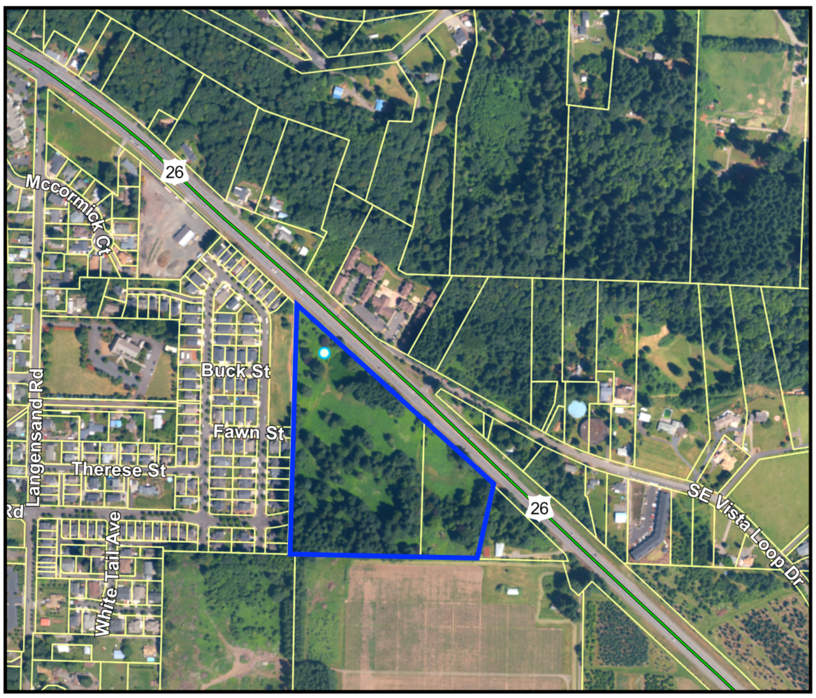
Deer Meadows Subdivision

Land Use Application

Submitted to the
City of Sandy



Submitted by
Dave Vandehey
Roll Tide Properties, Corp

June 2021

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Deer Meadows Subdivision
List of Exhibits

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Exhibit A
Incompleteness Letter

39250 Pioneer Blvd
Sandy, OR 97055
503-668-5533

WHERE INNOVATION MEETS ELEVATION

April 13, 2021

Dave Vandehey
Roll Tide Properties, Corp.
P.O. Box 703
Cornelius, OR 97133

Michael Robinson
Schwabe, Williamson &Wyatt
1211 SW Fifth Ave
Suite 1900
Portland, OR 97204

Tracy Brown
Tracy Brown Planning Consultants, LLC
17075 Fir Drive
Sandy, OR 97055

RE: NOTICE REGARDING INCOMPLETION OF SUBMISSION
FILE NUMBER: 21-014 SUB/TREE
PROJECT NAME: Deer Meadows Subdivision

☐ Application accepted as complete on: ________

☒ Application incomplete. The additional information necessary to consider your application is listed below. The application will be deemed complete upon submission of one of the following options:
1. All of the missing information;
2. Some of the missing information and written notice that no other information will be provided; or
3. Written notice that none of the missing information will be provided.

If one of the above listed options is not received by the city by the 180th day following submittal of your application, the application will be void per state law (ORS 227.178 (4)).

☐ Requested additional information filed on: __________________

Your March 31, 2021 letter makes a number of assertions regarding Oregon law, the status of the city's development code and the applicability or inapplicability of provisions in the development code and the city's comprehensive plan. This letter does not respond to those assertions, and the lack of a response does not mean or imply the city agrees with your assertions. This letter is being provided in accordance with ORS 227.178(2), and its purpose is solely to identify information that is missing from your application.

Following submission of your land use application (received on 3/31/2021), staff finds the application incomplete. Please submit two paper copies and a digital copy (to planning@ci.sandy.or.us) of the following:

- Narrative addressing relevant code sections in the Sandy Municipal Code
- Variance fees for all requested variances
- Density analysis for the different zoning districts

- Mailing labels and list of all property owners within 300 feet or 500 feet (notice distance depends on application type)
- Tentative plat map in compliance with Section 17.100.60
- Existing conditions plan
- Utility plan
- Grading plan
- Sidewalk and street improvements plan, including profiles for different street types
- Street tree plan (including driveway, hydrant, mailbox locations, and street light locations)
- On-street parking analysis plan (including locations of driveways, mailbox locations, and hydrants)
- Future street plan in compliance with Section 17.100.100
- Tree Inventory and Arborist Report completed by an ISA certified arborist
- Tree Retention Plan
- Traffic impact study
- $1,500 third party review fee
- Retaining wall profiles and material types
- Geotechnical report and topographic analysis
- Stormwater report/analysis
- Preliminary title search

Please call me at (503) 489-2163 or email koneill@ci.sandy.or.us if you have any questions.

Sincerely,

Kelly O'Neill Jr.
Development Services Director


Exhibit B
Project Narrative
26
Mccormick Ct
Buck St
Fawn St
Therese St
Langensand Rd
White Tail Ave
26
SE Vista Loop Dr

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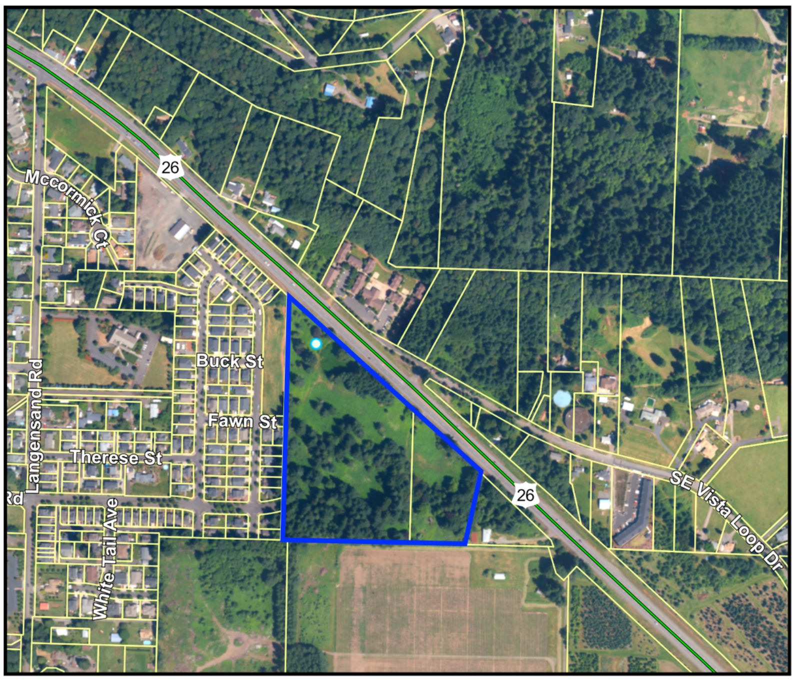
Project Narrative
For

Deer Meadows Subdivision
Sandy, Oregon 97055



Prepared by Tracy Brown Planning Consultants, LLC
June 2021

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Project Details

Project Location:	South side of Highway 26, east of Langensand Road 40808 and 41010 Highway 26, Sandy, OR
Legal Description:	Map 25E 18CD, Tax Lots 900 and 1000
Zoning District	R-1, Low Density Residential R-2, Medium Density Residential C-3, Village Commercial
Site Size	Total Site 15.91 acres (693,057 sq. ft.)

Applicant

Dave Vandehey
Roll Tide Properties, Corp.
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Cornelius, OR 97113
Phone: 503-327-6084
Email: Dave.vandehey@accessmax.com

Representative:

Civil Engineer / Surveyor
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All County Surveyors & Planners, Inc.
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Consultant Team:

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I. Introduction

The Applicant submitted this application on March 31, 2021 and the City deemed the application incomplete on April 13, 2021 (Exhibit A). The City was required to notify the Applicant of "exactly what information was missing" in its incompleteness determination.

This submittal provides all of the missing information as provided for in ORS 227.178(2)(a) and the date of receipt of the missing information starts the 120-day period in ORS 227.178(1). The applicable approval standards are those in effect on the date of the Application submittal because the application was made complete within 180 days of submittal as required by ORS 227.178(3)(a).

The applicant is submitting this application requesting land use approval to construct a Type II subdivision in compliance with existing zoning to include the following:

- 32 lots
- On-street parking
- Installation of public and franchise utilities
- Tree removal
- Fee-in-lieu payment for parkland dedication

The proposed subdivision is part of the planned progression of land use planning for this area of Sandy and involves the creation of "Needed Housing" under ORS 197.303(1) and 197.307(4) on land zoned for residential uses within the city limits of Sandy and is also a Limited Land Use Application under ORS 197.015(12)(a)(A). The Applicant is not waiving any rights under ORS 197.015(12), 197.195(1), 197.303(1), 197.307(4) and (6), 197.522, 227.173(2) and 227.175(4).

ORS 197.307(4) states, a local government may apply only clear and objective standards, conditions, and procedures regulating the creation of Need Housing, and such standards, conditions, and procedures cannot have the effect, either in themselves or cumulatively, of discouraging Needed Housing through unreasonable cost or delay.

Oregon Courts and the Land Use Board of Appeals (LUBA) have held that an approval standard is not clear and objective if it imposes on an applicant "subjective, value-laden analyses that are designed to balance or mitigate impacts of the development." *Rogue Valley Association of Realtors v. City of Ashland,* 35 Or LUBA 139, 158 (1998) aff'd, 158 Or App 1 (1999). ORS 197.831 places the burden on local governments to demonstrate that the standards and conditions placed on Needed Housing applications can be imposed only in a clear and objective manner. While this application addresses all standards and conditions, the Applicant reserves the right to object to the application of standards and conditions that are not clear and objective and does not waive its right to assert that the Needed Housing statues apply to this application. The exceptions in ORS 197.307(4)(a) and 197.307(5) do not apply to this application. ORS 197.307(7)(a) is controlled by ORS 197.307(4). The City has not taken an exception for Needed Housing under ORS 197.303(3).

II. General Project Description

The project site consists of two parcels located at Township 2 South, Range 5 East, Section 18CD, tax lots 900 and 1000. The property contains 15.91 acres and is vacant. The property contains a mix of R-1, Low Density Residential (5.512 acres), R-2, Medium Density Residential (4.739 acres), and C-3, Village Commercial (2.841 acres) zoning designations. In compliance with existing zoning, 30 lots (Lots 1 - 30) will be zoned R-1, one lot (Lot 31) R-2, and one lot (Lot 32) will contain both R-2 zoning (61%) and C-3 zoning (39%). Development on these lots will include construction of permitted outright use in these zones.

The property is gently sloping from the Southeast corner to the Northwest corner at Highway 26. The primary access to the development will be from an extension of Dubarko Road and Fawn Street to be extended onto the property. The applicant attended pre-application conferences with the City on March 17, 2021.

III. Application Approval Requests

The applicant requests the following approvals with this application:

- Type II Subdivision;
- Type II Tree Removal

IV. Items Submitted With This Application

- Land Use Application
- Preliminary Title Report
- Notification Mailing Labels
- Exhibit A - April 13, 2021 Incompleteness Letter
- Exhibit B - Project Narrative
- Exhibit C - Civil Plans
  - Sheet C1 - Cover Sheet and Future Street Plan
  - Sheet C2 - Preliminary Plat Map
  - Sheet C3 - Existing Conditions and Tree Retention Plan
  - Sheet C4 - Tree Tables
  - Sheet C5 - Master Street and Utility Plan
  - Sheet C6 - Preliminary Street Tree and Parking Plan
  - Sheet C7 - Preliminary. Grading and Erosion Control Plan
  - Sheet C8 - Slope Analysis
- Exhibit D - Preliminary Stormwater Report
- Exhibit E - Traffic Impact Study
- Exhibit F - Arborist Report
- Exhibit G - Wetland Determination

- Exhibit H - DSL Offsite Determination
- Exhibit I - Geotechnical and Slope Stability Investigation
- Exhibit J - Geotechnical Supplemental Review Letter

V. Review of Applicable Approval Criteria

Development applications are required to meet development standards set forth in the City of Sandy Development Code. This section addresses all applicable review criteria. Pertinent code provisions are cited below in regular text followed by a response describing how the proposal complies with this standard in *italics*. The following code chapters have been reviewed in this narrative:

Chapter		Title
17.18	-	Processing Applications
17.30	-	Zoning District
17.36	-	Low Density Residential (R-1)
17.38	-	Medium Density Residential (R-2
17.46	-	Village Commercial (C-3)
17.60	-	Flood and Slope Hazard Overlay
17.80	-	Additional Setbacks on Collector and Arterial Streets
17.82	-	Special Setbacks on Transit Streets
17.84	-	Improvements Required with Development
17.86	-	Parkland and Open Space
17.90	-	Design Standards
17.92	-	Landscaping and Screening
17.98	-	Parking, Loading, and Access Requirements
17.100	-	Land Division
17.102	-	Urban Forestry
15.30	-	Dark Sky Ordinance

CHAPTER 17.18 - PROCESSING APPLICATIONS

17.18.00 PROCEDURES FOR PROCESSING LAND USE APPLICATIONS

An application shall be processed under a Type I, II, III or IV procedure. The differences between the procedures are generally associated with the different nature of the decisions as described in Chapter 17.12.

When an application and proposed development is submitted, the Director shall determine the type of procedure the Code specifies for its processing and the potentially affected agencies.

If a development proposal requires an applicant to file a land use application with the city (e.g. a design review application) and if there is a question as to the appropriate procedure to guide review of the application (e.g. a Type II versus a Type III design review process), the question will be resolved in favor of the lower type number.

Response: *The applicant has submitted a Type II Needed Housing application in compliance with the clear and objective standards contained in the Sandy Development Code.*

17.18.20 PRE-APPLICATION CONFERENCE

A pre-application conference is required for all Type II, III, and IV applications unless the Director determines a conference is not needed.

Response: *A pre-application conference was held with the City to review the project on March 17, 2021. Based on input received at this meeting, modifications were made to the project layout.*

CHAPTER 17.30 - ZONING DISTRICTS

17.30.20 - RESIDENTIAL DENSITY CALCULATION PROCEDURE

The number of dwelling units permitted on a parcel of land is calculated after the determination of the net site area and the acreage of any restricted development areas (as defined by Chapter 17.60). Limited density transfers are permitted from restricted development areas to unrestricted areas consistent with the provisions of the Flood and Slope Hazard Area Overlay District, Chapter 17.60.

Response: *The applicant proposes developing a 32 lot subdivision in conformance with the existing zoning on the property. Thirty lots will be zoned R-1, Low Density Residential, one lot zoned R-2, Medium Residential, and one lot (lot will contain a combination of R-2 and C-3, Village Commercial zoning.*

The subject property contains a gross site area of 15.910 acres. After deducting dedicated rights-of-way and a public stormwater tract, the portion of the property zoned R-1 contains a net site area (NSA) of 5.64 acres, the R-2 zoned portion 4.74 acres, and the C-3 zoned portion 2.84 acres. The subject property also does not contain any restricted development areas (RDA) as defined by Chapter 17.60

The R-1 zone allows a minimum of 5 and a maximum of 8 units per net acre. The minimum density is calculated by multiplying the NSA x the required minimum density (5.64 acres x 5 = 28.2 units, rounded to 28 ***units****)*

The maximum density is determined by multiplying the NSA x the maximum allowed density (5.64 x 8 = 45.12, rounded to 45 ***units).***

As a result of these calculations the density range for the subject property is a <u>minimum of 28 units and a maximum of 45 dwelling units</u>. The proposal includes 30 units in conformance with this section.

The R-2 zone allows a minimum of 8 and a maximum of 14 units per net acre. The minimum density is calculated by multiplying the NSA x the required minimum density (4.74 acres x 8 = 37.92 units, rounded to 38 ***units****)*

The maximum density is determined by multiplying the NSA x the maximum allowed density (4.74 x 14 = 66.36, rounded to 66 ***units).***

As a result of these calculations the density range for the subject property is a <u>minimum of 38 units and a maximum of 66 dwelling units</u>. The exact number of dwelling units on the lots zoned R-2 will be determine with a future design review application.

The applicant has not determined the uses proposed for the C-3 zoned portion of the property at this time.

CHAPTER 17.36 - LOW DENSITY RESIDENTIAL (R-1)

17.36.00 - INTENT

This district is intended to implement the Low Density Residential Comprehensive Plan designation by providing for an urban level of low-density residential development. It is to be used as a transition between the Single Family Residential zone and the higher densities of a village. The uses are to be fully serviced by public facilities. This zone is intended to provide walkable neighborhoods with excellent linkage between residential areas, schools, parks, and village commercial. This zone is one of four zones included in a village area and is designed as a mixed-use neighborhood with a range of housing types and accessible commercial areas. Density shall not be less than 5 or more than 8 units per net acre.
Response: *As detailed in Chapter 17.30 above, the proposed 30 lots (Lots 1 - 30) complies with the density range in the R-1 zoning district.*

17.36.10 - PERMITTED USES

A. <u>Primary Uses Permitted Outright</u>:

1. Single detached dwelling subject to design standards in Chapter 17.90;
   Response: *The applicant proposes constructing uses permitted in this zoning district.*

17.36.30 - DEVELOPMENT STANDARDS

Type	Standard	Proposed
A. Minimum Lot Area - Single detached dwelling	5,500 square ft.	All lots comply
B. Minimum Average Lot Width - Single detached dwelling	50 ft	All lots comply
C. Minimum Lot Frontage	20 ft. except as allowed by Section 17.100.160	All lots comply
D. Minimum Average Lot Depth	No minimum	Complies
E. Setbacks (Main Building) Front yard Rear yard Side yard (interior) Corner Lot Garage	10 ft. minimum 15 ft. minimum 5 ft. minimum 10 ft. minimum on side abutting the street 22 ft. minimum for front vehicle access 15 ft. minimum if entrance is perpendicular to the street (subject to Section 17.90.220)	All lots are capable of complying with setbacks. Setbacks will be confirmed with submittal of building permits.

F. Projections into Required Setbacks	See Chapter 17.74	No projections are proposed at this time.
G. Accessory Structures in Required Setbacks	See Chapter 17.74	No accessory structures are proposed at this time.
H. Structure Height	35 ft. maximum	To be determined.
I. Building Site Coverage	No minimum	Complies
J. Off-Street Parking	See Chapter 17.98	See Chapter 17.98.

Response: *As shown on the plan set, all lots in the proposed subdivision contain at least 5,500 square feet, have at least 20 feet of street frontage, contain an average lot width of at least 50 feet as required. The details of development standards will be reviewed with submittal of building permits. Compliance with off-street parking requirements is reviewed in Chapter 17.98 below.*

17.36.40 - MINIMUM REQUIREMENTS

A. Must connect to municipal water.
Response: The applicant proposes extending water service to serve all dwellings in the new subdivision.

B. Must connect to municipal sewer if service is currently within 200 feet of the site. Sites more than 200 feet from municipal sewer, may be approved to connect to an alternative disposal system provided all of the following are satisfied:

1. A county septic permit is secured and a copy is provided to the city;
2. The property owner executes a waiver of remonstrance to a local improvement district and/or signs a deed restriction agreeing to complete improvements, including but not limited, to curbs, sidewalks, sanitary sewer, water, storm sewer or other improvements which directly benefit the property;
3. The minimum size of the property is one acre or is a pre-existing buildable lot, as determined by the city;
4. Site consists of a buildable parcel(s) created through dividing property in the city, which is less than five acres in size.
Response: *All proposed units will be connected to sanitary sewer service.*

C. The location of any real improvements to the property must provide for a future street network to be developed.
Response: *A new street network will be constructed to serve each dwelling as required.*

D. Must have frontage or approved access to public streets.

Response: All lots contain frontage on a public street and all lots will gain access from this street. No lots are proposed to gain access from Dubarko Drive or Street B.

17.36.50 - ADDITIONAL REQUIREMENTS

A. Design review as specified in Chapter 17.90 is required for all uses.
Response: *Only Section 17.90.150, Residential Design Standards of Chapter 17.90 is applicable to residential developments. This section is reviewed below.*

B. Lots with 40 feet or less of street frontage shall be accessed by a rear alley or a shared private driveway.
Response: *All lots contain at least 40 feet of street frontage or will gain access by a shared private drive.*

C. Lots with alley access may be up to 10 percent smaller than the minimum lot size of the zone.
Response: *No lots will be accessed by an alley.*

D. Zero Lot Line Dwellings: Prior to building permit approval, the applicant shall submit a recorded easement between the subject property and the abutting lot next to the yard having the zero setback. This easement shall be sufficient to guarantee rights for maintenance purposes of structures and yard, but in no case shall it be less than 5 feet in width.
Response: *No zero lot line dwellings are proposed.*

CHAPTER 17.38 - MEDIUM DENSITY RESIDENTIAL (R-2)

17.38.00 - This district intended to implement the Medium Density Residential Comprehensive Plan designation by providing for medium density single-family and multiple-family uses in suitable locations, where public sewer, water and other services are readily accessible. All development shall also provide access to the surrounding neighborhood with excellent linkage between residential areas, schools, and parks. Density shall not be less than 8 or more than 14 units per net acre.

Response: *The applicant is not proposing to construct any dwellings at this time. As discussed in Chapter 17.30 above, the density range for this property is 38 - 66 units as allowed in the R-2 zoning district. The exact number of units proposed within the allowed density range will be determine with a future design review application.*

17.38.10 - PERMITTED USES

A. Primary Uses Permitted Outright:
Response: *The applicant proposes constructing uses permitted outright in this zone.*

17.38.30 - DEVELOPMENT STANDARDS

Response: *As shown on the plan set, all lots are at least 50 feet wide and can provide minimum setbacks required by this section. Required off-street parking is shown on the plan set and is reviewed in more detail in Chapter 17.98 below.*

17.38.40 - MINIMUM REQUIREMENTS

A. Must connect to municipal water.
Response: The applicant proposes extending water service to serve all dwellings in the development.

B. Must connect to municipal sewer if service is currently within 200 feet of the site. Sites more than 200 feet from municipal sewer, may be approved to connect to an alternative disposal system provided all of the following are satisfied:
1. A county septic permit is secured and a copy is provided to the city;
2. The property owner executes a waiver of remonstrance to a local improvement district and/or signs a deed restriction agreeing to complete improvements, including but not limited, to curbs, sidewalks, sanitary sewer, water, storm sewer or other improvements which directly benefit the property;
3. The minimum size of the property is one acre or is a pre-existing buildable lot, as determined by the city;
4. Site consists of a buildable parcel(s) created through dividing property in the city, which is less than five acres in size.
Response: *There is no existing septic system needing decommissioning. All dwellings will be connected to the city's sanitary sewer system as required.*

C. The location of any real improvements to the property must provide for a future street network to be developed.
Response: *A future street plan is included with the application materials.*

D. Must have frontage or approved access to public streets.
Response: *Each new residence constructed in the subdivision will gain access from a public street.*

17.38.50 - ADDITIONAL REQUIREMENTS

A. Design review as specified in Chapter 17.90 is required for all uses.
Response: *The Residential Design Standard of Section 17.90.150, are applicable to residential development.*

B. Lots with 40 feet or less of street frontage shall be accessed by a rear alley or a shared private driveway.
Response: *All proposed lots contain greater than 40 feet of street frontage or will be accessed by a shared drive.*

C. Zero Lot Line Dwellings: Prior to building permit approval, the applicant shall submit a recorded easement between the subject property and the abutting lot

next to the yard having the zero setback. This easement shall be sufficient to guarantee rights for maintenance purposes of structures and yard, but in no case shall it be less than 5 feet in width.
Response: *No zero lot line dwellings are proposed.*

CHAPTER 17.46 - VILLAGE COMMERCIAL (C-3)

17.46.10 PERMITTED USES

Response: *The C-3 zone allows single family dwellings and multi-family dwellings units above, beside, or behind a commercial business, and a variety of commercial uses. At this time the applicant does not have a plan for developing this portion of the property. Development of this property will be reviewed with submittal of a future design review application.*

CHAPTER 17.56 - HILLSIDE DEVELOPMENT

17.56.10 APPLICABILITY

These regulations shall apply to any parcel with slopes greater than twenty-five percent (25%) as shown on the Hillside Development Overlay District Map or with slope hazards mapped by the Department of Geology and Mineral Industries (DOGAMI). This chapter shall apply only to activities and uses that require a building, grading, tree removal and/or land use permit.
Response: *As shown on the slope analysis submitted with the plan set, the site contains a small area of slopes exceeding 25%. As such, a Geotechnical Report is and a supplemental review letter are included with the submittal.*

CHAPTER 17.80 - ADDITIONAL SETBACKS ON COLLECTOR AND ARTERIAL STREETS

17.80.00 - INTENT

The requirement of additional special setbacks for development on arterial or collector is intended to provide better light, air and vision on more heavily traveled streets. The additional setback, on substandard streets, will protect collector and arterial streets and permit the eventual widening of streets.

17.80.10 - APPLICABLITY

These regulations apply to all collector and arterial streets as identified in the latest adopted Sandy Transportation System Plan (TSP). The Central Business District (C-1) is exempt from Chapter 17.80 regulations.

17.80.20 - SPECIFIC SETBACKS

Any structure located on streets listed above or identified in the Transportation System Plan as arterials or collectors shall have a minimum setback of 20 feet measured from the property line. This applies to applicable front, rear and side yards.
Response: *The City's Transportation System Plan identifies Dubarko Road as a "Minor Arterial" street, Highway 26 a "Major Arterial", and Street B terminating to tax lot 900 as a "Collector Street". The Preliminary Plat shows a 20 foot setback for all lots adjacent to these roads. The requirements of this section will be confirmed with construction of dwellings on the adjacent lots.*

CHAPTER 17.82 - SPECIAL SETBACKS ON TRANSIT STREETS

17.82.10 APPLICABILITY

This chapter applies to all residential development located adjacent to a transit street. A transit street is defined as any street designated as a collector or arterial, unless otherwise designated in the Transit System Plan.

Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "adjacent","to a transit street", "unless otherwise designated in the Transit System Plan" as used in this section are subjective words or not properly incorporated into the Development Code. The proposed subdivision is located adjacent to Highway 26, a major arterial, Dubarko Road, a Minor Arterial and Street B, a designated Collector in the City's Transportation System Plan.*

17.82.20 BUILDING ORIENTATION

A. All residential dwellings shall have their primary entrances oriented toward a transit street rather than a parking area, or if not adjacent to a transit street, toward a public right-of-way or private walkway which leads to a transit street.

Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "primary entrances" and "oriented toward" as used in this section are subjective words. Lot 2 will be accessed from Street A and Lots 27 - 30 will be accessed from Street C, an access drive constructed for this purpose. Lot 31 also with frontage on Street B will be accessed from Street C. All dwellings constructed on these lots can be designed in compliance with this standard as required.*

B. Dwellings shall have a primary entrance connecting directly between the street and building interior. A clearly marked, convenient, safe and lighted pedestrian route shall be provided to the entrance, from the transit street. The pedestrian route shall consist of materials such as concrete, asphalt, stone, brick, permeable pavers, or other materials as approved by the Director. The pedestrian path shall be permanently affixed to the ground with gravel subsurface or a comparable subsurface as approved by the Director.

Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "primary entrances" and "clearly marked, convenient, and safe", and "comparable subsurface as approved" as used in this section are subjective words. All dwellings constructed on Lots 2 and 27 - 31 can be designed in compliance with this standard as required.*

C. Primary dwelling entrances shall be architecturally emphasized and visible from the street and shall include a covered porch at least 5 feet in depth.

__Response:__ All dwellings constructed on Lots 2 and 27 - 31 can be designed in compliance with this standard as required.

D. If the site has frontage on more than one transit street, the dwelling shall provide one main entrance oriented to a transit street or to a corner where two transit streets intersect.
__Response:__ Only Lot 30 contains frontage on more than one transit street (Dubarko Drive and Street B). The details of this design will be determined during review of a building permit application for this lot.

CHAPTER 17.84 - IMPROVEMENTS REQUIRED WITH DEVELOPMENT

17.84.20 - TIMING OF IMPROVEMENTS

A. All improvements required by the standards in this chapter shall be installed concurrently with development, as follows:
   1. Where a land division is proposed, each proposed lot shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to approval of the final plat.
   __Response:__ All lots in the proposed subdivision will be required to install public and franchise utility improvements or financially guarantee these improvements prior to final plat approval.

   2. Where a land division is not proposed, the site shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to temporary or final occupancy of structures.
   __Response:__ This section is not applicable because a land division is proposed.

B. Where specific approval for a phasing plan has been granted for a planned development and/or subdivision, improvements may similarly be phased in accordance with that plan.
__Response:__ The applicant proposes constructing the subdivision in a single phase.

17.84.30 - PEDESTRIAN AND BICYCLIST REQUIREMENTS

A. Sidewalks shall be required along both sides of all arterial, collector, and local streets, as follows:
   1. Sidewalks shall be a minimum of 5 ft. wide on local streets. The sidewalks shall be separated from curbs by a tree planting area that provides separation between sidewalk and curb, unless modified in accordance with Subsection 3 below.
   __Response:__ All proposed sidewalks on the internal (local) streets will be five feet wide as required and separated from curbs by a tree planting area.

2. Sidewalks along arterial and collector streets shall be separated from curbs with a planting area, except as necessary to continue an existing curb-tight sidewalk. The planting area shall be landscaped with trees and plant materials approved by the City. The sidewalks shall be a minimum of 6 ft. wide. ***Response:*** *As shown on Sheet C5, six-foot sidewalks are proposed to be constructed along Dubarko Road, a minor arterial and on Street B, a collector street. The cross-section for these street improvements includes a planter strip as required.*

3. Sidewalk improvements shall be made according to city standards, unless the city determines that the public benefit in the particular case does not warrant imposing a severe adverse impact to a natural or other significant feature such as requiring removal of a mature tree, requiring undue grading, or requiring modification to an existing building. Any exceptions to the standards shall generally be in the following order.
   a) Narrow landscape strips
   b) Narrow sidewalk or portion of sidewalk to no less than 4 feet in width
   c) Eliminate landscape strips
   d) Narrow on-street improvements by eliminating on-street parking
   e) Eliminate sidewalks

   Response: *No exceptions or modifications to the sidewalk standards of this section are requested with this application.*

4. The timing of the installation of sidewalks shall be as follows:
   a) Sidewalks and planted areas along arterial and collector streets shall be installed with street improvements, or with development of the site if street improvements are deferred.
   b) Sidewalks along local streets shall be installed in conjunction with development of the site, generally with building permits, except as noted in (c) below.
   c) Where sidewalks on local streets abut common areas, drainageways, or other publicly owned or semi-publicly owned areas, the sidewalks and planted areas shall be installed with street improvements. ***Response:*** *The applicant intends to construct sidewalks along Dubarko Road and Street B prior to final plat approval, or at the time of home construction whichever the city prefers. All other sidewalks are proposed to be constructed at the time of home construction.*

B. Safe and convenient pedestrian and bicyclist facilities that strive to minimize travel distance to the extent practicable shall be provided in conjunction with new development within and between new subdivisions, planned developments, commercial developments, industrial areas, residential areas, public transit stops, school transit stops, and neighborhood activity centers such as schools and parks, as follows:

1. For the purposes of this section, "safe and convenient" means pedestrian and bicyclist facilities that: are reasonably free from hazards which would

interfere with or discourage travel for short trips; provide a direct route of travel between destinations; and meet the travel needs of pedestrians and bicyclists considering destination and length of trip.
Response: *No pedestrian or bicycle facilities other than sidewalks and on-street bicycle lanes have been identified or are any proposed.*

2. To meet the intent of "B" above, right-of-ways connecting cul-de-sacs or passing through unusually long or oddly shaped blocks shall be a minimum of 15 ft. wide with 8 feet of pavement.
Response: *As noted above, no off-street facilities are proposed.*

3. 12 feet wide pathways shall be provided in areas with high bicycle volumes or multiple use by bicyclists, pedestrians, and joggers.
Response: *No facilities of this type are proposed with the subdivision.*

4. Pathways and sidewalks shall be encouraged in new developments by clustering buildings or constructing convenient pedestrian ways. Pedestrian walkways shall be provided in accordance with the following standards:
   a) The pedestrian circulation system shall be at least five feet in width and shall connect the sidewalk on each abutting street to the main entrance of the primary structure on the site to minimize out of direction pedestrian travel.
   b) Walkways at least five feet in width shall be provided to connect the pedestrian circulation system with existing or planned pedestrian facilities which abut the site but are not adjacent to the streets abutting the site.
   c) Walkways shall be as direct as possible and avoid unnecessary meandering.
   Response: *No pedestrian pathways are proposed at this time, only sidewalks adjacent to public streets.*

   d) Walkway/driveway crossings shall be minimized. Internal parking lot design shall maintain ease of access for pedestrians from abutting streets, pedestrian facilities, and transit stops.
   e) With the exception of walkway/driveway crossings, walkways shall be separated from vehicle parking or vehicle maneuvering areas by grade, different paving material, painted crosshatching or landscaping. They shall be constructed in accordance with the sidewalk standards adopted by the City. (This provision does not require a separated walkway system to collect drivers and passengers from cars that have parked on site unless an unusual parking lot hazard exists).
   f) Pedestrians amenities such as covered walk-ways, awnings, visual corridors and benches will be encouraged. For every two benches provided, the minimum parking requirements will be reduced by one, up to a maximum of four benches per site. Benches shall have direct access to the circulation system.

Response: *The requirements of these sections are not applicable to the proposed subdivision.*

C. Where a development site is traversed by or adjacent to a future trail linkage identified within the Transportation System Plan, improvement of the trail linkage shall occur concurrent with development. Dedication of the trail to the City shall be provided in accordance with 17.84.80.
Response: *No trails are identified in the City's Transportation System Plan or Parks Master Plan on the subject property.*

D. To provide for orderly development of an effective pedestrian network, pedestrian facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).
Response: *No pedestrian facilities, except sidewalks are proposed.*

E. To ensure improved access between a development site and an existing developed facility such as a commercial center, school, park, or trail system, the Planning Commission or Director may require off-site pedestrian facility improvements concurrent with development.
Response: *No off-site pedestrian improvements have been identified.*

17.84.40 - TRANSIT AND SCHOOL BUS TRANSIT REQUIREMENTS

A. Development sites located along existing or planned transit routes shall, where appropriate, incorporate bus pull-outs and/or shelters into the site design. These improvements shall be installed in accordance with the guidelines and standards of the transit agency. School bus pull-outs and/or shelters may also be required, where appropriate, as a condition of approval for a residential development of greater than 50 dwelling units where a school bus pick-up point is anticipated to serve a large number of children.
Response: *A small portion of the subject property is located along Dubarko Road, a minor arterial. No required transit improvements were identified during the pre-application conference for this development.*

B. New developments at or near existing or planned transit or school bus transit stops shall design development sites to provide safe, convenient access to the transit system, as follows:
   1. Commercial and civic use developments shall provide a prominent entrance oriented towards arterial and collector streets, with front setbacks reduced as much as possible to provide access for pedestrians, bicycles, and transit.
   2. All developments shall provide safe, convenient pedestrian walkways between the buildings and the transit stop, in accordance with the provisions of 17.84.30 B.
   Response: *The proposed subdivision complies with the requirements of this section.*

17.84.50 - STREET REQUIREMENTS

A. Transportation Impact Study (No Dwellings). For development applications that do not propose any dwelling units, the City may require a transportation impact study that evaluates the impact of the proposed development on the transportation system. Unless the City does not require a transportation impact study, the applicant shall prepare the study in accordance with the following:

1. A proposal establishing the scope of the study shall be submitted for review to the City Traffic Engineer. The scope shall reflect the magnitude of the project in accordance with accepted transportation planning and engineering practices. Large projects shall assess intersections and street segments where the development causes increases of more than 20 vehicles in either the AM or PM peak hours. Once the City Traffic Engineer has approved the scope of the study, the applicant shall submit the results of the study as part of its development application. Failure to submit a required study will result in an incomplete application. A traffic impact study shall bear the seal of a Professional Engineer licensed in the State of Oregon and qualified in traffic or civil engineering.
2. If the study identifies level-of-service conditions less than the minimum standard established in the development code or the Sandy Transportation System Plan, or fails to demonstrate that average daily traffic on existing or proposed streets will meet the ADT standards established in the development code, the applicant shall propose improvements and funding strategies for mitigating identified problems or deficiencies that will be implemented concurrent with the proposed development.

__Response__: At this time the proposal only includes dwellings and this section is not applicable. Future development of Lot 32 with commercial uses may trigger compliance with this section.

B. Transportation Impact Study (Dwellings). For development applications that propose dwelling units, an applicant must submit a transportation impact study unless the application is exempt from this requirement pursuant to subsection (B)(6), below. Failure to submit the study will result in an incomplete application. A traffic impact study shall bear the seal of a Professional Engineer licensed in the State of Oregon and qualified in traffic or civil engineering. The applicant shall prepare the study in accordance with the following:

__Response__: A traffic impact study is included with this application.

1. The study area must include all existing and proposed site accesses and all existing and proposed streets and intersections where the development adds more than 20 vehicles during any peak hour as determined by using the most recent edition of the Institute of Transportation Engineers Trip Generation Manual. The determination of peak hour vehicle addition shall include the cumulative impact of the proposed development and development on abutting properties that received a certificate of occupancy or recorded a plat within the past 5 years.

2. The study must analyze existing conditions and projected conditions upon completion of the proposed development.
3. The study must be performed for the weekday a.m. peak hour (one hour between 7 a.m. and 9 a.m.) and p.m. peak hour (one hour between 4 p.m. and 6 p.m.). Analysis of other time periods may be required for uses that generate their highest traffic volumes at other times of the day or on weekends.
4. The study must demonstrate that the transportation impacts from the proposed development will comply with the City's level-of-service and average daily traffic standards and the Oregon Department of Transportation's mobility standard.
5. If the study identifies level-of-service conditions less than the minimum standard established in the development code or the Sandy Transportation System Plan, or fails to demonstrate that average daily traffic on existing or proposed streets will meet the ADT standards established in the development code or fails to meet the Oregon Department of Transportation's mobility standard, the applicant shall propose improvements and funding strategies for mitigating identified problems or deficiencies that will be implemented concurrent with the proposed development.
   Response: *A traffic impact study developed in compliance with the requirements of this section is included with the application.*

6. A transportation impact study is not required under this section if:
   a) The cumulative impact of the proposed development and development on abutting properties that received a certificate of occupancy or recorded a plat within the past 5 years will generate no more than 20 vehicle trips in any weekday a.m. or p.m. peak hour as determined by using the most recent edition of the Institute of Transportation Engineers Trip Generation Manual; or
   b) The proposed development completed a transportation impact study at the time of annexation within the past 5 years and that study assessed the impact of the same or more dwelling units than proposed under the new land use action; or
   c) The application only proposes to convert an existing detached single family dwelling to a duplex.
      Response: *This section is not applicable as a traffic impact study is included.*

C. Transportation Impact Study (Dwellings) – Discretionary Track. As an alternative to the process outlined in Section 17.84.50(B), an applicant may choose to follow the process in Section 17.84.50(A).
   Response: *This section is not applicable.*

D. Location of new arterial streets shall conform to the Transportation System Plan in accordance with the following:
   1. Arterial streets should generally be spaced in one-mile intervals.

2. Traffic signals should generally not be spaced closer than 1500 ft. for reasonable traffic progression.
   Response: *No new arterial streets are required as part of this application.*

E. Local streets shall be designed to discourage through traffic. NOTE: for the purposes of this section, "through traffic" means the traffic traveling through an area that does not have a local origination or destination. To discourage through traffic and excessive vehicle speeds the following street design characteristics shall be considered, as well as other designs intended to discourage traffic:
   1. Straight segments of local streets should be kept to less than a quarter mile in length. As practical, local streets should include traffic calming features, and design features such as curves and "T" intersections while maintaining pedestrian connectivity.
   2. Local streets should typically intersect in "T" configurations rather than 4-way intersections to minimize conflicts and discourage through traffic. Adjacent "T" intersections shall maintain a minimum of 150 ft. between the nearest edges of the 2 rights-of-way.
      Response: *The proposed subdivision does not include any long straight street segments. All streets have been designed in accordance with the requirements of these sections.*

   3. Cul-de-sacs should generally not exceed 400 ft. in length nor serve more than 20 dwelling units, except in cases where existing topography, wetlands, or drainage systems or other existing features necessitate a longer cul-de-sac in order to provide adequate access to an area. Cul-de-sacs longer than 400 feet or developments with only one access point may be required to provide an alternative access for emergency vehicle use only, install fire prevention sprinklers, or provide other mitigating measures, determined by the City.
      Response: *Two cul-de-sac streets are proposed (the extension of Fawn Street and Street A north of Fawn Street). The Fawn Street extension is 194 feet long and will serve 12 lots. The Street A cul-de-sac north of Fawn Street is 389 feet long and will serve 10 lots. Both of these streets are less than 400 feet long and will serve fewer than 20 dwelling units in compliance with this standard.*

F. Development sites shall be provided with access from a public street improved to City standards in accordance with the following:
   1. Where a development site abuts an existing public street not improved to City standards, the abutting street shall be improved to City standards along the full frontage of the property concurrent with development.
      Response: *All lots will gain access from an abutting street improved to city standards.*

2. Half-street improvements are considered the minimum required improvement. Three quarter-street or full-street improvements shall be required where traffic volumes generated by the development are such that a half-street improvement would cause safety and/or capacity problems. Such a determination shall be made by the City Engineer.
   Response: *All new streets are proposed as full street improvements.*

3. To ensure improved access to a development site consistent with policies on orderly urbanization and extension of public facilities the Planning Commission or Director may require off-site improvements concurrent with development. Off-site improvement requirements upon the site developer shall be reasonably related to the anticipated impacts of the development.
   Response: *No off-site improvements have been identified or are warranted with construction of this subdivision.*

4. Reimbursement agreements for 3/4 street improvements (i.e., curb face to curb face) may be requested by the developer per Chapter 12 of the SMC.
   Response: *All streets are proposed as full streets. No 3/4 streets are proposed.*

5. A ½ street improvement includes curb and pavement 2 feet beyond the center line of the right-of-way. A ¾ street improvement includes curbs on both sides of the side and full pavement between curb faces.
   Response: *No 1/2 street improvements are proposed.*

G. As necessary to provide for orderly development of adjacent properties, public streets installed concurrent with development of a site shall be extended through the site to the edge of the adjacent property(ies) in accordance with the following:
   1. Temporary dead-ends created by this requirement to extend street improvements to the edge of adjacent properties may be installed without turn-arounds, subject to the approval of the Fire Marshal.
   2. In order to assure the eventual continuation or completion of the street, reserve strips may be required.
      Response: *The proposed street layout results in one temporary dead-end street (Street B, "New Street") that will be stubbed to the southern property line of the subject property. The applicant is aware the Fire Marshal will need to review the proposal. In addition, the applicant is aware that reserve strips will likely be required at the end of this street.*

H. Where required by the Planning Commission or Director, public street improvements may be required through a development site to provide for the logical extension of an existing street network or to connect a site with a nearby neighborhood activity center, such as a school or park. Where this creates a land division incidental to the development, a land partition shall be completed concurrent with the development.

__Response:__ The applicant does not anticipate that any public street improvements will be required to be extended beyond the site boundaries. No such improvements were identified at the pre-application conference.

I. Except for extensions of existing streets, no street names shall be used that will duplicate or be confused with names of existing streets. Street names and numbers shall conform to the established pattern in the surrounding area and be subject to approval of the Director.
__Response:__ The proposal contains five street segments: Dubarko Road, an extension of Fawn Street, and Streets A, B, and C. The City will need to determine if the street extension of Fawn Street will carry the Fawn Street name or a different name.

J. Location, grades, alignment, and widths for all public streets shall be considered in relation to existing and planned streets, topographical conditions, public convenience and safety, and proposed land use. Where topographical conditions present special circumstances, exceptions to these standards may be granted by the City Engineer provided the safety and capacity of the street network is not adversely affected. The following standards shall apply:

1. Location of streets in a development shall not preclude development of adjacent properties. Streets shall conform to planned street extensions identified in the Transportation Plan and/or provide for continuation of the existing street network in the surrounding area.
   __Response:__ A future street plan is submitted with this application on Sheet C1. This plan shows that the proposal will facilitate and not preclude development on adjacent properties.

2. Grades shall not exceed 6 percent on arterial streets, 10 percent on collector streets, and 15 percent on local streets.
   __Response:__ Dubarko, a minor arterial is proposed to have a grade of 6%, the extension of Fawn Street, a local street will have a grade of 4%, Street A, a local street, will have a grade south of Fawn Street of 3% and a grade north of Fawn Street of 2% to 11%, Street B ("New Street") will have a grade of 4% to 6%, and Street C will have a grade of 7%. All streets comply with these standards.

3. As far as practical, arterial streets and collector streets shall be extended in alignment with existing streets by continuation of the street centerline. When staggered street alignments resulting in "T" intersections are unavoidable, they shall leave a minimum of 150 ft. between the nearest edges of the two rights-of-way.
   __Response:__ Dubarko Road, a minor arterial will be extended by a continuation of the centerline of this existing street. Street B ("New Road") is not an extension of an existing street. The proposal complies with this standard.

4. Centerline radii of curves shall not be less than 500 ft. on arterial streets, 300 ft. on collector streets, and 100 ft. on local streets.
   Response: *As shown on Sheet 2, Dubarko Road, a minor arterial is designed with a centerline radii of 500 feet, Street B, a collector, will have a centerline radii of 300 feet, and the extension of Fawn Street, a local street, will have a centerline radii of 100 feet. All of these streets comply with this standard.*

5. Streets shall be designed to intersect at angles as near as practicable to right angles and shall comply with the following:
   a) The intersection of an arterial or collector street with another arterial or collector street shall have a minimum of 100 ft. of straight (tangent) alignment perpendicular to the intersection.
      Response: *The intersection of Street B with Dubarko Drive is designed in compliance with this standard.*

   b) The intersection of a local street with another street shall have a minimum of 50 ft. of straight (tangent) alignment perpendicular to the intersection.
      Response: *All local streets intersect in compliance with this standard.*

   c) Where right angle intersections are not possible, exceptions can be granted by the City Engineer provided that intersections not at right angles have a minimum corner radius of 20 ft. along the right-of-way lines of the acute angle.
      Response: *All intersections are designed to intersect at a right angle or very close to a right angle.*

   d) Intersections with arterial streets shall have a minimum curb corner radius of 20 ft. All other intersections shall have a minimum curb corner radius of 10 ft.
      Response: *As shown on submitted plans, all street intersections comply with this standard.*

6. Right-of-way and improvement widths shall be as specified by the Transportation System Plan. Exceptions to those specifications may be approved by the City Engineer to deal with specific unique physical constraints of the site.
   Response: *The proposed right-of-way width of Dubarko Road and Street B are proposed at 64 feet and Street A and the Fawn Street extension are proposed at 50 feet. Street C is proposed as an Access Drive to have a 40 foot right-of-way in compliance this standard.*

K. Private streets may be considered within a development site provided all the following conditions are met:
   Response: *No private streets are proposed.*

17.84.60 - PUBLIC FACILITY EXTENSIONS

A. All development sites shall be provided with public water, sanitary sewer, broadband (fiber), and storm drainage.
__Response__: The submitted Utility Plan (Sheet C5) shows the location of proposed public water, sanitary sewer, and stormwater drainage facilities. Broadband fiber service will be detailed with construction plans.

B. Where necessary to serve property as specified in “A” above, required public facility installations shall be constructed concurrent with development.
__Response__: All of the utilities identified above will be constructed concurrent with the development.

C. Off-site public facility extensions necessary to fully serve a development site and adjacent properties shall be constructed concurrent with development.
__Response__: The applicant will extend all utilities as necessary to serve the development as required by this section.

D. As necessary to provide for orderly development of adjacent properties, public facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).
__Response__: As shown on the submitted Sheet C5, Master Street and Utility Plan, all public facilities are proposed to be extended through the site to the edge of adjacent properties.

E. Private on-site sanitary sewer and storm drainage facilities may be considered provided all the following conditions exist:
__Response__: No private sanitary sewer or storm drainage facilities are proposed.

17.84.70 - PUBLIC IMPROVEMENT PROCEDURES

__Response__: The applicant is aware of and intends to comply with the requirements of this section.

17.84.80 - FRANCHISE UTILITY INSTALLATIONS

These standards are intended to supplement, not replace or supersede, requirements contained within individual franchise agreements the City has with providers of electrical power, telephone, cable television, and natural gas services (hereinafter referred to as “franchise utilities”).

A. Where a land division is proposed, the developer shall provide franchise utilities to the development site. Each lot created within a subdivision shall have an individual service available or financially guaranteed prior to approval of the final plat.
__Response__: Franchise utilities will be provided to all lots within the proposed subdivision as required. The location of these utilities will be identified on construction plans and installed or guaranteed prior to final plat approval.

B. Where necessary, in the judgment of the Director, to provide for orderly development of adjacent properties, franchise utilities shall be extended through the site to the edge of adjacent property(ies), whether or not the development involves a land division.
__Response__: The applicant does not anticipate extending franchise utilities beyond the site.

C. The developer shall have the option of choosing whether or not to provide natural gas or cable television service to the development site, providing all of the following conditions exist:
   1. Extension of franchise utilities through the site is not necessary for the future orderly development of adjacent property(ies);
   2. The development site remains in one ownership and land division does not occur (with the exception of land divisions that may occur under the provisions of 17.84.50 F above); and
   3. The development is non-residential.
   __Response__: The applicant anticipates installing natural gas and will determine if the installation of cable television service is required.

D. Where a land division is not proposed, the site shall have franchise utilities required by this section provided in accordance with the provisions of 17.84.70 prior to occupancy of structures.
__Response__: A land division is proposed, as such this section is not applicable. With the future review of the proposed multi-family units, this section will be applicable.

E. All franchise utility distribution facilities installed to serve new development shall be placed underground except as provided below. The following facilities may be installed aboveground:
   1. Poles for street lights and traffic signals, pedestals for police and fire system communications and alarms, pad mounted transformers, pedestals, pedestal mounted terminal boxes and meter cabinets, concealed ducts, substations, or facilities used to carry voltage higher than 35,000 volts;
   2. Overhead utility distribution lines may be permitted upon approval of the City Engineer when unusual terrain, soil, or other conditions make underground installation
   impracticable. Location of such overhead utilities shall follow rear or side lot lines wherever feasible.
   __Response__: All franchise utilities will be installed underground with the exception of street lights as allowed by this section.

F. The developer shall be responsible for making necessary arrangements with franchise utility providers for provision of plans, timing of installation, and payment for services installed. Plans for franchise utility installations shall be submitted concurrent with plan submittal for public improvements to facilitate review by the City Engineer.

Response: *The developer will make all necessary arrangements with franchise utility providers as required by this section.*

G. The developer shall be responsible for installation of underground conduit for street lighting along all public streets improved in conjunction with the development in accordance with the following:
   1. The developer shall coordinate with the City Engineer to determine the location of future street light poles. The street light plan shall be designed to provide illumination meeting standards set by the City Engineer.
   2. The developer shall make arrangements with the serving electric utility for trenching prior to installation of underground conduit for street lighting.
   Response: *The developer will install underground conduit for street lighting in accordance with the requirements of this section.*

17.84.90 - LAND FOR PUBLIC PURPOSES

A. Easements for public sanitary sewer, water, storm drain, pedestrian and bicycle facilities shall be provided whenever these facilities are located outside a public right-of-way in accordance with the following:
   1. When located between adjacent lots, easements shall be provided on one side of a lot line.
   2. The minimum easement width for a single utility is 15 ft. The minimum easement width for two adjacent utilities is 20 ft. The easement width shall be centered on the utility to the greatest extent practicable. Wider easements may be required for unusually deep facilities.
   Response: *There is an existing 15-foot wide water easement bisecting the site along the western line of Lot 32. A new 10-foot public storm easement is proposed along the back of Lots 3 and Lots 9 - 12 and between Lots 27 and 28. The rest of public facilities will be located within the public right-of-way.*

B. Public utility easements with a minimum width of 5 feet shall be provided adjacent to all street rights-of-way for franchise utility installations.
Response: *Despite the language in this section, eight foot wide public utility easements will be provided along all lots adjacent to street rights-of-way for future franchise utility installations.*

C. Where a development site is traversed by a drainageway or water course, a drainage way dedication shall be provided to the City.
Response: *The site is not traversed by a drainage way or water course and this section is not applicable.*

D. Where a development is traversed by, or adjacent to, a future trail linkage identified within the Transportation System Plan, dedications of suitable width to accommodate the trail linkage shall be provided. This width shall be determined by the City Engineer, considering the type of trail facility involved.

Response: *No future trail is identified in the TSP on the subject property and no trails are proposed.*

E. Where existing rights-of-way and/or easements within or adjacent to development sites are nonexistent or of insufficient width, dedications may be required. The need for and widths of those dedications shall be determined by the City Engineer.
Response: *The only existing right-of-way adjacent to the development is Highway 26. No additional right-of-way dedication along this facility has been identified.*

F. Where easement or dedications are required in conjunction with land divisions, they shall be recorded on the plat. Where a development does not include a land division, easements and/or dedications shall be recorded on standard document forms provided by the City Engineer.
Response: *All easements and dedications will be identified on the plat as required.*

17.84.100 - MAIL DELIVERY FACILITIES

Response: *The location and type of mail delivery facilities will be coordinated with the City Engineer and the Post Office as part of the construction plan process.*

CHAPTER 17.86 - PARKLAND and OPEN SPACE

17.86.00 - INTENT

The availability of parkland and open space is a critical element in maintaining and improving the quality of life in Sandy. Land that features trees, grass and vegetation provides not only an aesthetically pleasing landscape but also buffers incompatible uses, and preserves sensitive environmental features and important resources. Parks and open space, together with support facilities, also help to meet the active and passive recreational needs of the population of Sandy. This chapter implements policies of Goal 8 of the Comprehensive Plan and the Parks Master Plan by outlining provisions for parks and open space in the City of Sandy.
Response: *The city's adopted Parks Master Plan and Comprehensive Plan map shows a conceptual neighborhood park located in the vicinity of the subject property and the property directly west. The subdivision approval criteria in Sandy Development Code Section 17.100.60 do not incorporate the 1997 Parks Master Plan. As such, the sections in this chapter do not apply to this application. The applicant will pay a fee in lieu of parkland dedication in accordance with Subsection 2 of this Section. A one acre park tract dedicated as part of the Deer Pointe 2 Subdivision in 2007 appears to have satisfied this plan.*

17.86.10 - MINIMUM PARKLAND DEDICATION REQUIREMENTS

Parkland Dedication: New residential subdivisions, planned developments, multifamily or manufactured home park developments shall be required to provide parkland to serve existing and future residents of those developments.

Response: *The proposed residential subdivision is subject to the provisions of this chapter.*

1. The required parkland shall be dedicated as a condition of approval for the following:
   a. Tentative plat for a subdivision or partition;
   b. Planned Development conceptual or detailed development plan;
   c. Design review for a multi-family development or manufactured home park; and
   d. Replat or amendment of any site plan for multi-family development or manufactured home park where dedication has not previously been made or where the density of the development involved will be increased.
   Response: *No public parkland has been identified on the tentative plat.*

2. Calculation of Required Dedication: The required parkland acreage to be dedicated is based on a calculation of the following formula rounded to the nearest 1/100 (0.00) of an acre:
   Required parkland dedication (acres) = (proposed units) x (persons/unit) x 0.0043 (per person park land dedication factor)
   Response: *Of the proposed 32 lots, 30 are zoned R-1, one is zoned R-2, and one is proposed to contain both R-2 and C-3 zoning. The exact unit count is not known at this time. The applicant is aware that payment of a fee in lieu of parkland dedication will be based on the proposed unit count.*

17.86.20 - MINIMUM PARKLAND STANDARDS

Land required or proposed for parkland dedication shall be contained within a continuous unit and must be suitable for active use as a neighborhood or mini-park, based on the following criteria:

1. Homes must front on the parkland as shown in the example below:
2. The required dedication shall be contained as a contiguous unit and not separated into pieces or divided by roadways.
3. The parkland must be able to accommodate play structures, play fields, picnic areas, or other active park use facilities. The average slope of the active use parkland shall not exceed 15%.

Response: *The applicant does not propose dedicating any parkland with this development. The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The minimum parkland standards listed in this section contain subjective language. The words "continuous unit", "suitable", "contiguous", and "accommodate" are subjective words as used in this section. No parkland dedication is proposed with this application.*

17.86.40 - CASH IN LIEU OF DEDICATION

At the city's discretion only, the city may accept payment of a fee in lieu of land dedication. The city may require payment in lieu of land when the park land to be dedicated is less than 3 acres. A payment in lieu of land dedication is separate from Park Systems Development Charges, and is not eligible for a credit of Park Systems Development Charges. The amount of the fee in lieu of land dedication (in dollars per acre) shall be set by City Council Resolution, and it shall be based on the typical market value of developed property (finished lots) in Sandy net of related development costs.

1. The following factors shall be used in the choice of whether to accept land or cash in lieu:
   a. The topography, geology, access to, parcel size, and location of land in the development available for dedication;
   b. Potential adverse/beneficial effects on environmentally sensitive areas;
   c. Compatibility with the Parks Master Plan, Public Facilities element of the Comprehensive Plan, and the City of Sandy Capital Improvements Program in effect at the time of dedication;
   d. Availability of previously acquired property; and
   e. The feasibility of dedication.
2. Cash in lieu of parkland dedication shall be paid prior to approval of the final plat or as specified below:
   a. 50 percent of the payment shall be paid prior to final plat approval, and
   b. The remaining 50 percent of the payment pro-rated equally among the lots, plus an administrative surcharge as determined by the City Council through a resolution, will constitute a lien against the property payable at the time of sale.

Response*: The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The choice between dedication and payment of a fee in lieu of land dedication is subjective, as is the procedure to make the recommendation on the choice. The words "topography, geology, access to, parcel size, and location of land in the development available for dedication" and "potential adverse/beneficial effects on environmentally sensitive areas", "compatibility with", "availability" and "feasibility" as used in this section are subjective. The subdivision approval criteria in Sandy Development Code Section 17.100.60 do not incorporate the 1997 Parks Master Plan. As such, the sections above do not apply to this application. The applicant will pay a fee in lieu of parkland dedication in accordance with Subsection 2 of this Section.*

17.86.50 - MINIMUM STANDARDS FOR OPEN SPACE DEDICATION

The applicant through a subdivision or design review process may propose the designation and protection of open space areas as part of that process. This open space will not, however, be counted toward the parkland dedication requirement of Sections 17.86.10 through 17.86.40.

1. The types of open space that may be provided are as follows:
   a. Natural Areas: areas of undisturbed vegetation, steep slopes, stream corridors, wetlands, wildlife habitat areas or areas replanted with native vegetation after construction.

b. Greenways: linear green belts linking residential areas with other open space areas. These greenways may contain bicycle paths or footpaths. Connecting greenways between residences and recreational areas are encouraged.
   Response: *The applicant does not proposed dedicating open space and this section is not applicable.*

2. A subdivision or design review application proposing designation of open space shall include the following information as part of this application:
   a. Designate the boundaries of all open space areas; and
   b. Specify the manner in which the open space shall be perpetuated, maintained, and administered; and
   c. Provide for public access to trails included in the Park Master Plan, including but not limited to the Tickle Creek Path.
      Response: *This section is not applicable as no open space is proposed or required.*

CHAPTER 17.92 - LANDSCAPING AND SCREENING GENERAL STANDARDS - ALL ZONES

Response: *This chapter has limited applicability to subdivisions so only those applicable sections are reviewed in this submittal.*

17.92.10 - GENERAL PROVISIONS

A. Where landscaping is required by this Code, detailed planting plans shall be submitted for review with development applications. No development may commence until the Director or Planning Commission has determined the plans comply with the purposes clause and specific standards in this chapter. All required landscaping and related improvements shall be completed or financially guaranteed prior to the issuance of a Certificate of Occupancy.
B. Appropriate care and maintenance of landscaping onsite and landscaping in the adjacent public right-of-way is the right and responsibility of the property owner, unless City ordinances specify otherwise for general public and safety reasons. If street trees or other plant materials do not survive or are removed, materials shall be replaced in kind within 6 months.
C. Significant plant and tree specimens should be preserved to the greatest extent practicable and integrated into the design of a development. Trees of 25-inches or greater circumference measured at a height of 4-1/2 ft. above grade are considered significant. Plants to be saved and methods of protection shall be indicated on the detailed planting plan submitted for approval. Existing trees may be considered preserved if no cutting, filling, or compaction of the soil takes place between the trunk of the tree and the area 5-ft. outside the tree's drip line. Trees to be retained shall be protected from damage during construction by a construction fence located 5 ft. outside the dripline.
   Response: *As previously determined by the Planning Commission, the City's tree protection standards in this section do not apply to residential subdivi-*

sions. The regulations of Chapter 17.102, Urban Forestry relevant to this proposal are reviewed below. Landscaping is primarily confined to the proposed stormwater facility and street side landscape planters.

17.92.20 - MINIMUM IMPROVEMENTS - LANDSCAPING AND SCREENING

Response: *The Single Family Residential zone is not listed in this section requiring compliance with minimum landscaping requirements. Future development of Lot 32 will trigger compliance with the requirements depending on the proposed use. Compliance will be reviewed as part of a future design review application.*

CHAPTER 17.98 - PARKING, LOADING, AND ACCESS REQUIREMENTS

17.98.10 - GENERAL PROVISIONS

M. Residential Parking Analysis Plan. A Residential Parking Analysis Plan shall be required for all new residential planned developments, subdivisions, and partitions to include a site plan depicting all of the following:
   a. Location and dimension of required parking spaces as specified in Section 17.98.200.
   b. Location of areas where parking is not permitted as specified in Sections 17.98.200(A)(3) and (5).
   c. Location and design of parking courts (if applicable).

   Response: *A Residential Parking Analysis Plan identifying the location of parking for 31 lots as required by this section is included on sheet C7 of the plan set. Parking for Lot 32 will be accommodated onsite. The details of this analysis is discussed in Section 17.98.200 below.*

17.98.20 - OFF-STREET PARKING REQUIREMENTS

A. Off Street Parking Requirements. Off street parking shall conform to the following standards:
   2. All square footage measurements are gross square feet of total floor area.
   3. 18 lineal inches of bench shall be considered 1 seat.
   4. Except as otherwise specified, parking for employees shall be provided based on 1 space per 2 employees for the largest shift in addition to required parking specified in Sections A6-A9 below.
   5. Where less than 5 parking spaces are required, then only one bicycle space shall be required except as otherwise modified in Sections 5-9 below.
   6. In addition to requirements for residential off street parking, new dwellings shall meet the on-street parking requirements in Section 17.98.200.

   Response: *Each single-family dwelling is required to provide at least two off-street parking spaces. Compliance with this requirement will be evaluated during building plan review. Parking for the development on Lot 32 will be evaluated as part of a future design review application.*

17.98.60 - DESIGN, SIZE AND ACCESS

All off-street parking facilities, vehicular maneuvering areas, driveways, loading facilities, accessways, and private streets shall conform to the standards set forth in this section.

Response: *The details of this section will be evaluated with submittal of the design review application for the multi-family/condominium units.*

17.98.80 - ACCESS TO ARTERIAL AND COLLECTOR STREETS

Response: *No lots are proposed to gain access from an arterial or collector street.*

17.98.90 - ACCESS TO UNIMPROVED STREETS

Response: *All streets proposed in the subdivision will be improved to city standards.*

17.98.100 - DRIVEWAYS

A. A driveway to an off-street parking area shall be improved from the public roadway to the parking area a minimum width of 20 feet for a two-way drive or 12 feet for a one-way drive but in either case not less than the full width of the standard approach for the first 20 feet of the driveway.
   Response: *All lots are designed in compliance with this standard.*

B. A driveway for a single-family dwelling shall have a minimum width of 10 feet.
   Response: *All lots will have a curb cut and driveway approach in compliance with this standard.*

C. A driveway for a two-family dwelling shall have a minimum width of 20 feet. A driveway approach must be constructed in accordance with applicable city standards and the entire driveway must be paved with asphalt or concrete.
   Response: *Any of the lots constructed with two-family dwellings will be developed in compliance with this section.*

D. Driveways, aisles, turnaround areas and ramps shall have a minimum vertical clearance of twelve feet for their entire length and width but such clearance may be reduced in parking structures.
   Response: *All driveways will be designed in compliance with this standard.*

E. No driveway shall traverse a slope in excess of 15 percent at any point along the driveway length.
   Response: *All driveways will be designed in compliance with this standard.*

F. The location and design of the driveway shall provide for unobstructed sight per the vision clearance requirements. Requests for exceptions to these requirements will be evaluated by the City Engineer considering the physical limitations of the lot and safety impacts to vehicular, bicycle, and pedestrian traffic.
   Response: *All driveways will be designed in compliance with this standard.*

17.98.110 - VISION CLEARANCE

A. Except within the Central Business District, vision clearance areas shall be provided at intersections of all streets and at intersections of driveways and alleys with streets to promote pedestrian, bicycle, and vehicular safety. The extent

of vision clearance to be provided shall be determined from standards in Chapter 17.74 and taking into account functional classification of the streets involved, type of traffic control present at the intersection, and designated speed for the streets.
Response: *The subject property is located in the R-1, R-2, and C-3 zones requiring compliance with this section. The requirements of this section will be considered in placing landscaping in these areas with construction of homes and will be evaluated with a future design review application for the multi-family/condominium units.*

B. Traffic control devices, streetlights, and utility installations meeting approval by the City Engineer are permitted within vision clearance areas.
Response: *The exceptions contained in this section will be considered in the design and placement of these structures.*

17.98.200 - RESIDENTIAL ON-STREET PARKING REQUIREMENTS

A. Residential On-Street Parking Requirements. Residential on-street parking shall conform to the following standards:
1. In addition to required off-street parking, all new residential planned developments, subdivisions and partitions shall provide one (1) on-street parking space within 200 feet of each dwelling except as provided in Section 17.98.200(A)(6) below.
2. The location of residential on-street parking shall be reviewed for compliance with this section through submittal of a Residential Parking Analysis Plan as required in Section 17.98.10(M).
3. Residential on-street parking shall not obstruct required clear vision areas and shall not violate any local or state laws.
4. Parallel residential on-street parking spaces shall be 22 feet minimum in length.
5. Residential on-street parking shall be measured along the curb from the outside edge of a driveway wing or curb cut. Parking spaces must be set back a minimum of 15 feet from an intersection and may not be located within 10 feet of a fire hydrant.
Response: *This section is applicable to the 31 lots zoned R-1 and R-2. A Residential On-Street Parking Analysis designed in compliance with the requirements of this section is included on Sheet C6 of the application package. A shown on this plan, at least one on-street parking space at least 22 feet in length has been identified within 200 feet of each of these lots as required. This sheet shows that 47 on-street parking spaces have been identified in compliance with this standard.*

6. Portions of residential on-street parking required by this section may be provided in parking courts that are interspersed throughout a development when the following standards are met:
Response: *No parking courts are proposed.*

CHAPTER 17.100 - LAND DIVISION

17.100.20 - LAND DIVISION CLASSIFICATION - TYPE I, II OR III PROCEDURES

C. Type II Land Division (Major Partition or Subdivision). A major partition or subdivision shall be a Type II procedure when a street is extended, satisfactory street conditions exist and the resulting parcels/lots comply with the standards of the zoning district and this chapter. Satisfactory street conditions exist when the Director determines one of the following:
   1. Existing streets are stubbed to the property boundaries and are linked by the land division.
   2. An existing street or a new proposed street need not continue beyond the land division in order to complete an appropriate street system or to provide access to adjacent property.
   3. The proposed street layout is consistent with a street pattern adopted as part of the Comprehensive Plan or an officially adopted City street plan.

      Response: *The proposed subdivision complies with all applicable code requirements to be processed as a Type II application.*

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   1. Existing streets are stubbed to the property boundaries and are linked by the land division.
   2. An existing street or a new proposed street need not continue beyond the land division in order to complete an appropriate street system or to provide access to adjacent property.
   3. The proposed street layout is consistent with a street pattern adopted as part of the Comprehensive Plan or an officially adopted City street plan.

      Response: *The proposal is for a Type II "Needed Housing" residential subdivision designed in compliance with applicable standards.*

17.100.60 - SUBDIVISIONS

Approval of a subdivision is required for a land division of 4 or more parcels in a calendar year. A two-step procedure is required for subdivision approval: (1) tentative plat review and approval; and (2) final plat review and approval.

Response: *The proposal is a 90 lot subdivision.*

A. Preapplication Conference. The applicant for a subdivision shall participate in a preapplication conference with city staff to discuss procedures for approval, applicable state and local requirements, objectives and policies of the Sandy Comprehensive Plan, and the availability of services.

   Response: *A pre-application conference was held with the city on February 26, 2020.*

B. Application Requirements for a Tentative Plat. Subdivision applications shall be made on forms provided by the planning department and shall be accompanied by:
   Response: *All of the items required by this section are included with the submittal.*

E. Approval Criteria. The Director or Planning Commission shall review the tentative plat for the subdivision based on the classification procedure (Type II or III) set forth in Section 17.12 and the following approval criteria:
   1. The proposed subdivision is consistent with the density, setback and dimensional standards of the base zoning district, unless modified by a Planned Development approval.
      Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "consistent with" as used in this section are subjective words. As reviewed in this narrative, the proposed subdivision is designed in compliance with density, setback, and dimensional standards in the R-1 and R-2 zoning districts. This criterion is met.*

   2. The proposed subdivision is consistent with the design standards set forth in this chapter.
      Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "consistent with" as used in this section are subjective words. As discussed in this narrative, the proposed subdivision is consistent with all required design standards in this chapter. This criterion is met.*

   3. The proposed street pattern is connected and consistent with the Comprehensive Plan or official street plan for the City of Sandy.
      Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "connected" and "consisted with" as used in this section are subjective words. Further, the City's Transportation System is not specifically incorporated into the Development and cannot be applied to this application. This criterion is met.*

   4. Traffic volumes shall not exceed average daily traffic (ADT) standards for local streets as detailed in Chapter 17.10, Definitions.
      Response: *As detailed in the submitted Traffic Study traffic volumes on local streets are not projected to exceed ADT standards. This criterion is met.*

5. Adequate public facilities are available or can be provided to serve the proposed subdivision.
   Response: *The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "adequate" as used in this section are subjective words. There is no indication by City officials that public facilities are not adequate to serve the proposed subdivision.*

6. All proposed improvements meet City standards.
   Response: *As reviewed in this narrative, the proposed improvements in this application comply with City standards.*

7. The phasing plan, if requested, can be carried out in a manner that meets the objectives of the above criteria and provides necessary public improvements for each phase as it develops.
   Response: *The applicant proposes developing the subdivision in a single phase.*

17.100.80 - CHARACTER OF THE LAND

Land which the Director or the Planning Commission finds to be unsuitable for development due to flooding, improper drainage, steep slopes, rock formations, adverse earth formations or topography, utility easements, or other features which will reasonably be harmful to the safety, health, and general welfare of the present or future inhabitants of the partition or subdivision and the surrounding areas, shall not be developed unless adequate methods are formulated by the subdivider and approved by the Director or the Planning Commission to solve the problems created by the unsuitable land conditions.
Response: *The subject property does not contain any of the items identified as "unsuitable" in this section. As demonstrated in this narrative, the subject property is suitable to construct the proposed subdivision.*

17.100.90 - ACCESS CONTROL GUIDELINES AND COORDINATION

A. Notice and coordination with ODOT required. The city will coordinate and notify ODOT regarding all proposals for new or modified public and private accesses on to Highways 26 and 211.
   Response: *The applicant's traffic consultant coordinated with ODOT and the City's traffic consultant prior to the preparation of the traffic impact study submitted with this application. The subject property abuts Highways 26 but no access to this road is proposed.*

17.100.100 - STREETS GENERALLY

A. Street Connectivity Principle. The pattern of streets established through land divisions should be connected to: (a) provide safe and convenient options for cars, bikes and pedestrians; (b) create a logical, recognizable pattern of circu-

lation; and (c) spread traffic over many streets so that key streets (particularly U.S. 26) are not overburdened.
Response: *Fawn Street and Dubarko Drive will be extended onto the subject property to provide access to lots in the subdivision. These streets are designed to create a logical street pattern and spread out traffic rather than concentrate it on a single street. No access is proposed to Highway 26. The submitted Future Street Plan identifies how the proposed street pattern can be extended to serve adjacent properties.*

B. Transportation Impact Studies. An applicant is required to prepare and submit a transportation impact study in accordance with the standards of Chapter 17.84 unless those standards exempt the application from the requirement.
Response: *As reviewed above, the proposed development triggers preparation of a transportation impact study. A Traffic Impact Study is included with the application package.*

C. <u>Topography and Arrangement.</u> All streets shall be properly related to special traffic generators such as industries, business districts, schools, and shopping centers and to the pattern of existing and proposed land uses.
Response: *All proposed streets comply with the requirements of this section.*

D. <u>Street Spacing.</u> Street layout shall generally use a rectangular grid pattern with modifications as appropriate to adapt to topography or natural conditions.
Response: *As noted above, the location of Highway 26, Dubarko Road, and Street B control the street and lot layout of the subject property. With these conditions, a rectangular grid street pattern is not practical and the proposed street pattern represents a logical and efficient street system.*

E. <u>Future Street Plan.</u> Future street plans are conceptual plans, street extensions and connections on acreage adjacent to land divisions. They assure access for future development and promote a logical, connected pattern of streets. It is in the interest of the city to promote a logical, connected pattern of streets. All applications for land divisions shall provide a future street plan that shows the pattern of existing and proposed future streets within the boundaries of the proposed land divisions, proposed connections to abutting properties, and extension of streets to adjacent parcels within a 400 foot radius of the study area where development may practically occur.
Response: *A future street plan in compliance with this section is included with the plan set.*

F. <u>Connections.</u> Except as permitted under Exemptions, all streets, alleys and pedestrian walkways shall connect to other streets within the development and to existing and planned streets outside the development and to undeveloped properties which have no future street plan. Streets shall terminate at other streets or at parks, schools or other public land within a neighborhood.

Where practicable, local roads shall align and connect with other roads when crossing collectors and arterials.

Proposed streets or street extensions shall be located to provide direct access to existing or planned transit stops, and existing or planned neighborhood activity centers, such as schools, shopping areas and parks.
Response*: As shown on submitted plans, Street A in the proposed subdivision connects Dubarko Road to Fawn Street extended onto the subject property. Street B is proposed to terminate at the southern property of the development so it can extended south with future development. All streets are designed as practical to provide a connection to abutting properties.*

17.100.120 - BLOCKS AND ACCESSWAYS

A. Blocks. Blocks shall have sufficient width to provide for two tiers of lots at appropriate depths. However, exceptions to the block width shall be allowed for blocks that are adjacent to arterial streets or natural features.
Response*: The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "sufficient width" and "appropriate depths" as used in this section are subjective. The shape of the subject property and the alignment of Highway 26, Dubarko Drive and Fawn Street control the lot layout and design. Due to these physical constraints, the site does not lend itself to creating blocks with two tiers.*

B. Residential Blocks. Blocks fronting local streets shall not exceed 400 feet in length, unless topographic, natural resource, or other similar physical conditions justify longer blocks. Blocks may exceed 400 feet if approved as part of a Planned Development, Specific Area Plan, adjustment or variance.
Response*: The submitted application is a "Needed Housing" application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore only objective standards and procedures apply to the application review. The words "unless topographic, natural resource, or other similar physical conditions justify longer blocks" as used in this section are subjective. The location of Highway 26, Dubarko Road, and topographic constraints in the eastern portion of the property do not make it practical or reasonable to require typical 400 foot residential blocks.*

D. Pedestrian and Bicycle Access Way Requirements. In any block in a residential or commercial district over 600 feet in length, a pedestrian and bicycle accessway with a minimum improved surface of 10 feet within a 15-foot right-of-way or tract shall be provided through the middle of the block. To enhance public convenience and mobility, such accessways may be required to connect to cul-de-sacs, or between streets and other public or semipublic lands or through greenway systems.

Response: No blocks are proposed greater than 600 feet in length to warrant construction of a pedestrian accessway as specified in this section.

17.100.130 - EASEMENTS

A minimum eight (8) foot public utility easement shall be required along property lines abutting a right-of-way for all lots within a partition or subdivision. Where a partition or subdivision is traversed by a watercourse, drainage way, channel or stream, the land division shall provide a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse, and such further width as determined needed for water quality and quantity protection.

Response: *Eight foot wide public utility easements will be platted along all property lines abutting a public right-of-way. As shown on submitted plans, a 10-foot wide public storm drainage easement is proposed to be platted along the back of Lots 3 and 9 - 12 and between Lots 27 and 28.*

17.100.140 - PUBLIC ALLEYS

Response: *No alleys are proposed or required.*

17.100.150 - RESIDENTIAL SHARED PRIVATE DRIVES

A shared private drive is intended to provide access to a maximum of two (2) dwelling units.

A. Criteria for Approval

Shared private drives may be approved by the Director when one or more of the following conditions exist:

1. Direct access to a local street is not possible due to physical aspects of the site including size, shape, or natural features.
2. The construction of a local street is determined to be unnecessary.

   Response: *Two private drives (Tracts A and B) are proposed as shown on submitted plans.*

B. Design

1. A shared private drive constructed to city standards shall not serve more than two (2) dwelling units.
2. A shared access easement and maintenance agreement shall be established between the two units served by a shared private drive. The language of the easement and maintenance agreement shall be subject to approval by the Director.
3. Public utility easements shall be provided where necessary in accordance with Section 17.100.130.
4. Shared private drives shall be fully improved with an all weather surface (e.g. concrete, asphalt, permeable pavers) in conformance with city standards. The pavement width shall be 20 feet.
5. Parking shall not be permitted along shared private drives at any time and shall be signed and identified accordingly.

Response: *Each private drive is proposed to serve only two lots as allowed. Each private drive will be constructed in accordance with the requirements of this section.*

17.100.160 - PUBLIC ACCESS LANES

Public access lanes are designed to provide primary access to a limited number of dwellings where the construction of a local street is not necessary. Public access lanes are intended to serve a maximum of six dwelling units.

A. Criteria for Approval. Public access lanes may be approved by the Director when certain conditions exist which make the construction of a standard local street unnecessary. Approval of public access lanes shall be based on one or more of the following:
   1. Physical conditions such as natural features, unusual lot size, shape, or other unique features prevent the construction of a local street.
   2. It is determined that construction of a local street is not necessary to facilitate orderly development of a future street system.
   3. It is determined that there are no logical extensions of an existing local street to serve the site.
      Response: *Due to the configuration of the subject property and the location and access limitations to Dubarko Drive and Street B, Street C is proposed as a Public Access Lane as detailed below.*

B. General Provisions.
   1. A public access lane may serve a maximum of six dwelling units.
   2. Public access lanes are subject to spacing requirements of Section 17.100.120.
   3. Public utility easements shall be provided where necessary in accordance with Section 17.100.130.
   4. If a public access lane is designed as a dead end, a turnaround shall be provided at the point where the lane terminates. The design of the turnaround shall be subject to approval by the Director and the Fire Department.
   5. Parking shall be prohibited in public access lane turnarounds.
   6. Street lighting may be required in public access lanes for traffic and pedestrian safety.
      Response: *The applicant is aware of these general provisions.*

C. Public Access Lane Design

2. Public Access Lane Option “B” (Figure 17.100-B).
   a. Public access lane “B” is designed to be double loaded and provide access to lots located on both sides of the lane.
   b. Public access lanes shall be constructed to city standards and must meet the required dimension as specified in this section.
   c. Curbside sidewalks are required along both sides of the access lane to achieve specified dimensions.

d. Planter strips are not required along public access lanes dues to the minimal lots served. Lots abutting a public access land are required to have street trees in accordance with Section 17.100.290.
e. Parking is permitted on both sides of a public access lane "B" as shown in Figure 17.100-B. Signage shall be display to indicate the parking regulations along the lane and in the turnaround.
Response: *Street C is designed in compliance with the standards in this section. As shown on Sheet C5 (Section C), this street is designed to include a 40-foot right-of-way with 28-feet of paving and sidewalks on both sides.*

17.100.170 - FLAG LOTS

Flag lots can be created where it can be shown that no other street access is possible to achieve the requested land division. The flag lot shall have a minimum street frontage of 15 feet for its accessway. The following dimensional requirements shall apply to flag lots:

A. Setbacks applicable to the underlying zoning district shall apply to the flag lot.
B. The access strip (pole) may not be counted toward the lot size requirements.
Response: *Lot 11 of the proposed subdivision could be considered a flag lot as defined by code. This lot conforms with all applicable standards.*

17.100.180 - INTERSECTIONS

A. Intersections. Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two new streets at an angle of less than 75 degrees shall not be acceptable. No more than two streets shall intersect at any one point unless specifically approved by the City Engineer. The city engineer may require left turn lanes, signals, special crosswalks, curb extensions and other intersection elements justified by a traffic study or necessary to comply with the Development Code.
Response: *All streets are designed to intersect an abutting street at a right angle in compliance with the requirements of this section.*

B. Curve Radius. All local and neighborhood collector streets shall have a minimum curve radius (at intersections of rights-of-way) of 20 feet, unless otherwise approved by the City Engineer. When a local or neighborhood collector enters on to a collector or arterial street, the curve radius shall be a minimum of 30 feet, unless otherwise approved by the City Engineer.
Response: *All proposed streets comply with the standards of this section.*

17.100.190 - STREET SIGNS

The subdivider shall pay the cost of street signs prior to the issuance of a Certificate of Substantial Completion. The City shall install all street signs and upon completion will bill the developer for costs associated with installation. In addition, the subdivider may be required to pay for any traffic safety devices related

to the development. The City Engineer shall specify the type and location of the street signs and/or traffic safety devices.
***Response**: The applicant understands it will be his responsibility to pay the cost of street signs and the city will install these signs.*

17.100.200 - STREET SURFACING
Public streets, including alleys, within the development shall be improved in accordance with the requirements of the City or the standards of the Oregon State Highway Department. An overlay of asphalt concrete, or material approved by the City Engineer, shall be placed on all streets within the development. Where required, speed humps shall be constructed in conformance with the City's standards and specifications.
***Response**: All streets will be improved in accordance with City standards.*

17.100.210 - STREET LIGHTING
A complete lighting system (including, but not limited to: conduits, wiring, bases, poles, arms, and fixtures) shall be the financial responsibility of the subdivider on all cul-de-sacs, local streets, and neighborhood collector streets. The subdivider will be responsible for providing the arterial street lighting system in those cases where the subdivider is required to improve an arterial street. Standards and specifications for street lighting shall be coordinated with the utility and any lighting district, as appropriate.
***Response**: The applicant is aware of the requirements of this section. A lighting plan will be coordinated with PGE and the city prior to installation of these fixtures.*

17.100.220 - LOT DESIGN

A. The lot arrangement shall be such that there will be no foreseeable difficulties, for reason of topography or other conditions, in securing building permits to build on all lots in compliance with the Development Code.
***Response**: The proposed subdivision contains a logical lot layout and no difficulties are anticipated in securing building permits to build on any of these lots. Development on Lot 32 will require design review approval prior to development.*

B. The lot dimensions shall comply with the minimum standards of the Development Code. When lots are more than double the minimum lot size required for the zoning district, the subdivider may be required to arrange such lots to allow further subdivision and the opening of future streets to serve such potential lots.
***Response**: As discussed above, all lots comply with the lot dimension and minimum standards as specified for lots platted within the R-1, R-2, and C-3 zoning districts.*

C. The lot or parcel width at the front building line shall meet the requirements of the Development Code and shall abut a public street other than an alley for a width of at least 20 feet. A street frontage of not less than 15 feet is acceptable in the case of a flag lot division resulting from the division of an unusually deep land parcel which is of a size to warrant division into not more than two parcels.
Response: *All lots in the proposed subdivision contain at least 20 feet of frontage along a public street with the exception of four lots (Lots 12, 13, 21 and 22) which are proposed to be accessed by private drives. The proposal complies with this section.*

D. Double frontage lots shall be avoided except where necessary to provide separation of residential developments from arterial streets or to overcome specific disadvantages of topography or orientation.
Response: *None of the lots contain double frontage as defined by code except Lots 25, 26 that have frontage on both Street A and Highway 26 and Lots 27 - 30 with frontage on both Dubarko Road and Street C. Because direct access from Highway 26 and Dubarko Road is not permitted, a double frontage lot configuration is unavoidable.*

E. Lots shall avoid deriving access from major or minor arterials. When driveway access from major or minor arterials may be necessary for several adjoining lots, the Director or the Planning Commission may require that such lots be served by a common access drive in order to limit possible traffic hazards on such streets. Where possible, driveways should be designed and arranged to avoid requiring vehicles to back into traffic on minor or major arterials.
Response: *All lots are proposed to gain access from a new local street. No direct access to Dubarko Road, a minor arterial or Street B, a collector are proposed.*

17.100.230 - WATER FACILITIES

Water lines and fire hydrants serving the subdivision or partition, and connecting the development to City mains, shall be installed to provide adequate water pressure to serve present and future consumer demand. The materials, sizes, and locations of water mains, valves, service laterals, meter boxes and other required appurtenances shall be in accordance with the standards of the Fire District, the City, and the State.

If the city requires the subdivider to install water lines in excess of eight inches, the city may participate in the oversizing costs. Any oversizing agreements shall be approved by the city manager based upon council policy and dependent on budget constraints. If required water mains will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement for the proportionate share of the cost.
Response: *The applicant intends to install all water lines and fire hydrants in compliance with applicable standards.*

17.100.240 - SANITARY SEWERS

Sanitary sewers shall be installed to serve the subdivision and to connect the subdivision to existing mains. Design of sanitary sewers shall take into account the capacity and grade to allow for desirable extension beyond the subdivision.

If required sewer facilities will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement by nonparticipating landowners for the proportionate share of the cost of construction.
Response: Response: *The applicant intends to install sanitary sewer lines in compliance with applicable standards. All lots can be served by a gravity sewer line.*

17.100.250 - SURFACE DRAINAGE AND STORM SEWER SYSTEM

A. Drainage facilities shall be provided within the subdivision and to connect with off-site drainage ways or storm sewers. Capacity, grade and materials shall be by a design approved by the city engineer. Design of drainage within the subdivision shall take into account the location, capacity and grade necessary to maintain unrestricted flow from areas draining through the subdivision and to allow extension of the system to serve such areas.
Response: *A single stormwater water quality and detention facility (Tract A) is proposed. This facility has been sized and located to accommodate public stormwater generated by the subdivision. A preliminary stormwater report is included with this application as required.*

B. In addition to normal drainage design and construction, provisions shall be taken to handle any drainage from preexisting subsurface drain tile. It shall be the design engineer's duty to investigate the location of drain tile and its relation to public improvements and building construction.
Response: *No subsurface drain tiles are known to exist on the site.*

C. The roof and site drainage from each lot shall be discharged to either curb face outlets (if minor quantity), to a public storm drain or to a natural acceptable drainage way if adjacent to the lot.
Response: *All roof and site drainage will be discharged to curb face outlets or another approved system as required.*

17.100.260 - UNDERGROUND UTILITIES

All subdivisions or major partitions shall be required to install underground utilities (including, but not limited to, electrical and telephone wiring). The utilities shall be installed pursuant to the requirements of the utility company.
Response: *As shown on improvement plans the applicant intends to install all utilities underground as required.*

17.100.270 - SIDEWALKS

Sidewalks shall be installed on both sides of a public street and in any special pedestrian way within the subdivision.
Response*: As shown on submitted plans, sidewalks will be constructed along both sides of all new streets as required.*

17.100.280 - BICYCLE ROUTES
If appropriate to the extension of a system of bicycle routes, existing or planned, the Director or the Planning Commission may require the installation of bicycle lanes within streets. Separate bicycle access ways may be required to reduce walking or cycling distance when no feasible street connection is available.
Response*: No bicycle routes are existing, planned, or proposed on the subject property.*

17.100.290 - STREET TREES
Where planting strips are provided in the public right-of-way, a master street tree plan shall be submitted and approved by the Director. The street tree plan shall provide street trees approximately every 30' on center for all lots.
Response*: Planter strips will be provided along all new street frontages as required. Street trees in accordance with City standards will be provided in these areas. The proposed tree species will be selected from the City's approved tree list.*

17.100.300 - EROSION CONTROL
Grass seed planting shall take place prior to September 30th on all lots upon which a dwelling has not been started but the ground cover has been disturbed. The seeds shall be of an annual rye grass variety and shall be sown at not less than four pounds to each 1000 square feet of land area.
Response*: Grass seeding will be completed as required by this section. The submitted erosion control plan provides additional details to address erosion control concerns.*

17.100.310 - REQUIRED IMPROVEMENTS
The following improvements shall be installed at no expense to the city, consistent with the design standards of Chapter 17.84, except as otherwise provided in relation to oversizing.

A. Drainage facilities
B. Lot, street and perimeter monumentation
C. Mailbox delivery units
D. Sanitary sewers
E. Sidewalks
F. Street lights
G. Street name signs
H. Street trees
I. Streets
J. Traffic signs

K. Underground communication lines, including broadband (fiber), telephone, and cable. Franchise agreements will dictate whether telephone and cable lines are required.
L. Underground power lines
M. Water distribution lines and fire hydrants
Response*: All improvements specified in this section will be installed by the developer at no expense to the City of Sandy consistent with the design standards of Chapter 17.84 and applicable standards.*

CHAPTER 17.102 - URBAN FORESTRY

17.102.20 - APPLICABILITY

This chapter applies only to properties within the Sandy Urban Growth Boundary that are greater than one acre including contiguous parcels under the same ownership.

A. General: No person shall cut, harvest, or remove trees 11 inches DBH or greater without first obtaining a permit and demonstrating compliance with this chapter.

1. As a condition of permit issuance, the applicant shall agree to implement required provisions of this chapter and to allow all inspections to be conducted.
2. Tree removal is subject to the provisions of Chapter 15.44, Erosion Control, Chapter 17.56, Hillside Development, and Chapter 17.60 Flood and Slope Hazard.

Response*: The subject property contains 15.91 acres and the standards of this chapter are applicable to the proposed application. As shown on submitted plans and detailed in the Arborist Report, development of the site requires removal of the majority of the trees on the site. The proposed tree removal and protection plan has been designed in accordance with the standards of this chapter and the provisions in Chapters 15.44, 17.56, and 17.60 as applicable.*

17.102.50 - TREE RETENTION AND PROTECTION REQUIREMENTS

A. Tree Retention: The landowner is responsible for retention and protection of trees required to be retained as specified below:

1. At least three trees 11 inches DBH or greater are to be retained for every one-acre of contiguous ownership.
2. Retained trees can be located anywhere on the site at the landowner's discretion before the harvest begins. Clusters of trees are encouraged.
3. Trees proposed for retention shall be healthy and likely to grow to maturity, and be located to minimize the potential for blow-down following the harvest.
4. If possible, at least two of the required trees per acre must be of conifer species.
5. Trees within the required protected setback areas may be counted towards the tree retention standard if they meet these requirements.

Response: *The subject property contains 15.91 acres requiring retention of 48 trees, 11 inches and greater DBH (15.91 x 3 = 47.73 rounded up to 48 trees). As stated in this section trees proposed for retention shall be "healthy and likely to grow to maturity". This section also has a preference for retaining conifer trees over deciduous. Submitted plans show that 48 trees are proposed to be retained in a grove along the northern boundary of the site. The submitted Arborist Report provides a description and quality assessment of each of the trees on the site. Most of the trees are in "good" condition but some have structural defects.*

B. Tree Protection Area: Except as otherwise determined by the Planning Director, all tree protection measures set forth in this section shall be instituted prior to any development activities and removed only after completion of all construction activity. Tree protection measures are required for land disturbing activities including but not limited to tree removal, clearing, grading, excavation, or demolition work.
   1. Trees identified for retention shall be marked with yellow flagging tape and protected by protective barrier fencing placed no less than 10 horizontal feet from the outside edge of the trunk.
   2. Required fencing shall be a minimum of six feet tall supported with metal posts placed no farther than ten feet apart installed flush with the initial undisturbed grade.
   3. No construction activity shall occur within the tree protection zone, including, but not limited to dumping or storage of materials such as building supplies, soil, waste items, equipment, or parked vehicles.
   Response: *As shown on the submitted Tree Retention and Protection plan the majority of trees proposed to be retained are located on Lot 13 with several trees also located on Lots 14, and 21. This entire group of trees is proposed to be retained and protected by a conservation easement platted for this purpose. The submitted Arborist report also contains additional recommendations for protection of these trees during construction.*

17.102.60 - TREE REPLANTING REQUIREMENTS

1. All areas with exposed soils resulting from tree removal shall be replanted with a ground cover of native species within 30 days of harvest during the active growing season, or by June 1st of the following spring.
2. All areas with exposed soils resulting from tree removal occurring between October 1 and March 31 shall also be covered with straw to minimize erosion.
3. Removal of hazard trees as defined shall be replanted with two native trees of quality nursery stock for every tree removed.
4. Tree Removal allowed within the FSH Overlay District shall be replanted with two native trees of quality nursery stock for every tree removed.

5. Tree Removal not associated with a development plan must be replanted following the provisions of OAR Chapter 629, Division 610, Section 020-060
   Response: *The requirements of this section as applicable will be completed with construction of subdivision improvements.*

17.102.70 - VARIANCES

Under a Type III review process, the Planning Commission may allow newly-planted trees to substitute for retained trees if:

1. The substitution is at a ratio of at least two-to-one (i.e., at least two native quality nursery grown trees will be planted for every protected tree that is removed); and
2. The substitution more nearly meets the intent of this ordinance due to:
   a. The location of the existing and proposed new trees, or
   b. The physical condition of the existing trees or their compatibility with the existing soil and climate conditions; or
   c. An undue hardship is caused by the requirement for retention of existing trees.
   d. Tree removal is necessary to protect a scenic view corridor.

   Response: *As noted above, the proposed tree retention plan complies with the tree retention requirements of Section 17.102.50 above. A variance to this section has not been requested or is one required.*

CHAPTER 15.30 - DARK SKY ORDINANCE

15.30.000 - PURPOSE

The purpose of the Sandy Dark Sky Ordinance is to regulate outdoor lighting in order to reduce or prevent light pollution. This means to the extent reasonably possible the reduction or prevention of glare and light trespass, the conservation of energy, and promotion of safety and security. (Ord. 2002-11)

15.30.030 - EXEMPTIONS AND EXCEPTIONS

D. Full cutoff street lighting, which is part of a federal, state, or municipal installation.

15.30.060 - GENERAL STANDARDS

D. All outdoor lighting systems shall be designed and operated so that the area 10 feet beyond the property line of the premises receives no more than .25 (one quarter) of a foot-candle of light from the premises lighting system.

Response: *The applicant understands the requirements of this chapter. A detailed lighting plan will be submitted with construction plans following land use approval.*

V. Conclusion

The proposed subdivision is part of the planned progression of land use planning for this area of Sandy and involves the creation of “Needed Housing” under ORS 197.303(1) and 197.307(4) on land zoned for residential uses within the city limits of Sandy. The applicant has submitted this application requesting land use approval to construct a Type II residential subdivision on the 15.91 acre site to include the following:

- 32 lots
- On-street parking
- Installation of public and franchise utilities
- Tree removal
- Fee-in-lieu payment for parkland dedication

As reviewed in this narrative and shown on submitted plans and studies including the submitted Arborist Report and Geotechnical Report, the proposed subdivision complies with all applicable standards. Given these facts the applicant respectfully requests this application be approved as submitted.

ExhibitC
Civil Plans

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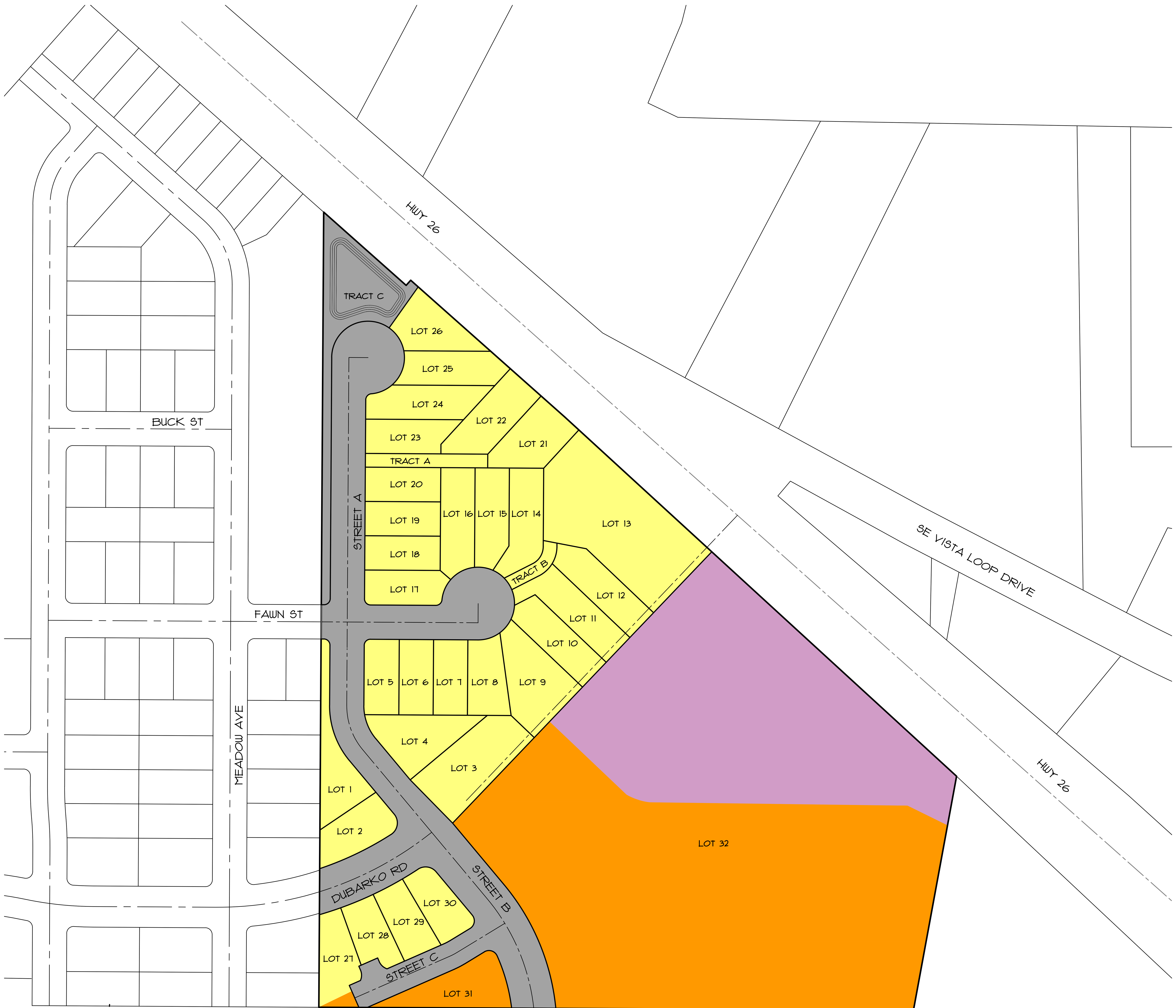
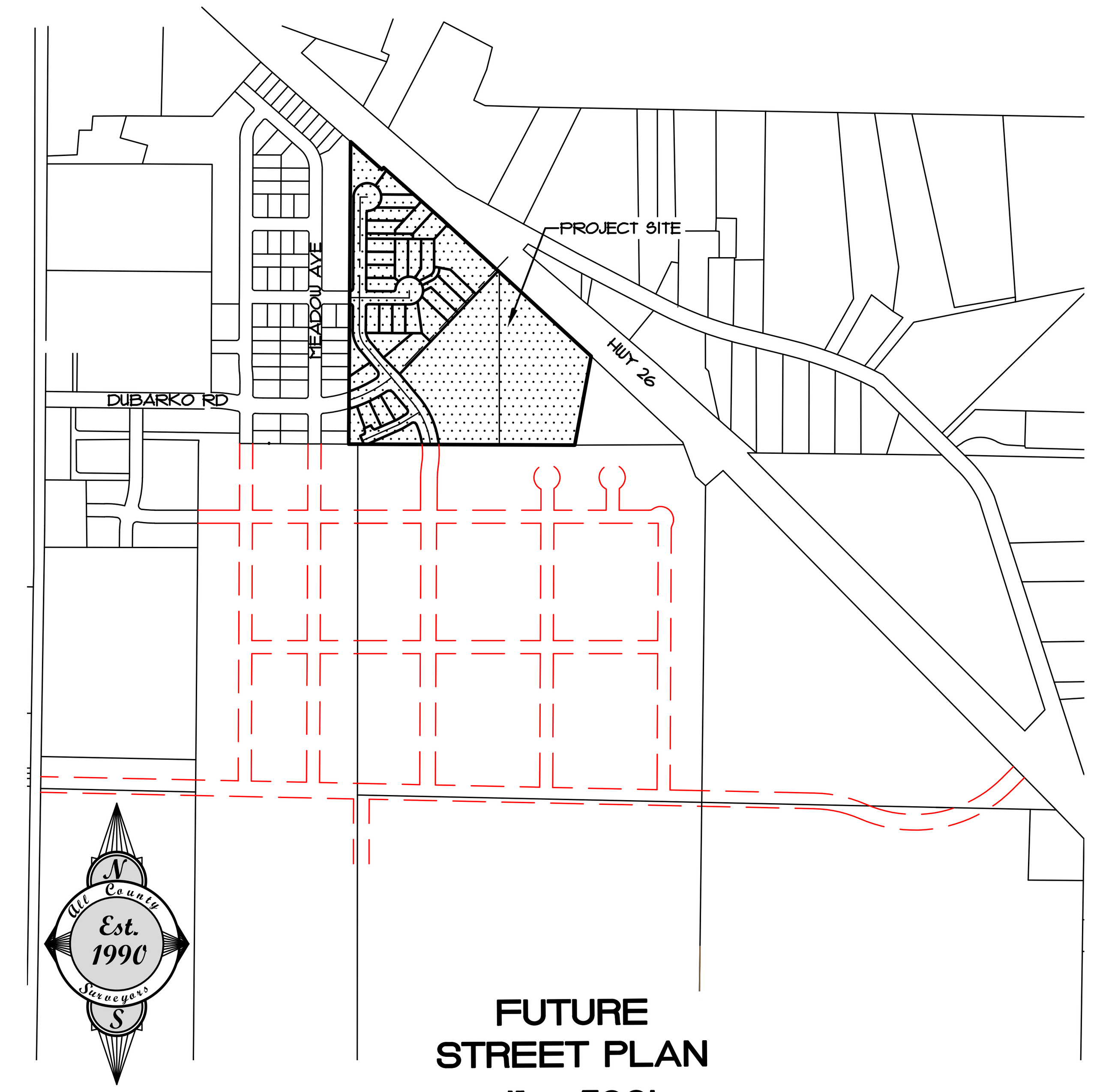
DEER MEADOWS

32-LOT SUBDIVISION





FUTURE STREET PLAN
1" = 500'

SCALE : 1" = 80'
0' 40' 80' 160'

CLIENT
ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113

SURVEYOR/ENGINEER
ALL COUNTY SURVEYORS & PLANNERS, INC.
PO BOX 955
SANDY, OR 97055

PLANNER
TRACY BROWN PLANNING CONSULTANTS, LLC
17075 FIR DR.
SANDY, OR 97055

LEGEND

- R-2 ZONE
- R-1 ZONE
- C-3 ZONE
- PUBLIC ROW, PUBLIC & PRIVATE TRACTS

SHEET INDEX

1. COVER SHEET & FUTURE STREET PLAN
2. PRELIMINARY PLAT MAP
3. EXISTING CONDITIONS AND TREE RETENTION PLAN
4. TREE TABLES
5. MASTER STREET & UTILITY PLAN
6. PRELIMINARY STREET TREE & PARKING PLAN
7. PRELIMINARY GRADING & EROSION CONTROL PLAN
8. SLOPE ANALYSIS

DATE	NO.	REVISION	BY
-	-	-	-

SHEET C1 OF 8

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

REGISTERED PROFESSIONAL ENGINEER OREGON RAY L. MOORE
RENEWAL DATE: 12/31/2022

SCALE VERT: N/A HORIZ: 1"=80'
DATE: 07/26/2018
FILE: 19-035-Planning-B.dwg

LEGAL		
SECTION	TWP.	RANGE
18	2S	5E

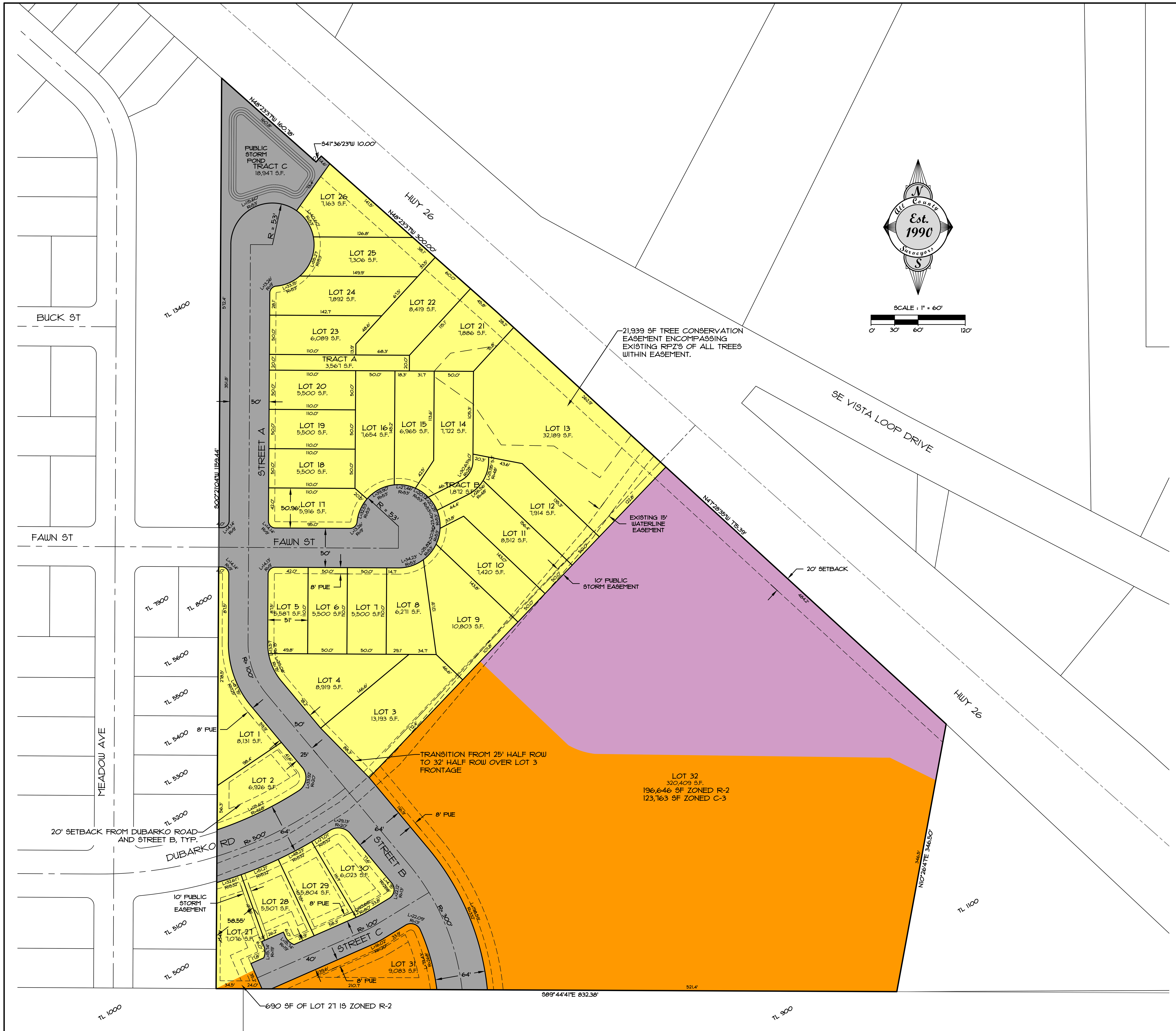
PROJECT: DEER MEADOWS SUBDIVISION
COVER SHEET AND FUTURE STREET PLAN

LOCATION: 40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT 05/28/2021

CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113



AREA TOTALS

TOTAL SITE AREA	= 693,056 SF = 15.910 ACRES
TRACT C (PUBLIC STORM POND)	= 18,947 SF = 0.435 ACRES
R-1 SINGLE FAMILY	= 245,536 SF = 5.637 ACRES
R-2 MULTI-FAMILY	= 206,419 SF = 4.739 ACRES
C-3 COMMERCIAL	= 123,763 SF = 2.841 ACRES
PUBLIC ROW	= 98,391 SF = 2.259 ACRES

DENSITY CALCULATIONS

R-1 SINGLE FAMILY MIN DENSITY
5.64 AC×(5 UNITS/AC) = 28 UNITS

R-1 SINGLE FAMILY MAX DENSITY
5.64 AC×(8 UNITS/AC) = 45 UNITS

R-1 SINGLE FAMILY PROPOSED DENSITY
30 UNITS

R-2 MULTI-FAMILY MIN DENSITY
4.74 AC×(8 UNITS/AC) = 38 UNITS

R-2 MULTI-FAMILY MAX DENSITY
4.74 AC×(14 UNITS/AC) = 66 UNITS

LEGEND

- R-1 ZONE
- R-2 ZONE
- C-3 ZONE
- PUBLIC ROW, PUBLIC TRACTS

NOTES

1. THIS IS NOT A BOUNDARY SURVEY. NO LIABILITY IS ASSUMED BY ALL COUNTY SURVEYORS AND PLANNERS FOR THE EXISTENCE OF ANY EASEMENTS, ENCUMBRANCES AND DISCREPANCIES IN BOUNDARY OR TITLE DEFECTS.
2. LOT 32 TO BE DEVELOPED UNDER SEPARATE DESIGN REVIEW PROCESS AT FUTURE DATE.

DATE	NO.	REVISION	BY
-	-	-	-

SHEET C2 OF 8

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

REGISTERED PROFESSIONAL ENGINEER OREGON RAY L. MOORE
RENEWAL DATE: 12/31/2022

SCALE: VERT: N/A HORIZ: 1"=60'
DATE: 07/26/2018
FILE: 19-035-Planning-B.dwg

LEGAL: SECTION 18 TWP. 2S RANGE 5E

PROJECT: **DEER MEADOWS SUBDIVISION**

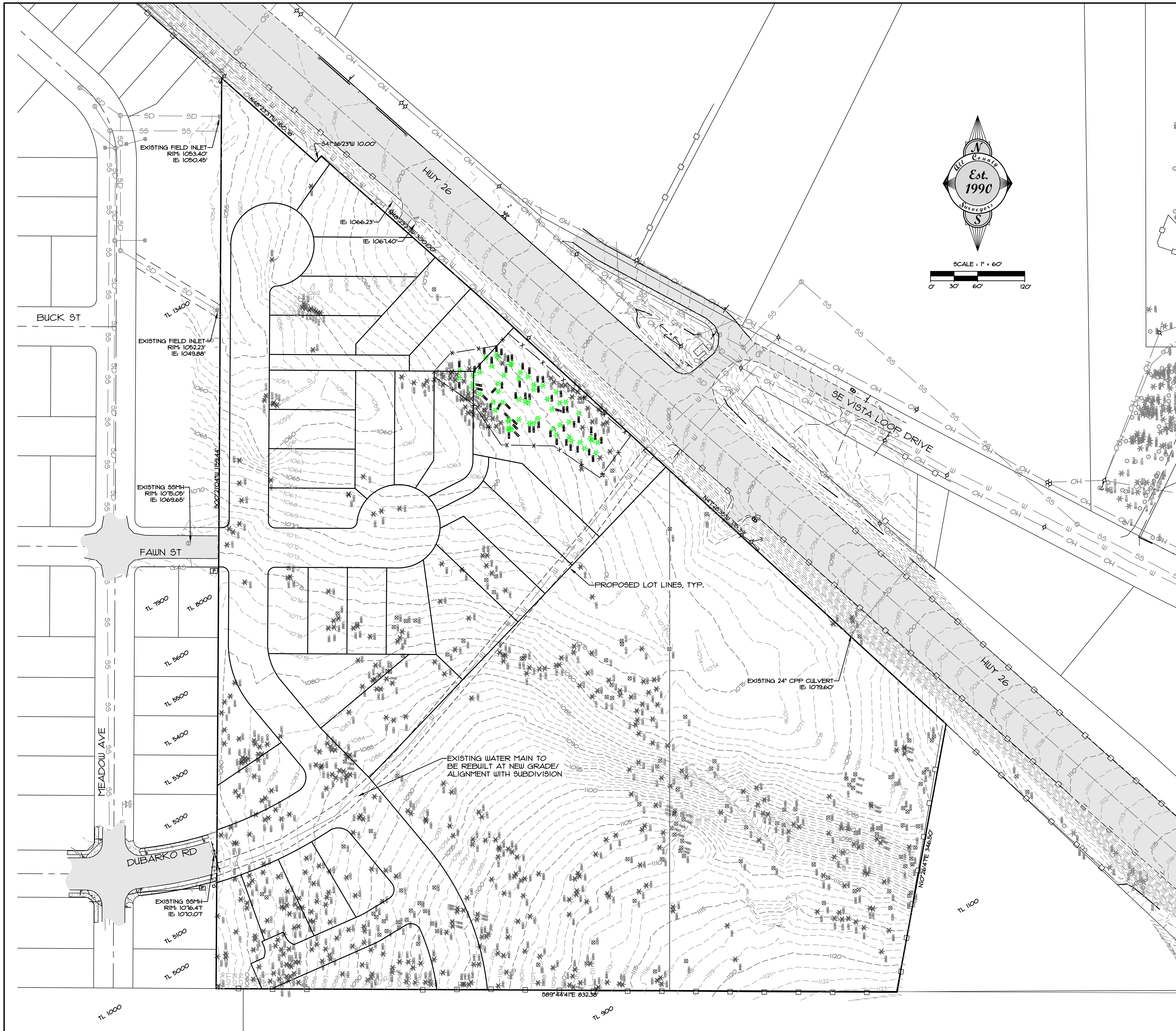
PRELIMINARY PLAT MAP

LOCATION: **40808 & 41010 HWY 26, SANDY, OR 97055**

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT: 05/28/2021

CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113



LEGEND

PROPERTY LINE
LOT LINE
EXISTING BUILDING
EXISTING EDGE OF PAVEMENT
EXISTING SIDEWALK/CONCRETE
EXISTING CURB
EXISTING WATER LINE
EXISTING STORM LINE
EXISTING SANITARY LINE
EXISTING GAS LINE
EXISTING TELEPHONE LINE
EXISTING UNDERGROUND POWER
EXISTING STORM MANHOLE
EXISTING CATCH BASIN
EXISTING SANITARY MANHOLE
EXISTING UTILITY POLE
EXISTING WATER METER
EXISTING WATER VALVE
EXISTING FIRE HYDRANT
EXISTING SIGN
EXISTING GROUND CONTOUR
EXISTING LIGHT POLE
EXISTING DECIDUOUS TREE
EXISTING CONIFEROUS TREE
NEW LOT LINE
NEW EASEMENT LINE
NEW CURB
NEW SIDEWALK/CONCRETE
NEW AC
NEW WATER LINE
NEW SANITARY LINE
NEW STORM LINE
SAWCUT LINE
NEW FINISH GRADE CONTOUR
NEW WATER METER
NEW STORM MANHOLE
NEW CATCH BASIN
NEW SANITARY MANHOLE
NEW CLEANOUT
NEW FIRE HYDRANT
NEW WATER VALVE
NEW STREET LIGHT
NEW SIGN
NEW MAILBOX UNIT

LEGEND

EXISTING CONIFEROUS TREE TO BE PRESERVED
EXISTING DECIDUOUS TREE TO BE REMOVED
EXISTING CONIFEROUS TREE TO BE REMOVED

INSTALL PROTECTIVE BARRIER FENCING TO PROTECT TREES DURING EXCAVATION FOR THE UTILITIES. REQUEST AN INSPECTION OF EROSION CONTROL MEASURES AND TREE PROTECTION MEASURES AS SPECIFIED IN SECTION 17.102.50(C) PRIOR TO CONSTRUCTION ACTIVITIES OR GRADING. REFER TO ARBORIST REPORT FOR DETAIL ON FENCING LOCATION.

TREE RETENTION NOTES

TREES REQUIRED TO BE RETAINED:

3 TREES/ACRE X 15.91 ACRES = 48 TREES

NUMBER OF TREES PROPOSED FOR RETENTION:

48 TREES

NOTES

1. THIS IS NOT A BOUNDARY SURVEY. NO LIABILITY IS ASSUMED BY ALL COUNTY SURVEYORS AND PLANNERS FOR THE EXISTENCE OF ANY EASEMENTS, ENCUMBRANCES AND DISCREPANCIES IN BOUNDARY OR TITLE DEFECTS.
2. UNDERGROUND UTILITIES SHOWN ON THIS SURVEY ARE LIMITED TO THOSE ITEMS VISIBLE BY SURFACE INSPECTION AND LOCATES PAINTED ON THE GROUND AS OF THE DATE OF THIS SURVEY. SUBSURFACE STRUCTURES, IF ANY, ARE NOT SHOWN.
3. UNDERGROUND UTILITY LOCATIONS MUST BE POTHOLED AND VERIFIED PRIOR TO CONSTRUCTION.
4. THE ELEVATION DATUM IS BASED ON THE CITY OF SANDY BENCHMARK #33. THE BENCHMARK IS LOCATED AT THE INTERSECTION OF MCCORMICK AND LANGENSEND. THE PUBLISHED ELEVATION IS 1021.57'

SHEET C3 OF 8

DATE	NO.	REVISION	BY
-	-	-	-

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

REGISTERED PROFESSIONAL ENGINEER, OREGON, RAY L. MOORE
RENEWAL DATE: 12/31/2022

SCALE: VERT.: N/A HORIZ.: 1"=60'
DATE: 07/26/2018
FILE: 19-035-Planning-B.dwg

LEGAL		
SECTION	TWP.	RANGE
18	2S	5E

PROJECT: DEER MEADOWS SUBDIVISION

EXISTING CONDITIONS AND TREE RETENTION PLAN

LOCATION: 40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT 05/28/2021

CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 1403
CORNELIUS, OR 97113

TREE PRESERVATION INVENTORY

TREE NO.	SPECIES (COMMON NAME)	DBH (INCHES)	CONDITION	COMMENTS	TREATMENT
13653	DOUGLAS-FIR	11	FAIR	THIN CROWN, LARGE WOUND AT LOWER TRUNK	REMOVE
15546	DOUGLAS-FIR	15	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15550	DOUGLAS-FIR	6	VERY POOR	DEAD	RETAIN
15551	DOUGLAS-FIR	30	GOOD	CODOMINANT AT 1', WEST STEM HAS 33% LIVE CROWN RATIO	RETAIN
15552	N/A	N/A	N/A	SAME AS TREE 15551	N/A
15553	DOUGLAS-FIR	13	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15554	DOUGLAS-FIR	11	FAIR	POOR TRUNK TAPER, SUPPRESSED	REMOVE
15555	DOUGLAS-FIR	30	GOOD	MODERATELY ONE SIDED	RETAIN
15556	DOUGLAS-FIR	12	POOR	OVERTOPPED BY ADJACENT TREES, SUPPRESSED	RETAIN
15557	GRAND FIR	22	GOOD	ONE SIDED, CODOMINANT AT 30' WITH INCLUDED BARK	RETAIN
15558	DOUGLAS-FIR	12	GOOD	33% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15562	DOUGLAS-FIR	20	GOOD	40% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15564	DOUGLAS-FIR	14	GOOD	MARGINAL TRUNK TAPER, 33% LIVE CROWN RATIO	RETAIN
15565	DOUGLAS-FIR	11	FAIR	ONE SIDED, MARGINAL TRUNK TAPER, 33% LIVE CROWN RATIO	REMOVE
15566	DOUGLAS-FIR	23	GOOD	ONE SIDED	RETAIN
15567	DOUGLAS-FIR	17	GOOD	MARGINAL TRUNK TAPER, 40% LIVE CROWN RATIO	RETAIN
15568	DOUGLAS FIR	7	VERY POOR	DEAD	REMOVE
15569	DOUGLAS-FIR	11	FAIR	POOR TRUNK TAPER	REMOVE
15570	DOUGLAS-FIR	14	FAIR	ONE SIDED, OVERTOPPED BY ADJACENT TREES	REMOVE
15571	DOUGLAS-FIR	9	FAIR	POOR TRUNK TAPER, SUPPRESSED	REMOVE
15582	DOUGLAS-FIR	10	FAIR	POOR TRUNK TAPER, SUPPRESSED	REMOVE
15583	DOUGLAS-FIR	13	GOOD	POOR TRUNK TAPER, 25% LIVE CROWN RATIO	RETAIN
15584	DOUGLAS-FIR	14	GOOD	MARGINAL TRUNK TAPER, 40% LIVE CROWN RATIO	RETAIN
15584.1	DOUGLAS-FIR	8	VERY POOR	DEAD	REMOVE
15585	DOUGLAS-FIR	15	GOOD	35% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15589	DOUGLAS-FIR	18	GOOD	33% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15590	DOUGLAS-FIR	13	GOOD	35% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15612	DOUGLAS-FIR	9	VERY POOR	DEAD	RETAIN
15614	DOUGLAS-FIR	9	FAIR	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15615	DOUGLAS-FIR	14	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15619	DOUGLAS-FIR	20, 16	GOOD	CODOMINANT AT GROUND LEVEL WITH INCLUDED BARK, MARGINAL TRUNK TAPER	RETAIN
15620	N/A	N/A	N/A	SAME AS TREE 15619	N/A
15621	N/A	N/A	N/A	DUPLICATE TREE POINT	N/A
15622	DOUGLAS-FIR	19	GOOD	ONE SIDED, BOWED TRUNK, MARGINAL TRUNK TAPER	RETAIN
15623	DOUGLAS-FIR	8	GOOD	ONE SIDED, POOR TRUNK TAPER	RETAIN
15624	DOUGLAS-FIR	9	VERY POOR	DEAD	RETAIN

TREE PRESERVATION INVENTORY

TREE NO.	SPECIES (COMMON NAME)	DBH (INCHES)	CONDITION	COMMENTS	TREATMENT
15630	DOUGLAS-FIR	18	GOOD	ONE SIDED	RETAIN
15631	DOUGLAS-FIR	24	GOOD	ONE SIDED	RETAIN
15632	DOUGLAS-FIR	13	GOOD	40% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15638	DOUGLAS-FIR	21	GOOD	ONE SIDED	RETAIN
15639	DOUGLAS-FIR	14	GOOD	ONE SIDED, MARGINAL TRUNK TAPER, BOWED TRUNK	RETAIN
15640	DOUGLAS-FIR	15	GOOD	ONE SIDED, 70% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15641	DOUGLAS-FIR	19	GOOD	40% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15642	DOUGLAS-FIR	19	GOOD	MODERATELY ONE SIDED, MARGINAL TRUNK TAPER, 50% LIVE CROWN RATIO	RETAIN
15643	DOUGLAS-FIR	16	GOOD	ONE SIDED	RETAIN
15644	DOUGLAS-FIR	17	GOOD	33% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	REMOVE
15645	DOUGLAS-FIR	24	GOOD	ONE SIDED	RETAIN
15646	DOUGLAS-FIR	16	GOOD	ONE SIDED	RETAIN
15648	DOUGLAS-FIR	17	GOOD	ONE SIDED, 60% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15649	DOUGLAS-FIR	16	GOOD	ONE SIDED, MARGINAL TRUNK TAPER	RETAIN
15649.1	DOUGLAS-FIR	17	GOOD	MODERATELY ONE SIDED, MARGINAL TRUNK TAPER	RETAIN
15650	DOUGLAS-FIR	23, 16	GOOD	CODOMINANT AT GROUND LEVEL, NORTH STEM HAS POOR TRUNK TAPER	RETAIN
15651	N/A	N/A	N/A	SAME AS TREE 15650	N/A
15654	DOUGLAS-FIR	21	GOOD	ONE SIDED, CODOMINANT AT 12' WITH INCLUDED BARK	REMOVE
15655	DOUGLAS-FIR	24	GOOD	ONE SIDED	REMOVE
15656	DOUGLAS-FIR	16	GOOD	MARGINAL TRUNK TAPER, 40% LIVE CROWN RATIO	REMOVE
15659	DOUGLAS-FIR	21	GOOD	MODERATELY ONE SIDED, 6" DEAD CODOMINANT STEM AT BASE OF TRUNK	REMOVE
15660	DOUGLAS-FIR	19	GOOD	35% LIVE CROWN RATIO, MARGINAL TRUNK TAPER, DEAD 8" CODOMINANT STEM AT 15'	RETAIN
15662	DOUGLAS-FIR	8	VERY POOR	DEAD	REMOVE
15666	DOUGLAS-FIR	13	GOOD	MARGINAL TRUNK TAPER, 35% LIVE CROWN RATIO	REMOVE
15667	DOUGLAS-FIR	16	GOOD	40% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15668	DOUGLAS-FIR	14	GOOD	40% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15669	DOUGLAS-FIR	15	GOOD	ONE SIDED, OVERTOPPED BY ADJACENT TREES	REMOVE
15670	DOUGLAS-FIR	23	GOOD	MODERATELY ONE SIDED	REMOVE
15671	DOUGLAS-FIR	10	GOOD	ONE SIDED, POOR TRUNK TAPER	REMOVE
15672	DOUGLAS-FIR	15	GOOD	33% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15673	DOUGLAS-FIR	15	GOOD	35% LIVE CROWN RATIO, MARGINAL TRUNK TAPER	RETAIN
15674	DOUGLAS-FIR	13	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15677	DOUGLAS-FIR	13	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15678	DOUGLAS-FIR	14	GOOD	33% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15679	DOUGLAS-FIR	16,12	GOOD	CODOMINANT AT GROUND LEVEL WITH INCLUDED BARK, SOUTH STEM HAS MARGINAL TRUNK TAPER WITH 25% LIVE CROWN RATIO	RETAIN
15680	DOUGLAS-FIR	11	GOOD	25% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN
15681	DOUGLAS-FIR	14	GOOD	POOR TRUNK TAPER, 20% LIVE CROWN RATIO	RETAIN
15682	DOUGLAS-FIR	26	GOOD	ONE SIDED	REMOVE
15685	DOUGLAS-FIR	22	GOOD	MODERATELY ONE SIDED	RETAIN
15686	DOUGLAS-FIR	25	GOOD	ONE SIDED	RETAIN
15688	DOUGLAS-FIR	20	GOOD	MARGINAL TRUNK TAPER, 50% LIVE CROWN RATIO	RETAIN
15690	DOUGLAS-FIR	16	GOOD	33% LIVE CROWN RATIO, POOR TRUNK TAPER	RETAIN

NOTE: INDICATES TREES 11" DBH AND GREATER DEEMED TO BE VIABLE BY ARBORIST INSPECTION, AND MEETING THE REQUIREMENTS OF THE SANDY DC FOR TREE RETENTION.

TOTAL NUMBER OF VIABLE, 11"+ DBH TREES TO BE PRESERVED: 48

DATE	NO.	REVISION	BY
-	-	-	-

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

SHEET C4 OF 8

REGISTERED PROFESSIONAL ENGINEER 49711 OREGON JULY 21, 1998 RAY L. MOORE
RENEWAL DATE: 12/31/2022

SCALE VERT: N/A HORIZ: 1"=60'
DATE: 07/26/2018
FILE:19-035-Planning-B.dwg

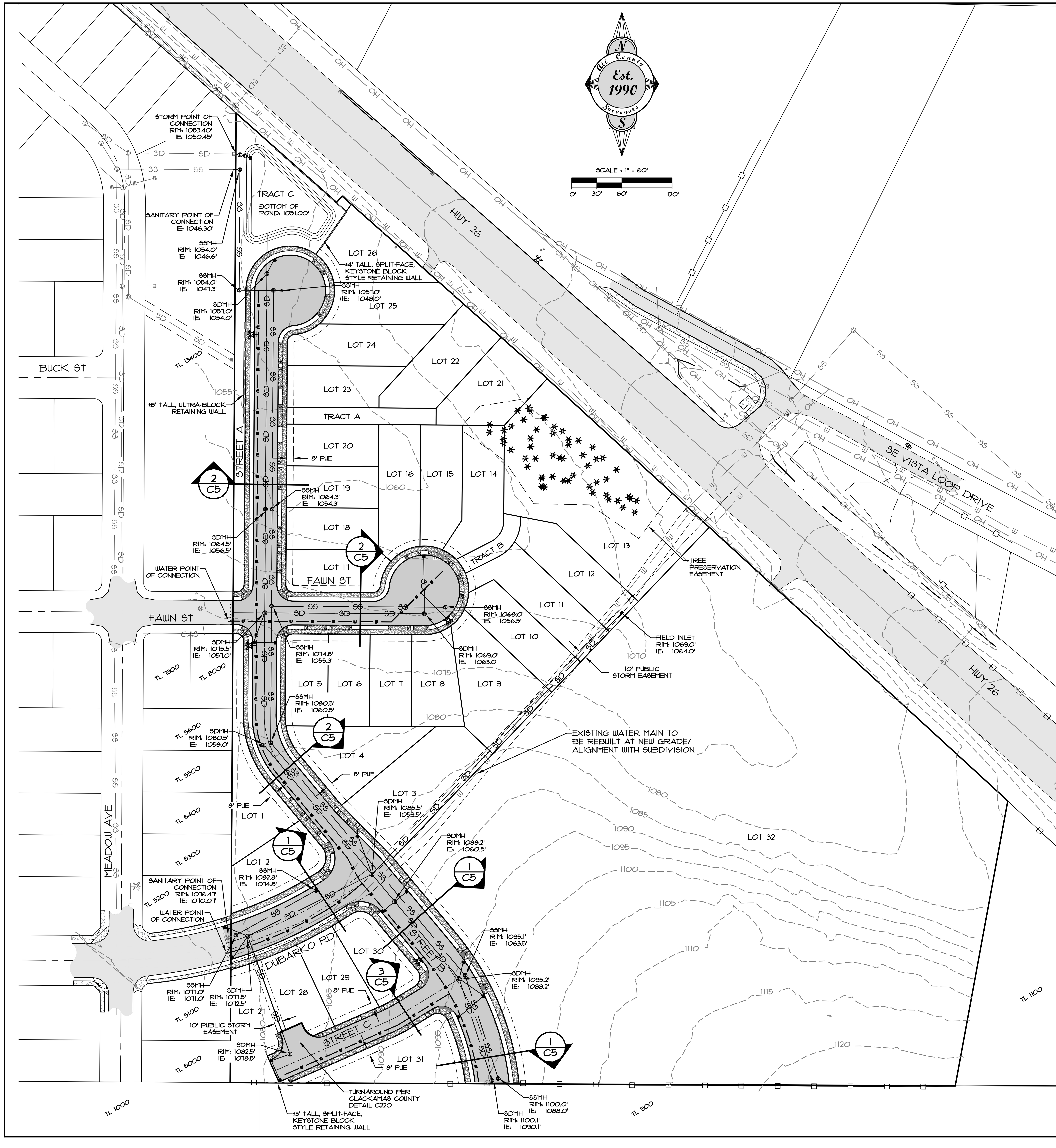
LEGAL		
SECTION	TWP.	RANGE
18	2S	5E

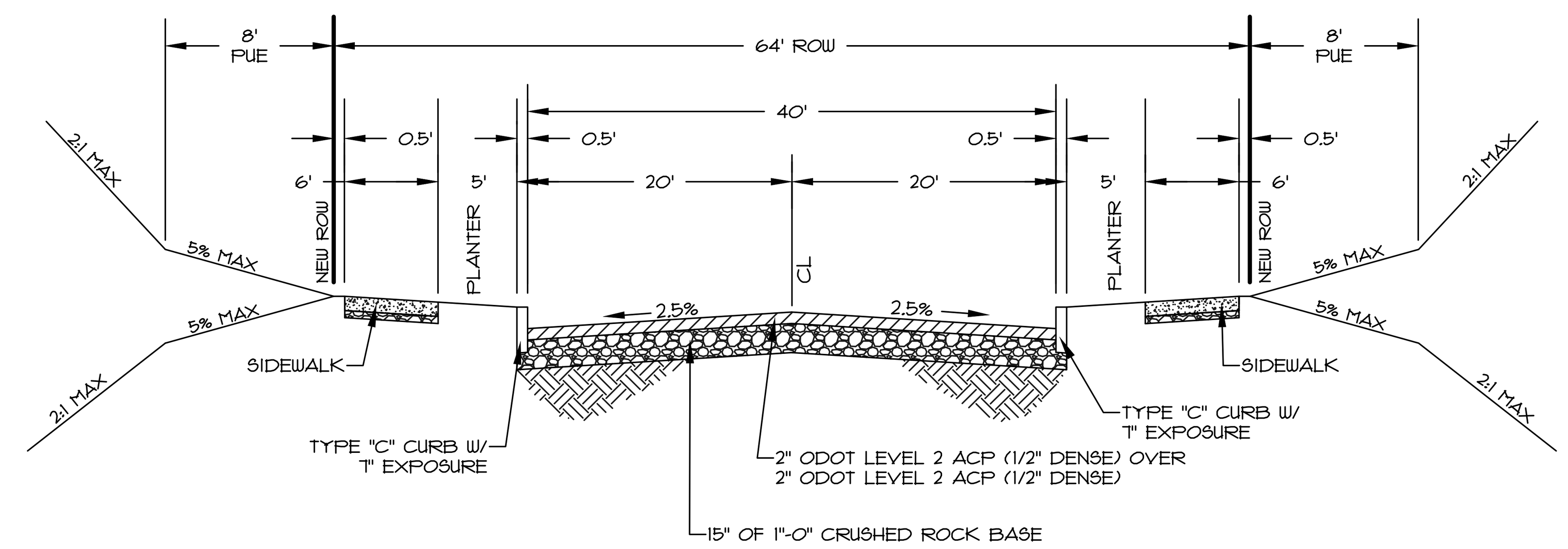
PROJECT:
DEER MEADOWS SUBDIVISION
TREE TABLES

LOCATION: 40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730
DATE OF PLOT 05/28/2021

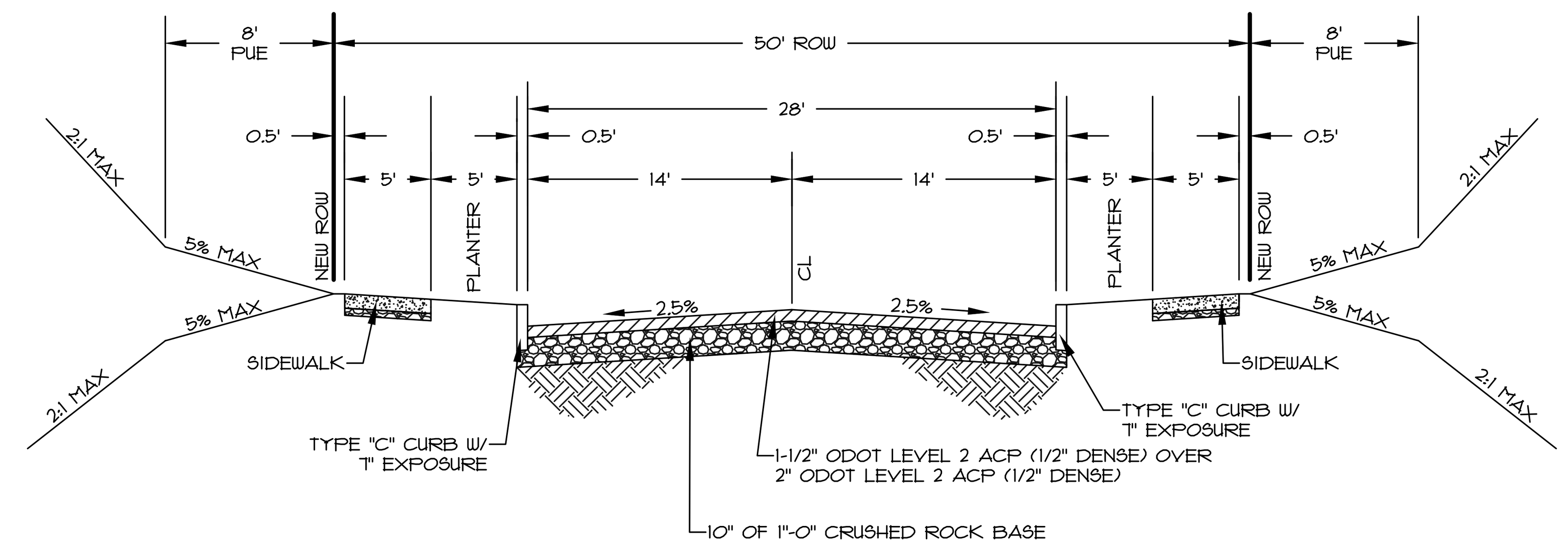
CLIENT:
ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113





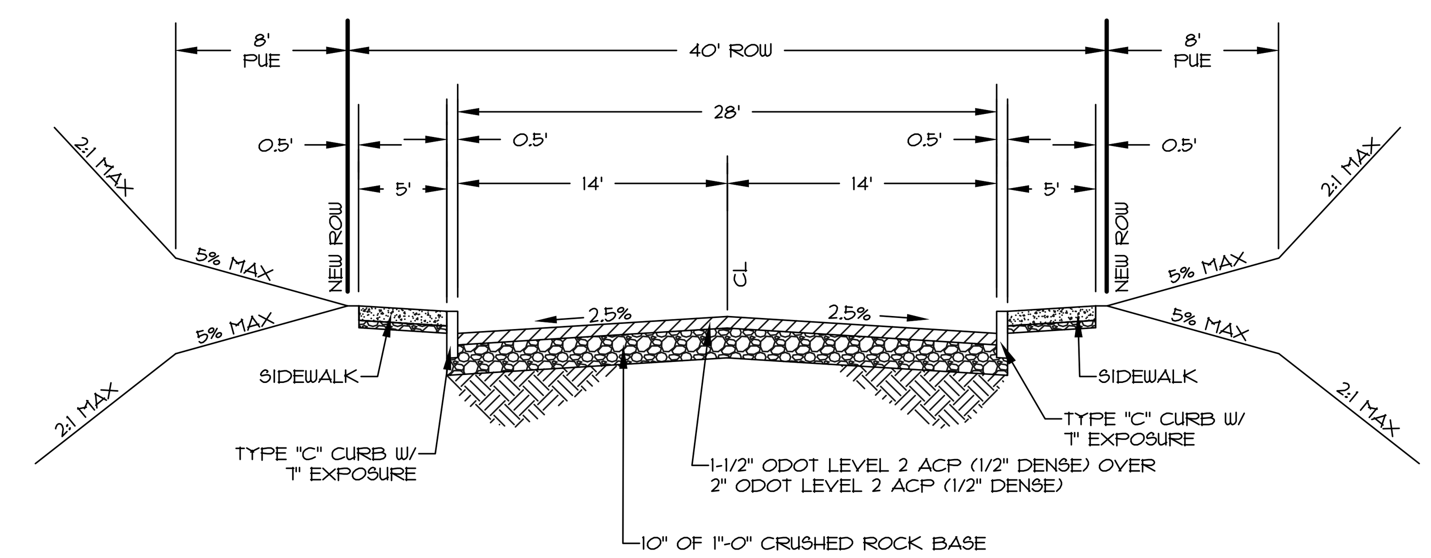
SECTION ① (64' ROW - FULL STREET IMPROVEMENTS)

DUBARKO STREET, STREET B - ARTERIAL, COLLECTOR STREET
NTS



SECTION ② (50' ROW - FULL STREET IMPROVEMENTS)

STREET A, FAWN STREET - LOCAL STREET
NTS



SECTION ③ (40' ROW - FULL STREET IMPROVEMENTS)

STREET C - ACCESS LANE
NTS

NOTES

1) BOTH OF THE PROPOSED CUL-DE-SACS HAVE LESS THAN 50% OF THEIR CIRCUMFERENCE COVERED BY DRIVEWAY DROPS.

PROJECT: **DEER MEADOWS SUBDIVISION**

MASTER STREET AND UTILITY PLAN

LOCATION: **40808 & 41010 HWY 26, SANDY, OR 97055**

CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT: 05/28/2021

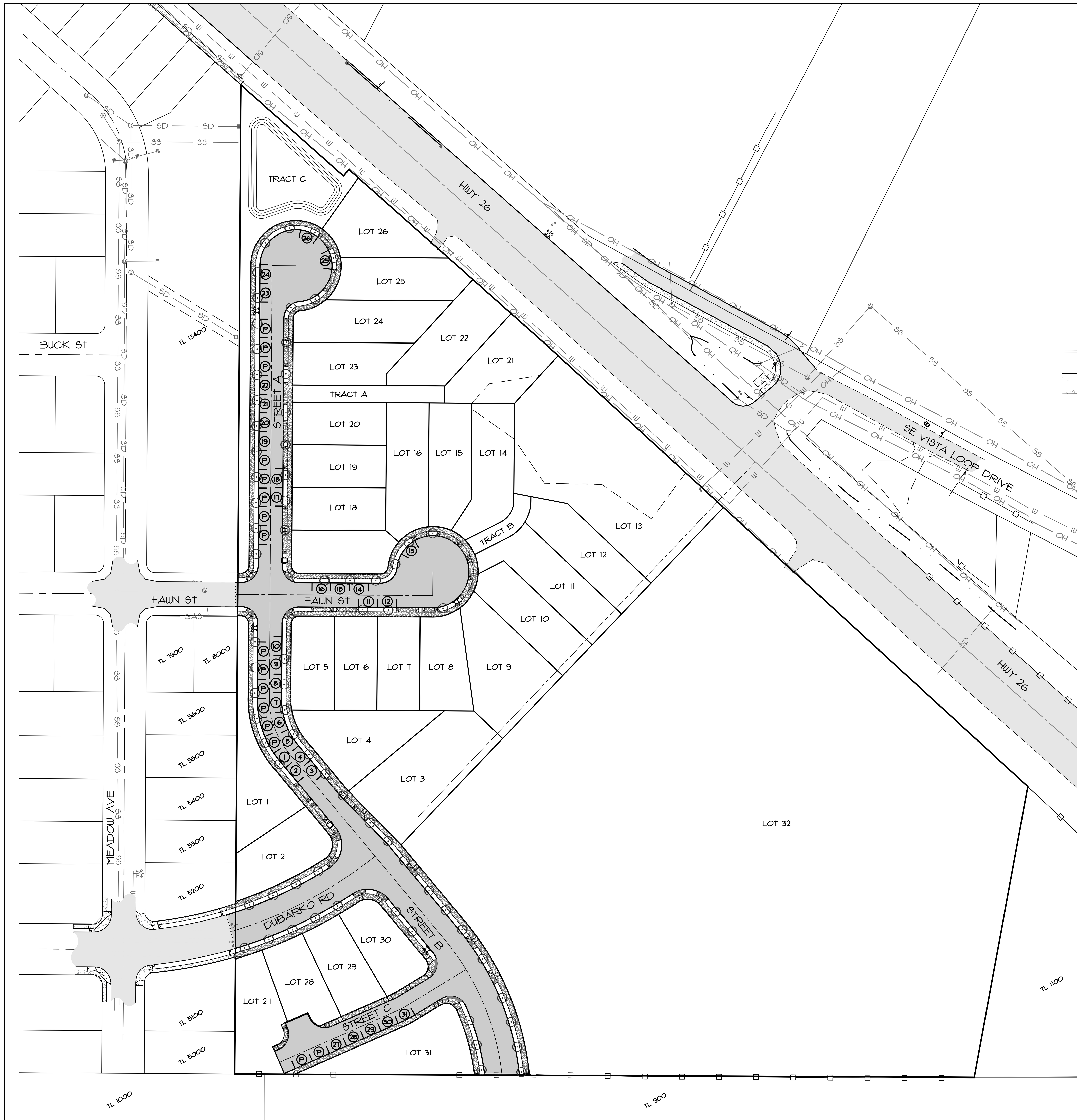
SCALE	VERT: N/A	HORIZ: 1"=60'
DATE: 07/26/2018		
FILE: 19-035-Planning-B.dwg		
LEGAL		
SECTION	TWP.	RANGE
18	2S	5E

RENEWAL DATE: 12/31/2022

DESIGNED:	CTH
DRAWN:	CTH
CHECKED:	RLM
APPROVED:	RLM

DATE	NO.	REVISION	BY
-	-	-	-

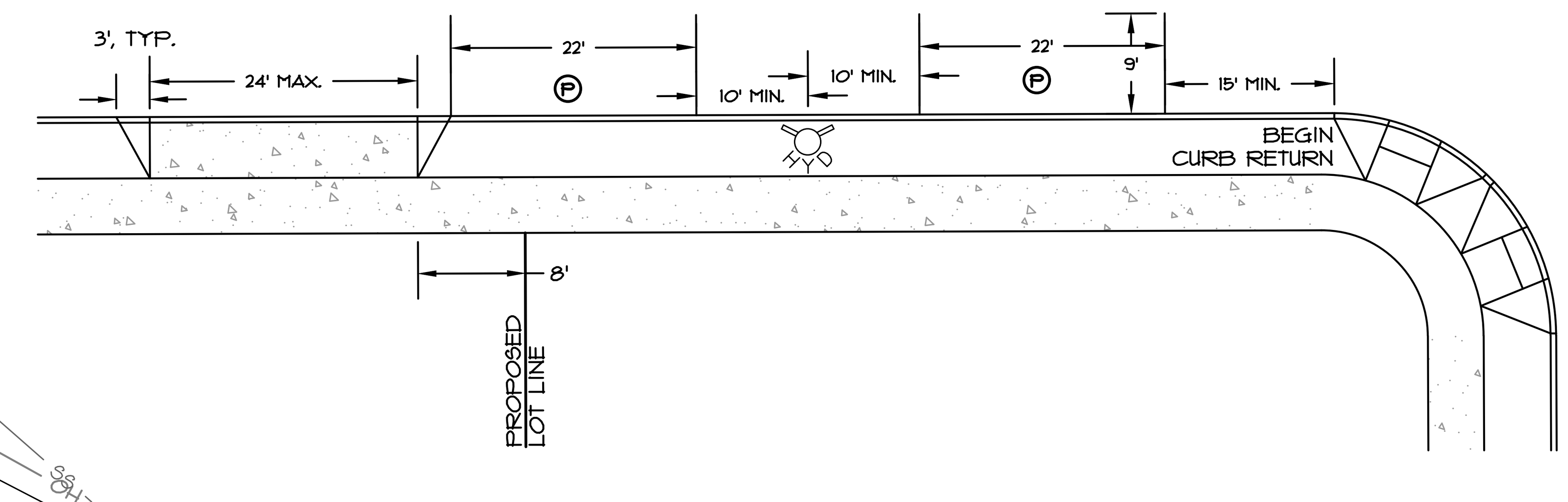
SHEET C5 OF 8



SCALE : 1" = 60'

0' 30' 60' 120'

TYPICAL ON-STREET PARKING REQUIREMENT DIMENSIONS



ON-STREET PARKING REQUIREMENTS
17.98.200 SDC

REQUIREMENT: 1 ON-STREET PARKING SPACE WITHIN 300 FEET OF EACH DWELLING

REQUIREMENT IS FULFILLED.

TOTAL NUMBER OF LOTS: 31

TOTAL NUMBER OF ON-STREET PARKING SPACES: 47

* NOTE: LOT 32 IS NOT SUBJECT TO THE ON-STREET PARKING REQUIREMENTS OF 17.98.200 SDC, AND PARKING WILL BE PROVIDED ONSITE AT THE TIME OF FUTURE DEVELOPMENT.

NOTES

1) STREET TREE SPECIES TO BE DICTATED BY CITY PLANNING STAFF AT THE TIME OF PLANTING.

2) LOCATION OF STREET TREES MAY VARY BASED ON FINAL LOCATION OF FUTURE UTILITIES AND DRIVEWAY CUTS.

3) FINAL LOCATION OF MBU'S TO BE DETERMINED BY SANDY POSTMASTER AT THE TIME OF FINAL ENGINEERING.

PARKING LEGEND

- SUBJECT PROPERTY BOUNDARY LINE
- PROPOSED LOT LINE
- PROPOSED CURB AND PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED UNSTRIPED 22' x 9' ON-STREET PARKING SPACE
- PARKING SPACE NUMBER CORRESPONDING TO LOT NUMBER
- PARKING SPACE THAT EXCEEDS THE REQUIREMENT
- PROPOSED FIRE HYDRANT
- PROPOSED MBU

DATE	NO.	REVISION	BY
-	-	-	-

SHEET C6 OF 8

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

REGISTERED PROFESSIONAL ENGINEER 49710 OREGON JULY 21, 1998 RAY L. MOORE
RENEWAL DATE: 12/31/2022

SCALE VERT: N/A HORIZ: 1"=60'
DATE: 07/26/2018
FILE:19-035-Planning-B.dwg

LEGAL		
SECTION	TWP.	RANGE
18	2S	5E

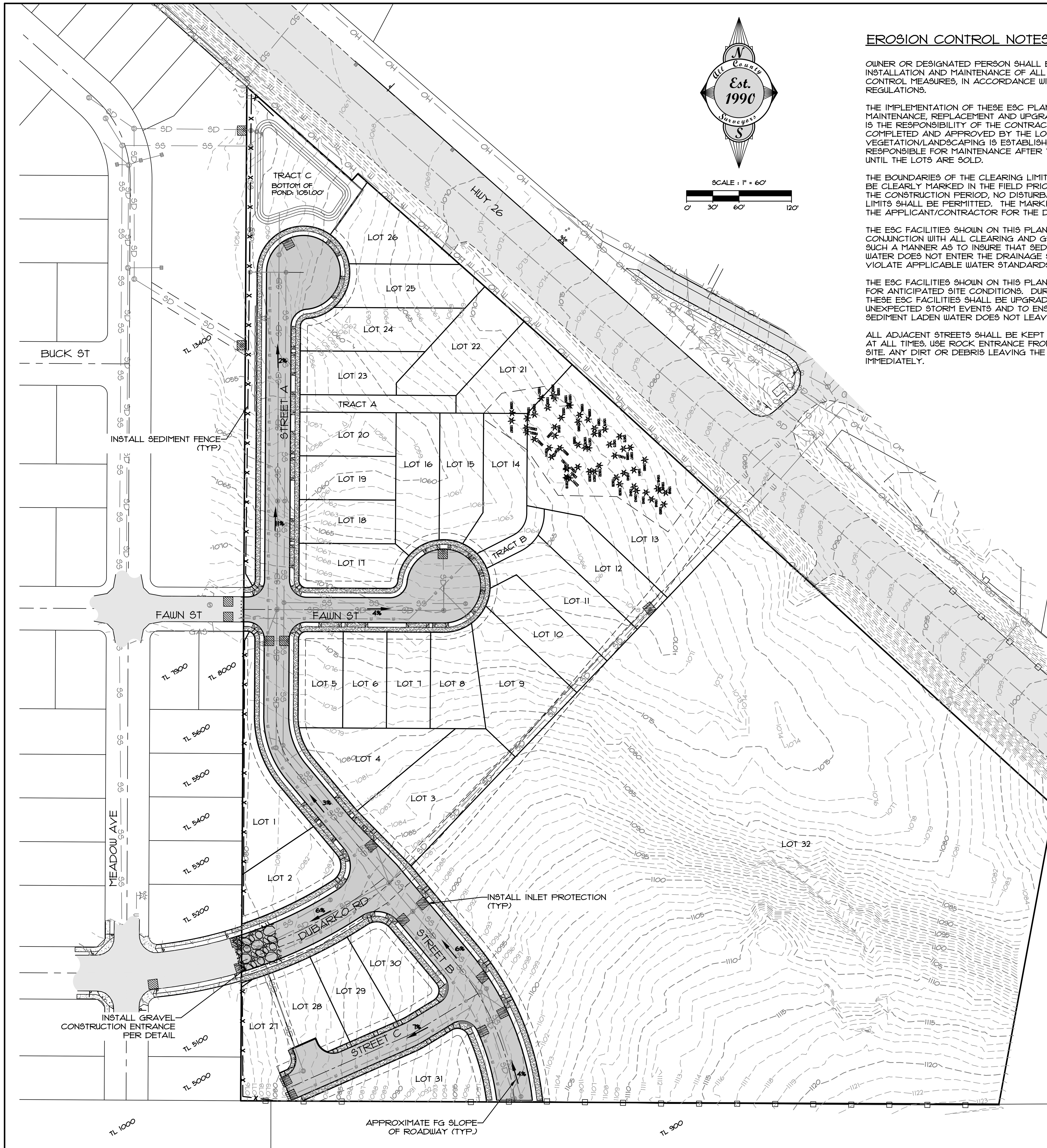
PROJECT:
DEER MEADOWS SUBDIVISION
STREET TREE PLAN & PARKING ANALYSIS

LOCATION:
40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT 05/28/2021

CLIENT:
ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113



EROSION CONTROL NOTES:

OWNER OR DESIGNATED PERSON SHALL BE RESPONSIBLE FOR PROPER INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL MEASURES, IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

THE IMPLEMENTATION OF THESE ESC PLANS AND CONSTRUCTION MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED BY THE LOCAL JURISDICTION, AND VEGETATION/LANDSCAPING IS ESTABLISHED. THE DEVELOPER SHALL BE RESPONSIBLE FOR MAINTENANCE AFTER THE PROJECT IS APPROVED UNTIL THE LOTS ARE SOLD.

THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY MARKED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE MARKINGS SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.

THE ESC FACILITIES SHOWN ON THIS PLAN ARE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DOES NOT LEAVE THE SITE.

ALL ADJACENT STREETS SHALL BE KEPT FROM DEBRIS, DIRT AND ROCK AT ALL TIMES. USE ROCK ENTRANCE FROM ENTERING AND LEAVING THE SITE. ANY DIRT OR DEBRIS LEAVING THE SITE SHALL BE CLEANED UP IMMEDIATELY.

AN EROSION CONTROL INSPECTION IS REQUIRED BEFORE ANY GROUND DISTURBING ACTIVITY IS COMMENCED ON-SITE. ALSO, THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE APPLICANT/CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.

STABILIZED GRAVEL ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

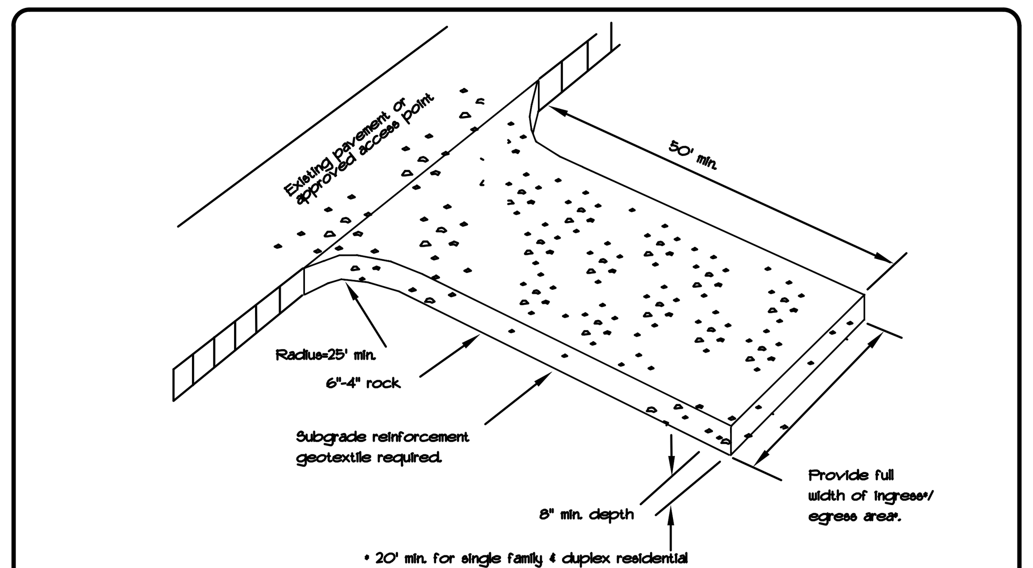
STORM INLETS, BASINS, AND AREA DRAINS SHALL BE PROTECTED UNTIL PAVEMENT SURFACES ARE COMPLETED AND/OR VEGETATION IS RE-ESTABLISHED.

PAVEMENT SURFACES AND VEGETATION ARE TO BE PLACED AS RAPIDLY AS POSSIBLE.

SEEDING SHALL BE PERFORMED NO LATER THAN SEPTEMBER 1 FOR EACH PHASE OF CONSTRUCTION.

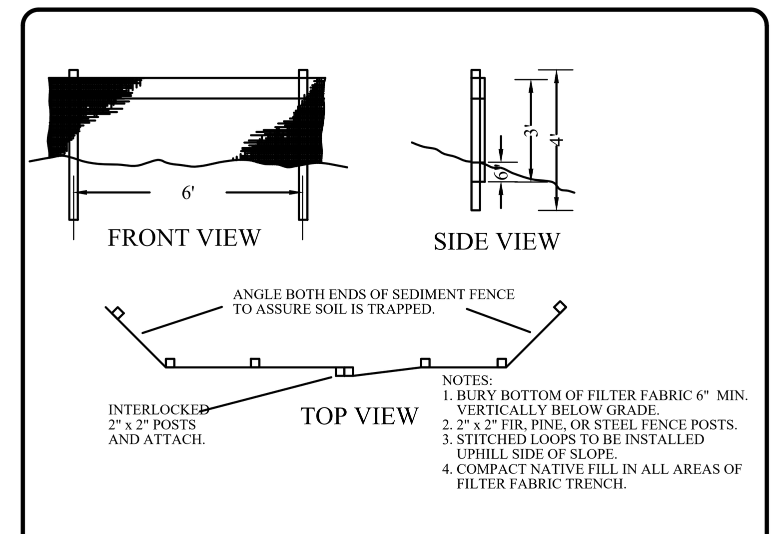
IF THERE ARE EXPOSED SOILS OR SOILS NOT FULLY ESTABLISHED FROM OCTOBER 1ST THROUGH APRIL 30TH, THE WET WEATHER EROSION PREVENTION MEASURES WILL BE IN EFFECT. SEE THE EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL (CHAPTER 4) FOR REQUIREMENTS.

THE DEVELOPER SHALL REMOVE ESC MEASURES WHEN VEGETATION IS FULLY ESTABLISHED.



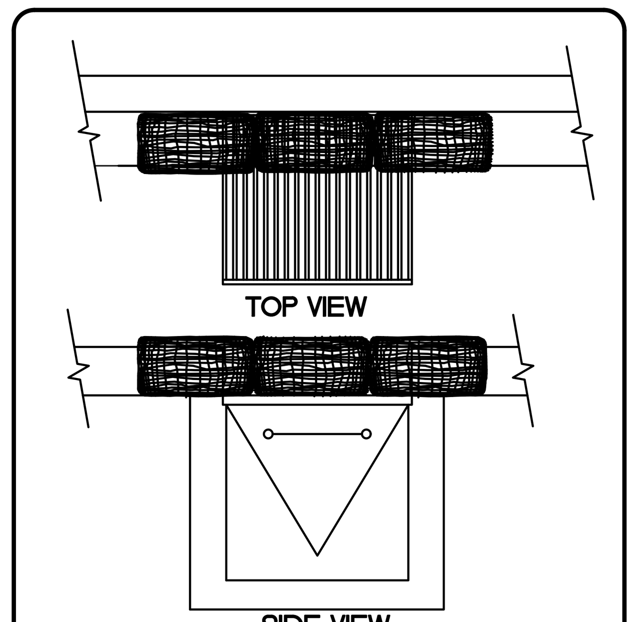
GRAVEL CONSTRUCTION ENTRANCE

NTS



SILT FENCE DETAIL

NTS



ENSURE THAT NO GAPS EXIST BETWEEN BAGS AND 1/2 BAG OVERLAP OF OPENING.

COMBINATION INLET PROTECTION DETAIL

NTS

SHEET	C7 OF 8
DESIGNED:	CTH
DRAWN:	CTH
CHECKED:	RLM
APPROVED:	RLM
SCALE	VERT: N/A; HORIZ: 1"=60'
DATE:	07/26/2018
FILE:	19-035-Planning-B.dwg
LEGAL	SECTION 18, TWP. 2S, RANGE 5E

REGISTERED PROFESSIONAL ENGINEER OREGON RAY L. MOORE
RENEWAL DATE: 12/31/2022

PROJECT: DEER MEADOWS SUBDIVISION

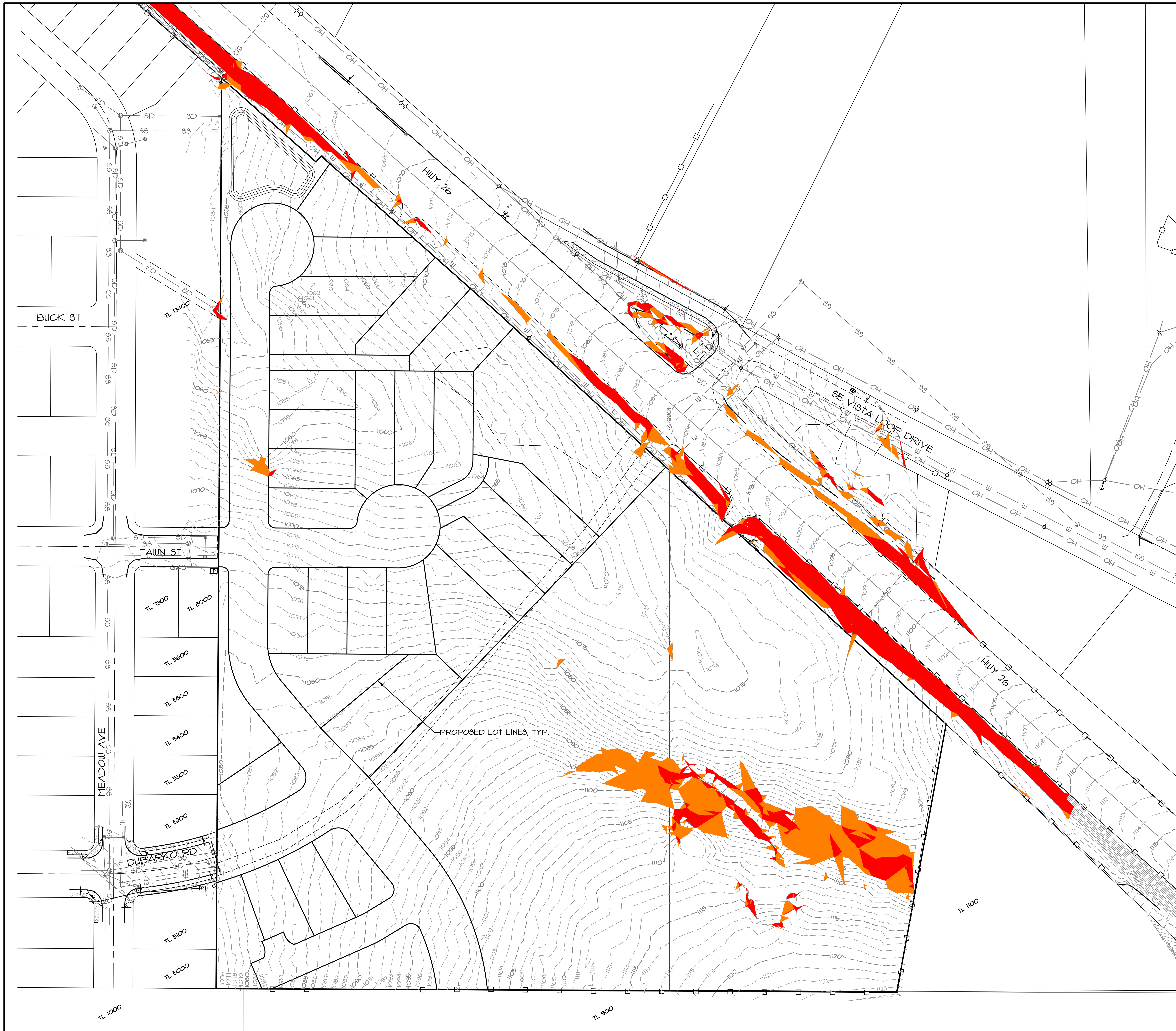
PRELIMINARY GRADING & EROSION CONTROL PLAN

LOCATION: 40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT: 05/28/2021

CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113



SCALE: 1" = 60'

0' 30' 60' 120'

LEGEND

	SLOPES OF 0-24.99%
(orange)	SLOPES OF 25-34.99%
(red)	SLOPES OF 35% AND GREATER

DATE	NO.	REVISION	BY
-	-	-	-

DESIGNED: CTH
DRAWN: CTH
CHECKED: RLM
APPROVED: RLM

RENEWAL DATE: 12/31/2022

SCALE
VERT: N/A
HORIZ: 1"=60'
DATE: 07/26/2018
FILE: 19-035-Planning-B.dwg

LEGAL

SECTION	TWP.	RANGE
18	2S	5E

PROJECT:
DEER MEADOWS SUBDIVISION
SLOPE ANALYSIS

LOCATION:
40808 & 41010 HWY 26, SANDY, OR 97055

All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

DATE OF PLOT 05/28/2021

CLIENT:
ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113

SHEET
C8
OF 8

Exhibit D
Preliminary Stormwater Report

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Preliminary Storm Drainage Design and Calculations For the Deer Meadows Subdivision

May, 2021

Prepared By:
All County Surveyors and Planners, Inc.
Tyler Henderson, P.E.
Ray L. Moore, P.E., P.L.S.
P.O. Box 955
Sandy, Oregon 97055
Phone: (503) 668-3151
Job #19-035

Prepared For:
Roll Tide Properties Corporation
Alex Reverman
P.O. Box 703
Cornelius, OR 97113
Phone: (503) 327-6084

RENEWAL DATE: 12/31/2022

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

Table of Contents: Page(s)

Appendices:

Appendix A
-Pre-Developed Plan
-Developed Plan

Appendix B
-Standard Formulas
-Coefficients
-Hydrograph Analysis Summary
-Detention System Summary
-Stage Storage Summary
-Rectangular, Sharp Crested Weir Calculations

PURPOSE:

The purpose of this analysis is to:

- Describe existing and proposed site conditions.
- Provide detention calculations for the 2-yr, 5-yr, 10-yr, and 25-yr storm events.
- Provide water quality calculations.

PROJECT LOCATION AND DESCRIPTION:

The project site is located on the south side of the Mount Hood Highway in Sandy, Oregon. The site includes tax lots 900 and 1000. The +/- 15.91-acre site consists of grassy fields, and plentiful tree cover. The land is generally sloped to the north and west with an average slope of about 8%. A Vicinity Map and Site Layout (with proposed storm sewer layout) can be found in Appendix A.

PROPOSED IMPROVEMENTS

The proposed 32-lot Deer Meadows Subdivision project will consist of 29 single-family residential lots ranging from 5,500 SF to 32,189 SF. The project also includes a single split-zoned R-1/R-2 lot 7,076 SF in size, and a single R-2 lot 9,083 SF in size. The final lot is split zoned R-2/C-3 and is 320,409 SF in size. The split-zoned R-2/C-3 lot will be developed in the future under a design review process and will provide it's own stormwater detention/water quality system onsite. The site improvements will include streets, curbs, sidewalks, utilities, etc.

New storm sewer pipes, manholes, and catch basins will be installed to convey storm water to a public detention pond located in Tract C. A new water quality manhole will be installed downstream of the detention pond (See Site Layout – Appendix A).

The pond will be sized to detain the new public streets and the new homes to be built on lots 1 through 31. Lot 32 will provide lot-level detention and water quality systems at the time of future development. Lot 32 will drain through the detention pond, and the pond will be sized to accommodate these anticipated flows. The existing upland drainage on the site will be intercepted and flow through the new storm detention pond.

Upstream and downstream analyses will be performed as needed at the time of final engineering.

HYDROGRAPH PARAMETERS:

Rainfall

The rainfall distribution numbers below were taken from the City of Sandy Stormwater Website: https://www.ci.sandy.or.us/publicworks/page/stormwater

2 year, 24 hr. rainfall = 3.5_
5 year, 24 hr. rainfall = 4.5_
10 year, 24 hr. rainfall = 4.8_
25 year, 24 hr. rainfall = 5.5_

Soils

The soil data for this site is from Soil Survey of Clackamas County, Oregon published by the United Stated Department of Agriculture (USDA). The post-development soil is assumed to be the same as pre-development.

Soil Type: 15B, Cazadero silty clay loam. Hydrologic Group `C_
15C, Cazadero silty clay loam. Hydrologic Group `C_
24B, Cottrell silty clay loam. Hydrologic Group `C_

(See next section and Portland SWMM/Sewer and Drainage Facilities Design Manual for CN˘s)

Areas and Curve Numbers
Drainage basin areas were determined using a topographic map drafted in AutoCAD. See the Pre-Developed Plan and Developed Plan in Appendix A.

The impervious area for these post-developed basins includes the proposed roofs from lots 1 through 31, streets, sidewalks, driveways, and curbs and planters, as well as the un-developed condition of lot 32. See the following tables for a specific breakdown of these areas.

Pre-Development		
Areas	CN	Reference
Pervious (15.91 acres)	79	Portland SWMM Table A-8. Curve Numbers Type `C_Soils
Impervious (0.00 acres)	98	N/A
Post-Development		
Areas	CN	Land Use Description
Pervious (11.52 acres)*	76	Portland SDFDM Table 6-5 Non-composite Curve Numbers Lawns with Type `C_Soils, and Table A-8 as above.
Impervious (4.39 acres)**	98	Buildings, AC, Sidewalks, etc.

*Post-Developed Pervious CN: Weighted CN
Undeveloped Type C Soil 7.36 AC: CN = 79
Lawns Type C Soil 4.16 AC: CN = 70
[(7.36AC x 79) + (4.16AC x 70)] / (7.36 + 4.16) = 75.75 = 76.0

**Refer to Water Quality Design Section for detailed area breakdown.

Time of Concentration
The times of concentrations (Tc), were assumed as follows.

Pre-development T_c= 30.0 minutes
Post-development T_c= 5.0 minutes

Hydrograph Modeling Results
Hydrographs for the site were determined using a spreadsheet based on the King County, Washington Hydrograph Program, version 4.21B, which uses the Santa Barbara Urban Hydrograph (SBUH) method.

DETENTION SIZING RESULTS:

The Post-Development flows were routed through a proposed 3-foot-deep detention pond. The 3-foot-deep detention pond has been designed so that the Post-Developed release rates for the entire site do not exceed the Pre-Developed rates for the 2-year, 5-year, 10-year, and 25-year storm events per the City of Sandy public Works Design Standards. See the Detention System Summary in Appendix B.

Hydrology Table			
Recurrence Interval (years)	Pre-developed Flows (cfs)	Developed Flows (cfs)	Proposed Release Rates (cfs)
2	3.84	7.46	3.73
5	6.37	11.21	6.09
10	7.17	12.39	7.17
25	9.09	15.21	9.09

The required storage volume is 20,016-cubic feet. This can be contained in a 3-foot-deep pond with a bottom area of 5,472 square feet.

Flow Control:

The flow control orifices were designed to release the Post-development Peak-Q's at or below the Pre-developed Peak-Q's.
(See the Detention System Summary - Appendix B)

Orifice Table		
Orifice	Dia. (inches)	Height (feet)
Bottom	10.72	0.00
Top	weir	weir

WATER QUALITY DESIGN:

CDS Storm Water Treatment Device

A CDS manhole by Contech Stormwater Solutions was designed for water quality for the site - see detail in Appendix B. The impervious area for the site includes AC pavement, sidewalks, and roofs. The impervious area is 4.39-acres.

Proposed asphalt, walks, etc.:	2.26 acres
Roof, Patio, Driveway*:	2.13 acres
Total Impervious Area:	4.39 acres

*40ˇx60ˇBuilding footprint:	2400SF
20ˇx20ˇDriveway:	400SF
2-10ˇx10ˇPatio:	200SF
Total:	3,000SF X 31 lots = 93,000SF

The flow (Q) from this runoff was calculated using the rational method (Q = CIA)

Where Q = flow (cfs)

C = runoff coefficient = 0.90 pavement and Roofs

I = Intensity = 0.2 inches per hour (Water Quality Design Storm)

A = Impervious Area = 4.39 Acres

Q = 0.90 X 0.2 X 4.39

Q = 0.79 cfs

A Contech Storm Water Treatment Device from the CDS line will be sized to treat the flow from impervious area at the time of final engineering.

CONCLUSIONS:

- The conveyance system for the proposed Deer Meadows Subdivision site has been sized to handle the peak 25-year, 24-hour storm.
- On-site detention has been designed to maintain existing downstream storm water runoff characteristics in accordance with the City of Sandy requirements.
- A CDS Storm Water Treatment Device will be used for water quality.

Appendix A

-Pre-Developed Plan
-Developed Plan

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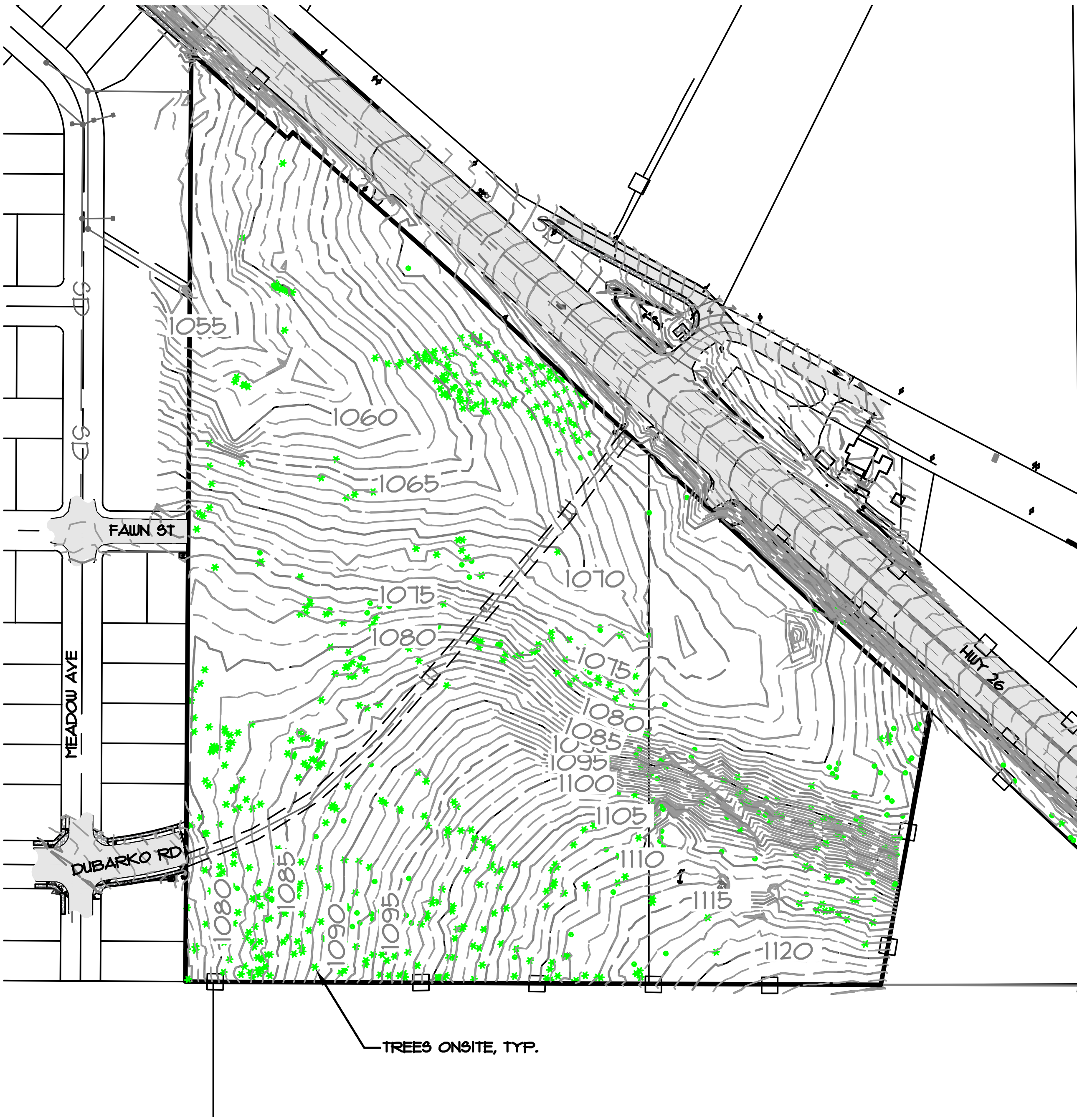
EXISTING CONDITIONS MAP



N
S
All County
Est. 1990
Surveyors

SCALE : 1" = 200'

0' 100' 200' 400'

REGISTERED PROFESSIONAL ENGINEER
49710
OREGON
JULY 21, 1998
RAY L. MOORE

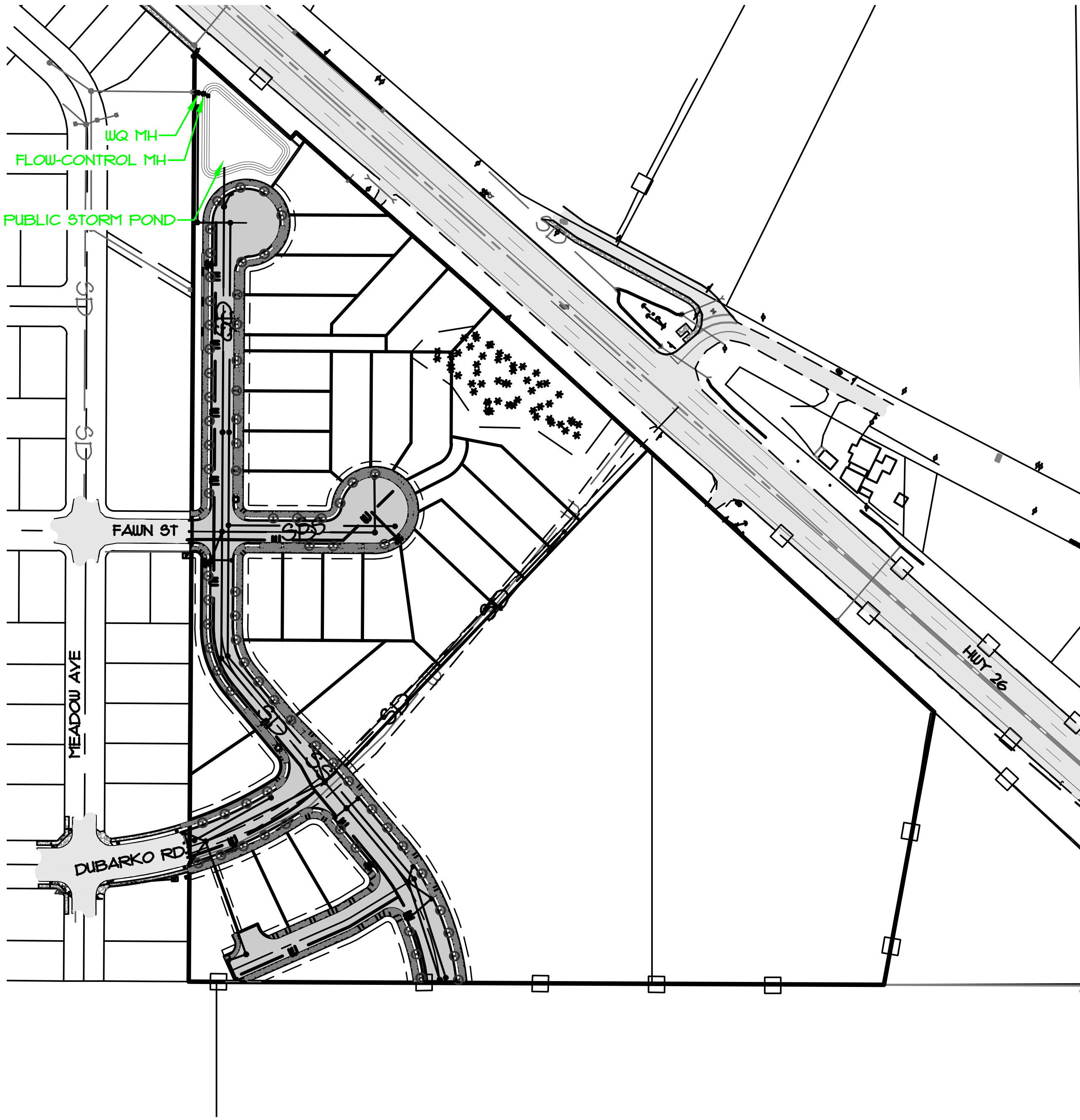
RENEWAL DATE: 12/31/2022

All County
Surveyors & Planners, Inc.
Surveying, Planning
and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

19-035-Planning-B.dwg
DATE OF PLOT: 5/27/21

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

DEVELOPED CONDITIONS MAP



SCALE : 1" = 200'

0' 100' 200' 400'

REGISTERED PROFESSIONAL ENGINEER
49710
OREGON
JULY 21, 1998
RAY L. MOORE

RENEWAL DATE: 12/31/2022

All County
Surveyors & Planners, Inc.
Surveying, Planning
and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730

19-035-Planning-B.dwg
DATE OF PLOT: 5/27/21

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

Appendix B

-Standard Formulas
-Coefficients
-Hydrograph Analysis Summary
-Detention System Summary
-Stage Storage Summary
-Rectangular, Sharp Crested Weir Calculations

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Standard formulas used for the Time of Concentration Calculations

Overland Flow (max 300' total)

$$\boxed{\frac{(0.42)[(Ns)(L)]^{0.8}}{(P_2)^{0.5}(S_0)^{0.4}}}$$

Tc	= time of concentration for less than 300˘of travel (minutes)
Ns	= sheet flow Manning˘s effective roughness coefficient
L	= flow length (ft)
P2	= 2-year, 24 hour rainfall (in)
So	= slope of hydraulic grade line (land slope, ft/ft)

Shallow Concentrated Flow (after initial 300')

$$T = \boxed{\frac{L}{(60)(k\sqrt{S_0})}}$$

T	= travel time for sheet flow (min)
L	= flow length (ft)
So	= slope of hydraulic grade line (land slope, ft/ft)
k	= time of concentration velocity factor (ft/s)

Flow in Swales

Q = (1.486/n) x A x R^2/3 x S^1/2 (Manning's Equation)

Tc	= time of concentration for gutter flow (minutes)
A	= area of flow (sf)
R	= hydraulic radius (ft)
Ls	= side slope
Q	= quantity of flow (ft^3/sec)
V	= average velocity of flow (ft/sec)
L	= length of flow
Ve	= vertical length of side slope
Ho	= horizontal length of side slope
Bw	= base width (in)
D	= depth (in)
S	= slope (ft/ft)
n	= Manning's n

Flow in gutters

$$V = \boxed{\frac{1.12}{n}(S)\text{^}0.5(Sx)\text{^}.67(T)\text{^}0.67}$$

Tc	= time of concentration for gutter flow (minutes)
V	= average velocity of flow (ft/sec)
Q	= quantity of flow (ft^3/sec)
S	= street longitudinal slope (ft/ft)
Sx	= street cross slope (ft/ft)
T	= total width of flow in the gutter (ft)
n	= sheet flow Manning˘s (pavement = 0.018)
L	= Length of flow (ft)

Flow in pipes

Mannings Equation

Tc	= time of concentration in pipe (minutes)
V	= calculated velocity pipe full (ft/sec)
Q	= quantity of flow (ft^3/sec)
n	= Manning's n
D	= pipe Diameter (in)
S	= slope (ft/ft)
L	= length of pipe

COEFFICIENTS

Ns =	= Manning's coefficient (sheet flow)
	n values are for sheet flow only
Design Value	
0.011	Concrete or asphalt
0.010	Bare soil
0.020	Graveled surface
0.020	Bare clay - loam (eroded)
0.150	Grass (short prairie)
0.240	Grass (dense lawn)
0.410	Grass (bermuda)
0.400	Woods (light underbrush)
0.800	Woods (dense underbrush)

k =	= time of concentration velocity factor (ft/s)
Design Value	
3	Forest with heavy ground cover and meadows (n=0.10)
5	Brushy ground with some trees (n=0.060)
8	Fallow or cultivation (n=0.040)
9	High grass (n=0.035)
11	Short grass, pasture or lawns (n=0.030)
13	Nearly bare ground (n=0.025)
27	Paved and gravel areas (n=0.012)

n =	= Manning's coefficient (channel)
Design Value	
	CONSTRUCTED CHANNELS
	A. Earth, straight and uniform
0.018	Earth (straight and uniform)
0.025	Gravel (straight and uniform)
0.027	Grass (with weeds)
	B. Earth, winding and sluggish
0.025	Earth (no vegetation)
0.030	Grass (some weeds)
0.035	Dense weeds (deep channel)
0.030	Earth (rubble bottom and sides)
0.035	Stony bottom and weedy banks
0.040	Cobble bottom with clean sides
	C. Rock lined
0.035	Smooth and uniform
0.040	Jagged and irregular
	D. Channels not maintained (weeds and brush uncut)
0.050	Dense weeds (high as flow depth)
0.050	Clean bottom (brush on sides)
0.100	Dense brush (high stage)
0.200	Water quality swales (mowed regulary)
	NATURAL STREAMS
0.029	Clean (straight no pools)
0.035	Clean (straight no pools with weeds and stones)
0.039	Clean (winding pools)
0.042	Clean (winding pools weeds and stones)
0.052	Clean (winding pools weeds and large stones)
0.065	Weedy (sluggish with deep pools)
0.112	Very weedy (sluggish with deep pools)

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

Project Name: Deer Meadows
Hydrograph Analysis Summary

Job # 19-035
Date: 5/28/2021

Rainfall (year)	Rainfall (inches)
2	3.50
5	4.50
10	4.80
25	5.50
100	0.00

Pre-Developed		
Pervious		
Area =	15.91	acres
CN =	79	na
Impervious		
Area =	0	acres
CN =	98	na
Tc =	30	min
Total A =	15.91	acres

Developed		
Pervious		
Area =	11.52	acres
CN =	76	na
Impervious		
Area =	4.39	acres
CN =	98	na
Tc =	5	min
Total A =	15.91	acres

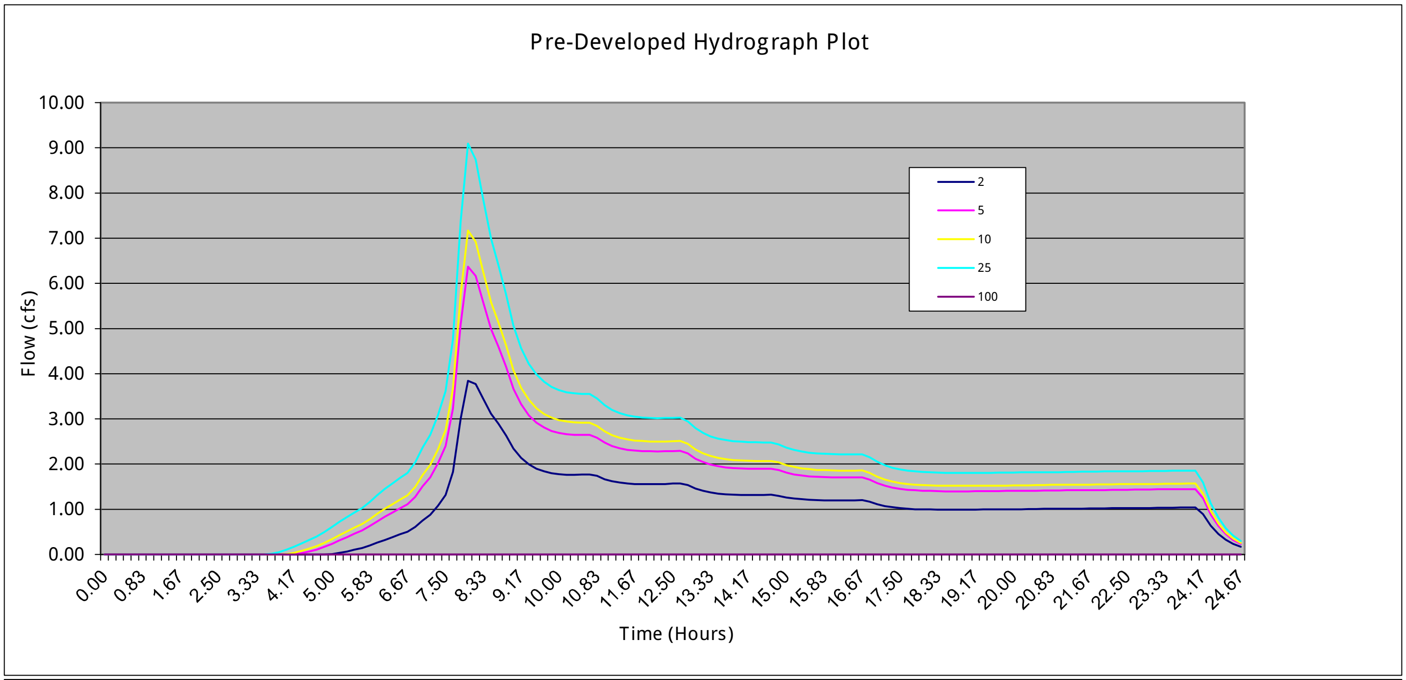
Note: The hydrographs shown are based on the S.C.S. Type - 1A, 24 hour storm using the SBUH method based on the King County Model.

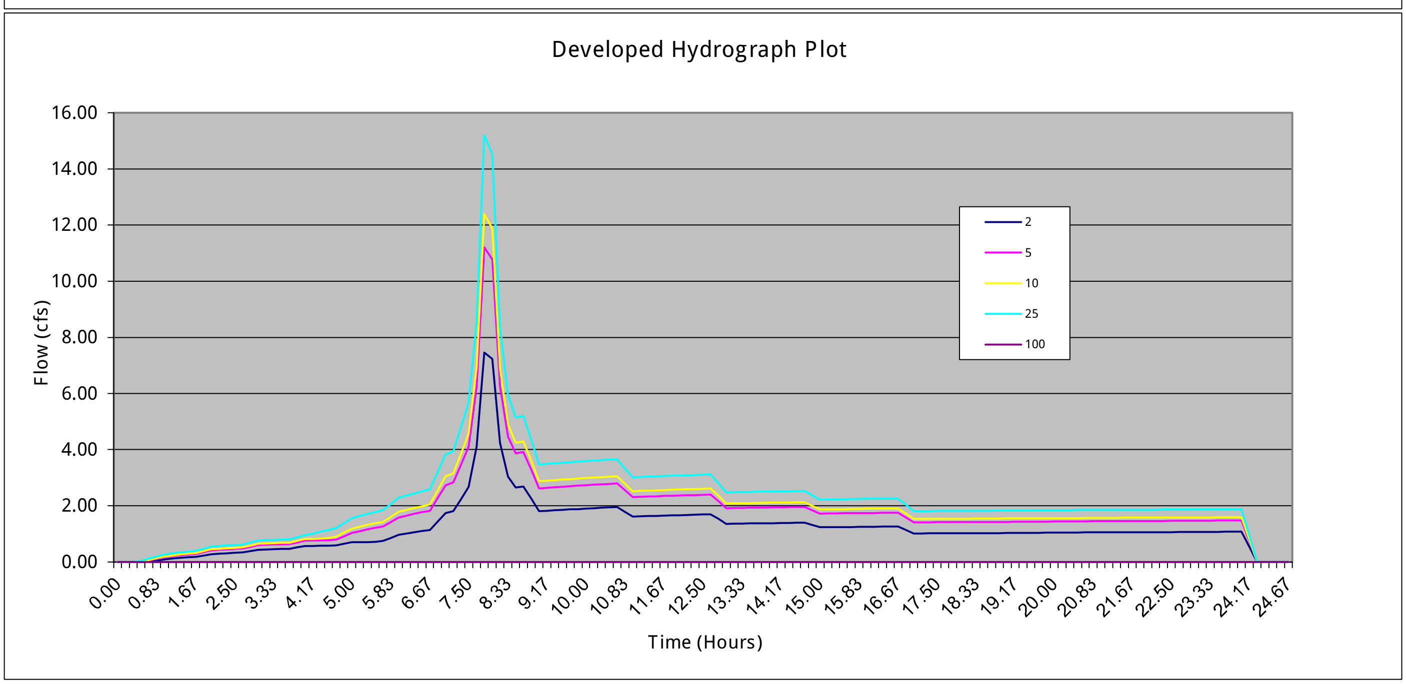
		Pre-Developed Hydrographs					Developed Hydrographs				
Year	=======>	2	5	10	25	100	2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00	7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-	109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10	470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17	7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100	2	5	10	25	100
Time (min)	Time (hr)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.00
40	0.67	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.07	0.12	0.00
50	0.83	0.00	0.00	0.00	0.00	0.00	0.05	0.12	0.14	0.20	0.00
60	1.00	0.00	0.00	0.00	0.00	0.00	0.09	0.17	0.19	0.26	0.00
70	1.17	0.00	0.00	0.00	0.00	0.00	0.12	0.21	0.23	0.30	0.00
80	1.33	0.00	0.00	0.00	0.00	0.00	0.14	0.24	0.27	0.34	0.00
90	1.50	0.00	0.00	0.00	0.00	0.00	0.17	0.27	0.30	0.37	0.00
100	1.67	0.00	0.00	0.00	0.00	0.00	0.19	0.29	0.32	0.40	0.00
110	1.83	0.00	0.00	0.00	0.00	0.00	0.23	0.35	0.39	0.47	0.00
120	2.00	0.00	0.00	0.00	0.00	0.00	0.28	0.41	0.45	0.55	0.00
130	2.17	0.00	0.00	0.00	0.00	0.00	0.30	0.43	0.47	0.57	0.00
140	2.33	0.00	0.00	0.00	0.00	0.00	0.31	0.45	0.49	0.59	0.00
150	2.50	0.00	0.00	0.00	0.00	0.00	0.33	0.46	0.51	0.60	0.00
160	2.67	0.00	0.00	0.00	0.00	0.00	0.34	0.48	0.52	0.62	0.00
170	2.83	0.00	0.00	0.00	0.00	0.00	0.38	0.54	0.58	0.69	0.00
180	3.00	0.00	0.00	0.00	0.00	0.00	0.43	0.60	0.65	0.77	0.00
190	3.17	0.00	0.00	0.00	0.00	0.00	0.44	0.61	0.66	0.78	0.00
200	3.33	0.00	0.00	0.00	0.00	0.00	0.45	0.62	0.67	0.79	0.00
210	3.50	0.00	0.00	0.00	0.00	0.00	0.46	0.63	0.68	0.80	0.00
220	3.67	0.00	0.00	0.00	0.01	0.00	0.47	0.64	0.69	0.80	0.00
230	3.83	0.00	0.00	0.00	0.05	0.00	0.52	0.70	0.75	0.88	0.00
240	4.00	0.00	0.00	0.01	0.10	0.00	0.56	0.76	0.82	0.96	0.00
250	4.17	0.00	0.01	0.04	0.17	0.00	0.57	0.77	0.82	1.01	0.00
260	4.33	0.00	0.03	0.08	0.24	0.00	0.58	0.77	0.83	1.07	0.00
270	4.50	0.00	0.07	0.13	0.32	0.00	0.58	0.78	0.86	1.14	0.00
280	4.67	0.00	0.11	0.19	0.40	0.00	0.59	0.79	0.91	1.20	0.00
290	4.83	0.00	0.17	0.26	0.50	0.00	0.64	0.91	1.04	1.38	0.00
300	5.00	0.01	0.24	0.34	0.61	0.00	0.70	1.04	1.19	1.56	0.00
310	5.17	0.03	0.31	0.43	0.72	0.00	0.70	1.10	1.25	1.63	0.00
320	5.33	0.06	0.39	0.51	0.83	0.00	0.71	1.15	1.31	1.71	0.00
330	5.50	0.10	0.46	0.59	0.93	0.00	0.72	1.21	1.37	1.77	0.00
340	5.67	0.15	0.54	0.68	1.03	0.00	0.75	1.26	1.43	1.84	0.00
350	5.83	0.20	0.63	0.78	1.16	0.00	0.86	1.42	1.61	2.06	0.00
360	6.00	0.26	0.73	0.90	1.31	0.00	0.97	1.59	1.79	2.29	0.00
370	6.17	0.32	0.84	1.01	1.45	0.00	1.01	1.65	1.86	2.37	0.00
380	6.33	0.39	0.93	1.12	1.58	0.00	1.06	1.71	1.92	2.44	0.00
390	6.50	0.45	1.02	1.21	1.70	0.00	1.10	1.77	1.99	2.51	0.00
400	6.67	0.51	1.11	1.31	1.81	0.00	1.15	1.83	2.05	2.58	0.00
410	6.83	0.61	1.27	1.50	2.04	0.00	1.43	2.27	2.54	3.19	0.00
420	7.00	0.75	1.51	1.76	2.37	0.00	1.74	2.73	3.05	3.83	0.00
430	7.17	0.88	1.71	1.98	2.65	0.00	1.81	2.83	3.16	3.94	0.00
440	7.33	1.07	2.02	2.32	3.07	0.00	2.23	3.46	3.85	4.79	0.00
450	7.50	1.32	2.40	2.76	3.61	0.00	2.67	4.11	4.57	5.67	0.00
460	7.67	1.83	3.22	3.67	4.76	0.00	4.10	6.25	6.93	8.55	0.00
470	7.83	3.00	5.09	5.76	7.36	0.00	7.46	11.21	12.39	15.21	0.00
480	8.00	3.84	6.37	7.17	9.09	0.00	7.23	10.78	11.88	14.53	0.00
490	8.17	3.77	6.17	6.93	8.74	0.00	4.24	6.26	6.89	8.38	0.00
500	8.33	3.44	5.57	6.24	7.84	0.00	3.04	4.46	4.91	5.95	0.00
510	8.50	3.12	5.00	5.58	6.99	0.00	2.65	3.87	4.25	5.15	0.00
520	8.67	2.90	4.60	5.13	6.41	0.00	2.69	3.92	4.30	5.20	0.00

		Pre-Developed Hydrographs					Developed Hydrographs				
Year	=======>	2	5	10	25	100	2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00	7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-	109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10	470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17	7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100	2	5	10	25	100
Time (min)	Time (hr)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)	Hyd (cfs)
530	8.83	2.64	4.15	4.63	5.76	0.00	2.25	3.28	3.60	4.35	0.00
540	9.00	2.34	3.66	4.08	5.06	0.00	1.81	2.63	2.88	3.47	0.00
550	9.17	2.14	3.32	3.69	4.57	0.00	1.82	2.64	2.90	3.50	0.00
560	9.33	1.99	3.08	3.42	4.22	0.00	1.84	2.66	2.92	3.52	0.00
570	9.50	1.90	2.92	3.24	3.98	0.00	1.86	2.68	2.94	3.54	0.00
580	9.67	1.84	2.81	3.11	3.82	0.00	1.87	2.70	2.95	3.56	0.00
590	9.83	1.80	2.74	3.03	3.71	0.00	1.89	2.72	2.97	3.58	0.00
600	10.00	1.78	2.69	2.97	3.64	0.00	1.90	2.73	2.99	3.59	0.00
610	10.17	1.77	2.66	2.94	3.59	0.00	1.92	2.75	3.01	3.61	0.00
620	10.33	1.76	2.65	2.92	3.57	0.00	1.93	2.77	3.02	3.63	0.00
630	10.50	1.77	2.65	2.92	3.55	0.00	1.94	2.78	3.04	3.65	0.00
640	10.67	1.77	2.65	2.92	3.55	0.00	1.96	2.80	3.06	3.66	0.00
650	10.83	1.74	2.59	2.85	3.46	0.00	1.79	2.56	2.79	3.34	0.00
660	11.00	1.67	2.48	2.72	3.31	0.00	1.62	2.31	2.52	3.02	0.00
670	11.17	1.62	2.40	2.64	3.20	0.00	1.63	2.32	2.53	3.03	0.00
680	11.33	1.59	2.35	2.58	3.13	0.00	1.64	2.33	2.54	3.04	0.00
690	11.50	1.57	2.32	2.55	3.08	0.00	1.65	2.34	2.55	3.05	0.00
700	11.67	1.56	2.30	2.52	3.05	0.00	1.66	2.35	2.56	3.06	0.00
710	11.83	1.56	2.29	2.51	3.03	0.00	1.66	2.36	2.57	3.07	0.00
720	12.00	1.55	2.28	2.50	3.02	0.00	1.67	2.37	2.58	3.08	0.00
730	12.17	1.56	2.28	2.50	3.02	0.00	1.68	2.38	2.59	3.09	0.00
740	12.33	1.56	2.28	2.50	3.02	0.00	1.69	2.39	2.60	3.10	0.00
750	12.50	1.57	2.29	2.51	3.02	0.00	1.69	2.39	2.61	3.11	0.00
760	12.67	1.57	2.29	2.51	3.03	0.00	1.70	2.40	2.62	3.12	0.00
770	12.83	1.53	2.23	2.45	2.94	0.00	1.53	2.16	2.35	2.80	0.00
780	13.00	1.46	2.12	2.32	2.79	0.00	1.36	1.91	2.08	2.48	0.00
790	13.17	1.41	2.04	2.24	2.69	0.00	1.36	1.92	2.09	2.49	0.00
800	13.33	1.37	1.99	2.18	2.62	0.00	1.37	1.92	2.09	2.49	0.00
810	13.50	1.35	1.95	2.14	2.57	0.00	1.37	1.93	2.10	2.50	0.00
820	13.67	1.33	1.93	2.11	2.53	0.00	1.38	1.93	2.10	2.50	0.00
830	13.83	1.32	1.91	2.09	2.51	0.00	1.38	1.94	2.11	2.51	0.00
840	14.00	1.32	1.90	2.08	2.49	0.00	1.38	1.94	2.11	2.51	0.00
850	14.17	1.32	1.90	2.07	2.49	0.00	1.39	1.95	2.12	2.52	0.00
860	14.33	1.32	1.90	2.07	2.48	0.00	1.39	1.95	2.12	2.52	0.00
870	14.50	1.32	1.89	2.07	2.48	0.00	1.40	1.96	2.13	2.53	0.00
880	14.67	1.32	1.90	2.07	2.48	0.00	1.40	1.96	2.13	2.53	0.00
890	14.83	1.30	1.87	2.04	2.44	0.00	1.32	1.84	2.00	2.38	0.00
900	15.00	1.26	1.81	1.98	2.36	0.00	1.24	1.73	1.88	2.23	0.00
910	15.17	1.24	1.77	1.94	2.31	0.00	1.24	1.73	1.88	2.23	0.00
920	15.33	1.22	1.75	1.91	2.28	0.00	1.24	1.73	1.88	2.23	0.00
930	15.50	1.21	1.73	1.89	2.26	0.00	1.24	1.74	1.89	2.24	0.00
940	15.67	1.20	1.72	1.87	2.24	0.00	1.25	1.74	1.89	2.24	0.00
950	15.83	1.20	1.71	1.87	2.23	0.00	1.25	1.74	1.89	2.24	0.00
960	16.00	1.20	1.71	1.86	2.22	0.00	1.25	1.75	1.90	2.25	0.00
970	16.17	1.20	1.71	1.86	2.22	0.00	1.26	1.75	1.90	2.25	0.00
980	16.33	1.20	1.71	1.86	2.22	0.00	1.26	1.75	1.90	2.25	0.00
990	16.50	1.20	1.71	1.86	2.22	0.00	1.26	1.76	1.91	2.26	0.00
1000	16.67	1.20	1.71	1.86	2.22	0.00	1.26	1.76	1.91	2.26	0.00
1010	16.83	1.17	1.66	1.81	2.16	0.00	1.14	1.59	1.72	2.04	0.00
1020	17.00	1.11	1.58	1.72	2.05	0.00	1.02	1.41	1.53	1.81	0.00
1030	17.17	1.07	1.52	1.66	1.97	0.00	1.02	1.41	1.53	1.81	0.00
1040	17.33	1.04	1.48	1.61	1.92	0.00	1.02	1.41	1.53	1.82	0.00
1050	17.50	1.03	1.45	1.58	1.88	0.00	1.02	1.42	1.54	1.82	0.00
1060	17.67	1.01	1.43	1.56	1.86	0.00	1.02	1.42	1.54	1.82	0.00
1070	17.83	1.00	1.42	1.55	1.84	0.00	1.02	1.42	1.54	1.82	0.00
1080	18.00	1.00	1.41	1.54	1.83	0.00	1.03	1.42	1.54	1.82	0.00
1090	18.17	0.99	1.40	1.53	1.82	0.00	1.03	1.42	1.54	1.82	0.00
1100	18.33	0.99	1.40	1.52	1.81	0.00	1.03	1.43	1.55	1.83	0.00
1110	18.50	0.99	1.40	1.52	1.81	0.00	1.03	1.43	1.55	1.83	0.00
1120	18.67	0.99	1.40	1.52	1.81	0.00	1.03	1.43	1.55	1.83	0.00
1130	18.83	0.99	1.40	1.52	1.81	0.00	1.03	1.43	1.55	1.83	0.00
1140	19.00	0.99	1.40	1.52	1.81	0.00	1.03	1.43	1.55	1.83	0.00
1150	19.17	0.99	1.40	1.52	1.81	0.00	1.04	1.43	1.55	1.83	0.00
1160	19.33	0.99	1.40	1.52	1.81	0.00	1.04	1.44	1.56	1.84	0.00
1170	19.50	1.00	1.40	1.52	1.81	0.00	1.04	1.44	1.56	1.84	0.00
1180	19.67	1.00	1.40	1.53	1.81	0.00	1.04	1.44	1.56	1.84	0.00
1190	19.83	1.00	1.41	1.53	1.81	0.00	1.04	1.44	1.56	1.84	0.00
1200	20.00	1.00	1.41	1.53	1.81	0.00	1.04	1.44	1.56	1.84	0.00
1210	20.17	1.00	1.41	1.53	1.82	0.00	1.05	1.44	1.56	1.84	0.00
1220	20.33	1.00	1.41	1.53	1.82	0.00	1.05	1.45	1.57	1.85	0.00
1230	20.50	1.01	1.41	1.53	1.82	0.00	1.05	1.45	1.57	1.85	0.00

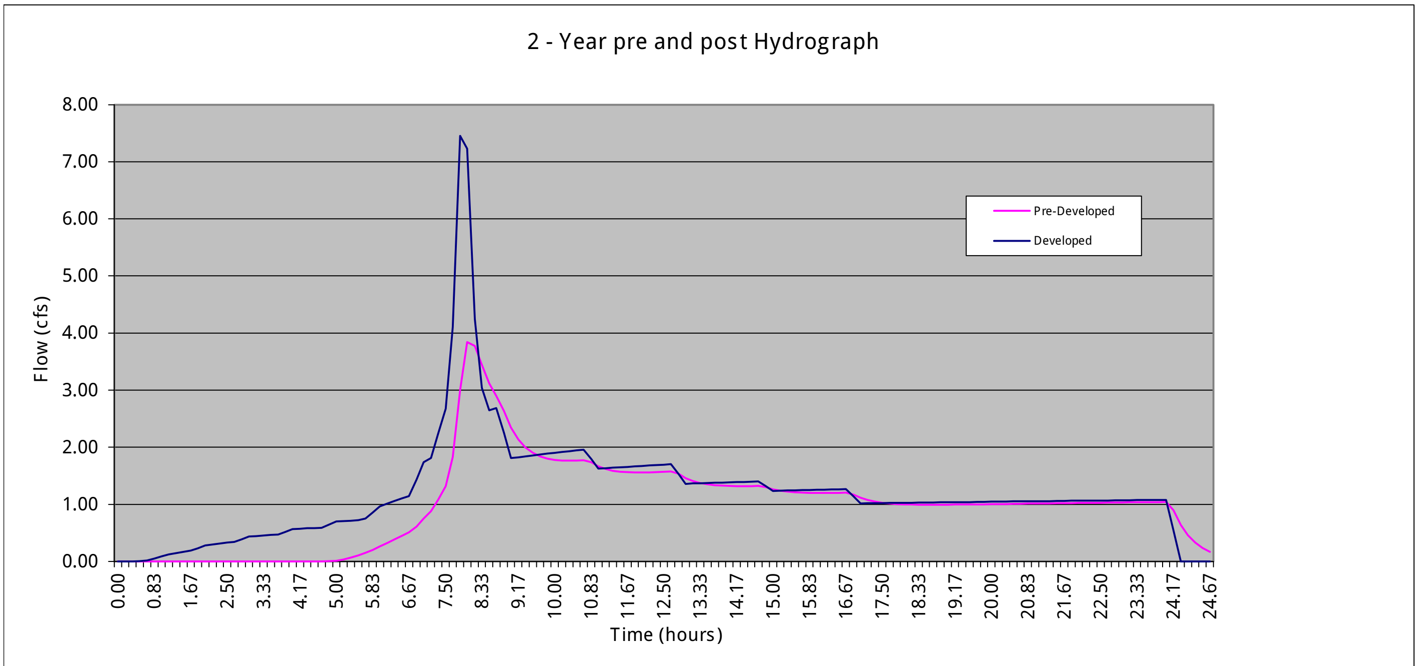
		Pre-Developed Hydrographs						Developed Hydrographs				
Year	=======>	2	5	10	25	100		2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00		7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-		109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10		470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17		7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100		2	5	10	25	100
Time	Time	Hyd	Hyd	Hyd	Hyd	Hyd		Hyd	Hyd	Hyd	Hyd	Hyd
(min)	(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)		(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1240	20.67	1.01	1.41	1.54	1.82	0.00		1.05	1.45	1.57	1.85	0.00
1250	20.83	1.01	1.42	1.54	1.82	0.00		1.05	1.45	1.57	1.85	0.00
1260	21.00	1.01	1.42	1.54	1.83	0.00		1.05	1.45	1.57	1.85	0.00
1270	21.17	1.01	1.42	1.54	1.83	0.00		1.05	1.45	1.57	1.85	0.00
1280	21.33	1.02	1.42	1.54	1.83	0.00		1.06	1.45	1.57	1.86	0.00
1290	21.50	1.02	1.42	1.55	1.83	0.00		1.06	1.46	1.58	1.86	0.00
1300	21.67	1.02	1.43	1.55	1.83	0.00		1.06	1.46	1.58	1.86	0.00
1310	21.83	1.02	1.43	1.55	1.83	0.00		1.06	1.46	1.58	1.86	0.00
1320	22.00	1.02	1.43	1.55	1.84	0.00		1.06	1.46	1.58	1.86	0.00
1330	22.17	1.02	1.43	1.55	1.84	0.00		1.06	1.46	1.58	1.86	0.00
1340	22.33	1.03	1.43	1.55	1.84	0.00		1.06	1.46	1.58	1.86	0.00
1350	22.50	1.03	1.43	1.56	1.84	0.00		1.07	1.46	1.58	1.87	0.00
1360	22.67	1.03	1.44	1.56	1.84	0.00		1.07	1.47	1.59	1.87	0.00
1370	22.83	1.03	1.44	1.56	1.84	0.00		1.07	1.47	1.59	1.87	0.00
1380	23.00	1.03	1.44	1.56	1.85	0.00		1.07	1.47	1.59	1.87	0.00
1390	23.17	1.03	1.44	1.56	1.85	0.00		1.07	1.47	1.59	1.87	0.00
1400	23.33	1.04	1.44	1.56	1.85	0.00		1.07	1.47	1.59	1.87	0.00
1410	23.50	1.04	1.44	1.57	1.85	0.00		1.07	1.47	1.59	1.87	0.00
1420	23.67	1.04	1.45	1.57	1.85	0.00		1.07	1.47	1.59	1.88	0.00
1430	23.83	1.04	1.45	1.57	1.85	0.00		1.08	1.48	1.60	1.88	0.00
1440	24.00	1.04	1.45	1.57	1.85	0.00		1.08	1.48	1.60	1.88	0.00
1450	24.17	0.89	1.24	1.35	1.59	0.00		0.54	0.74	0.80	0.94	0.00
1460	24.33	0.64	0.89	0.96	1.14	0.00		0.00	0.00	0.00	0.00	0.00
1470	24.50	0.46	0.63	0.69	0.81	0.00		0.00	0.00	0.00	0.00	0.00
1480	24.67	0.33	0.45	0.49	0.58	0.00		0.00	0.00	0.00	0.00	0.00
1490	24.67	0.23	0.32	0.35	0.41	0.00		0.00	0.00	0.00	0.00	0.00
1500	24.67	0.17	0.23	0.25	0.30	0.00		0.00	0.00	0.00	0.00	0.00

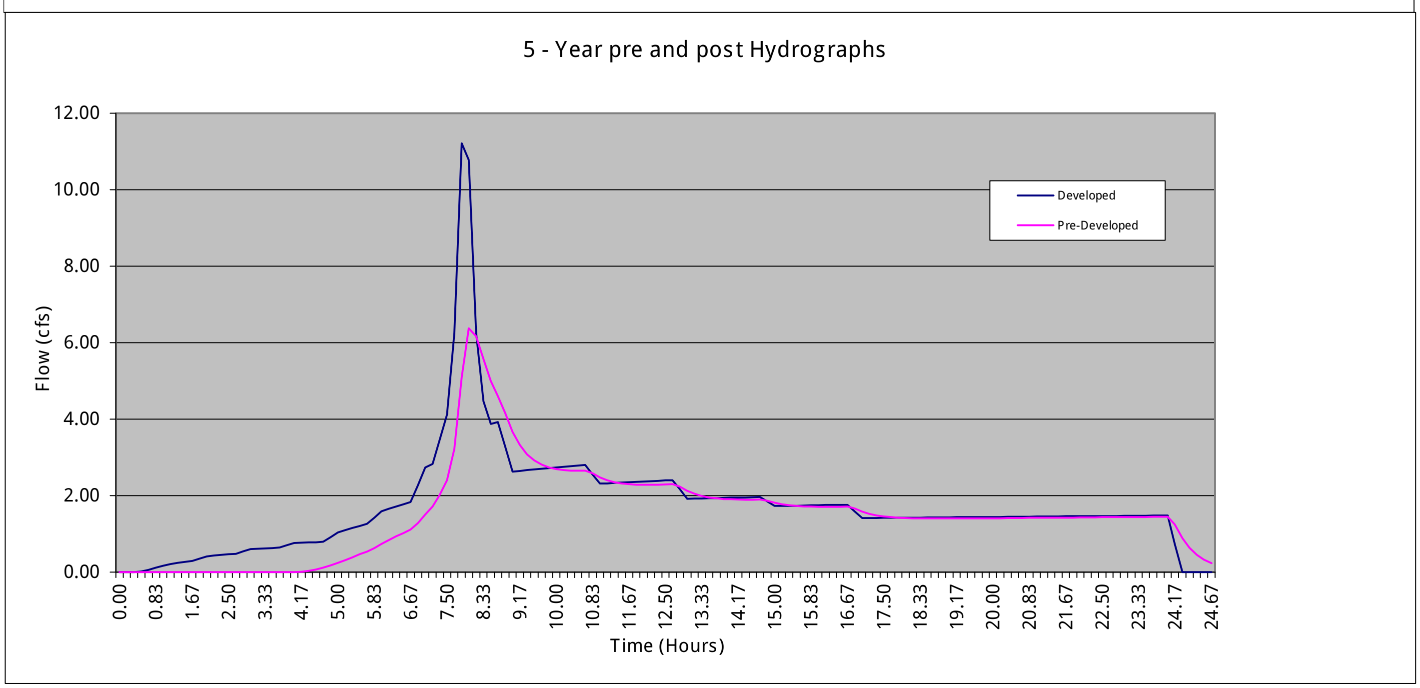
		Pre-Developed Hydrographs						Developed Hydrographs				
Year	=======>	2	5	10	25	100		2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00		7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-		109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10		470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17		7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100		2	5	10	25	100
Time	Time	Hyd	Hyd	Hyd	Hyd	Hyd		Hyd	Hyd	Hyd	Hyd	Hyd
(min)	(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)		(cfs)	(cfs)	(cfs)	(cfs)	(cfs)



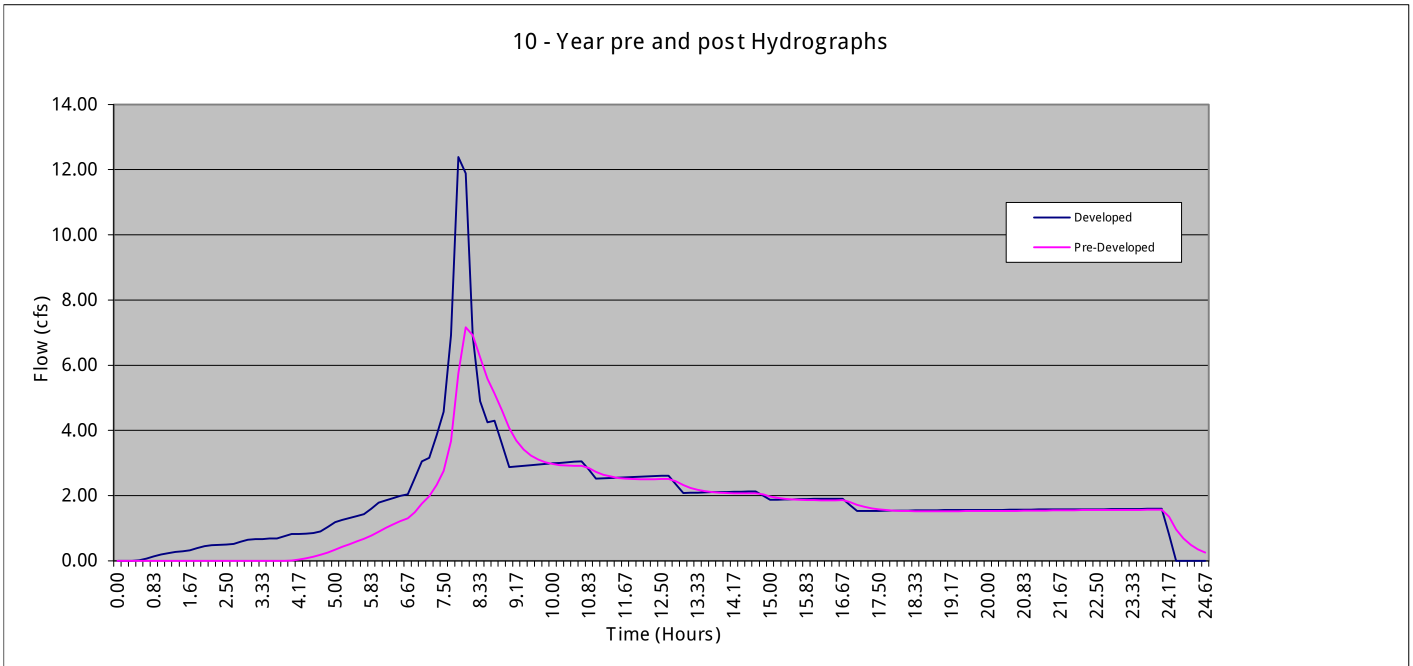


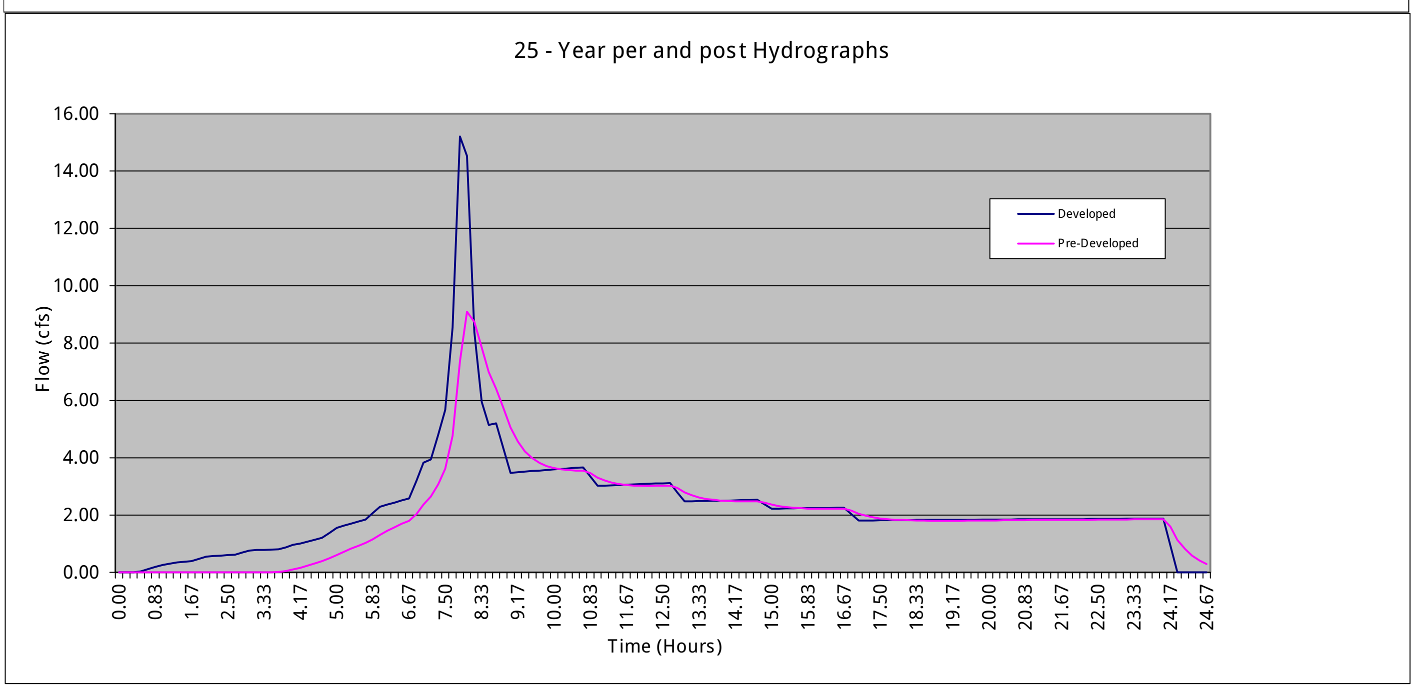
		Pre-Developed Hydrographs					Developed Hydrographs				
Year	=======>	2	5	10	25	100	2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00	7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-	109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10	470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17	7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100	2	5	10	25	100
Time	Time	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd
(min)	(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)



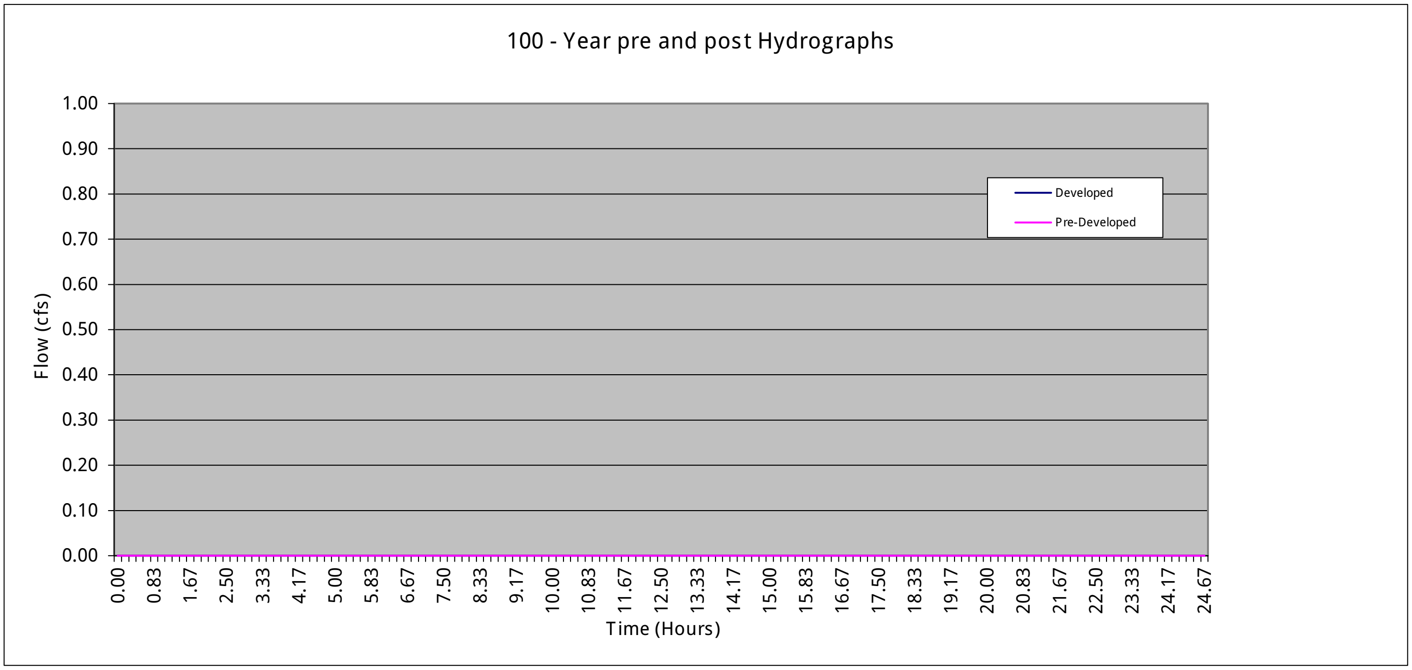


		Pre-Developed Hydrographs					Developed Hydrographs				
Year	=======>	2	5	10	25	100	2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00	7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-	109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10	470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17	7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100	2	5	10	25	100
Time	Time	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd	Hyd
(min)	(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)





		Pre-Developed Hydrographs						Developed Hydrographs				
Year	=======>	2	5	10	25	100		2	5	10	25	100
Qpeak	cfs =>	3.84	6.37	7.17	9.09	0.00		7.46	11.21	12.39	15.21	0.00
Volume	cf =>	90,144	136,837	151,461	186,400	-		109,099	156,947	171,829	207,263	-
Tpeak	min =>	480	480	480	480	10		470	470	470	470	10
Tpeak	hr =>	8.00	8.00	8.00	8.00	0.17		7.83	7.83	7.83	7.83	0.17
Hydrograph Name=>		2	5	10	25	100		2	5	10	25	100
Time	Time	Hyd	Hyd	Hyd	Hyd	Hyd		Hyd	Hyd	Hyd	Hyd	Hyd
(min)	(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)		(cfs)	(cfs)	(cfs)	(cfs)	(cfs)



Project Name:	Deer Meadows
Detention System Summary	
Job #	19-035
Date:	5/28/2021

Note: The detention system design is based on the King County Model "Facility Design Routine".

1) Detention Facility Design Input:

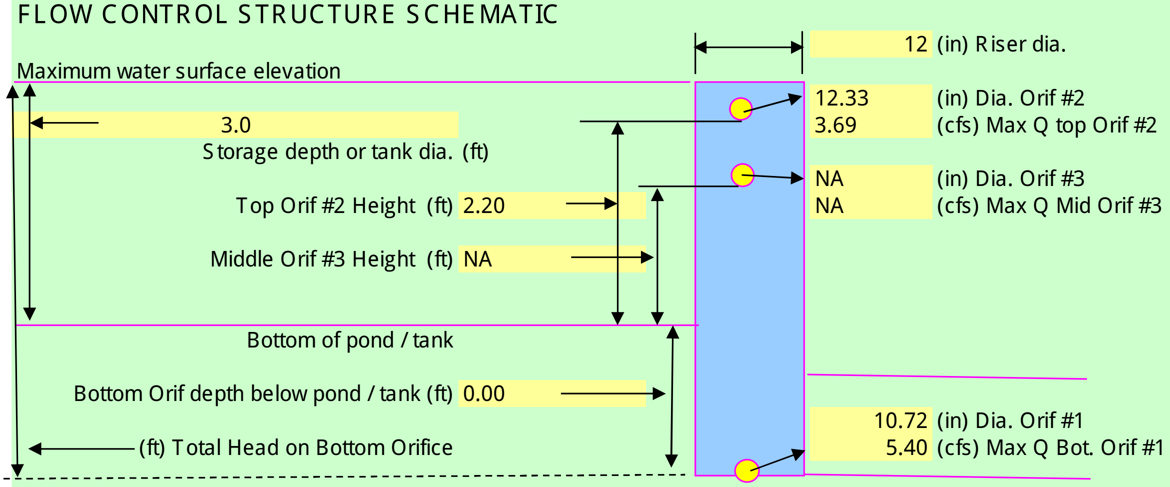
2) Type of facility:	DETENTION POND	
3) Pond side slopes:	3 to 1	
4) Pond storage depth:	3 ft (from bottom of pond to overflow)	
5) Vertical permeability	0 min/in	
6) Number of orifices:	2	
7) Riser dia. =>	12 in	
8) Orifice coefficient	0.62 (typically 0.62)	
9) IE - bottom orifice:	0 ft (distance below bottom of pond - Negative #)	
10) Max Q Bottom Orif. #1	5.40 cfs	
11) Top Orif #2 Height =	2.2 ft	
12) Max Q Mid Orif. #3	0.00 cfs	Orifice not being used
13) Mid Orif #3 Height =	0.00 ft	Orifice not being used

Detention Facility Design Results:

Performance year	Developed Inflow cfs	Pre-Developed Outflow cfs	Actual Outflow cfs	Peak Stage ft	Storage cf
100	0	0	0	0	-
25	15.21	9.09	9.09	3.00	20,016
10	12.39	7.17	7.17	2.50	16,021
5	11.21	6.37	6.09	2.31	14,602
2	7.46	3.84	3.73	1.43	8,474
			Required Storage	====	20,016

	Bottom Orif.	Middle Orif.	Top Orif.	Optional Weir Design (for top orifice)
Total Q =	5.40	0.00	3.69	
Head (ft) =	3.00	0.00	0.80	1.83 La (ft)
Dist. from bottom of pond (ft) =	0.00	NA	2.20	209.85 < deg.
Orif. Dia. (in) =	10.72	0.00	12.33	Must Use Weir

FLOW CONTROL STRUCTURE SCHEMATIC



Project Name: Deer Meadows

Detention Facility Type

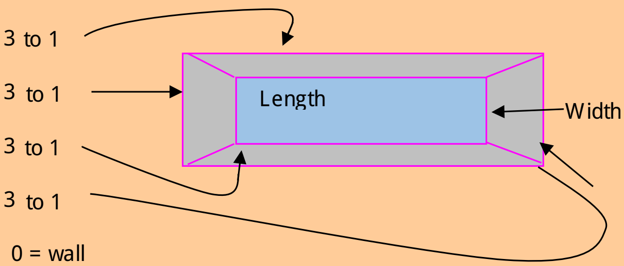
Job #	19-035
Date:	5/28/2021

Detention Facility Type:

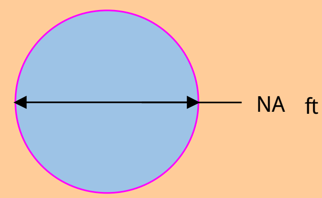
DETENTION POND

L =	72.5 ft
W =	72.5 ft
D =	3.0 ft
Pond Area =	5,259 sf

DETENTION POND



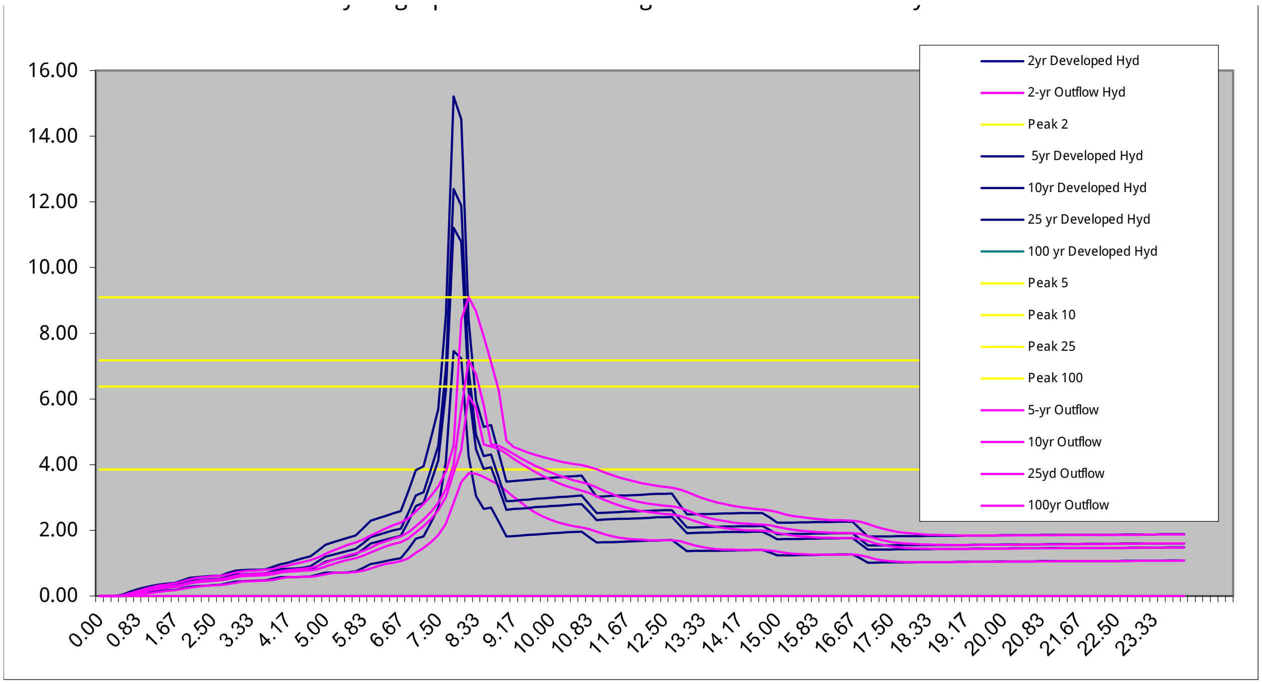
DETENTION TANK
NA

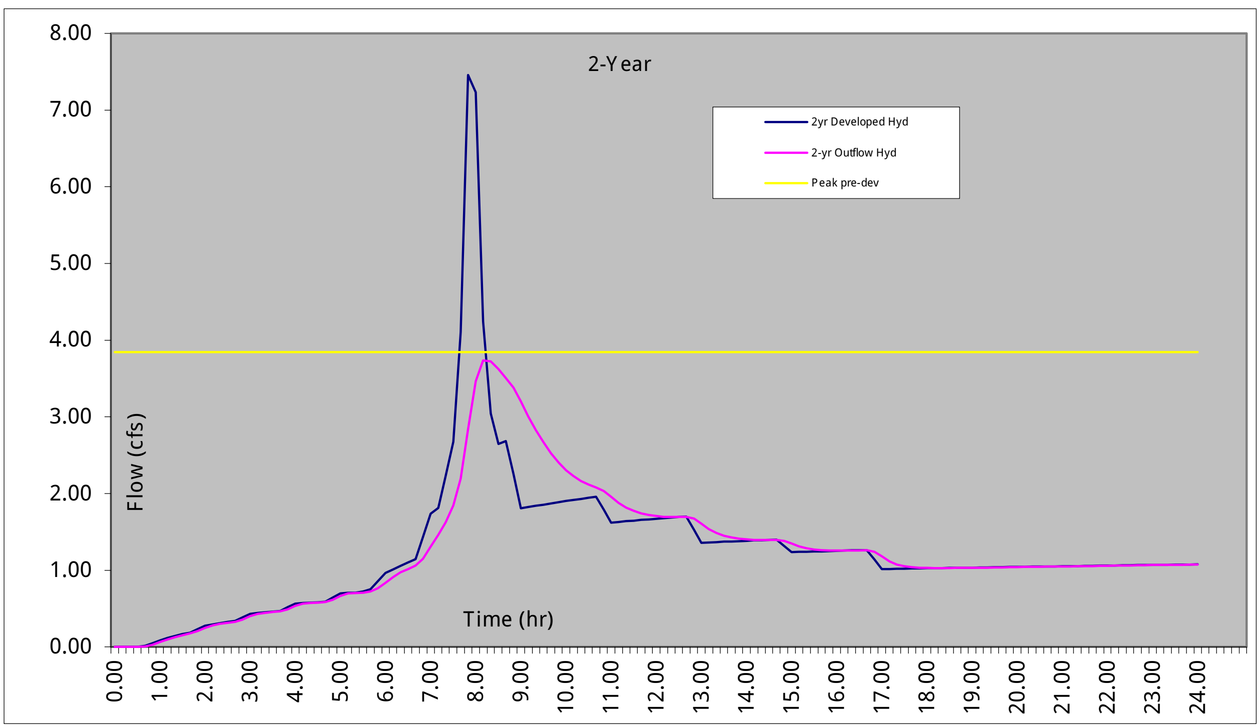


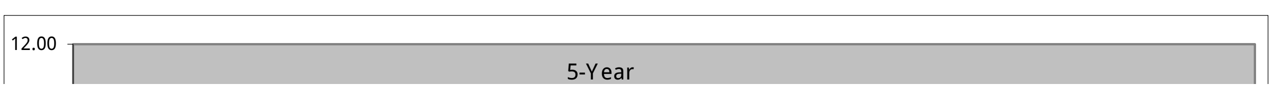
USER DEFINED POND
NA
Pond Geometry

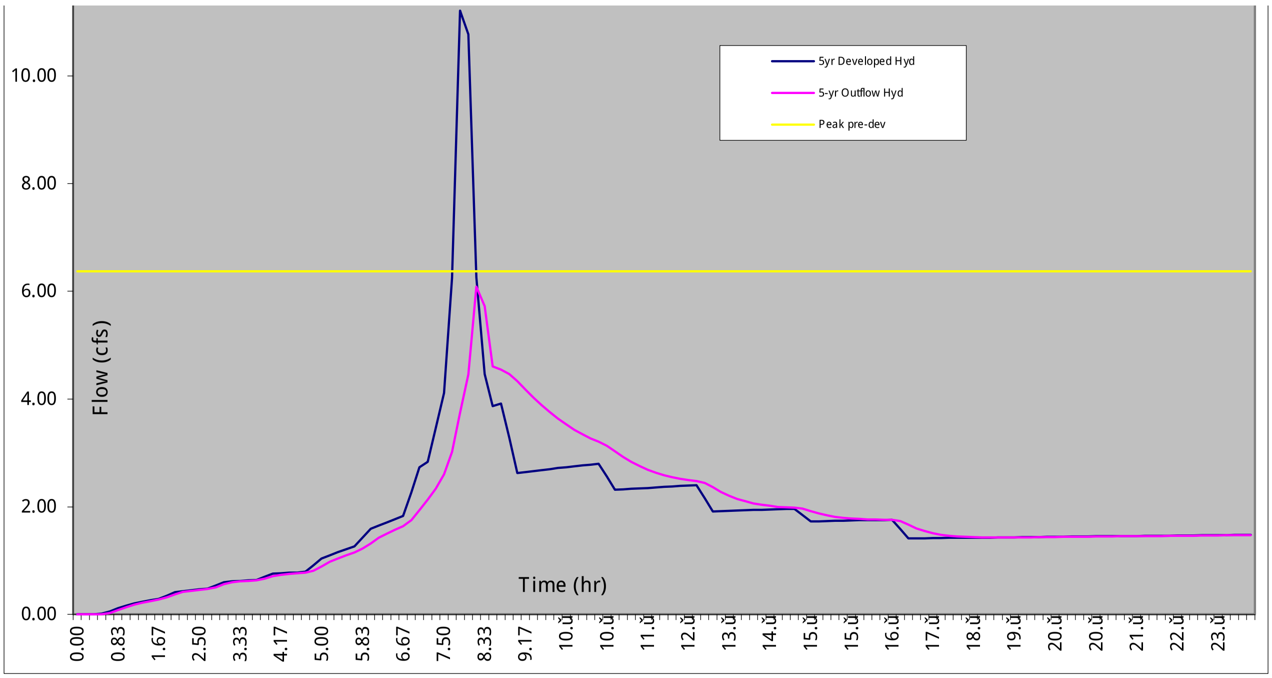
Stage (ft)	Area (sf)
0	NA
1	NA
2	NA
3	NA
4	NA
5	NA
6	NA
7	NA
8	NA
9	NA
10	NA
11	NA
12	NA
13	NA
14	NA
15	NA

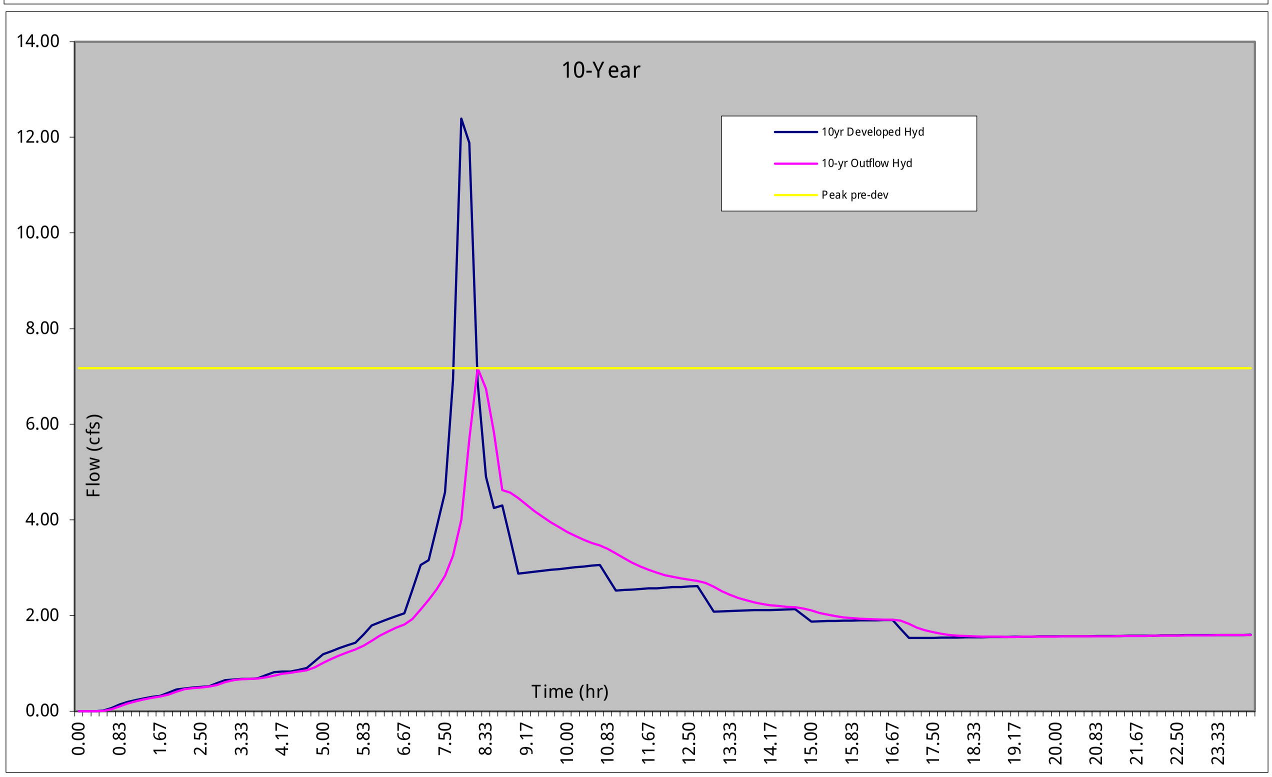
All Storm Hydrographs Routed Through The Detention Facility

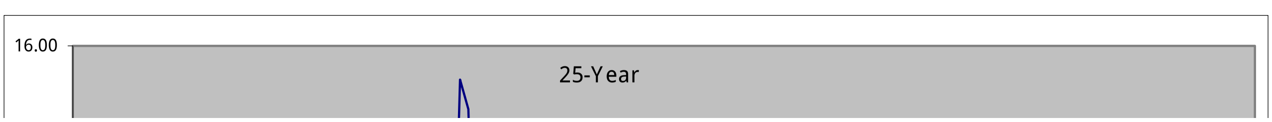

16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00 0.83 1.67 2.50 3.33 4.17 5.00 5.83 6.67 7.50 8.33 9.17 10.00 10.83 11.67 12.50 13.33 14.17 15.00 15.83 16.67 17.50 18.33 19.17 20.00 20.83 21.67 22.50 23.33
2yr Developed Hyd
2-yr Outflow Hyd
Peak 2
5yr Developed Hyd
10yr Developed Hyd
25 yr Developed Hyd
100 yr Developed Hyd
Peak 5
Peak 10
Peak 25
Peak 100
5-yr Outflow
10yr Outflow
25yd Outflow
100yr Outflow

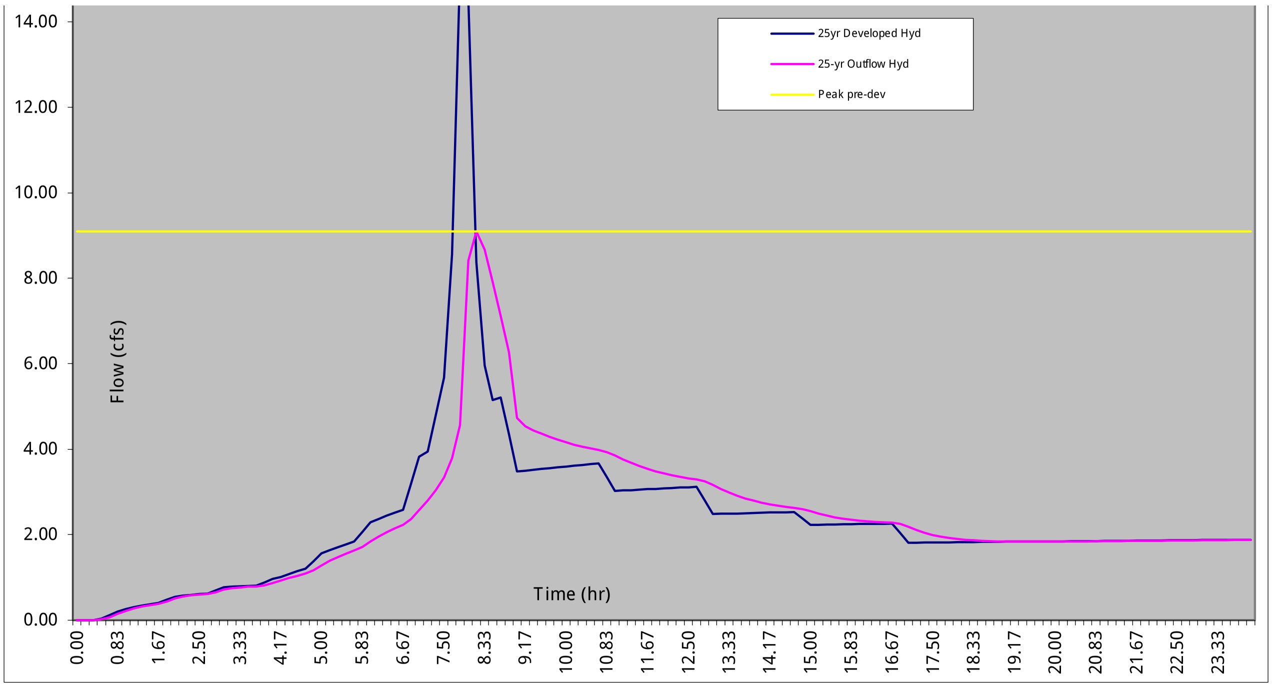

2-Year
2yr Developed Hyd
2-yr Outflow Hyd
Peak pre-dev
Flow (cfs)
Time (hr)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00

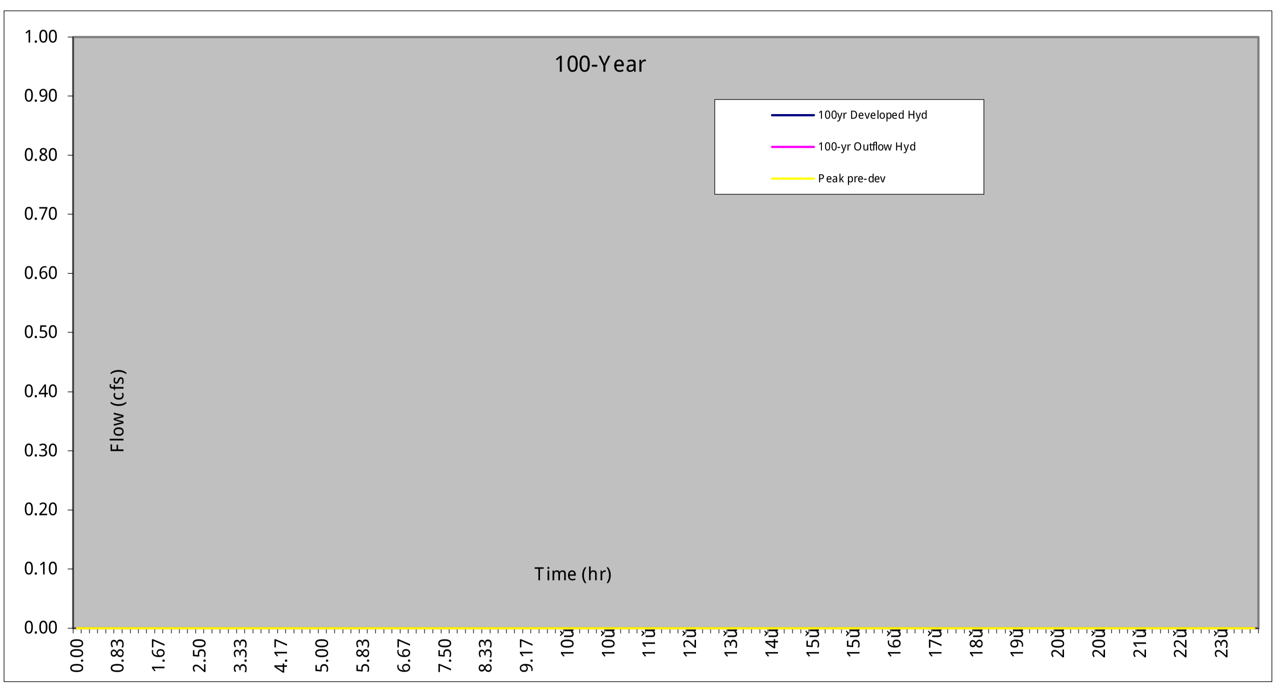

12.00
5-Year


5yr Developed Hyd
5-yr Outflow Hyd
Peak pre-dev
Flow (cfs)
Time (hr)


10-Year
10yr Developed Hyd
10-yr Outflow Hyd
Peak pre-dev
Flow (cfs)
Time (hr)

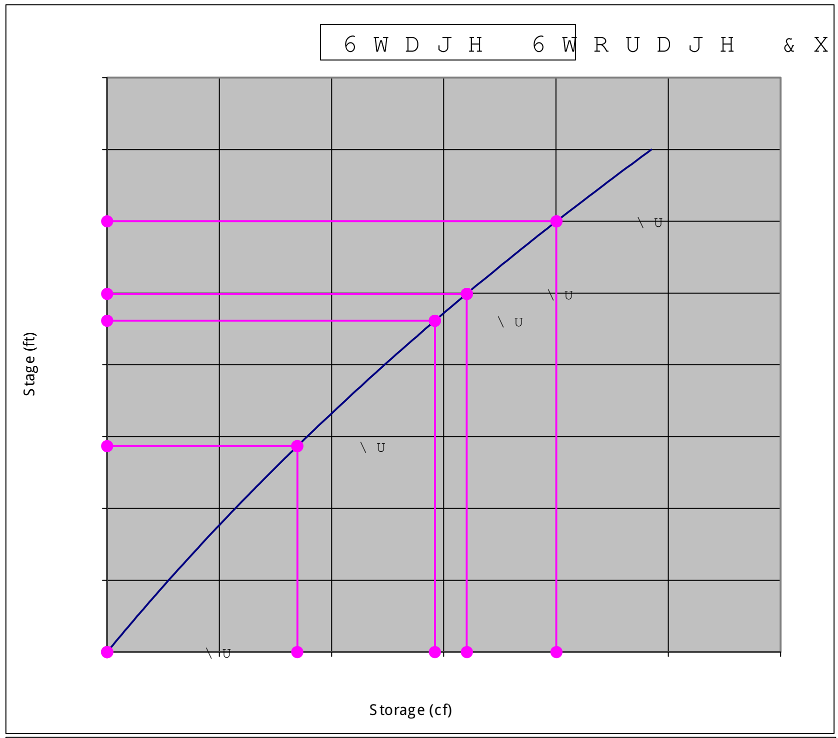

25-Year

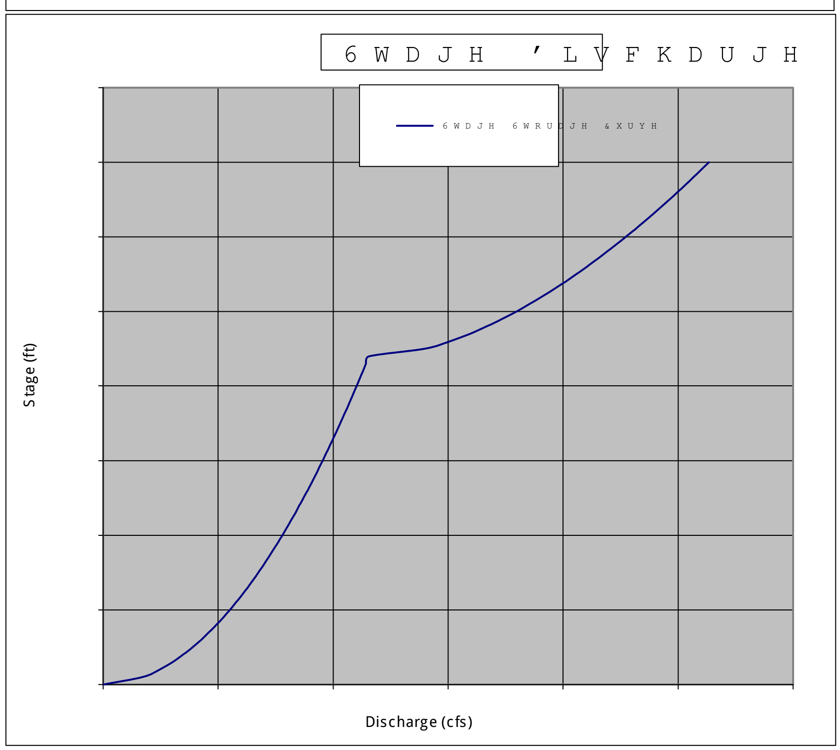

25yr Developed Hyd
25-yr Outflow Hyd
Peak pre-dev
Flow (cfs)
Time (hr)


100-Year
100yr Developed Hyd
100-yr Outflow Hyd
Peak pre-dev
Flow (cfs)
Time (hr)

3URMHFW 1DPH 'HHU 0HDGRZV
6WDJH 6WR
-R
'D

6W	6WR I	'LVF F





6W	6WR H	'LVH F

6 W	6 W R H	' L V F F

6WD I	6WRU F	'LVFKD FI
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3URMHFW 1DPH¸ 'HHU 0HDGRZV
5HFWDQJXODU 6KDUS &UHVWHG :HLU &DOFXODW

-RE ˝ ˘

'DWH¸ ˘ ˙

:HLU (TXDWLRQ¸ 4 & / + +

4)ORZ RYHU ZHLU FIV

& ˆ + 3 IW

/ $GMXVWHG OHQJWK RI ZHLU /D + [WKLV LV WR DFFF

/D $FWXDO OHQJWK RI ZHLU DORQJ SLSHV LQWHULRU FLUFXP

+ 'LVWDQFH IURP ERWWRP RI ZHLU WR PD[LPXP KHDG IW

3 'LVWDQFH IURP ERWWRP RI ZHLU WR RXWIDOO LQYHUW HO

' ,QVLGH ULVHU SLSH GLDPHWHU LQ

˜ $QJOH RI RSHQLQJ IRU ZHLU

*LYH

4	˘ ˝	FIV
+	˙	IW
3		IW
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)LQ

&		IW
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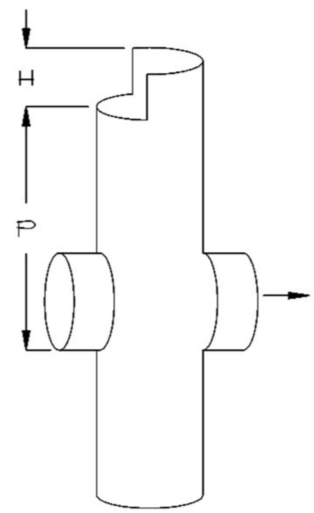
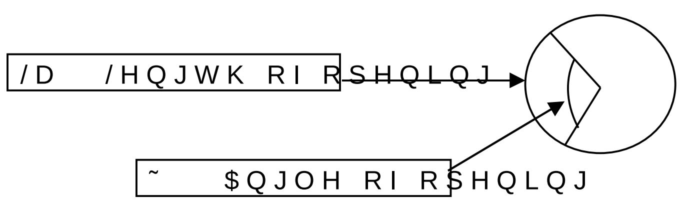
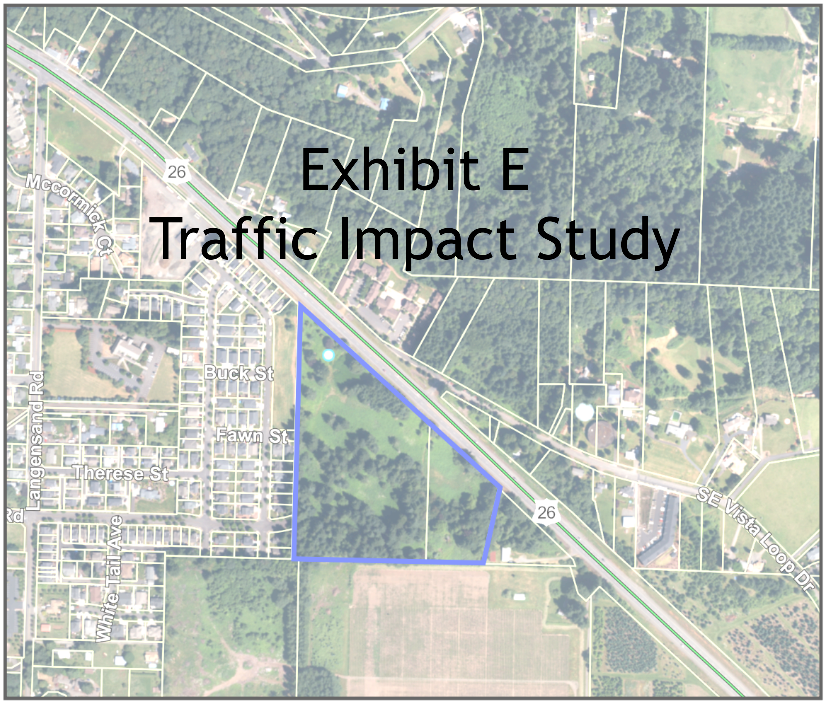
/[	˙	I
˜		GHJU





7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

Exhibit E
Traffic Impact Study



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DEER MEADOWS SUBDIVISION
TRAFFIC IMPACT STUDY

SANDY, OREGON

6/14/2021

REGISTERED PROFESSIONAL ENGINEER
54983PE
OREGON
JULY 10, 2002
MICHAEL T. ARD

EXPIRES: 12/31/2021

PREPARED FOR:
Alex Reverman

PREPARED BY:
Michael Ard, PE
Ard Engineering

DATE:
June 14, 2021

21370 SW Langer Farms Parkway, Suite 142, Sherwood, OR 97140 - (503)862-6960

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. A property located on the south side of US Highway 26 opposite SE Vista Loop Drive in Sandy, Oregon is proposed for a 32-lot subdivision which will support up to 32 single-family homes and 120 apartment units. The site will take access via extensions of Dubarko Road and Fawn Street into the site.

2. Upon completion of residential development within the R-1, R-2, and C-3 zones, the subject property is projected to generate up to 79 site trips during the morning peak hour, 99 trips during the evening peak hour, and 1,180 daily site trips.

3. With conversion to all-way stop control, the intersection of Highway 211 at Dubarko Road is projected to operate acceptably under year 2023 traffic conditions. All other study intersections are projected to operate acceptably through year 2023 either with or without the addition of site trips from the proposed development. No other operational mitigations are necessary or recommended in conjunction with the proposed subdivision.

4. Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. This intersection meets all-way stop control warrants based on crash history, and conversion to all-way stop control would be expected to reduce the frequency and severity of right-angle and turning-movement collisions. It is therefore recommended that all-way stop control be installed at the intersection of Highway 211 and Dubarko Road. No other safety improvements are recommended.

5. Based on the warrant analysis, no new turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.

Project Description & Location

Introduction

A property located on the south side of US Highway 26 opposite SE Vista Loop Drive is proposed for development with 32 lots across R-1, R-2, and C-3 zoning. The site can support up to 30 single-family homes, 2 duplex units, and 120 apartment units. The portion of the site zoned C-3 is expected to ultimately include some form of commercial development; however, the nature of this future use has not yet been determined. Accordingly, a future traffic study will be required as part of the design review application for the future commercial site use. The site will take access via extensions of Dubarko Road and Fawn Street into the site. Dubarko Road will be extended to intersect a new north/south collector street within the site, which will stub to the south side of the property.

This report addresses the impacts of the proposed development on the surrounding street system. An operational and safety analysis was conducted for the proposed site access as well as the intersections of:

- Highway 26 at SE Ten Eyck Road;
- Highway 26 at SE Langensand Road;
- Highway 211 at Dubarko Road; and
- Dubarko Road at SE Langensand Road.

The purpose of this analysis is to determine whether the surrounding transportation system is capable of safely and efficiently supporting the proposed use and to identify any necessary improvements and mitigations.

Site Location and Study Area Description

The project site has an area of approximately 16 acres, which is currently undeveloped. The property is surrounded by a mixture of residential development, agricultural uses and undeveloped forested land.

The proposed development will include an extension of Dubarko Road into the site to intersect a new north/south collector roadway. The proposed development will connect to the existing street system via extensions of Dubarko Road and Fawn Street into the project site.

US Highway 26 (Mt. Hood Highway) is classified by the Oregon Department of Transportation as a Statewide Highway and a Freight Route. It has two through lanes in each direction and added turn lanes at intersections. Between SE Langensand Road and SE Vista Loop Drive it has a center two-way left-turn lane. It has a posted speed limit of 25 mph at SE Ten Eyck Road, 40 mph at SE Langensand Road, and 55 mph at SE Vista Loop Drive. West of SE Ten Eyck Road the highway divides into a couplet, with westbound traffic traveling on Proctor Boulevard and eastbound traffic traveling on Pioneer Boulevard.

SE Ten Eyck Road has one through lane in each direction and is striped to prohibit passing in the site vicinity. It has a basic rule speed limit of 55 mph and is classified by the City of Sandy as a Minor Arterial.

SE Langensand Road is also classified by the City of Sandy as a Minor Arterial. It has a two-lane cross-section with one through lane in each direction and a posted speed limit of 25 mph. Partial sidewalks are in place on both sides of the roadway, and on-street parking is available where sufficient paved width is provided.

Oregon Highway 211 (Eagle Creek Sandy Highway) is classified by the Oregon Department of Transportation as a District Highway. It has a two-lane cross-section with one through lane in each direction and added turn lanes at major intersections. It has a posted speed limit of 45 mph in the vicinity of Dubarko Road.

Dubarko Road is classified by the City of Sandy as a Minor Arterial. It generally has a two-lane cross-section with some added turn lanes at major intersections and bike lanes on each side of the roadway. Partial sidewalks are in place on each side of the roadway adjacent to developed properties. It has a posted residential speed limit of 25 mph.

EXISTING CONDITIONS

The intersection of US Highway 26 at SE Ten Eyck Road/Wolf Drive is controlled by a traffic signal. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a left-turn lane, two through lanes, and a short right-turn pocket. The eastbound approach has a left-turn lane, a dedicated through lane and a shared through/right lane. The northbound and southbound approaches operate with concurrent signal phasing. Protected phasing is provided for the eastbound and westbound left-turn movements. Bike lanes are provided along Highway 26 to the right of the through lanes.

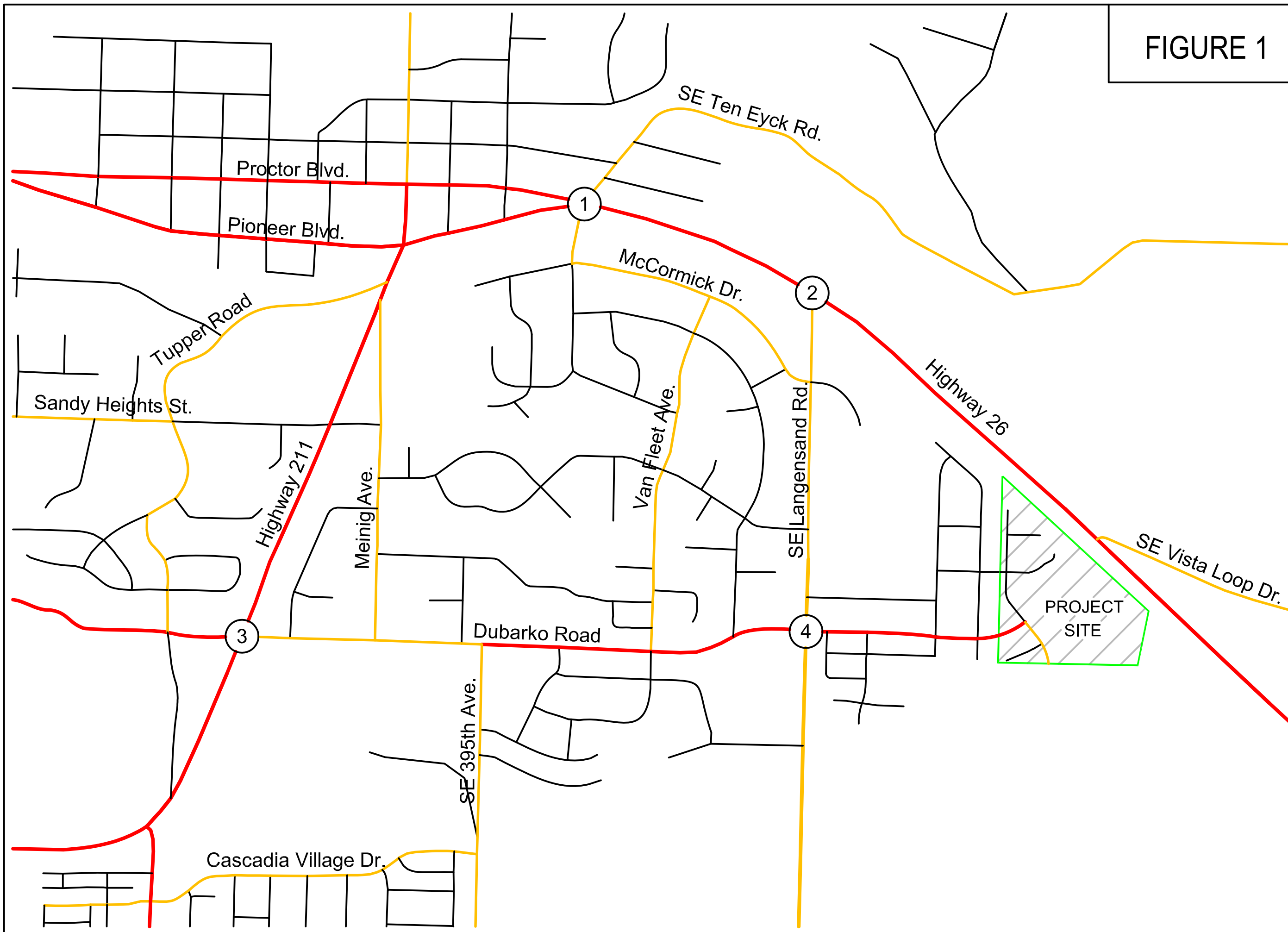
The intersection of US Highway 26 at SE Langensand Road is a T- intersection controlled by a stop sign on the northbound Langensand Road approach. Through traffic traveling along Highway 26 does not stop. The northbound approach has a left-turn lane and a right-turn lane. The eastbound approach has two through lanes and a right-turn lane. The westbound approach has a left-turn lane and two through lanes. Bike lanes are provided along Highway 26 to the right of the through lanes.

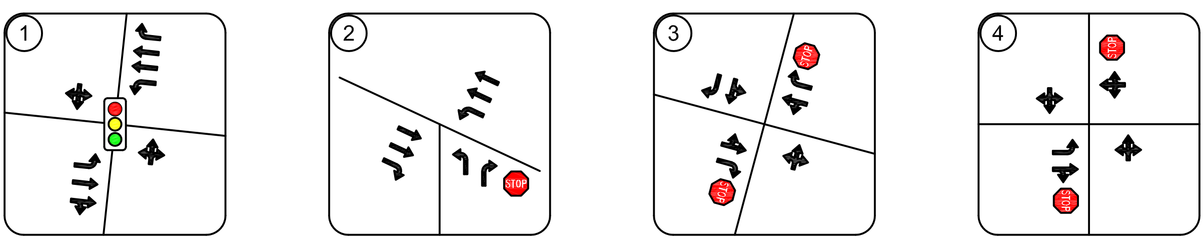
The intersection of Oregon Highway 211 at Dubarko Road is a four-way intersection controlled by stop signs on the eastbound and westbound Dubarko Road approaches. The southbound, eastbound and westbound approaches each have a shared through/left lane, a bike lane, and a dedicated right-turn lane. The northbound approach has a single, shared lane for all motorized turning movements and a bike lane.

The intersection of Dubarko Road at SE Langensand Road is a four-way intersection currently controlled by stop signs on the eastbound and westbound Dubarko Road approaches. Through traffic traveling along SE Langensand Road does not stop. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a single, shared lane for all motor vehicle turning movements and a bike lane. The eastbound approach has a left-turn lane, a shared through/right lane and a bike lane.

A vicinity map displaying the project site, vicinity streets, and the study intersections including lane configurations is provided in Figure 1 on page 7.

FIGURE 1





LEGEND

- Study Intersection
- Traffic Signal
- Stop Sign

VICINITY MAP
Study Intersections
Lane Configurations and Traffic Control

PAGE
7

TRAFFIC COUNT DATA

Traffic counts were conducted at the study intersections on Tuesday March 19th, 2019 from 4:00 to 6:00 PM and on Wednesday March 20th, 2019 from 7:00 to 9:00 AM. Data was used from the highest-volume hour during each analysis period. This historical data was used since it predates the impacts of the current COVID-19 pandemic, allowing conservative projections of future peak-hour traffic conditions once conditions return to normal.

Since the count data was collected during a non-peak period of the year, the observed traffic volumes were adjusted to account for seasonal traffic variations to represent the 30th-highest hour design volumes.

US Highway 26 serves local and commuter traffic as well as trips to and from Mt. Hood and beyond. These trip types would be expected to exhibit very different seasonal variations in travel demands over the course of the year, since local and commuter traffic volumes are relatively stable regardless of season, while travel volumes to and from Mt. Hood vary significantly based on the season.

To determine the portion of traffic attributable to each of the two primary travel types, data from ODOT's 2017 Highway Volume Tables was utilized. Specifically, the data used was collected at ODOT's Automatic Count Data station 03-006, located 0.30 miles east of Camp Creek Road in Rhododendron, Oregon. This site is located on Highway 26 approximately 21 miles east of SE Vista Loop Drive. Although the distance to the ATR station means the data cannot be used directly, the ATR data provides useful information regarding the variation in traffic volumes traveling to Mt. Hood and beyond during the time of the count data collection as well as during the peak season of the year. Accordingly, this data allows determination of the likely portion of highway traffic that falls into each of the two seasonal variation categories ("commuter" and "recreational summer/winter"), as well as providing information regarding the most appropriate seasonal adjustment factor for the recreational summer/winter traffic.

Based on the data, 6,763 vehicles per day (approximately 676 per hour during the peak hour) travel along Highway 26 to and from Mt. Hood at the Rhododendron permanent count station location during the month of March. This volume represents 45.3 percent of the through traffic volumes measured on Highway 26 east of SE Vista Loop Drive. Accordingly, it is expected that no more than 45.3 percent of the trips traveling along Highway 26 in the project vicinity are traveling to and from destinations beyond the Rhododendron count station. Since the remaining 54.7 percent of through traffic volumes on the Highway 26 at the study intersections never reach Mt. Hood, it was assumed that these traffic volumes represent more typical commuter and local trips.

The ODOT data also showed that 11,738 vehicles were measured per day (approximately 1174 per hour during the peak hour) during the peak-season month of August at the ATR station near Rhododendron. This indicates that the seasonal recreational traffic volumes along the Highway 26 corridor increased by no more than 4,975 vehicles per day (11,738 vehicles per day in August - 6,763 vehicles per day in March). This equates to roughly 498 additional vehicles per hour during the peak hour of the peak recreational season. It is expected that the increased recreational traffic flows will be somewhat directional, with approximately 55% traveling westbound during the evening peak hour.

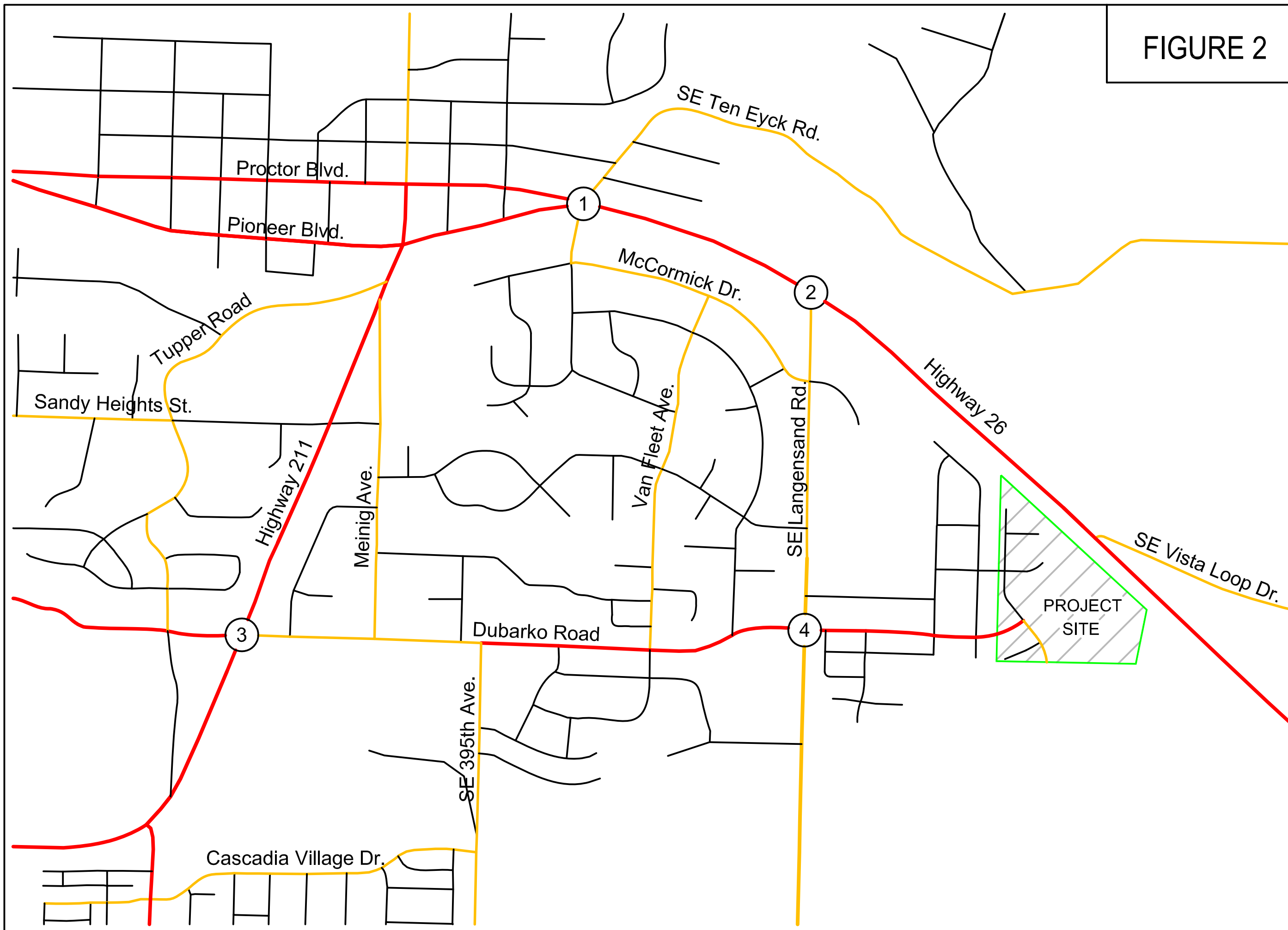
In order to seasonally adjust the local and commuter traffic volumes, the through traffic volumes were reduced by the amount of the assumed seasonal traffic (676 vehicles per hour during the evening peak hour), and a seasonal adjustment of 1.08 was applied to the remaining local and commuter traffic volumes. Following this adjustment, the 676 March recreational trips and the 498 peak-season through trips were added to determine the total peak-season traffic volumes. These calculated through traffic volumes represent the anticipated traffic levels for the intersections along Highway 26 during the 30th-highest hour in August. The morning peak hour traffic volumes along the highway were then increased by the same overall percentage as the evening peak hour volumes.

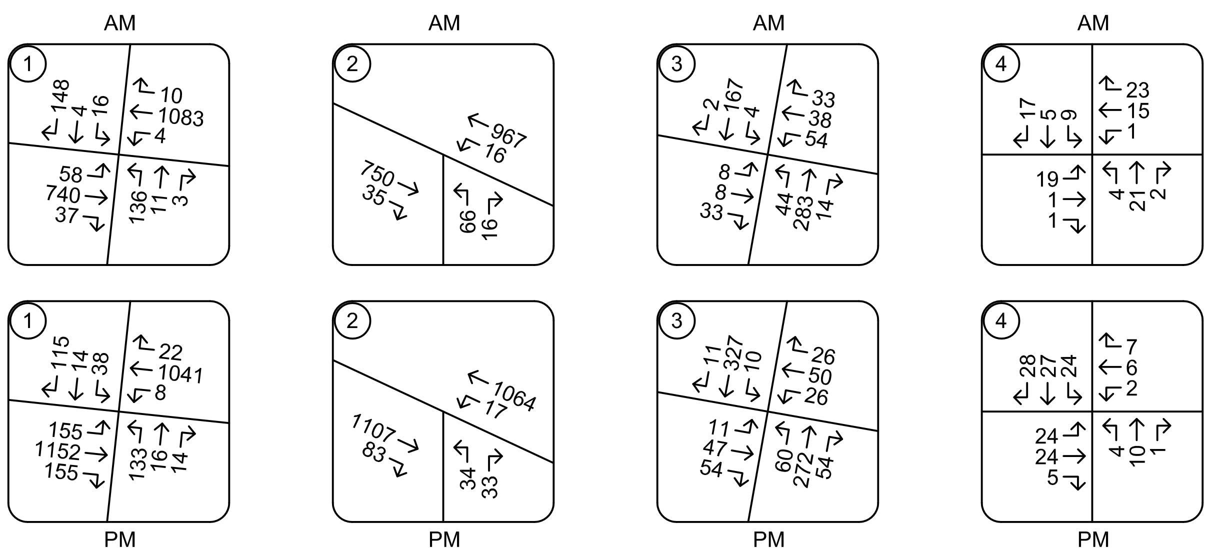
The observed traffic volumes along Highway 211 also had a seasonal adjustment of 1.08 applied to represent peak-season traffic volumes.

Following application of the seasonal adjustments, two years of growth was added to the year 2019 traffic count data to represent the expected year 2021 seasonal peak traffic conditions absent the impacts of the current COVID-19 pandemic. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.96 percent per year. The growth rate for traffic volumes on Highway 211 was calculated to be 3.13 percent per year. These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year applied. The respective growth rates were applied over a period of two years to generate the year 2021 seasonal peak traffic volumes.

Figure 2 on page 10 shows the existing year 2021 30th-highest hour traffic volumes for the morning and evening peak hours at the study intersections.

FIGURE 2





TRAFFIC VOLUMES
2021 Existing 30th-Highest Hour (August) Conditions
Morning and Evening Peak Hours

Operational Analysis

An operational analysis was conducted for the study intersections using Synchro 10 software, with outputs calculated based on the *HIGHWAY CAPACITY MANUAL, 6th Edition.* The analysis was conducted for the weekday morning and evening peak hours.

The purpose of the existing conditions analysis is to establish how the study area intersections operate currently and allow for calibration of the operational analysis if required.

The results of the operational analysis are reported based on delay, Level of Service (LOS), and volume-to-capacity ratio (v/c). Delays are reported in seconds. Level of service is reported as a letter grade and can range from A to F, with level of service A representing nearly free-flow conditions and level of service F representing high delays and severe congestion. A report of level of service D generally indicates moderately high but tolerable delays, and typically occurs prior to reaching intersection capacity. For unsignalized intersections, the v/c represents the portion of the available intersection capacity that is being utilized on the worst intersection approach. For signalized intersections, it indicates the portion of the overall intersection's capacity that is being used. A v/c ratio of 1.0 would indicate that the intersection is operating at capacity.

The Oregon Department of Transportation requires that the signalized intersection of Highway 26 at SE Ten Eyck Road operate with a v/c ratio of 0.85 or less during the peak hours. The intersection of Highway 26 at SE Langensand Road is required to operate with a v/c ratio of 0.80 or less on the major-street approaches and a v/c ratio of 0.90 or less on the minor-street approaches.

Intersections operating under the jurisdiction of the City of Sandy are required to operate at level of service D or better. This operational standard applies to the intersections of Dubarko Road at Langensand Road and Highway 211 at Dubarko Road.

A summary of the existing conditions operational analysis is provided in Table 1 on the following page. For the unsignalized intersections the reported delays and levels-of-service represent the approach lane which experiences the highest delays. The reported v/c ratios represent the highest ratio for the major-street and minor-street movements. For the signalized intersection of Highway 26 at SE Ten Eyck Road, the reported delays, levels-of-service and v/c ratios represent the operation of the overall intersection.

Based on the analysis, the study intersections are currently operating acceptably per the respective ODOT and City of Sandy standards. Detailed capacity analysis worksheets are provided in the technical appendix.

Table 1 - Operational Analysis Summary: Year 2021 30th-Highest Hour Conditions

Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	v/c*	Delay	LOS	v/c*
Highway 26 at Ten Eyck Road	24.0	C	0.66	27.3	C	0.71
Highway 26 at Langensand Road	56.1	F	0.29 / 0.51	96.7	F	0.36 / 0.50
Highway 211 at Dubarko Road	18.9	C	0.22 / 0.28	27.0	D	0.23 / 0.33
Dubarko Road at Langensand Road	9.4	A	0.05	9.8	A	0.04

*(major street v/c) / (minor-street v/c) is shown for unsignalized ODOT intersections.

SITE TRIPS

Proposed Development

The proposed subdivision will support development of 32 single-family homes as well as up to 120 apartment units. Although some commercial development is expected to occur within the C-3 zoned portion of the property in the longer-range future, a separate design review application and analysis will be required for future commercial development. To estimate the number of trips that will be generated by the potential residential development within the proposed subdivision, trip rates from the *TRIP GENERATION MANUAL, 10th EDITION* were used. Data from land-use code 210, *Single-Family Detached* Housing, and 220, *Multi-Family Housing*, were used. The trip estimates are based on the number of dwelling units.

A summary of the trip generation calculations is provided in Table 2 below. Detailed trip generation worksheets are also included in the technical appendix.

Table 2 - Proposed Development Trip Generation Summary

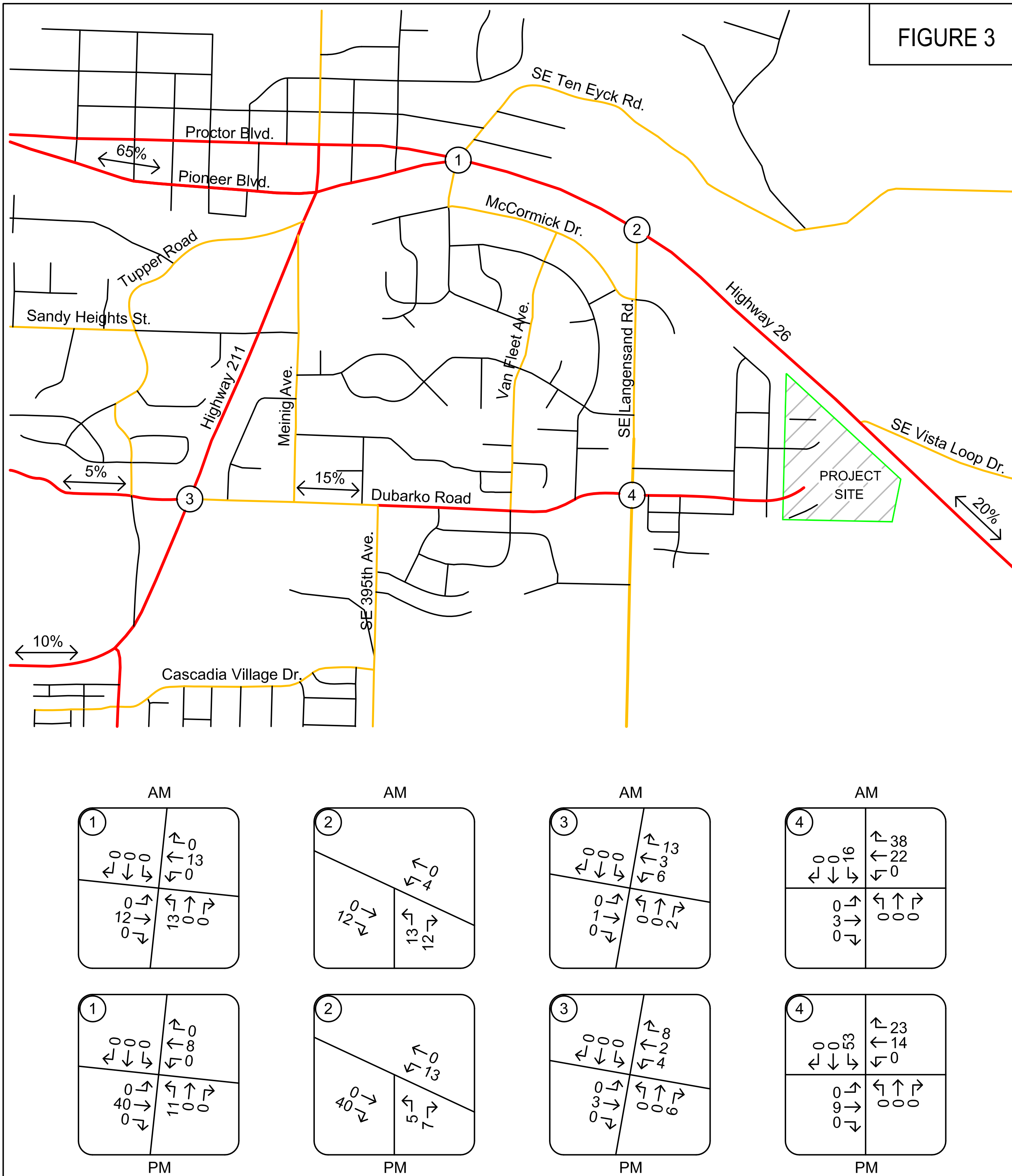
	AM Peak Hour			PM Peak Hour			Daily
	In	Out	Total	In	Out	Total	Total
32 Single-Family Homes	6	18	24	20	12	32	302
120 Multi-Family Dwelling Units	13	42	55	42	25	67	878
Total Site Trips	19	60	79	62	37	99	1,180

TRIP DISTRIBUTION

The directional distribution of site trips to and from the project site was estimated based the existing travel patterns in the site vicinity, as well as the locations of likely trip destinations and major transportation routes. Overall, 65 percent of the anticipated site trips are projected to travel to and from the northwest on Highway 26, 20 percent are projected to travel to and from the southeast on Highway 26, and the remaining 15 percent of site trips are projected to travel to and from the west on Dubarko Road.

The trip distribution percentages and trip assignment for residential development within the proposed subdivision are shown in Figure 3 on page 14.

FIGURE 3



TRAFFIC VOLUMES

Proposed Development - Primary Site Trips

Morning and Evening Peak Hours

FUTURE CONDITIONS ANALYSIS

BACKGROUND VOLUMES

In order to determine the expected impact of site trips on the study area intersections, it is necessary to compare traffic conditions both with and without the addition of the projected traffic from the proposed development. This comparison is made for future traffic conditions at the time of project completion. It is anticipated that the proposed use will be completed and occupied within two years. Accordingly, the analysis was conducted for year 2023 traffic conditions.

Prior to adding the projected site trips to the study intersections, the existing traffic volumes were adjusted to account for background traffic growth over time. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.96 percent per year (linear). The growth rate for traffic volumes on Highway 211 was calculated to be 3.13 percent per year (linear). These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year (exponential) applied.

In addition to the background growth, future site trips associated with other anticipated developments within the City of Sandy were added to the background traffic volumes. These projects included the Clackamas County Health Clinic, Mt. Hood Senior Living, The Pad, The Views, Shaylee Meadows, Mt. View Ridge, Marshall Ridge, Jacoby Heights, Trimble PD, and Bornstedt Views. The projected site trips for these residential developments are shown in Figure 6 in the attached technical appendix.

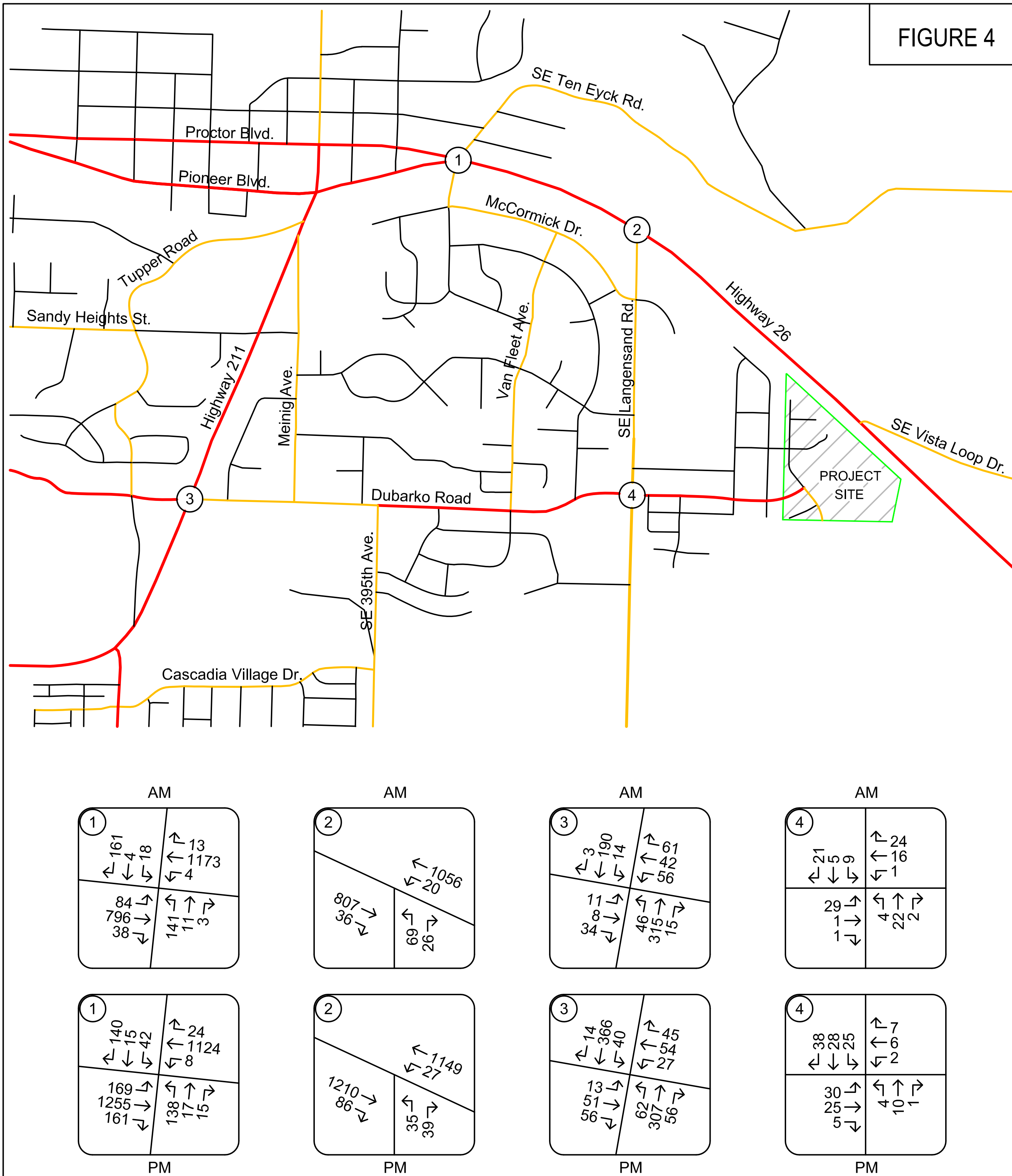
Figure 4 on page 16 shows the projected year 2023 background traffic volumes at the study intersections during the morning and evening peak hours.

BACKGROUND VOLUMES PLUS SITE TRIPS

Peak hour trips calculated to be generated by the proposed development were added to the projected year 2023 background traffic volumes to obtain the year 2023 total traffic volumes following completion of the proposed residential development.

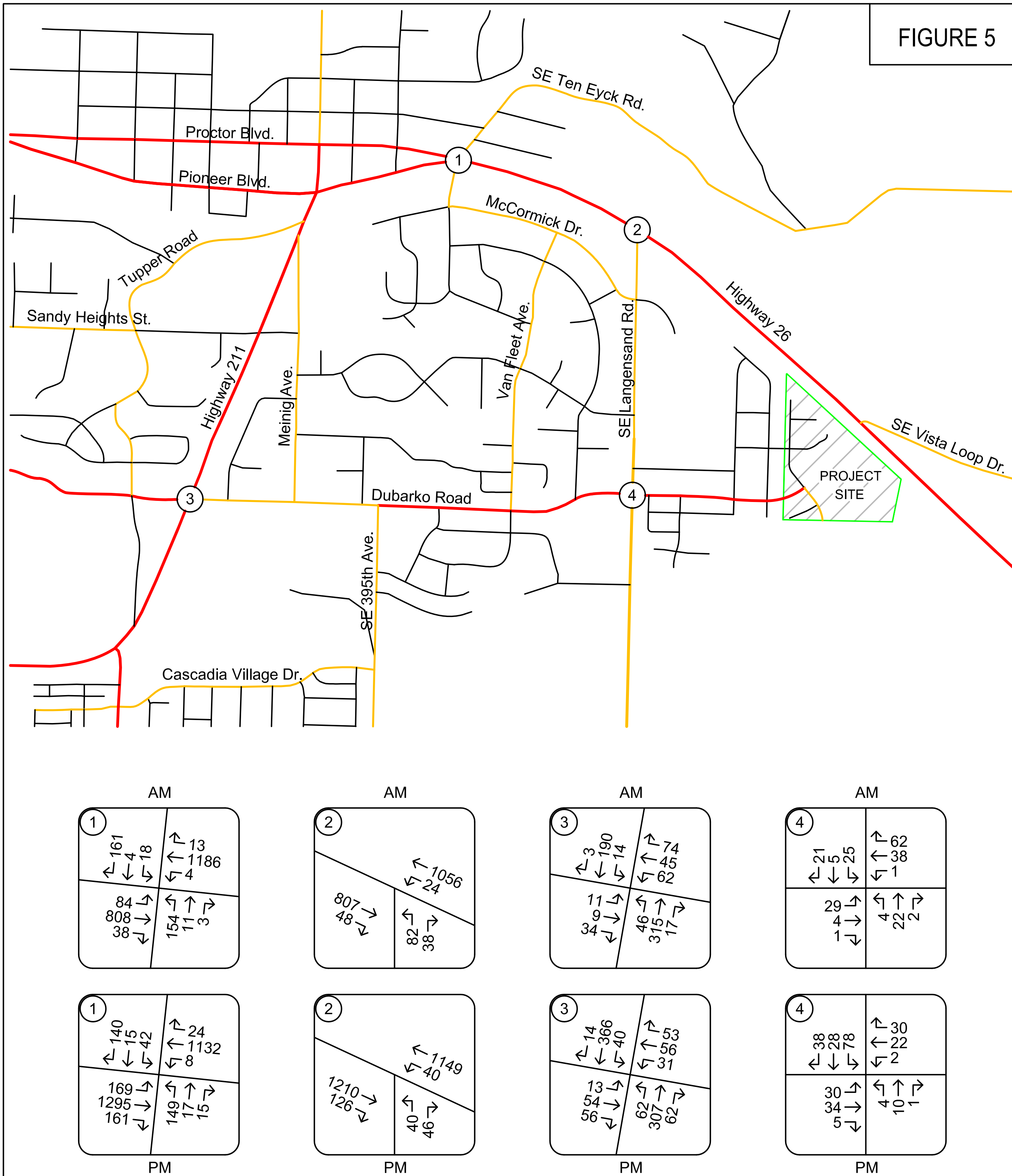
Figure 5 on page 17 shows the projected year 2023 peak hour volumes including background growth, and site trips from the proposed development for the morning and evening peak hours.

FIGURE 4



TRAFFIC VOLUMES
2023 Background Conditions
Morning and Evening Peak Hours

FIGURE 5



TRAFFIC VOLUMES

2023 Background Plus Site Trips

Morning and Evening Peak Hours

Operational Analysis

The operational analysis for future traffic conditions was again conducted using Synchro analysis software, with outputs based on the analysis methodologies contained in the *HIGHWAY CAPACITY MANUAL*. The analysis was prepared for the intersections' morning and evening peak hours.

The results of the operational analysis are summarized in Table 4 below. Detailed analysis worksheets are also included in the technical appendix.

Table 4 - Operational Analysis Summary: Year 2023 Future Conditions

Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	v/c*	Delay	LOS	v/c*
Highway 26 at Ten Eyck Road						
2023 Background Conditions	25.5	C	0.72	29.2	C	0.78
2023 Background plus Site	25.8	C	0.75	29.8	C	0.81
Highway 26 at Langensand Road						
2023 Background Conditions	76.4	F	0.32 / 0.62	160.1	F	0.39 / 0.68
2023 Background plus Site	97.3	F	0.32 / 0.75	210.4	F	0.40 / 0.84
Highway 211 at Dubarko Road						
2023 Background Conditions	22.8	C	0.35	39.4	E	0.46
2023 Background plus Site	23.9	C	0.39	43.3	E	0.50
2023 Background plus Site AWSC	19.5	C	0.67	29.6	D	0.79
Dubarko Road at Langensand Road						
2023 Background Conditions	9.5	A	0.05	9.9	A	0.04
2023 Background plus Site	10.5	B	0.13	11.3	B	0.08

*(major street v/c) / (minor-street v/c) is shown for the unsignalized ODOT intersection.
AWSC = Mitigated conditions analysis with conversion to all-way stop control

The intersection of Oregon Highway 211 at Dubarko Road was previously under the jurisdiction of the Oregon Department of Transportation and subject to a volume-to-capacity ratio standard rather than level of service. The intersection would have met ODOT standards for operation, but with conversion to a city intersection it is projected to operate at level of service "E" either with or without the addition of site trips from the proposed development. If the intersection is converted to all-way stop control (as recommended in the safety analysis section of this report on page 20), the intersection is projected to operate at level of service D, thereby meeting the city's operational standard.

All other intersections are projected to operate acceptably per the appropriate jurisdictional standards. No other operational mitigations are recommended in conjunction with the proposed development.

SAFETY ANALYSIS

CRASH DATA ANALYSIS

Using data obtained from the Oregon Department of Transportation, a review of the five most recent years of available crash history (from January 2015 through December 2019) was performed for the study intersections. The crash data was evaluated based on the number, type, and severity of collisions, as well as the intersection crash rate. Crash rates allow comparison of relative safety risks at intersections with different lane configurations, volumes, and traffic control devices by accounting for both the number of crashes that occur during the study period and the number of vehicles that traveled through the intersection during that period. Crash rates are calculated using the standard assumption that evening peak hour volumes are approximately 10 percent of the average daily traffic volume at an intersection. The crash rates were compared to statewide crash rates for similar intersection types to identify any locations with crash rates in excess of the 90^{th} percentile.

The intersection of Highway 26 at SE Ten Eyck Road had eight reported collisions during the five-year analysis period. These included four rear-end collisions, three turning movement collisions, and one angle collision. The crashes resulted in no serious injuries or fatalities and six reports of a “possible injury/complaint of pain”. The crash rate for the intersection was calculated to be 0.15 crashes per million entering vehicles. This is well below the 90^{th} percentile crash rate of 0.86 crashes per million entering vehicles for signalized, four-way urban intersections in Oregon.

The intersection of Highway 26 at SE Langensand Road had seven reported collisions during the five-year analysis period. These included five turning-movement collisions, one backing collision and one pedestrian collision. The pedestrian collision occurred when a pedestrian walking along the south side of Highway 26 crossing Langensand Road was struck by a driver making an eastbound right turn from the highway onto Langensand Road. The collision resulted in a report of a “possible injury/complaint of pain” by the pedestrian. Overall, the crashes resulted in one non-incapacitating injury and five reports of a “possible injury/complaint of pain”. The crash rate for the intersection was calculated to be 0.16 crashes per million entering vehicles. This is well below the 90^{th} percentile crash rate of 0.29 crashes per million entering vehicles for stop-controlled, three-way urban intersections in Oregon.

The intersection of Highway 211 at Dubarko Road had 27 reported crashes during the five-year analysis period. These included 16 angle collisions, 4 turning-movement collisions, 4 rear-end collisions, 1 backing collision, 1 sideswipe-overtaking collision, and 1 pedestrian collision. The crashes resulted in one incapacitating injury and no fatalities. There were 10 “non-incapacitating” injuries reported and 19 reports of a “possible injury/complaint of pain”. The incapacitating injury occurred when a westbound driver failed to yield to a southbound vehicle and was struck in the intersection. The pedestrian collision occurred when a southbound pedestrian was struck by a westbound driver that failed to yield right-of-way to the pedestrian crossing, resulting in a report of a possible injury/complaint of pain by the pedestrian. The crash rate for the intersection was calculated to be 1.56 crashes per million entering vehicles. This is above the 90^{th} percentile crash rate of 1.08 crashes per million entering vehicles for rural unsignalized four-way intersections in the state of Oregon.

The Oregon Department of Transportation recently undertook safety improvements at this intersection, including re-alignment of the minor-street approaches to intersect at a 90-degree angle and the addition of some striping and speed feedback signs along the major-street to increase driver awareness of speed. However, the crash data for subsequent years has shown no significant improvement in the crash frequency at this intersection. An examination of the current intersection configuration revealed no significant apparent hazards and adequate sight distance from the minor-street approaches, allowing drivers approaching the highway to select safe gaps when turning onto or crossing the highway.

As described in the Warrant Analysis section of this report below, the intersection currently meets all-way stop control warrants based on crash history. Accordingly, it is recommended that all-way stop control be installed at this intersection. No other safety mitigations are recommended at this time.

The intersection of Dubarko Road at SE Langensand Road had one reported collision during the five-year analysis period. It was an angle collision that resulted in property damage only. The crash rate for the intersection was calculated to be 0.34 crashes per million entering vehicles. This is well below the 90th percentile crash rate of 0.408 crashes per million entering vehicles for stop-controlled, four-way urban intersections in Oregon.

Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that consideration be given to installing all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.

TRAFFIC SIGNAL AND ALL-WAY STOP CONTROL WARRANT ANALYSIS

Traffic signal warrants were examined for the unsignalized study intersections. Based on the projected traffic volumes, traffic signal warrants are not projected to be met for any of the unsignalized study intersections under any of the analysis scenarios.

All-way stop control can be installed where there are "Five or more crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions." Examination of the crash data shows that there were six angle collisions at the intersection in the most recent year for which complete data is available (2019). Accordingly, installation of all-way stop control is warranted based on crash history.

Consideration was also given to installing a roundabout at the intersection of Highway 211 and Dubarko Road. Installation of a roundabout would result in operation well within capacity and at level of service A. However, according to *Roundabouts: An Informational Guide*, published by the Federal Highway Administration, "It is generally not desirable to locate roundabouts in locations where grades through the intersection are greater than four percent. The installation of roundabouts on roadways with grades lower than three percent is generally not problematic." In this instance, Highway 211 has a constant grade of approximately 6 percent through its intersection with Dubarko Road. Accordingly, installation of a roundabout would not be recommended absent significant re-grading of the approach roadways. The potential for snow and ice at the intersection compound this concern.

TURN LANE WARRANT ANALYSIS

Turn lane warrants were also examined for the major-street approaches to the unsignalized study intersections. Left-turn lane warrants are intended to evaluate whether a meaningful safety benefit may be expected if the turning vehicles are provided with turn lane within the street, allowing left-turning drivers to move out of the through travel lane so that following vehicles may pass without conflicts.

The intersection of Highway 26 at Langensand Road already has left and right turn lanes in place.

The intersection of Highway 211 at Dubarko Road currently meets ODOT warrants for a northbound left-turn lane and a northbound right-turn lane. However, the need for these turn lanes is not meaningfully related to the proposed development. Further, if all-way stop control is installed at the intersection as recommended based on the safety analysis, additional turn lanes will not be required for either safety or operations.

The intersection of Dubarko Road at Langensand Road is not projected to meet turn lane warrants under any analysis scenarios.

CONCLUSIONS

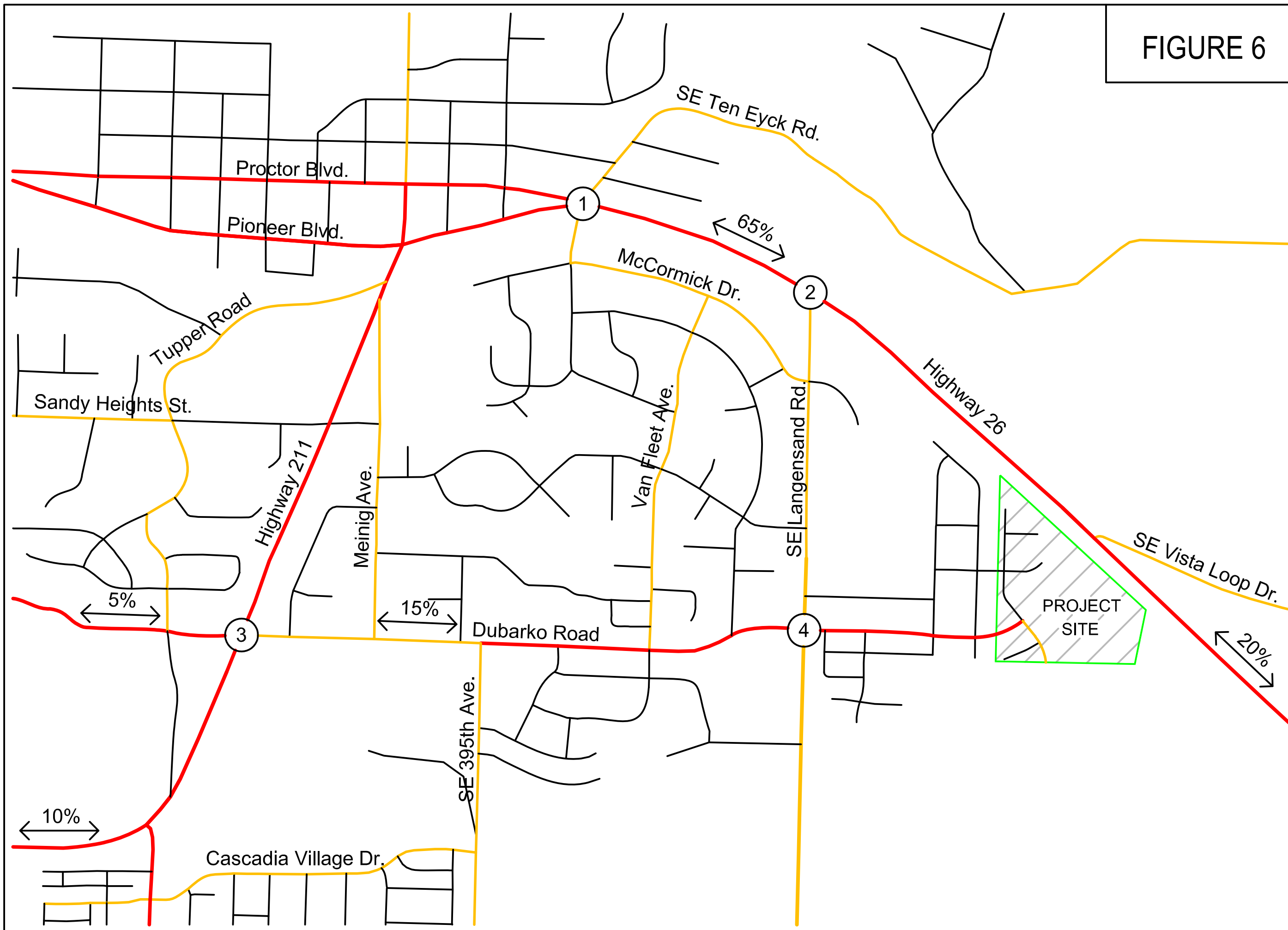
With conversion to all-way stop control, the intersection of Highway 211 at Dubarko Road is projected to operate acceptably under year 2023 traffic conditions. All other study intersections are projected to operate acceptably through year 2023 either with or without the addition of site trips from the proposed development. No other operational mitigations are necessary or recommended in conjunction with the proposed subdivision.

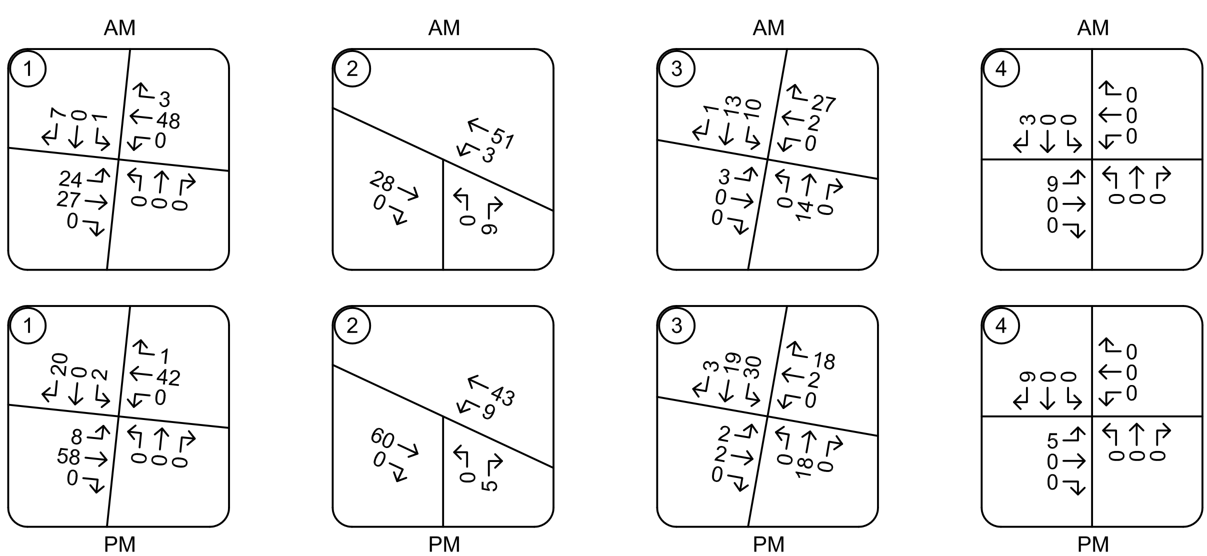
Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. This intersection meets all-way stop control warrants based on crash history, and conversion to all-way stop control would be expected to reduce the frequency and severity of right-angle and turning-movement collisions. It is therefore recommended that all-way stop control be installed at the intersection of Highway 211 and Dubarko Road. No other safety improvements are recommended.

Based on the warrant analysis, no new turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.

APPENDIX

FIGURE 6





TRAFFIC VOLUMES

In-Process Development - Site Trips

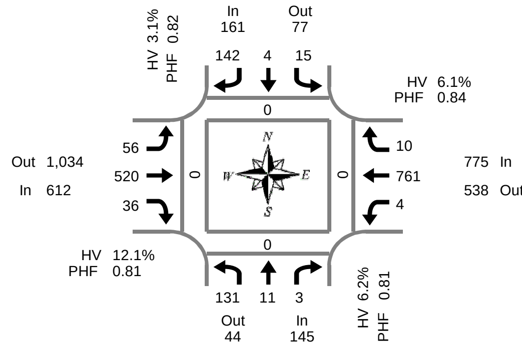
Morning and Evening Peak Hours

PAGE

APP1

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
7:00 AM to 8:00 AM

SE Ten Eyck Rd & Hwy 26

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval	Pedestrians Crosswalk			
Time	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	Total	North	South	East	West
7:00 AM	16	0	0	0	0	0	17	0	5	26	2	0	0	74	0	0	140	0	0	0	0
7:05 AM	10	0	1	0	1	0	10	0	2	18	3	0	1	65	2	0	113	0	0	0	0
7:10 AM	17	1	0	0	2	0	11	0	7	36	2	0	2	74	1	0	153	0	0	0	0
7:15 AM	12	0	0	0	1	2	9	0	9	40	2	0	1	84	1	0	161	0	0	0	0
7:20 AM	15	0	0	0	3	0	11	0	3	40	1	0	0	68	0	0	141	0	0	0	0
7:25 AM	14	1	0	0	1	1	16	0	2	40	4	0	0	70	1	0	150	0	0	0	0
7:30 AM	7	1	1	0	0	0	16	0	8	43	2	0	0	67	0	0	145	0	0	0	0
7:35 AM	12	2	0	0	3	0	12	0	0	56	5	0	0	57	1	0	148	0	0	0	0
7:40 AM	8	2	0	0	0	0	11	0	4	59	3	0	0	53	0	0	140	0	0	0	0
7:45 AM	12	1	1	0	2	0	11	0	4	53	3	0	0	45	2	0	134	0	0	0	0
7:50 AM	4	2	0	0	1	0	10	0	9	47	4	0	0	62	0	0	139	0	0	0	0
7:55 AM	4	1	0	0	1	1	8	0	3	62	5	0	0	42	2	0	129	0	0	0	0
8:00 AM	5	0	1	0	2	1	13	0	2	46	2	0	0	41	0	0	113	0	0	0	0
8:05 AM	6	0	0	0	1	1	5	0	8	50	2	0	0	42	2	0	117	0	0	0	0
8:10 AM	3	0	0	0	2	1	10	0	5	45	4	0	0	53	1	0	124	0	0	0	1
8:15 AM	12	0	0	0	2	0	7	0	3	38	1	0	0	34	1	0	98	0	0	0	0
8:20 AM	6	2	0	0	2	0	9	0	5	38	1	0	1	49	0	0	113	0	0	0	0
8:25 AM	8	0	0	0	1	0	11	0	4	44	3	0	0	39	2	0	112	0	0	0	1
8:30 AM	5	0	0	0	2	1	10	0	4	66	2	0	0	47	0	0	137	1	0	0	0
8:35 AM	10	0	0	0	3	0	13	0	6	59	5	0	0	45	1	0	142	0	0	0	0
8:40 AM	7	0	0	0	5	1	15	0	10	62	3	0	1	43	1	0	148	0	0	0	0
8:45 AM	5	0	0	0	1	0	12	0	5	69	5	0	0	63	0	0	160	0	0	0	0
8:50 AM	9	2	0	0	3	0	12	0	7	56	8	0	1	46	1	0	145	0	0	0	0
8:55 AM	8	1	0	0	2	0	13	0	6	51	8	0	2	44	1	0	136	0	0	0	0
Total Survey	215	16	4	0	41	9	272	0	121	1,144	80	0	9	1,307	20	0	3,238	1	0	0	2

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval	Pedestrians Crosswalk			
Time	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	Total	North	South	East	West
7:00 AM	43	1	1	0	3	0	38	0	14	80	7	0	3	213	3	0	406	0	0	0	0
7:15 AM	41	1	0	0	5	3	36	0	14	120	7	0	1	222	2	0	452	0	0	0	0
7:30 AM	27	5	1	0	3	0	39	0	12	158	10	0	0	177	1	0	433	0	0	0	0
7:45 AM	20	4	1	0	4	1	29	0	16	162	12	0	0	149	4	0	402	0	0	0	0
8:00 AM	14	0	1	0	5	3	28	0	15	141	8	0	0	136	3	0	354	0	0	0	1
8:15 AM	26	2	0	0	5	0	27	0	12	120	5	0	1	122	3	0	323	0	0	0	1
8:30 AM	22	0	0	0	10	2	38	0	20	187	10	0	1	135	2	0	427	1	0	0	0
8:45 AM	22	3	0	0	6	0	37	0	18	176	21	0	3	153	2	0	441	0	0	0	0
Total Survey	215	16	4	0	41	9	272	0	121	1,144	80	0	9	1,307	20	0	3,238	1	0	0	2

Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	145	44	189	0	161	77	238	0	612	1,034	1,646	0	775	538	1,313	0	1,693	0	0	0	0
%HV	6.2%				3.1%				12.1%				6.1%				8.0%				
PHF	0.81				0.82				0.81				0.84				0.93				

By Movement	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	131	11	3	145	15	4	142	161	56	520	36	612	4	761	10	775	1,693
%HV	6.9%	0.0%	0.0%	6.2%	13.3%	25.0%	1.4%	3.1%	8.9%	12.7%	8.3%	12.1%	75.0%	5.5%	20.0%	6.1%	8.0%
PHF	0.74	0.55	0.75	0.81	0.63	0.33	0.81	0.82	0.74	0.77	0.75	0.81	0.25	0.84	0.63	0.84	0.93

Rolling Hour Summary
7:00 AM to 9:00 AM

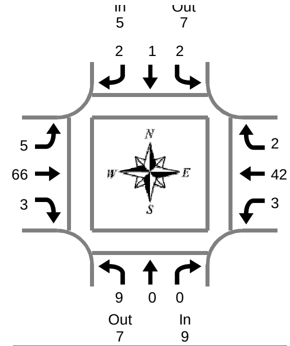
Interval Start	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval	Pedestrians Crosswalk			
Time	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	Total	North	South	East	West
7:00 AM	131	11	3	0	15	4	142	0	56	520	36	0	4	761	10	0	1,693	0	0	0	0
7:15 AM	102	10	3	0	17	7	132	0	57	581	37	0	1	684	10	0	1,641	0	0	0	1
7:30 AM	87	11	3	0	17	4	123	0	55	581	35	0	1	584	11	0	1,512	0	0	0	2
7:45 AM	82	6	2	0	24	6	122	0	63	610	35	0	2	542	12	0	1,506	1	0	0	2
8:00 AM	84	5	1	0	26	5	130	0	65	624	44	0	5	546	10	0	1,545	1	0	0	2

Heavy Vehicle Summary

All Traffic Data
Services Inc.

Clay Carney
(503) 833-2740

Out 53
In 74



Peak Hour Summary
7:00 AM to 8:00 AM

SE Ten Eyck Rd & Hwy 26

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	0	0	1	0	0	0	0	1	6	1	8	0	6	0	6	15
7:05 AM	0	0	0	0	0	0	0	0	0	5	0	5	0	5	0	5	10
7:10 AM	3	0	0	3	0	0	0	0	0	3	0	3	2	2	1	5	11
7:15 AM	1	0	0	1	0	1	0	1	2	6	0	8	1	1	0	2	12
7:20 AM	2	0	0	2	1	0	0	1	0	5	0	5	0	1	0	1	9
7:25 AM	0	0	0	0	0	0	0	0	0	6	1	7	0	1	0	1	8
7:30 AM	0	0	0	0	0	0	0	0	0	7	0	7	0	7	0	7	14
7:35 AM	0	0	0	0	1	0	0	1	0	7	0	7	0	6	0	6	14
7:40 AM	0	0	0	0	0	0	0	0	1	8	0	9	0	1	0	1	10
7:45 AM	0	0	0	0	0	0	1	1	0	6	0	6	0	4	0	4	11
7:50 AM	0	0	0	0	0	0	1	1	0	3	0	3	0	7	0	7	11
7:55 AM	2	0	0	2	0	0	0	0	1	4	1	6	0	1	1	2	10
8:00 AM	1	0	0	1	0	0	1	1	0	10	1	11	0	2	0	2	15
8:05 AM	0	0	0	0	1	0	1	2	0	9	0	9	0	7	1	8	19
8:10 AM	0	0	0	0	0	0	0	0	0	2	0	2	0	6	0	6	8
8:15 AM	0	0	0	0	0	0	0	0	0	4	0	4	0	3	0	3	7
8:20 AM	0	0	0	0	0	0	1	1	0	5	0	5	1	2	0	3	9
8:25 AM	0	0	0	0	0	0	0	0	0	6	1	7	0	3	0	3	10
8:30 AM	0	0	0	0	1	0	0	1	2	6	0	8	0	3	0	3	12
8:35 AM	0	0	0	0	0	0	0	0	1	5	0	6	0	8	0	8	14
8:40 AM	0	0	0	0	0	0	1	1	0	5	0	5	0	1	0	1	7
8:45 AM	0	0	0	0	0	0	0	0	0	9	0	9	0	3	0	3	12
8:50 AM	0	0	0	0	0	0	0	0	1	4	0	5	1	8	0	9	14
8:55 AM	0	0	0	0	0	0	3	3	0	0	2	2	0	3	0	3	8
Total Survey	10	0	0	10	4	1	9	14	9	131	7	147	5	91	3	99	270

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	4	0	0	4	0	0	0	0	1	14	1	16	2	13	1	16	36
7:15 AM	3	0	0	3	1	1	0	2	2	17	1	20	1	3	0	4	29
7:30 AM	0	0	0	0	1	0	0	1	1	22	0	23	0	14	0	14	38
7:45 AM	2	0	0	2	0	0	2	2	1	13	1	15	0	12	1	13	32
8:00 AM	1	0	0	1	1	0	2	3	0	21	1	22	0	15	1	16	42
8:15 AM	0	0	0	0	0	0	1	1	0	15	1	16	1	8	0	9	26
8:30 AM	0	0	0	0	1	0	1	2	3	16	0	19	0	12	0	12	33
8:45 AM	0	0	0	0	0	0	3	3	1	13	2	16	1	14	0	15	34
Total Survey	10	0	0	10	4	1	9	14	9	131	7	147	5	91	3	99	270

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

By Approach	Northbound SE Ten Eyck Rd			Southbound SE Ten Eyck Rd			Eastbound Hwy 26			Westbound Hwy 26			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	9	7	16	5	7	12	74	53	127	47	68	115	135
PHF	0.38			0.63			0.80			0.73			0.89

By Movement	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	9	0	0	9	2	1	2	5	5	66	3	74	3	42	2	47	135
PHF	0.38	0.00	0.00	0.38	0.50	0.25	0.25	0.63	0.63	0.75	0.75	0.80	0.25	0.75	0.50	0.73	0.89

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

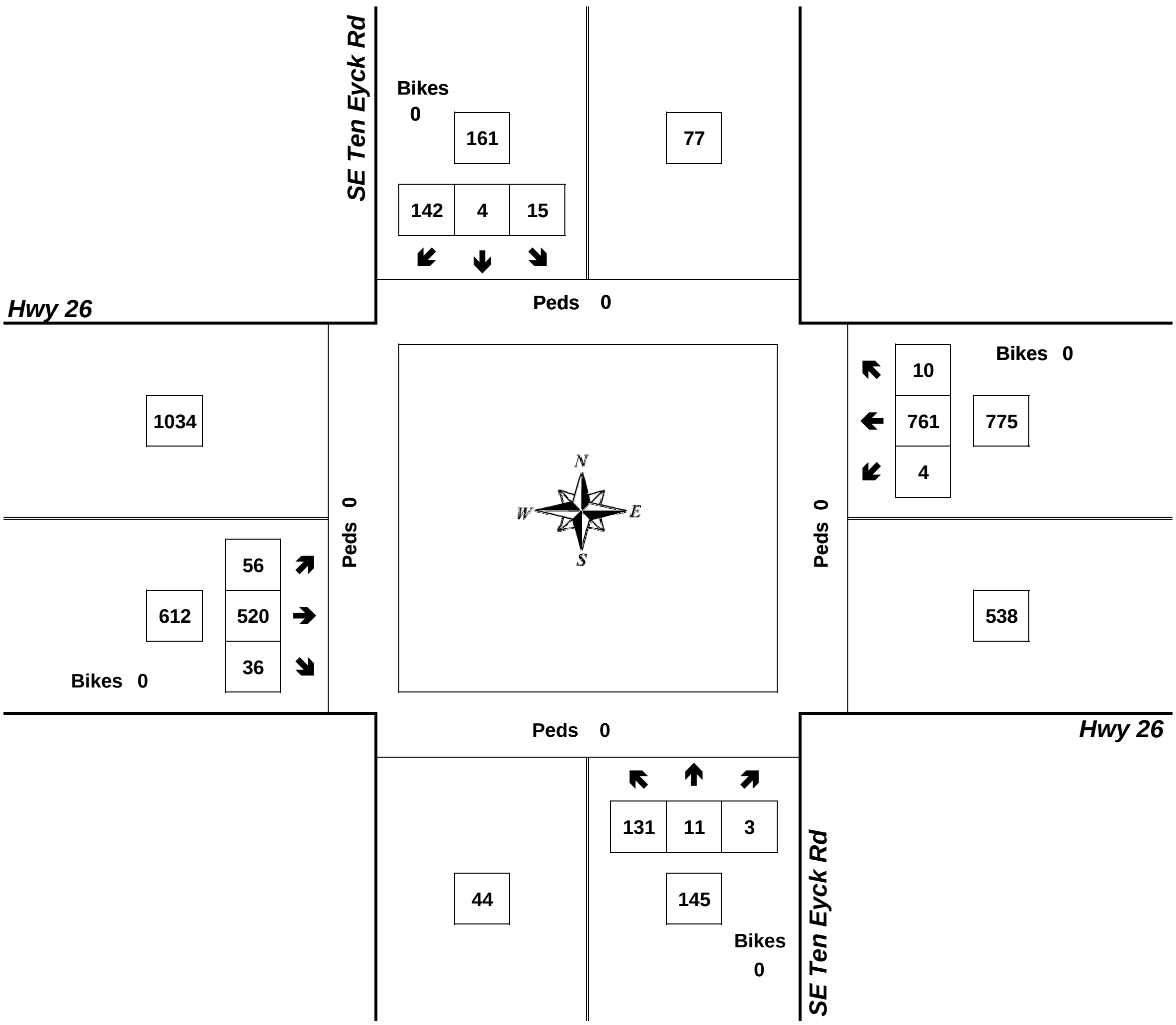
Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	9	0	0	9	2	1	2	5	5	66	3	74	3	42	2	47	135
7:15 AM	6	0	0	6	3	1	4	8	4	73	3	80	1	44	2	47	141
7:30 AM	3	0	0	3	2	0	5	7	2	71	3	76	1	49	2	52	138
7:45 AM	3	0	0	3	2	0	6	8	4	65	3	72	1	47	2	50	133
8:00 AM	1	0	0	1	2	0	7	9	4	65	4	73	2	49	1	52	135

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

SE Ten Eyck Rd & Hwy 26

7:00 AM to 8:00 AM
Wednesday, March 20, 2019

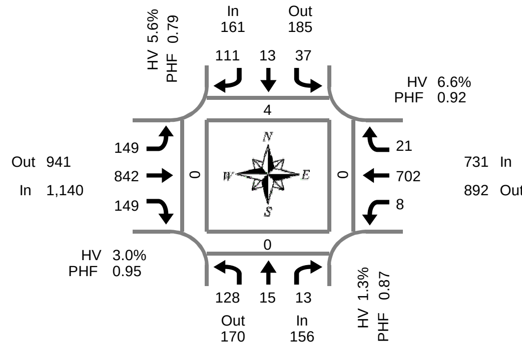


Approach	PHF	HV%	Volume
EB	0.81	12.1%	612
WB	0.84	6.1%	775
NB	0.81	6.2%	145
SB	0.82	3.1%	161
Intersection	0.93	8.0%	1,693

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:10 PM to 5:10 PM

SE Ten Eyck Rd & Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	4	0	2	0	4	3	11	0	8	58	12	0	1	49	2	0	154	0	1	0	0
4:05 PM	10	1	0	0	7	1	5	0	12	63	8	0	1	53	3	0	164	0	0	0	0
4:10 PM	7	2	3	0	1	0	17	0	12	76	11	0	0	65	1	0	195	0	0	0	0
4:15 PM	14	0	1	0	7	1	9	0	18	71	15	0	0	62	1	0	199	0	0	0	0
4:20 PM	9	0	1	0	4	1	11	0	9	75	10	0	0	62	7	0	189	0	0	0	0
4:25 PM	12	2	0	0	5	0	10	0	12	61	14	0	0	52	0	0	168	0	0	0	0
4:30 PM	11	1	4	0	3	2	12	0	17	87	16	1	1	58	1	0	213	0	0	0	0
4:35 PM	15	0	0	0	2	2	6	0	6	59	14	0	0	65	3	0	172	0	0	0	0
4:40 PM	7	1	1	0	3	0	7	0	7	54	9	0	1	57	0	0	147	1	0	0	0
4:45 PM	8	1	0	0	4	1	3	0	13	71	15	1	3	51	3	0	173	0	0	0	0
4:50 PM	13	2	1	0	1	1	6	0	19	74	8	0	0	56	0	0	181	0	0	0	0
4:55 PM	7	1	0	0	1	0	12	0	10	67	14	0	3	57	1	0	173	1	0	0	0
5:00 PM	13	3	1	0	2	2	14	0	12	81	12	0	0	49	1	0	190	2	0	0	0
5:05 PM	12	2	1	0	4	3	4	0	14	66	11	0	0	68	3	1	188	0	0	0	0
5:10 PM	8	0	0	0	6	2	10	0	13	60	12	0	0	68	2	0	181	2	0	0	0
5:15 PM	8	2	1	0	6	2	8	0	9	70	11	0	0	57	1	0	175	0	0	0	0
5:20 PM	8	1	1	1	1	4	10	0	15	73	10	0	0	43	1	0	167	0	1	0	0
5:25 PM	9	1	0	0	4	2	8	0	14	74	11	0	0	43	0	0	166	0	0	0	0
5:30 PM	5	0	1	0	4	0	5	0	15	64	10	0	0	44	0	0	148	1	0	0	0
5:35 PM	5	1	0	0	7	0	9	0	17	50	4	1	0	39	0	0	132	0	0	0	0
5:40 PM	4	0	0	0	2	1	5	0	11	56	7	0	0	30	1	0	117	2	0	0	2
5:45 PM	4	1	0	0	3	2	8	0	14	76	6	0	3	41	1	0	159	0	0	0	0
5:50 PM	7	1	0	0	0	1	6	0	14	69	8	0	0	42	0	0	148	0	0	0	0
5:55 PM	10	1	0	0	0	2	3	0	16	65	10	0	0	51	1	0	159	0	0	0	0
Total Survey	210	24	18	1	81	33	199	0	307	1,620	258	3	13	1,262	33	1	4,058	9	2	0	2

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	21	3	5	0	12	4	33	0	32	197	31	0	2	167	6	0	513	0	1	0	0
4:15 PM	35	2	2	0	16	2	30	0	39	207	39	0	0	176	8	0	556	0	0	0	0
4:30 PM	33	2	5	0	8	4	25	0	30	200	39	1	2	180	4	0	532	1	0	0	0
4:45 PM	28	4	1	0	6	2	21	0	42	212	37	1	6	164	4	0	527	1	0	0	0
5:00 PM	33	5	2	0	12	7	28	0	39	207	35	0	0	185	6	1	559	4	0	0	0
5:15 PM	25	4	2	1	11	8	26	0	38	217	32	0	0	143	2	0	508	0	1	0	0
5:30 PM	14	1	1	0	13	1	19	0	43	170	21	1	0	113	1	0	397	3	0	0	2
5:45 PM	21	3	0	0	3	5	17	0	44	210	24	0	3	134	2	0	466	0	0	0	0
Total Survey	210	24	18	1	81	33	199	0	307	1,620	258	3	13	1,262	33	1	4,058	9	2	0	2

Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	156	170	326	0	161	185	346	0	1,140	941	2,081	2	731	892	1,623	1	2,188	4	0	0	0
%HV	1.3%				5.6%				3.0%				6.6%				4.3%				
PHF	0.87				0.79				0.95				0.92				0.94				

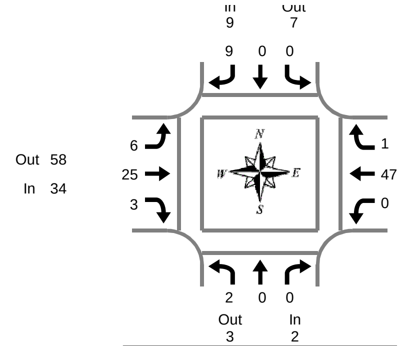
By Movement	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	128	15	13	156	37	13	111	161	149	842	149	1,140	8	702	21	731	2,188
%HV	1.6%	0.0%	0.0%	1.3%	0.0%	0.0%	8.1%	5.6%	4.0%	3.0%	2.0%	3.0%	0.0%	6.7%	4.8%	6.6%	4.3%
PHF	0.84	0.63	0.65	0.87	0.58	0.65	0.75	0.79	0.89	0.94	0.85	0.95	0.33	0.93	0.58	0.92	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Ten Eyck Rd				Southbound SE Ten Eyck Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	117	11	13	0	42	12	109	0	143	816	146	2	10	687	22	0	2,128	2	1	0	0
4:15 PM	129	13	10	0	42	15	104	0	150	826	150	2	8	705	22	1	2,174	6	0	0	0
4:30 PM	119	15	10	1	37	21	100	0	149	836	143	2	8	672	16	1	2,126	6	1	0	0
4:45 PM	100	14	6	1	42	18	94	0	162	806	125	2	6	605	13	1	1,991	8	1	0	2
5:00 PM	93	13	5	1	39	21	90	0	164	804	112	1	3	575	11	1	1,930	7	1	0	2

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



SE Ten Eyck Rd & Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

Peak Hour Summary
4:10 PM to 5:10 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Ten Eyck Rd L	T	R	Total	Southbound SE Ten Eyck Rd L	T	R	Total	Eastbound Hwy 26 L	T	R	Total	Westbound Hwy 26 L	T	R	Total	Interval Total
4:00 PM	0	0	0	0	0	0	0	0	0	4	0	4	0	10	1	11	15
4:05 PM	0	0	0	0	1	0	0	1	0	6	0	6	0	3	1	4	11
4:10 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	8	0	8	10
4:15 PM	2	0	0	2	0	0	2	2	2	3	0	5	0	3	0	3	12
4:20 PM	0	0	0	0	0	0	2	2	1	3	0	4	0	5	1	6	12
4:25 PM	0	0	0	0	0	0	1	1	0	5	1	6	0	4	0	4	11
4:30 PM	0	0	0	0	0	0	2	2	1	0	0	1	0	3	0	3	6
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	5
4:40 PM	0	0	0	0	0	0	1	1	0	3	0	3	0	2	0	2	6
4:45 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	4	0	4	6
4:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7	7
4:55 PM	0	0	0	0	0	0	1	1	1	2	1	4	0	0	0	0	5
5:00 PM	0	0	0	0	0	0	0	0	0	4	1	5	0	1	0	1	6
5:05 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	5	0	5	7
5:10 PM	0	0	0	0	0	0	0	0	1	3	0	4	0	4	0	4	8
5:15 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	2	0	2	4
5:20 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	5	0	5	6
5:25 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	1	0	1	3
5:30 PM	0	0	0	0	0	0	0	0	0	3	1	4	0	3	0	3	7
5:35 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	4	0	4	6
5:40 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
5:45 PM	1	0	0	1	0	0	0	0	0	2	0	2	0	3	0	3	6
5:50 PM	1	0	0	1	0	0	0	0	0	1	1	2	0	4	0	4	7
5:55 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	5	0	5	8
Total Survey	4	0	0	4	1	0	9	10	10	53	5	68	0	91	3	94	176

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Ten Eyck Rd L	T	R	Total	Southbound SE Ten Eyck Rd L	T	R	Total	Eastbound Hwy 26 L	T	R	Total	Westbound Hwy 26 L	T	R	Total	Interval Total
4:00 PM	0	0	0	0	1	0	0	1	0	12	0	12	0	21	2	23	36
4:15 PM	2	0	0	2	0	0	5	5	3	11	1	15	0	12	1	13	35
4:30 PM	0	0	0	0	0	0	3	3	1	3	0	4	0	10	0	10	17
4:45 PM	0	0	0	0	0	0	1	1	2	3	1	6	0	11	0	11	18
5:00 PM	0	0	0	0	0	0	0	0	1	9	1	11	0	10	0	10	21
5:15 PM	0	0	0	0	0	0	0	0	1	4	0	5	0	8	0	8	13
5:30 PM	0	0	0	0	0	0	0	0	1	6	1	8	0	7	0	7	15
5:45 PM	2	0	0	2	0	0	0	0	1	5	1	7	0	12	0	12	21
Total Survey	4	0	0	4	1	0	9	10	10	53	5	68	0	91	3	94	176

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound SE Ten Eyck Rd In	Out	Total	Southbound SE Ten Eyck Rd In	Out	Total	Eastbound Hwy 26 In	Out	Total	Westbound Hwy 26 In	Out	Total	Total
Volume	2	3	5	9	7	16	34	58	92	48	25	73	93
PHF	0.25			0.45			0.57			0.71			0.66

By Movement	Northbound SE Ten Eyck Rd L	T	R	Total	Southbound SE Ten Eyck Rd L	T	R	Total	Eastbound Hwy 26 L	T	R	Total	Westbound Hwy 26 L	T	R	Total	Total
Volume	2	0	0	2	0	0	9	9	6	25	3	34	0	47	1	48	93
PHF	0.25	0.00	0.00	0.25	0.00	0.00	0.45	0.45	0.50	0.57	0.38	0.57	0.00	0.73	0.25	0.71	0.66

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

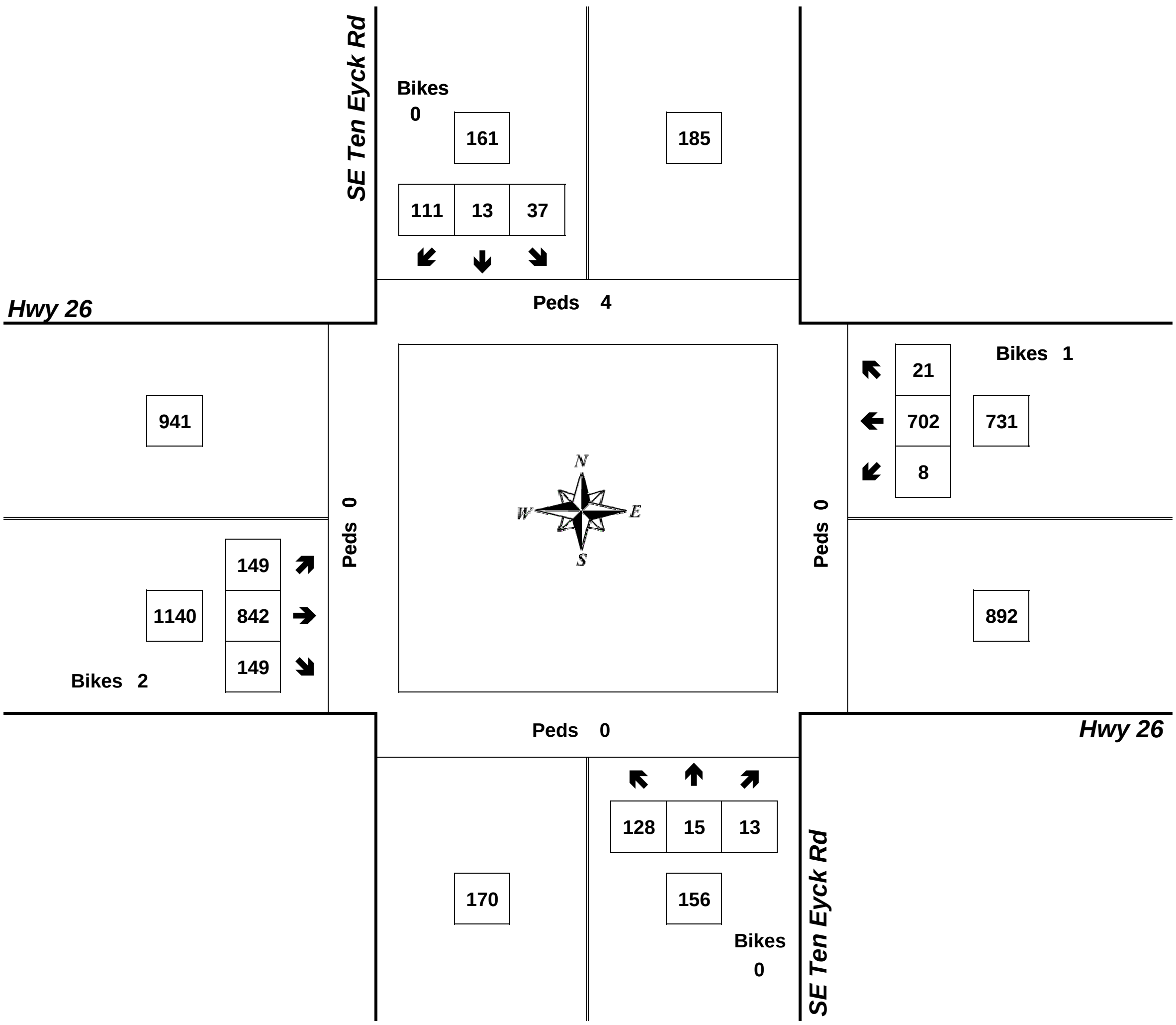
Interval Start Time	Northbound SE Ten Eyck Rd L	T	R	Total	Southbound SE Ten Eyck Rd L	T	R	Total	Eastbound Hwy 26 L	T	R	Total	Westbound Hwy 26 L	T	R	Total	Interval Total
4:00 PM	2	0	0	2	1	0	9	10	6	29	2	37	0	54	3	57	106
4:15 PM	2	0	0	2	0	0	9	9	7	26	3	36	0	43	1	44	91
4:30 PM	0	0	0	0	0	0	4	4	5	19	2	26	0	39	0	39	69
4:45 PM	0	0	0	0	0	0	1	1	5	22	3	30	0	36	0	36	67
5:00 PM	2	0	0	2	0	0	0	0	4	24	3	31	0	37	0	37	70

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

SE Ten Eyck Rd & Hwy 26

4:10 PM to 5:10 PM
Tuesday, March 19, 2019



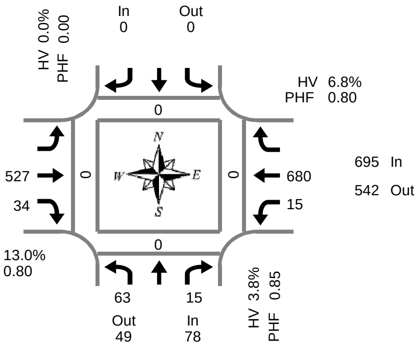
Approach	PHF	HV%	Volume
EB	0.95	3.0%	1,140
WB	0.92	6.6%	731
NB	0.87	1.3%	156
SB	0.79	5.6%	161
Intersection	0.94	4.3%	2,188

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

SE Langensand Rd & Hwy 26

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	4		0	0				0		25	1	0	2	62		0	94	0	0	0	0
7:05 AM	9		0	0				0		24	2	0	2	65		0	102	0	0	0	0
7:10 AM	3		0	0				0		22	2	0	0	74		0	101	0	0	0	0
7:15 AM	4		2	0				0		33	3	0	1	71		0	114	0	0	0	0
7:20 AM	9		2	0				0		52	1	0	0	71		0	135	0	0	0	0
7:25 AM	4		1	0				0		31	3	0	4	67		0	110	0	0	0	0
7:30 AM	5		2	0				0		39	5	0	0	60		0	111	0	0	0	0
7:35 AM	4		1	0				0		52	1	0	2	54		0	114	0	0	0	0
7:40 AM	8		0	0				0		56	3	0	2	41		0	110	0	0	0	0
7:45 AM	1		2	0				0		49	8	0	3	42		0	105	0	0	0	0
7:50 AM	4		2	0				0		56	2	0	1	52		0	117	0	0	0	0
7:55 AM	7		1	0				0		59	2	0	0	45		0	114	0	0	0	0
8:00 AM	5		2	0				0		54	2	0	0	38		0	101	0	0	0	0
8:05 AM	2		2	0				0		44	3	0	1	41		0	93	0	0	0	0
8:10 AM	2		2	0				0		41	1	0	0	49		0	95	0	0	0	0
8:15 AM	4		1	0				0		46	0	0	2	34		0	87	0	0	0	0
8:20 AM	2		1	0				0		40	3	0	0	42		0	88	0	0	0	0
8:25 AM	4		2	0				0		39	2	0	1	43		0	91	0	0	0	0
8:30 AM	5		4	0				0		53	1	0	2	37		0	102	0	0	0	0
8:35 AM	2		3	0				0		56	1	0	0	53		0	115	0	0	0	0
8:40 AM	1		2	0				0		53	8	0	1	47		0	112	0	0	0	0
8:45 AM	6		2	0				0		77	5	0	0	53		0	143	0	0	0	0
8:50 AM	4		4	0				0		52	2	0	5	60		0	127	0	0	0	0
8:55 AM	5		0	0				0		60	0	0	1	42		0	108	0	0	0	0
Total Survey	104		38	0				0		1,113	61	0	30	1,243		0	2,589	0	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	16		0	0				0		71	5	0	4	201		0	297	0	0	0	0
7:15 AM	17		5	0				0		116	7	0	5	209		0	359	0	0	0	0
7:30 AM	17		3	0				0		147	9	0	4	155		0	335	0	0	0	0
7:45 AM	12		5	0				0		164	12	0	4	139		0	336	0	0	0	0
8:00 AM	9		6	0				0		139	6	0	1	128		0	289	0	0	0	0
8:15 AM	10		4	0				0		125	5	0	3	119		0	266	0	0	0	0
8:30 AM	8		9	0				0		162	10	0	3	137		0	329	0	0	0	0
8:45 AM	15		6	0				0		189	7	0	6	155		0	378	0	0	0	0
Total Survey	104		38	0				0		1,113	61	0	30	1,243		0	2,589	0	0	0	0

Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Hwy 26				Westbound Hwy 26				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	78	49	127	0	0	0	0	0	561	743	1,304	0	695	542	1,237	0	1,334	0	0	0	0
%HV	3.8%				0.0%				13.0%				6.8%				9.2%				
PHF	0.85				0.00				0.80				0.80				0.93				

By Movement	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Hwy 26				Westbound Hwy 26				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	63		15	78				0		527	34	561	15	680		695	1,334
%HV	3.2%	NA	6.7%	3.8%	NA	NA	NA	0.0%	NA	13.1%	11.8%	13.0%	20.0%	6.5%	NA	6.8%	9.2%
PHF	0.88		0.75	0.85				0.00		0.78	0.65	0.80	0.54	0.79		0.80	0.93

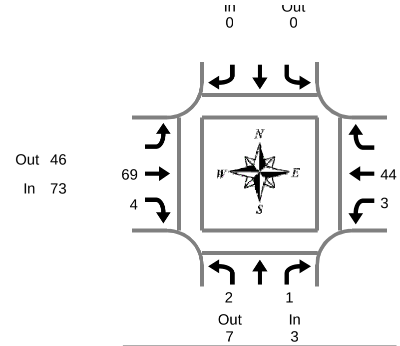
Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Hwy 26				Westbound Hwy 26				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	62		13	0				0		498	33	0	17	704		0	1,327	0	0	0	0
7:15 AM	55		19	0				0		566	34	0	14	631		0	1,319	0	0	0	0
7:30 AM	48		18	0				0		575	32	0	12	541		0	1,226	0	0	0	0
7:45 AM	39		24	0				0		590	33	0	11	523		0	1,220	0	0	0	0
8:00 AM	42		25	0				0		615	28	0	13	539		0	1,262	0	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

SE Langensand Rd & Hwy 26

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
7:00 AM	0		0	0				0		6	1	7	0	6		6	13
7:05 AM	0		0	0				0		4	1	5	0	6		6	11
7:10 AM	0		0	0				0		2	0	2	0	3		3	5
7:15 AM	0		0	0				0		6	0	6	0	3		3	9
7:20 AM	0		0	0				0		7	0	7	0	0		0	7
7:25 AM	0		0	0				0		5	1	6	1	2		3	9
7:30 AM	0		0	0				0		6	0	6	0	6		6	12
7:35 AM	0		0	0				0		5	0	5	1	7		8	13
7:40 AM	1		0	1				0		7	0	7	0	2		2	10
7:45 AM	0		0	0				0		11	1	12	1	3		4	16
7:50 AM	0		1	1				0		4	1	5	0	5		5	11
7:55 AM	1		0	1				0		3	0	3	0	5		5	9
8:00 AM	0		0	0				0		9	0	9	0	2		2	11
8:05 AM	1		0	1				0		11	1	12	0	7		7	20
8:10 AM	0		0	0				0		2	0	2	0	5		5	7
8:15 AM	0		0	0				0		3	0	3	0	4		4	7
8:20 AM	0		0	0				0		4	1	5	0	2		2	7
8:25 AM	0		1	1				0		4	1	5	0	3		3	9
8:30 AM	0		2	2				0		9	0	9	1	3		4	15
8:35 AM	1		1	2				0		5	0	5	0	6		6	13
8:40 AM	0		0	0				0		5	0	5	0	3		3	8
8:45 AM	0		0	0				0		7	0	7	0	1		1	8
8:50 AM	0		0	0				0		3	0	3	0	9		9	12
8:55 AM	0		0	0				0		4	0	4	0	4		4	8
Total Survey	4		5	9				0		132	8	140	4	97		101	250

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
7:00 AM	0		0	0				0		12	2	14	0	15		15	29
7:15 AM	0		0	0				0		18	1	19	1	5		6	25
7:30 AM	1		0	1				0		18	0	18	1	15		16	35
7:45 AM	1		1	2				0		18	2	20	1	13		14	36
8:00 AM	1		0	1				0		22	1	23	0	14		14	38
8:15 AM	0		1	1				0		11	2	13	0	9		9	23
8:30 AM	1		3	4				0		19	0	19	1	12		13	36
8:45 AM	0		0	0				0		14	0	14	0	14		14	28
Total Survey	4		5	9				0		132	8	140	4	97		101	250

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound				Southbound				Eastbound				Westbound				Total
	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				
	In	Out	Total		In	Out	Total		In	Out	Total		In	Out	Total		
Volume	3	7	10		0	0	0		73	46	119		47	70	117		123
PHF	0.38				0.00				0.76				0.69				0.79

By Movement	Northbound				Southbound				Eastbound				Westbound				Total
	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	2		1	3				0		69	4	73	3	44		47	123
PHF	0.50		0.25	0.38				0.00		0.75	0.50	0.76	0.38	0.73		0.69	0.79

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

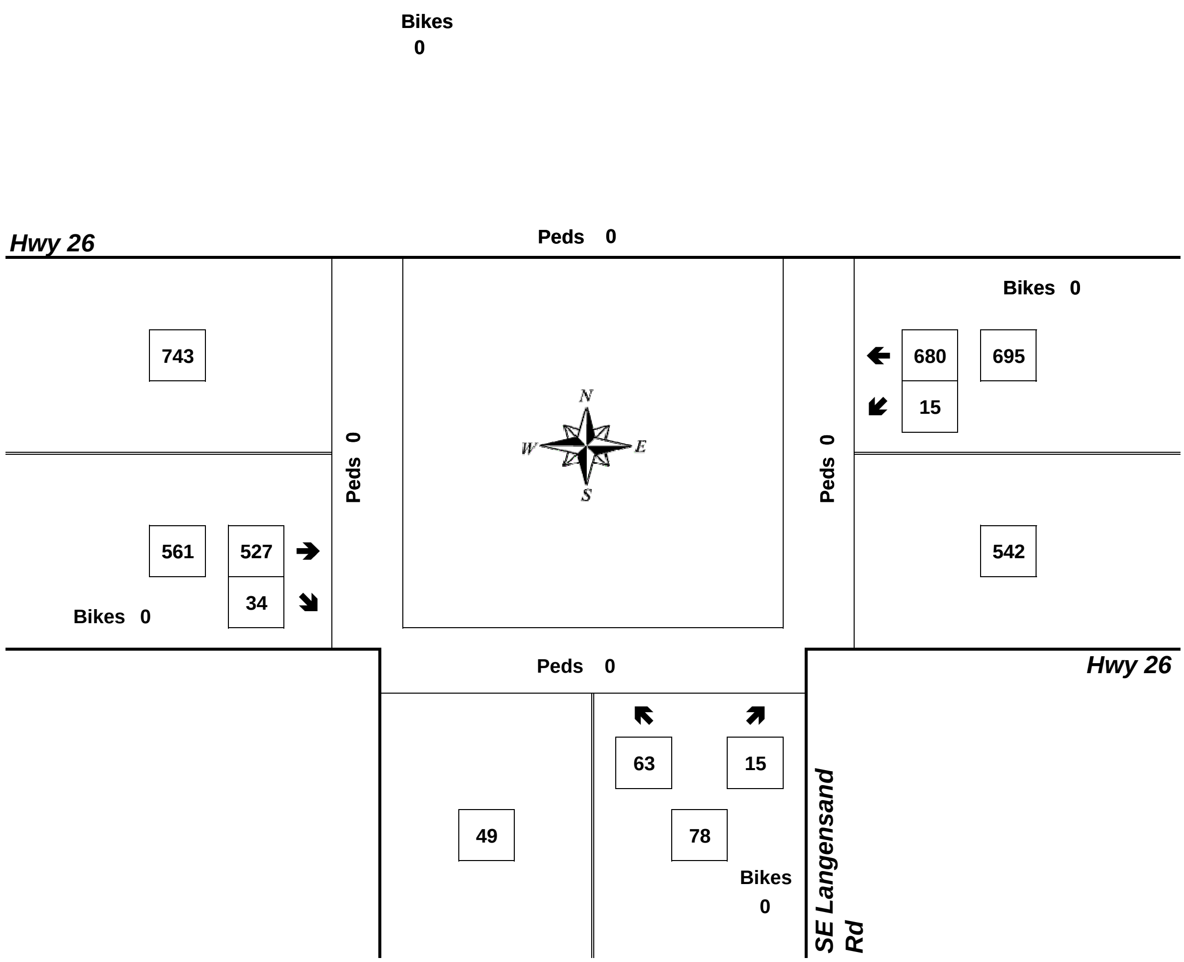
Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
7:00 AM	2		1	3				0		66	5	71	3	48		51	125
7:15 AM	3		1	4				0		76	4	80	3	47		50	134
7:30 AM	3		2	5				0		69	5	74	2	51		53	132
7:45 AM	3		5	8				0		70	5	75	2	48		50	133
8:00 AM	2		4	6				0		66	3	69	1	49		50	125

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

SE Langensand Rd & Hwy 26

7:05 AM to 8:05 AM
Wednesday, March 20, 2019

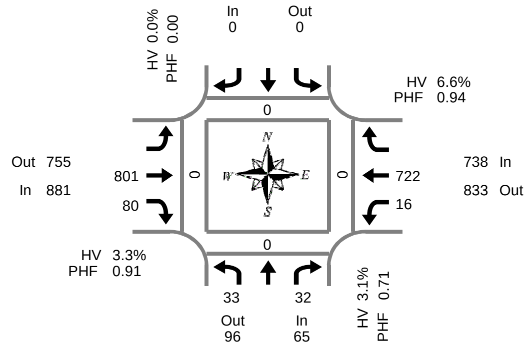


Approach	PHF	HV%	Volume
EB	0.80	13.0%	561
WB	0.80	6.8%	695
NB	0.85	3.8%	78
SB	0.00	0.0%	0
Intersection	0.93	9.2%	1,334

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:10 PM to 5:10 PM

SE Langensand Rd & Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L		R	Bikes	Southbound SE Langensand Rd			Bikes	Eastbound Hwy 26	T	R	Bikes	Westbound Hwy 26 L	T		Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	2		4	0				0		62	9	0	5	50		0	132	0	0	0	0
4:05 PM	1		2	0				0		69	6	0	3	52		0	133	0	0	0	0
4:10 PM	1		3	0				0		61	3	0	1	74		0	143	0	0	0	0
4:15 PM	6		1	0				0		76	5	0	1	50		0	139	0	0	0	0
4:20 PM	5		5	0				0		79	9	0	1	70		0	169	0	0	0	0
4:25 PM	6		0	1				0		58	8	0	1	49		0	122	0	0	0	0
4:30 PM	0		3	0				0		75	12	0	1	56		0	147	0	0	0	0
4:35 PM	2		5	0				0		61	7	0	1	64		0	140	0	0	0	0
4:40 PM	0		1	0				0		59	1	0	1	55		0	117	0	0	0	0
4:45 PM	1		1	0				0		64	3	0	2	63		0	134	0	0	0	0
4:50 PM	6		5	0				0		62	6	0	0	54		0	133	0	0	0	0
4:55 PM	3		0	0				0		72	5	0	2	56		0	138	0	0	0	0
5:00 PM	1		5	0				0		62	10	0	1	55		0	134	0	0	0	0
5:05 PM	2		3	0				0		72	11	0	4	76		0	168	0	0	0	0
5:10 PM	2		3	0				0		58	14	0	1	65		0	143	0	0	0	0
5:15 PM	1		2	0				0		51	8	0	2	59		0	123	0	0	0	0
5:20 PM	2		4	0				0		78	7	0	2	43		0	136	0	0	0	0
5:25 PM	3		1	0				0		71	5	0	1	42		0	123	0	0	0	0
5:30 PM	2		2	0				0		67	7	0	3	38		0	119	0	0	0	0
5:35 PM	1		1	0				0		60	5	0	1	38		0	106	0	0	0	0
5:40 PM	0		4	0				0		49	7	0	0	34		0	94	0	0	0	0
5:45 PM	2		1	0				0		69	7	0	1	45		0	125	0	0	0	0
5:50 PM	0		3	0				0		60	4	0	0	43		0	110	0	0	0	0
5:55 PM	4		1	0				0		65	8	0	3	52		0	133	0	0	0	0
Total Survey	53		60	1				0		1,560	167	0	38	1,283		0	3,161	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L		R	Bikes	Southbound SE Langensand Rd			Bikes	Eastbound Hwy 26	T	R	Bikes	Westbound Hwy 26 L	T		Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	4		9	0				0		192	18	0	9	176		0	408	0	0	0	0
4:15 PM	17		6	1				0		213	22	0	3	169		0	430	0	0	0	0
4:30 PM	2		9	0				0		195	20	0	3	175		0	404	0	0	0	0
4:45 PM	10		6	0				0		198	14	0	4	173		0	405	0	0	0	0
5:00 PM	5		11	0				0		192	35	0	6	196		0	445	0	0	0	0
5:15 PM	6		7	0				0		200	20	0	5	144		0	382	0	0	0	0
5:30 PM	3		7	0				0		176	19	0	4	110		0	319	0	0	0	0
5:45 PM	6		5	0				0		194	19	0	4	140		0	368	0	0	0	0
Total Survey	53		60	1				0		1,560	167	0	38	1,283		0	3,161	0	0	0	0

Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound SE Langensand Rd In	Out	Total	Bikes	Southbound SE Langensand Rd In	Out	Total	Bikes	Eastbound Hwy 26 In	Out	Total	Bikes	Westbound Hwy 26 In	Out	Total	Bikes	Total
Volume	65	96	161	1	0	0	0	0	881	755	1,636	0	738	833	1,571	0	1,684
%HV	3.1%				0.0%				3.3%				6.6%				4.8%
PHF	0.71				0.00				0.91				0.94				0.93

Pedestrians Crosswalk North	South	East	West
0	0	0	0

By Movement	Northbound SE Langensand Rd L		R	Total	Southbound SE Langensand Rd			Total	Eastbound Hwy 26	T	R	Total	Westbound Hwy 26 L	T		Total	Total
Volume	33		32	65				0		801	80	881	16	722		738	1,684
%HV	3.0%	NA	3.1%	3.1%	NA	NA	NA	0.0%	NA	3.4%	2.5%	3.3%	0.0%	6.8%	NA	6.6%	4.8%
PHF	0.49		0.80	0.71				0.00		0.93	0.69	0.91	0.57	0.93		0.94	0.93

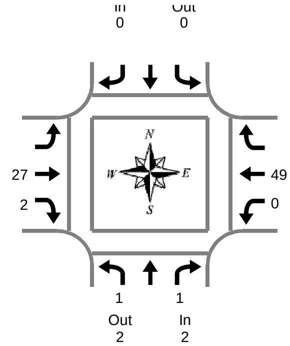
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L		R	Bikes	Southbound SE Langensand Rd			Bikes	Eastbound Hwy 26	T	R	Bikes	Westbound Hwy 26 L	T		Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	33		30	1				0		798	74	0	19	693		0	1,647	0	0	0	0
4:15 PM	34		32	1				0		798	91	0	16	713		0	1,684	0	0	0	0
4:30 PM	23		33	0				0		785	89	0	18	688		0	1,636	0	0	0	0
4:45 PM	24		31	0				0		766	88	0	19	623		0	1,551	0	0	0	0
5:00 PM	20		30	0				0		762	93	0	19	590		0	1,514	0	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

Out 50
In 29



Peak Hour Summary
4:10 PM to 5:10 PM

SE Langensand Rd & Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
4:00 PM	0		0	0				0		3	0	3	0	11		11	14
4:05 PM	0		0	0				0		8	0	8	0	5		5	13
4:10 PM	0		0	0				0		2	0	2	0	7		7	9
4:15 PM	0		0	0				0		5	0	5	0	4		4	9
4:20 PM	1		0	1				0		4	1	5	0	4		4	10
4:25 PM	0		0	0				0		3	0	3	0	5		5	8
4:30 PM	0		1	1				0		1	1	2	0	3		3	6
4:35 PM	0		0	0				0		1	0	1	0	4		4	5
4:40 PM	0		0	0				0		2	0	2	0	3		3	5
4:45 PM	0		0	0				0		1	0	1	0	4		4	5
4:50 PM	0		0	0				0		2	0	2	0	6		6	8
4:55 PM	0		0	0				0		1	0	1	0	2		2	3
5:00 PM	0		0	0				0		3	0	3	0	1		1	4
5:05 PM	0		0	0				0		2	0	2	0	6		6	8
5:10 PM	0		0	0				0		0	1	1	0	4		4	5
5:15 PM	0		0	0				0		2	0	2	0	3		3	5
5:20 PM	0		0	0				0		0	0	0	0	5		5	5
5:25 PM	0		0	0				0		1	0	1	0	1		1	2
5:30 PM	0		0	0				0		4	0	4	0	2		2	6
5:35 PM	0		0	0				0		0	0	0	1	2		3	3
5:40 PM	0		0	0				0		1	0	1	0	3		3	4
5:45 PM	0		0	0				0		4	0	4	0	3		3	7
5:50 PM	0		0	0				0		1	0	1	0	2		2	3
5:55 PM	0		0	0				0		2	0	2	0	7		7	9
Total Survey	1		1	2				0		53	3	56	1	97		98	156

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
4:00 PM	0		0	0				0		13	0	13	0	23		23	36
4:15 PM	1		0	1				0		12	1	13	0	13		13	27
4:30 PM	0		1	1				0		4	1	5	0	10		10	16
4:45 PM	0		0	0				0		4	0	4	0	12		12	16
5:00 PM	0		0	0				0		5	1	6	0	11		11	17
5:15 PM	0		0	0				0		3	0	3	0	9		9	12
5:30 PM	0		0	0				0		5	0	5	1	7		8	13
5:45 PM	0		0	0				0		7	0	7	0	12		12	19
Total Survey	1		1	2				0		53	3	56	1	97		98	156

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound				Southbound				Eastbound				Westbound				Total
	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				
	In	Out	Total		In	Out	Total		In	Out	Total		In	Out	Total		
Volume	2	2	4		0	0	0		29	50	79		49	28	77		80
PHF	0.25				0.00				0.56				0.82				0.71

By Movement	Northbound				Southbound				Eastbound				Westbound				Total
	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	1		1	2				0		27	2	29	0	49		49	80
PHF	0.25		0.25	0.25				0.00		0.56	0.25	0.56	0.00	0.82		0.82	0.71

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

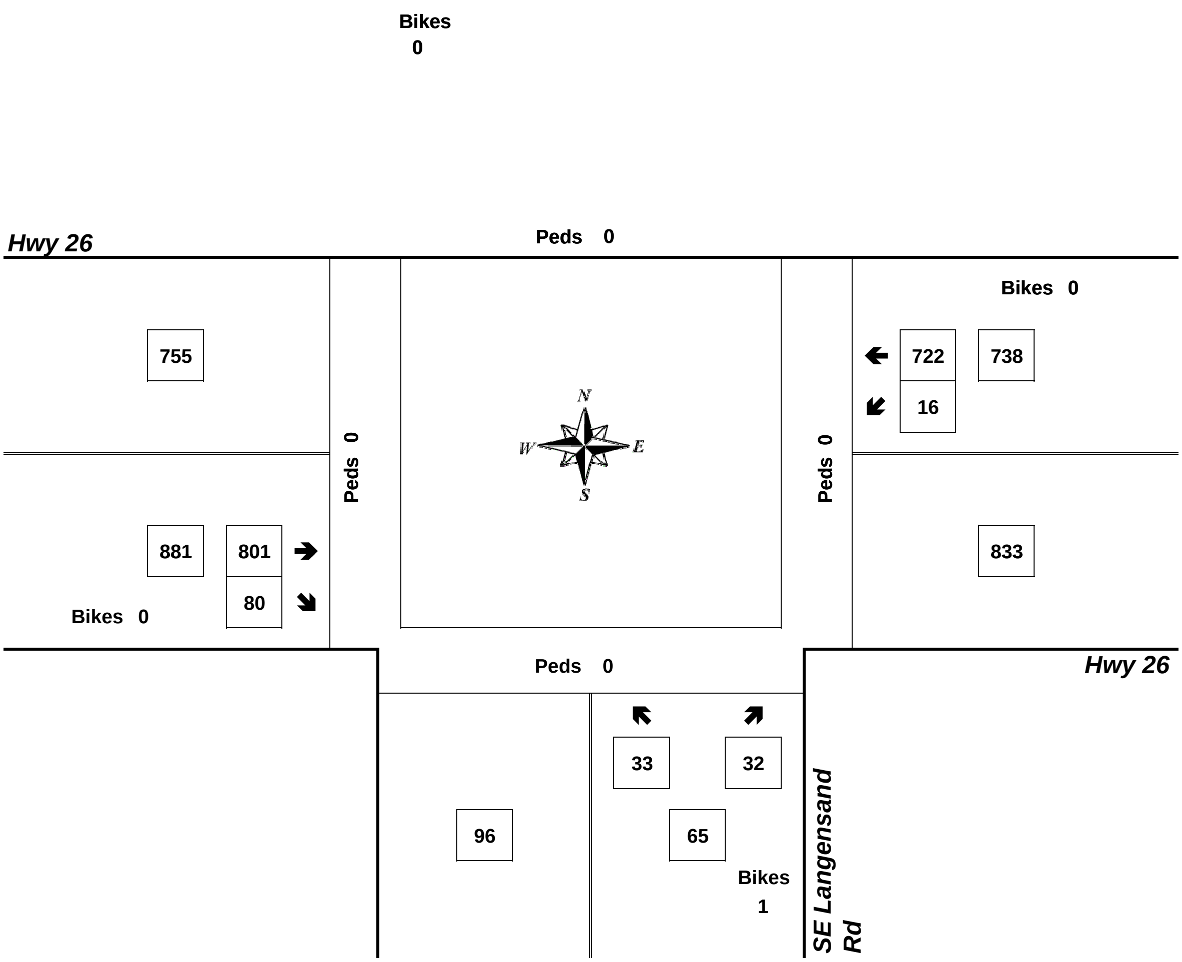
Interval	Northbound				Southbound				Eastbound				Westbound				
Start	SE Langensand Rd				SE Langensand Rd				Hwy 26				Hwy 26				Interval
Time	L		R	Total				Total		T	R	Total	L	T		Total	Total
4:00 PM	1		1	2				0		33	2	35	0	58		58	95
4:15 PM	1		1	2				0		25	3	28	0	46		46	76
4:30 PM	0		1	1				0		16	2	18	0	42		42	61
4:45 PM	0		0	0				0		17	1	18	1	39		40	58
5:00 PM	0		0	0				0		20	1	21	1	39		40	61

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

SE Langensand Rd & Hwy 26

4:10 PM to 5:10 PM
Tuesday, March 19, 2019

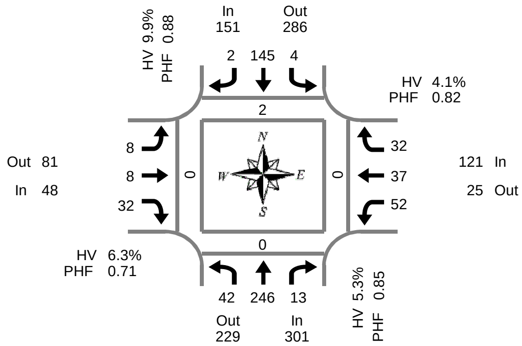


Approach	PHF	HV%	Volume
EB	0.91	3.3%	881
WB	0.94	6.6%	738
NB	0.71	3.1%	65
SB	0.00	0.0%	0
Intersection	0.93	4.8%	1,684

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

Hwy 211 & Dubarko Rd

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	2	18	1	0	0	8	0	0	0	0	0	0	4	5	0	0	38	0	1	0	0
7:05 AM	3	20	1	0	0	12	0	0	0	0	0	0	3	1	5	0	45	0	0	0	0
7:10 AM	5	23	0	0	0	12	0	0	2	2	4	0	4	3	9	0	64	0	0	0	0
7:15 AM	5	32	0	0	0	9	0	0	1	0	2	0	4	2	2	0	57	1	0	0	0
7:20 AM	8	13	0	0	2	13	1	0	0	0	2	0	5	3	5	0	52	0	0	0	0
7:25 AM	1	23	2	0	0	13	0	0	1	1	5	0	4	3	3	0	56	0	0	0	0
7:30 AM	3	17	0	0	1	12	0	0	0	0	3	0	4	9	1	0	50	1	0	0	0
7:35 AM	2	23	0	0	0	17	0	0	0	0	7	0	6	5	1	0	61	0	0	0	0
7:40 AM	2	23	1	0	0	6	1	0	1	2	4	0	6	4	1	0	51	0	0	0	0
7:45 AM	4	20	3	0	0	14	0	0	0	1	0	0	3	1	0	0	46	0	0	0	0
7:50 AM	5	15	3	0	0	10	0	0	1	1	1	0	5	4	2	0	47	0	0	0	0
7:55 AM	1	21	2	0	1	15	0	0	1	0	3	0	3	1	1	0	49	0	0	0	0
8:00 AM	3	16	1	0	0	12	0	0	1	1	1	0	5	1	2	0	43	0	0	0	0
8:05 AM	2	15	0	0	0	7	0	0	1	1	2	0	4	0	3	0	35	1	0	0	0
8:10 AM	2	19	1	0	1	8	0	0	3	1	2	0	3	4	1	0	45	0	0	0	0
8:15 AM	3	27	1	0	0	8	0	0	0	0	1	0	1	3	2	0	46	0	0	0	0
8:20 AM	0	19	0	0	0	10	0	0	0	1	0	0	1	3	0	0	34	0	0	0	0
8:25 AM	6	8	1	0	0	8	0	0	0	1	1	0	1	1	2	0	29	0	0	0	0
8:30 AM	3	27	2	0	0	10	0	0	0	1	1	0	2	2	5	0	53	0	0	0	0
8:35 AM	1	14	0	0	0	16	0	0	0	1	0	0	2	2	0	0	36	0	0	0	0
8:40 AM	0	19	1	0	0	15	0	0	0	1	1	0	1	3	1	0	42	0	0	0	0
8:45 AM	1	21	1	0	0	15	1	0	0	2	3	0	1	2	4	0	51	0	0	0	0
8:50 AM	0	21	0	0	0	9	0	0	0	2	0	0	3	3	2	0	40	0	0	0	0
8:55 AM	4	20	1	0	1	10	0	0	1	3	2	0	3	3	3	0	51	0	0	0	0
Total Survey	66	474	22	0	6	269	3	0	13	22	45	0	78	68	55	0	1,121	3	1	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	10	61	2	0	0	32	0	0	2	2	4	0	11	9	14	0	147	0	1	0	0
7:15 AM	14	68	2	0	2	35	1	0	2	1	9	0	13	8	10	0	165	1	0	0	0
7:30 AM	7	63	1	0	1	35	1	0	1	2	14	0	16	18	3	0	162	1	0	0	0
7:45 AM	10	56	8	0	1	39	0	0	2	2	4	0	11	6	3	0	142	0	0	0	0
8:00 AM	7	50	2	0	1	27	0	0	5	3	5	0	12	5	6	0	123	1	0	0	0
8:15 AM	9	54	2	0	0	26	0	0	0	2	2	0	3	7	4	0	109	0	0	0	0
8:30 AM	4	60	3	0	0	41	0	0	0	3	2	0	5	7	6	0	131	0	0	0	0
8:45 AM	5	62	2	0	1	34	1	0	1	7	5	0	7	8	9	0	142	0	0	0	0
Total Survey	66	474	22	0	6	269	3	0	13	22	45	0	78	68	55	0	1,121	3	1	0	0

Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	301	229	530	0	151	286	437	0	48	81	129	0	121	25	146	0	621	2	0	0	0
%HV	5.3%				9.9%				6.3%				4.1%				6.3%				
PHF	0.85				0.88				0.71				0.82				0.90				

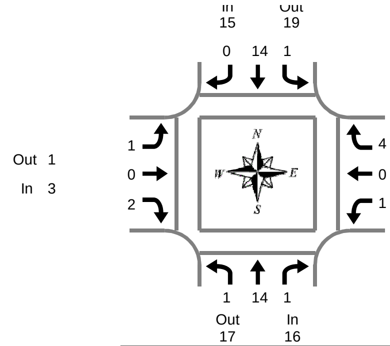
By Movement	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	42	246	13	301	4	145	2	151	8	8	32	48	52	37	32	121	621
%HV	2.4%	5.7%	7.7%	5.3%	25.0%	9.7%	0.0%	9.9%	12.5%	0.0%	6.3%	6.3%	1.9%	0.0%	12.5%	4.1%	6.3%
PHF	0.58	0.82	0.41	0.85	0.33	0.86	0.50	0.88	0.67	0.50	0.53	0.71	0.81	0.51	0.50	0.82	0.90

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	41	248	13	0	4	141	2	0	7	7	31	0	51	41	30	0	616	2	1	0	0
7:15 AM	38	237	13	0	5	136	2	0	10	8	32	0	52	37	22	0	592	3	0	0	0
7:30 AM	33	223	13	0	3	127	1	0	8	9	25	0	42	36	16	0	536	2	0	0	0
7:45 AM	30	220	15	0	2	133	0	0	7	10	13	0	31	25	19	0	505	1	0	0	0
8:00 AM	25	226	9	0	2	128	1	0	6	15	14	0	27	27	25	0	505	1	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Hwy 211 & Dubarko Rd

Wednesday, March 20, 2019

7:00 AM to 9:00 AM

Peak Hour Summary
7:05 AM to 8:05 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval
Time	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:05 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
7:10 AM	0	1	0	1	0	0	0	0	0	0	1	1	0	0	1	1	3
7:15 AM	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	2
7:20 AM	0	0	0	0	1	1	0	2	0	0	0	0	1	0	0	1	3
7:25 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	2	3
7:30 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
7:35 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
7:40 AM	0	3	1	4	0	0	0	0	0	0	0	0	0	0	1	1	5
7:45 AM	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	3
7:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:55 AM	1	0	0	1	0	3	0	3	0	0	0	0	0	0	0	0	4
8:00 AM	0	6	0	6	0	2	0	2	0	0	0	0	0	0	0	0	8
8:05 AM	0	0	0	0	0	3	0	3	0	0	0	0	1	0	0	1	4
8:10 AM	0	2	0	2	0	0	0	0	0	0	0	0	1	1	0	2	4
8:15 AM	1	2	0	3	0	1	0	1	0	0	0	0	0	0	0	0	4
8:20 AM	0	2	0	2	0	2	0	2	0	1	0	1	0	0	0	0	5
8:25 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
8:30 AM	0	3	0	3	0	2	0	2	0	0	0	0	0	0	0	0	5
8:35 AM	0	3	0	3	0	4	0	4	0	0	0	0	0	0	0	0	7
8:40 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
8:45 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8:50 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
8:55 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	1	0	1	3
Total Survey	2	31	1	34	1	31	0	32	1	1	2	4	3	3	4	10	80

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval
Time	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	Total
7:00 AM	0	2	0	2	0	1	0	1	0	0	1	1	0	1	1	2	6
7:15 AM	0	1	0	1	1	1	0	2	1	0	1	2	1	0	2	3	8
7:30 AM	0	5	1	6	0	4	0	4	0	0	0	0	0	0	1	1	11
7:45 AM	1	0	0	1	0	6	0	6	0	0	0	0	0	0	0	0	7
8:00 AM	0	8	0	8	0	5	0	5	0	0	0	0	2	1	0	3	16
8:15 AM	1	6	0	7	0	4	0	4	0	1	0	1	0	0	0	0	12
8:30 AM	0	7	0	7	0	7	0	7	0	0	0	0	0	0	0	0	14
8:45 AM	0	2	0	2	0	3	0	3	0	0	0	0	0	1	0	1	6
Total Survey	2	31	1	34	1	31	0	32	1	1	2	4	3	3	4	10	80

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound Hwy 211			Southbound Hwy 211			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	16	17	33	15	19	34	3	1	4	5	2	7	39
PHF	0.57			0.63			0.38			0.42			0.81

By Movement	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	14	1	16	1	14	0	15	1	0	2	3	1	0	4	5	39
PHF	0.25	0.58	0.25	0.57	0.25	0.58	0.00	0.63	0.25	0.00	0.25	0.38	0.25	0.00	0.50	0.42	0.81

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

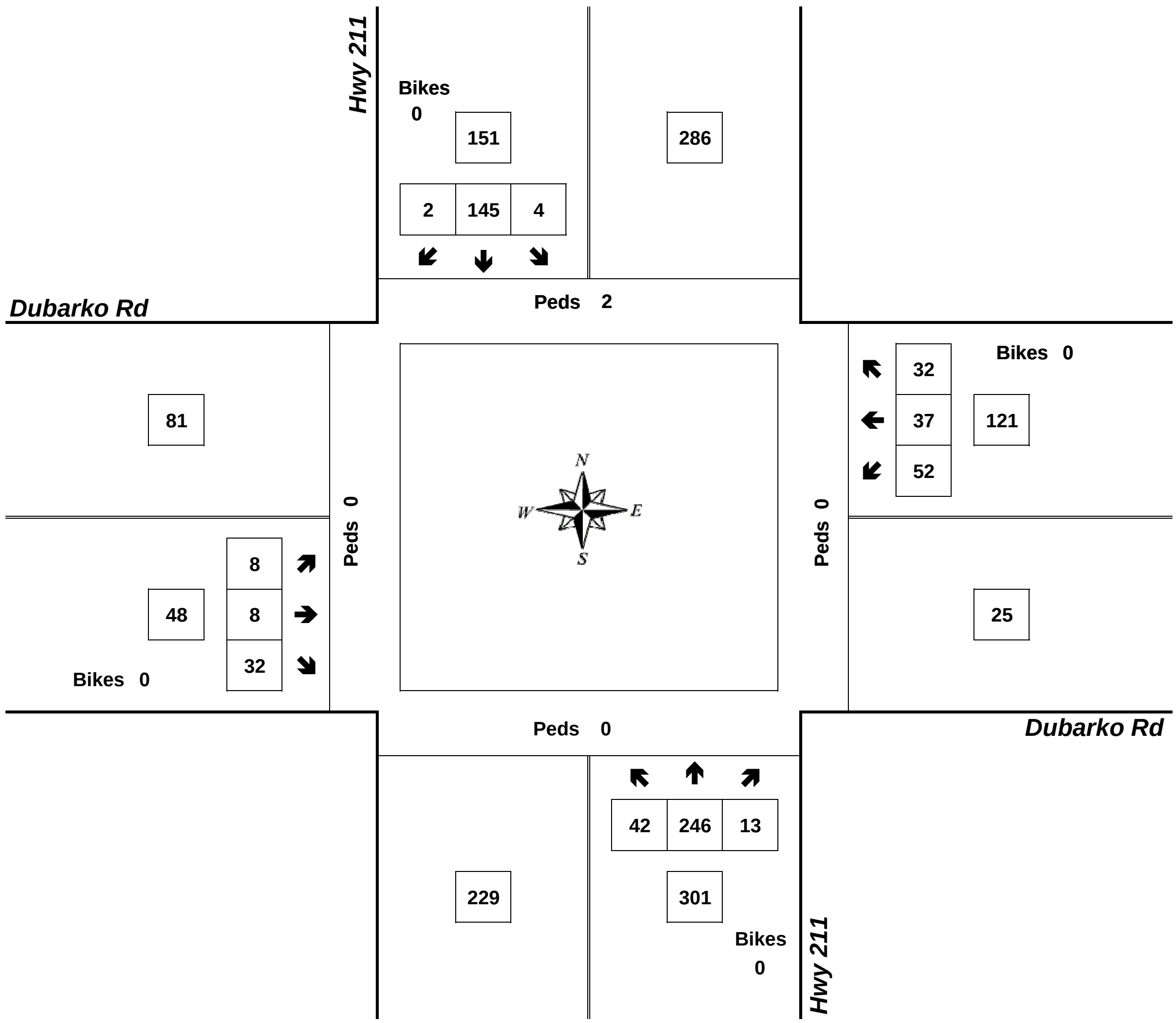
Interval Start	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval
Time	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	Total
7:00 AM	1	8	1	10	1	12	0	13	1	0	2	3	1	1	4	6	32
7:15 AM	1	14	1	16	1	16	0	17	1	0	1	2	3	1	3	7	42
7:30 AM	2	19	1	22	0	19	0	19	0	1	0	1	2	1	1	4	46
7:45 AM	2	21	0	23	0	22	0	22	0	1	0	1	2	1	0	3	49
8:00 AM	1	23	0	24	0	19	0	19	0	1	0	1	2	2	0	4	48

Peak Hour Summary

Clay Carney
(503) 833-2740

Hwy 211 & Dubarko Rd

7:05 AM to 8:05 AM
Wednesday, March 20, 2019

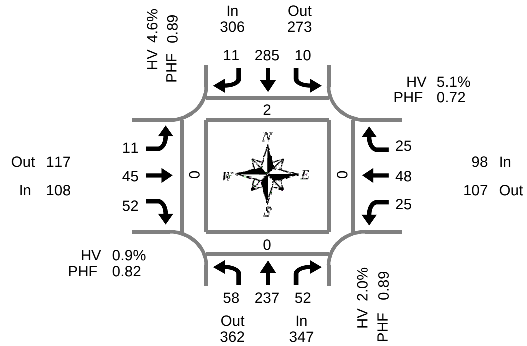


Approach	PHF	HV%	Volume
EB	0.71	6.3%	48
WB	0.82	4.1%	121
NB	0.85	5.3%	301
SB	0.88	9.9%	151
Intersection	0.90	6.3%	621

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:05 PM to 5:05 PM

Hwy 211 & Dubarko Rd

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	4	14	0	0	2	25	1	0	0	3	3	0	2	3	3	0	60	0	0	1	0
4:05 PM	4	28	3	0	1	31	0	0	1	7	6	0	2	6	2	0	91	0	0	0	0
4:10 PM	10	17	2	0	1	19	0	0	0	4	3	0	3	4	3	0	66	0	0	0	0
4:15 PM	4	20	6	0	2	20	1	0	2	7	3	1	1	5	1	0	72	0	0	0	0
4:20 PM	6	12	1	0	1	14	1	0	2	3	4	0	5	7	4	0	60	1	0	0	0
4:25 PM	5	16	4	0	1	21	1	0	3	3	4	0	2	4	1	0	65	0	0	0	0
4:30 PM	4	22	3	0	0	19	3	0	1	2	2	0	5	5	1	0	67	1	0	0	0
4:35 PM	2	23	7	0	0	29	1	0	1	2	1	0	0	1	3	0	70	0	0	0	0
4:40 PM	2	17	4	0	0	22	0	0	0	2	1	0	1	3	3	0	55	0	0	0	0
4:45 PM	10	23	7	0	2	29	1	0	0	6	8	0	3	2	0	0	91	0	0	0	0
4:50 PM	3	22	6	0	1	19	1	0	1	0	4	0	1	1	2	0	61	0	0	0	0
4:55 PM	4	20	3	0	0	20	2	0	0	6	2	0	1	6	1	0	65	0	0	0	0
5:00 PM	4	17	6	0	1	42	0	0	0	3	14	0	1	4	4	0	96	0	0	0	0
5:05 PM	2	24	5	0	0	20	0	0	0	4	5	0	1	2	3	0	66	0	0	0	0
5:10 PM	8	24	4	0	1	13	1	0	1	8	2	0	2	1	3	0	68	0	0	0	0
5:15 PM	4	13	4	0	1	19	1	0	0	4	3	0	5	3	0	0	57	0	0	0	0
5:20 PM	1	19	6	0	1	29	1	0	1	2	2	0	1	4	0	0	67	0	0	0	0
5:25 PM	5	14	6	0	0	17	1	0	1	3	9	0	2	4	3	0	65	0	0	0	0
5:30 PM	5	19	6	0	0	19	1	0	1	5	5	0	0	2	3	0	66	0	0	0	0
5:35 PM	5	15	1	0	2	24	0	0	1	5	6	0	1	2	1	0	63	0	0	0	0
5:40 PM	5	19	7	0	0	29	1	0	0	8	3	0	1	2	0	1	75	0	0	0	0
5:45 PM	4	15	8	0	0	16	1	0	0	7	3	0	3	0	0	0	57	0	0	0	0
5:50 PM	4	13	2	0	0	20	3	0	2	5	3	0	0	5	3	0	60	0	0	0	0
5:55 PM	5	13	2	0	1	18	0	0	0	2	3	0	2	1	1	0	48	0	0	0	0
Total Survey	110	439	103	0	18	534	22	0	18	101	99	1	45	77	45	1	1,611	2	0	1	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	18	59	5	0	4	75	1	0	1	14	12	0	7	13	8	0	217	0	0	1	0
4:15 PM	15	48	11	0	4	55	3	0	7	13	11	1	8	16	6	0	197	1	0	0	0
4:30 PM	8	62	14	0	0	70	4	0	2	6	4	0	6	9	7	0	192	1	0	0	0
4:45 PM	17	65	16	0	3	68	4	0	1	12	14	0	5	9	3	0	217	0	0	0	0
5:00 PM	14	65	15	0	2	75	1	0	1	15	21	0	4	7	10	0	230	0	0	0	0
5:15 PM	10	46	16	0	2	65	3	0	2	9	14	0	8	11	3	0	189	0	0	0	0
5:30 PM	15	53	14	0	2	72	2	0	2	18	14	0	2	6	4	1	204	0	0	0	0
5:45 PM	13	41	12	0	1	54	4	0	2	14	9	0	5	6	4	0	165	0	0	0	0
Total Survey	110	439	103	0	18	534	22	0	18	101	99	1	45	77	45	1	1,611	2	0	1	0

Peak Hour Summary
4:05 PM to 5:05 PM

By Approach	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	347	362	709	0	306	273	579	0	108	117	225	1	98	107	205	0	859	2	0	0	0
%HV	2.0%				4.6%				0.9%				5.1%				3.1%				
PHF	0.89				0.89				0.82				0.72				0.94				

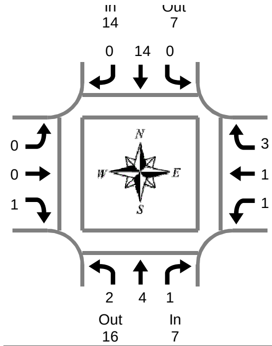
By Movement	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	58	237	52	347	10	285	11	306	11	45	52	108	25	48	25	98	859
%HV	3.4%	1.7%	1.9%	2.0%	0.0%	4.9%	0.0%	4.6%	0.0%	0.0%	1.9%	0.9%	4.0%	2.1%	12.0%	5.1%	3.1%
PHF	0.73	0.91	0.72	0.89	0.63	0.88	0.55	0.89	0.39	0.63	0.65	0.82	0.52	0.75	0.78	0.72	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	58	234	46	0	11	268	12	0	11	45	41	1	26	47	24	0	823	2	0	1	0
4:15 PM	54	240	56	0	9	268	12	0	11	46	50	1	23	41	26	0	836	2	0	0	0
4:30 PM	49	238	61	0	7	278	12	0	6	42	53	0	23	36	23	0	828	1	0	0	0
4:45 PM	56	229	61	0	9	280	10	0	6	54	63	0	19	33	20	1	840	0	0	0	0
5:00 PM	52	205	57	0	7	266	10	0	7	56	58	0	19	30	21	1	788	0	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:05 PM to 5:05 PM

Hwy 211 & Dubarko Rd

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	1	0	1	0	4	0	4	0	0	1	1	1	0	0	1	7
4:05 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:10 PM	2	0	0	2	0	0	0	0	0	0	0	0	0	0	1	1	3
4:15 PM	0	1	0	1	0	4	0	4	0	0	0	0	0	0	0	0	5
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
4:25 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
4:30 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	1	1	3
4:35 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1	3
4:40 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
4:50 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:55 PM	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	2
5:00 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
5:05 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:10 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:20 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:25 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:40 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:50 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:55 PM	0	0	0	0	0	2	0	2	0	0	1	1	1	0	0	1	4
Total Survey	3	9	2	14	0	23	0	23	0	0	3	3	3	1	3	7	47

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	1	0	3	0	5	0	5	0	0	1	1	1	0	1	2	11
4:15 PM	0	1	0	1	0	6	0	6	0	0	0	0	1	1	0	2	9
4:30 PM	0	1	0	1	0	4	0	4	0	0	0	0	0	0	2	2	7
4:45 PM	0	1	1	2	0	1	0	1	0	0	1	1	0	0	0	0	4
5:00 PM	0	2	0	2	0	3	0	3	0	0	0	0	0	0	0	0	5
5:15 PM	1	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	4
5:30 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
5:45 PM	0	0	0	0	0	3	0	3	0	0	1	1	1	0	0	1	5
Total Survey	3	9	2	14	0	23	0	23	0	0	3	3	3	1	3	7	47

Heavy Vehicle Peak Hour Summary
4:05 PM to 5:05 PM

By Approach	Northbound Hwy 211			Southbound Hwy 211			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	7	16	23	14	7	21	1	3	4	5	1	6	27
PHF	0.58			0.58			0.25			0.42			0.68

By Movement	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	2	4	1	7	0	14	0	14	0	0	1	1	1	1	3	5	27
PHF	0.25	0.50	0.25	0.58	0.00	0.58	0.00	0.58	0.00	0.00	0.25	0.25	0.25	0.25	0.38	0.42	0.68

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 211				Southbound Hwy 211				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	4	1	7	0	16	0	16	0	0	2	2	2	1	3	6	31
4:15 PM	0	5	1	6	0	14	0	14	0	0	1	1	1	1	2	4	25
4:30 PM	1	6	2	9	0	8	0	8	0	0	1	1	0	0	2	2	20
4:45 PM	1	6	2	9	0	5	0	5	0	0	1	1	0	0	0	0	15
5:00 PM	1	5	1	7	0	7	0	7	0	0	1	1	1	0	0	1	16

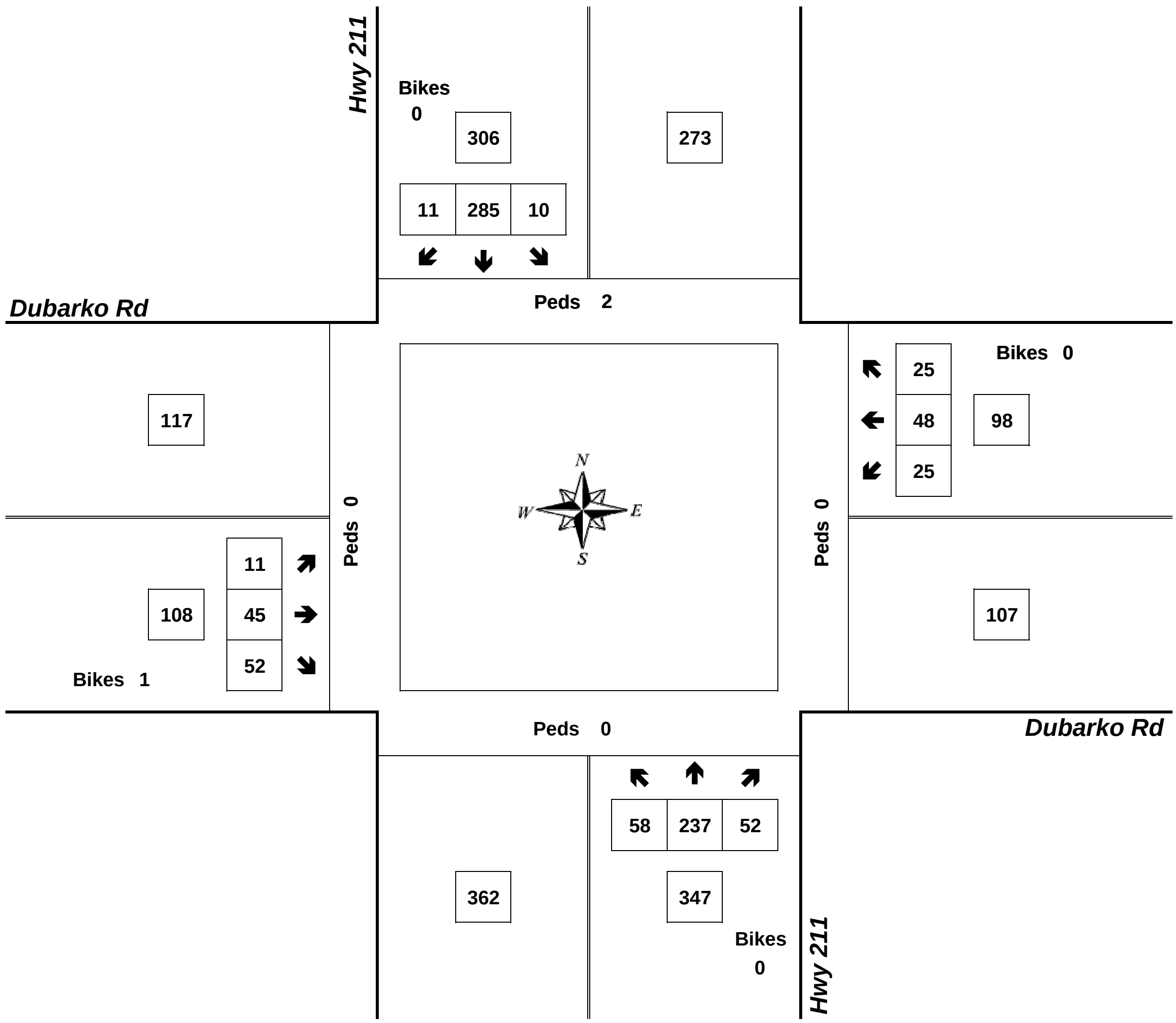
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

Hwy 211 & Dubarko Rd

4:05 PM to 5:05 PM
Tuesday, March 19, 2019

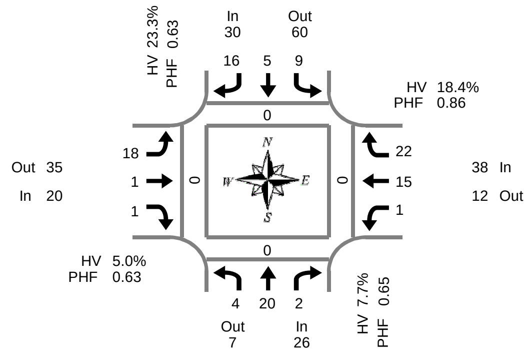


Approach	PHF	HV%	Volume
EB	0.82	0.9%	108
WB	0.72	5.1%	98
NB	0.89	2.0%	347
SB	0.89	4.6%	306
Intersection	0.94	3.1%	859

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



SE Langensand Rd & Dubarko Rd

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

Peak Hour Summary
7:05 AM to 8:05 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
7:00 AM	1	1	0	0	0	1	1	0	0	0	0	0	0	2	0	0	6	0	0	0	0
7:05 AM	2	1	0	0	1	0	3	0	1	1	0	0	0	2	3	0	14	0	0	0	0
7:10 AM	0	0	0	0	1	0	0	0	1	0	0	0	0	1	2	0	5	0	0	0	0
7:15 AM	0	2	1	0	0	1	1	0	2	0	0	0	0	0	1	0	8	0	0	0	0
7:20 AM	0	0	0	0	0	0	0	0	3	0	0	0	1	3	2	0	9	0	0	0	0
7:25 AM	0	0	0	0	2	2	3	0	1	0	0	0	0	1	2	0	11	0	0	0	0
7:30 AM	0	6	0	0	0	0	3	0	0	0	0	0	0	1	1	0	11	0	0	0	0
7:35 AM	1	2	0	0	0	0	0	0	0	0	1	0	0	2	0	0	6	0	0	0	0
7:40 AM	0	0	1	0	2	1	3	0	0	0	0	0	0	2	2	0	11	0	0	0	0
7:45 AM	0	1	0	0	2	0	1	0	2	0	0	0	0	0	3	0	9	0	0	0	0
7:50 AM	1	1	0	0	1	0	2	0	3	0	0	0	0	1	3	0	12	0	0	0	0
7:55 AM	0	4	0	0	0	0	0	0	3	0	0	0	0	0	2	0	9	0	0	0	0
8:00 AM	0	3	0	0	0	1	0	0	2	0	0	0	0	2	1	0	9	0	0	0	0
8:05 AM	0	1	0	0	0	1	1	0	3	0	0	0	0	3	1	0	10	0	0	0	0
8:10 AM	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	3	1	0	0	0
8:15 AM	0	2	0	0	0	0	1	0	3	0	0	0	0	1	1	0	8	0	0	0	0
8:20 AM	1	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	5	0	0	0	0
8:25 AM	1	0	0	0	0	1	1	0	3	0	1	0	0	0	1	0	8	0	0	1	0
8:30 AM	0	0	0	0	0	0	0	0	2	2	0	0	1	2	1	0	8	0	0	0	0
8:35 AM	1	0	0	0	1	0	0	0	1	1	1	0	1	2	0	0	8	0	0	0	0
8:40 AM	1	1	0	0	0	3	2	0	1	0	0	0	0	1	0	0	9	0	0	0	0
8:45 AM	1	3	0	0	0	1	2	0	3	0	2	0	1	2	1	0	16	0	0	0	0
8:50 AM	1	4	1	0	0	1	2	0	2	0	0	0	0	1	3	0	15	0	0	0	0
8:55 AM	1	2	1	0	0	0	1	0	1	0	0	0	0	2	1	0	9	0	0	0	0
Total Survey	12	35	4	0	11	14	29	0	38	5	5	0	4	31	31	0	219	1	0	1	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
7:00 AM	3	2	0	0	2	1	4	0	2	1	0	0	0	5	5	0	25	0	0	0	0
7:15 AM	0	2	1	0	2	3	4	0	6	0	0	0	1	4	5	0	28	0	0	0	0
7:30 AM	1	8	1	0	2	1	6	0	0	0	1	0	0	5	3	0	28	0	0	0	0
7:45 AM	1	6	0	0	3	0	3	0	8	0	0	0	0	1	8	0	30	0	0	0	0
8:00 AM	0	5	0	0	1	2	2	0	5	0	0	0	0	5	2	0	22	1	0	0	0
8:15 AM	2	2	0	0	0	2	3	0	7	1	1	0	0	1	2	0	21	0	0	1	0
8:30 AM	2	1	0	0	1	3	2	0	4	3	1	0	2	5	1	0	25	0	0	0	0
8:45 AM	3	9	2	0	0	2	5	0	6	0	2	0	1	5	5	0	40	0	0	0	0
Total Survey	12	35	4	0	11	14	29	0	38	5	5	0	4	31	31	0	219	1	0	1	0

Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SE Langensand Rd In	Out	Total	Bikes	Southbound SE Langensand Rd In	Out	Total	Bikes	Eastbound Dubarko Rd In	Out	Total	Bikes	Westbound Dubarko Rd In	Out	Total	Bikes	Total
Volume	26	7	33	0	30	60	90	0	20	35	55	0	38	12	50	0	114
%HV	7.7%				23.3%				5.0%				18.4%				14.9%
PHF	0.65				0.63				0.63				0.86				0.89

Pedestrians Crosswalk North	South	East	West
0	0	0	0

By Movement	Northbound SE Langensand Rd L	T	R	Total	Southbound SE Langensand Rd L	T	R	Total	Eastbound Dubarko Rd L	T	R	Total	Westbound Dubarko Rd L	T	R	Total	Total
Volume	4	20	2	26	9	5	16	30	18	1	1	20	1	15	22	38	114
%HV	25.0%	0.0%	50.0%	7.7%	22.2%	20.0%	25.0%	23.3%	5.6%	0.0%	0.0%	5.0%	0.0%	26.7%	13.6%	18.4%	14.9%
PHF	0.50	0.63	0.50	0.65	0.45	0.42	0.67	0.63	0.56	0.25	0.25	0.63	0.25	0.75	0.69	0.86	0.89

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
7:00 AM	5	18	2	0	9	5	17	0	16	1	1	0	1	15	21	0	111	0	0	0	0
7:15 AM	2	21	2	0	8	6	15	0	19	0	1	0	1	15	18	0	108	1	0	0	0
7:30 AM	4	21	1	0	6	5	14	0	20	1	2	0	0	12	15	0	101	1	0	1	0
7:45 AM	5	14	0	0	5	7	10	0	24	4	2	0	2	12	13	0	98	1	0	1	0
8:00 AM	7	17	2	0	2	9	12	0	22	4	4	0	3	16	10	0	108	1	0	1	0

Heavy Vehicle Summary

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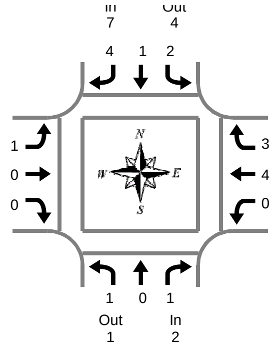
Out 9
In 1



Peak Hour Summary
7:05 AM to 8:05 AM

SE Langensand Rd & Dubarko Rd

Wednesday, March 20, 2019
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:05 AM	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	2
7:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
7:15 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
7:25 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	2
7:30 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
7:35 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	2
7:50 AM	0	0	0	0	1	0	0	1	1	0	0	1	0	1	1	2	4
7:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	2
8:05 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
8:10 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:25 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
8:35 AM	1	0	0	1	0	0	0	0	1	0	0	1	1	0	0	1	3
8:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	2	1	1	4	2	1	5	8	3	0	0	3	2	4	3	9	24

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	0	0	1	0	0	1	1	0	0	0	0	0	0	1	1	3
7:15 AM	0	0	1	1	0	0	1	1	0	0	0	0	0	3	0	3	5
7:30 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	2	0	1	3	1	0	0	1	0	1	1	2	6
8:00 AM	0	1	0	1	0	1	1	2	0	0	0	0	0	0	1	1	4
8:15 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
8:30 AM	1	0	0	1	0	0	0	0	1	0	0	1	2	0	0	2	4
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	2	1	1	4	2	1	5	8	3	0	0	3	2	4	3	9	24

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SE Langensand Rd			Southbound SE Langensand Rd			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	2	1	3	7	4	11	1	9	10	7	3	10	17
PHF	0.25			0.58			0.25			0.58			0.71

By Movement	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	0	1	2	2	1	4	7	1	0	0	1	0	4	3	7	17
PHF	0.25	0.00	0.25	0.25	0.25	0.25	0.50	0.58	0.25	0.00	0.00	0.25	0.00	0.33	0.38	0.58	0.71

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	0	1	2	2	0	4	6	1	0	0	1	0	4	2	6	15
7:15 AM	0	1	1	2	2	1	4	7	1	0	0	1	0	4	2	6	16
7:30 AM	0	1	0	1	2	1	3	6	2	0	0	2	0	1	2	3	12
7:45 AM	1	1	0	2	2	1	2	5	3	0	0	3	2	1	2	5	15
8:00 AM	1	1	0	2	0	1	1	2	2	0	0	2	2	0	1	3	9

Peak Hour Summary

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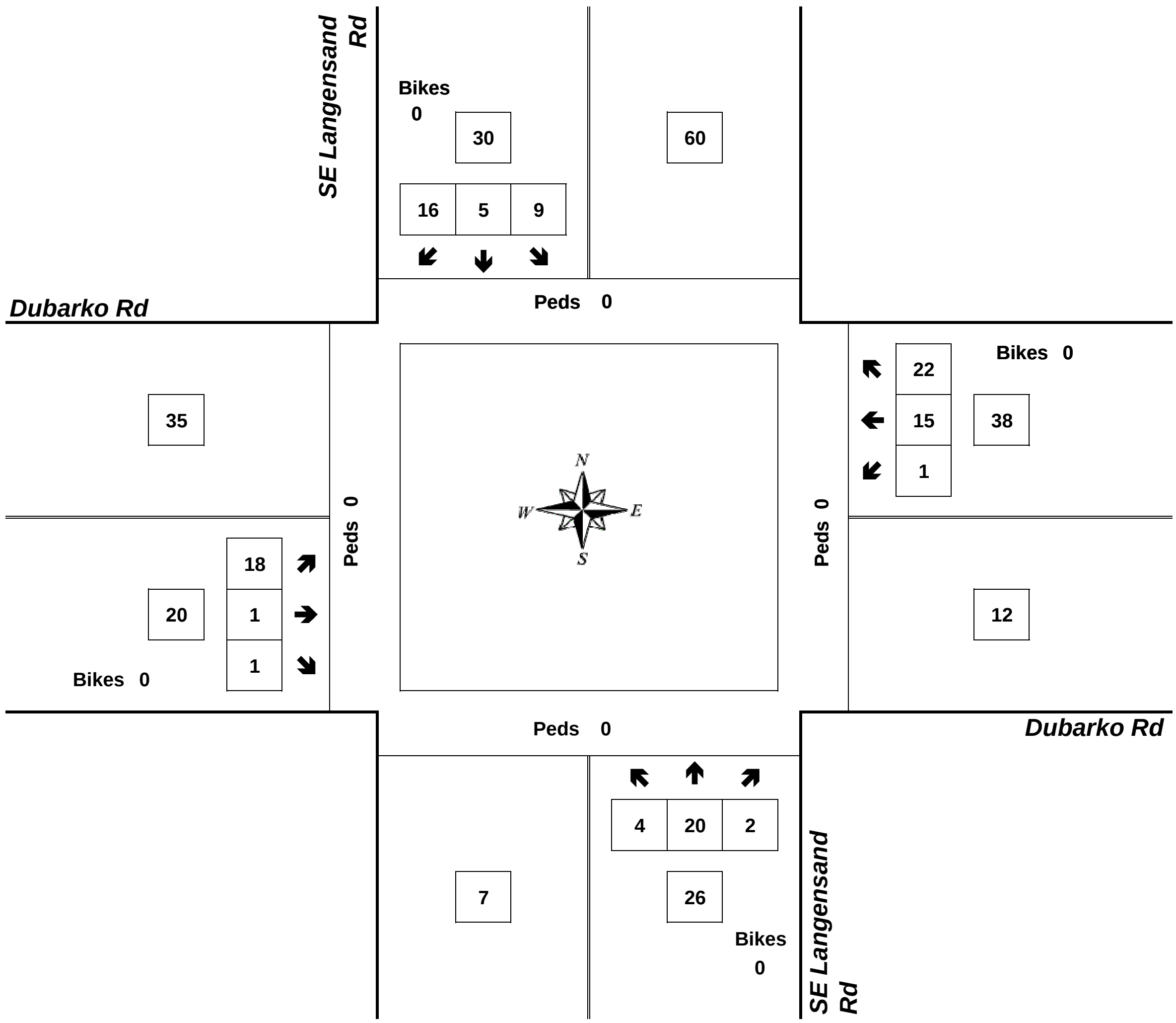
SE Langensand Rd & Dubarko Rd

7:05 AM to 8:05 AM
Wednesday, March 20, 2019



Approach	PHF	HV%	Volume
EB	0.63	5.0%	20
WB	0.86	18.4%	38
NB	0.65	7.7%	26
SB	0.63	23.3%	30
Intersection	0.89	14.9%	114

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
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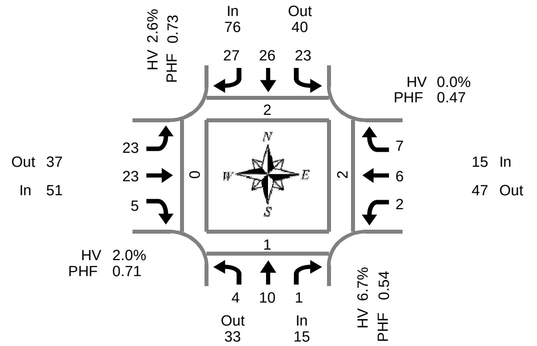

Peak Hour Summary
4:55 PM to 5:55 PM

SE Langensand Rd & Dubarko Rd

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	1	2	1	0	1	0	5	0	3	2	0	0	0	0	0	0	15	0	0	0	0
4:05 PM	2	1	1	0	0	2	2	0	1	1	0	0	0	2	0	0	12	0	0	0	0
4:10 PM	2	0	0	0	2	0	0	0	1	1	2	0	0	0	1	0	9	0	0	1	0
4:15 PM	3	2	0	0	1	1	3	0	4	0	0	0	0	1	1	0	16	1	0	0	0
4:20 PM	0	0	0	0	1	3	2	0	3	2	0	0	0	2	1	0	14	0	0	1	0
4:25 PM	0	3	0	0	1	2	1	0	1	0	0	1	0	3	1	0	12	0	0	0	0
4:30 PM	0	2	0	0	0	1	3	2	4	0	0	0	0	2	0	0	12	2	0	3	0
4:35 PM	0	1	0	0	0	2	0	0	1	0	1	0	0	0	0	0	5	0	0	1	0
4:40 PM	0	2	0	0	0	2	1	0	1	0	1	0	0	1	1	0	9	0	0	0	0
4:45 PM	0	2	0	0	0	2	1	0	3	2	1	0	0	1	1	0	13	0	0	0	0
4:50 PM	0	0	0	0	2	4	0	0	1	2	0	0	0	1	2	0	12	0	0	0	0
4:55 PM	1	2	0	0	1	2	2	0	2	0	0	0	0	0	0	0	10	0	0	0	0
5:00 PM	1	3	0	0	3	3	1	0	1	2	0	0	0	0	0	0	14	0	0	0	0
5:05 PM	0	0	0	0	1	4	4	0	4	2	0	0	0	0	0	0	15	0	0	0	0
5:10 PM	0	0	0	0	2	2	4	0	1	2	0	0	0	0	0	0	11	0	1	0	0
5:15 PM	0	1	0	0	3	3	3	0	3	1	0	0	0	1	1	0	16	0	0	1	0
5:20 PM	1	1	0	0	1	1	4	0	0	1	1	0	0	0	2	0	12	0	0	0	0
5:25 PM	0	0	0	0	3	0	2	0	2	2	2	0	2	0	1	0	14	1	0	0	0
5:30 PM	0	0	0	0	1	2	3	0	0	3	0	0	0	3	0	0	12	0	0	0	0
5:35 PM	0	0	0	1	3	1	0	0	3	1	0	0	0	1	1	0	10	1	0	0	0
5:40 PM	0	1	1	0	1	1	1	1	2	4	0	0	0	1	0	0	12	0	0	1	0
5:45 PM	1	0	0	0	2	3	2	0	4	2	1	0	0	0	0	0	15	0	0	0	0
5:50 PM	0	2	0	0	2	4	1	0	1	3	1	0	0	0	2	0	16	0	0	0	0
5:55 PM	1	0	0	0	1	0	3	0	1	1	0	0	0	1	0	0	8	0	0	0	0
Total Survey	13	25	3	1	32	45	48	3	47	34	10	1	2	20	15	0	294	5	1	8	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	5	3	2	0	3	2	7	0	5	4	2	0	0	2	1	0	36	0	0	1	0
4:15 PM	3	5	0	0	3	6	6	0	8	2	0	1	0	6	3	0	42	1	0	1	0
4:30 PM	0	5	0	0	0	5	4	2	6	0	2	0	0	3	1	0	26	2	0	4	0
4:45 PM	1	4	0	0	3	8	3	0	6	4	1	0	0	2	3	0	35	0	0	0	0
5:00 PM	1	3	0	0	6	9	9	0	6	6	0	0	0	0	0	0	40	0	1	0	0
5:15 PM	1	2	0	0	7	4	9	0	5	4	3	0	2	1	4	0	42	1	0	1	0
5:30 PM	0	1	1	1	5	4	4	1	5	8	0	0	0	5	1	0	34	1	0	1	0
5:45 PM	2	2	0	0	5	7	6	0	6	6	2	0	0	1	2	0	39	0	0	0	0
Total Survey	13	25	3	1	32	45	48	3	47	34	10	1	2	20	15	0	294	5	1	8	0

Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SE Langensand Rd In	Out	Total	Bikes	Southbound SE Langensand Rd In	Out	Total	Bikes	Eastbound Dubarko Rd In	Out	Total	Bikes	Westbound Dubarko Rd In	Out	Total	Bikes	Total
Volume	15	33	48	1	76	40	116	1	51	37	88	0	15	47	62	0	157
%HV	6.7%				2.6%				2.0%				0.0%				2.5%
PHF	0.54				0.73				0.71				0.47				0.91

Pedestrians Crosswalk North	South	East	West
2	1	2	0

By Movement	Northbound SE Langensand Rd L	T	R	Total	Southbound SE Langensand Rd L	T	R	Total	Eastbound Dubarko Rd L	T	R	Total	Westbound Dubarko Rd L	T	R	Total	Total
Volume	4	10	1	15	23	26	27	76	23	23	5	51	2	6	7	15	157
%HV	25.0%	0.0%	0.0%	6.7%	0.0%	0.0%	7.4%	2.6%	4.3%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	2.5%
PHF	0.50	0.50	0.25	0.54	0.82	0.72	0.61	0.73	0.64	0.64	0.42	0.71	0.25	0.30	0.44	0.47	0.91

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd L	T	R	Bikes	Southbound SE Langensand Rd L	T	R	Bikes	Eastbound Dubarko Rd L	T	R	Bikes	Westbound Dubarko Rd L	T	R	Bikes	Interval Total	Pedestrians Crosswalk North	South	East	West
4:00 PM	9	17	2	0	9	21	20	2	25	10	5	1	0	13	8	0	139	3	0	6	0
4:15 PM	5	17	0	0	12	28	22	2	26	12	3	1	0	11	7	0	143	3	1	5	0
4:30 PM	3	14	0	0	16	26	25	2	23	14	6	0	2	6	8	0	143	3	1	5	0
4:45 PM	3	10	1	1	21	25	25	1	22	22	4	0	2	8	8	0	151	2	1	2	0
5:00 PM	4	8	1	1	23	24	28	1	22	24	5	0	2	7	7	0	155	2	1	2	0

Heavy Vehicle Summary

Clay Carney
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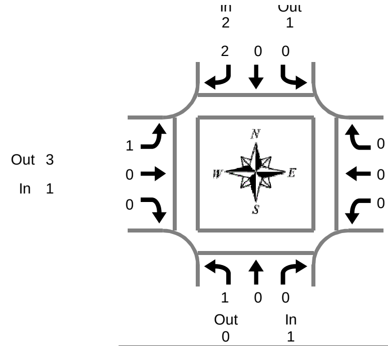


Peak Hour Summary
4:55 PM to 5:55 PM

SE Langensand Rd & Dubarko Rd

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	2
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
4:20 PM	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	2
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	2
5:50 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	1	0	1	2	1	1	3	5	2	0	0	2	0	1	0	1	10

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	0	0	1	1	0	2	1	0	0	1	0	0	0	0	3
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0	3
Total Survey	1	0	1	2	1	1	3	5	2	0	0	2	0	1	0	1	10

Heavy Vehicle Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SE Langensand Rd			Southbound SE Langensand Rd			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	0	1	2	1	3	1	3	4	0	0	0	4
PHF	0.25			0.50			0.25			0.00			0.33

By Movement	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	0	0	1	0	0	2	2	1	0	0	1	0	0	0	0	4
PHF	0.25	0.00	0.00	0.25	0.00	0.00	0.50	0.50	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.33

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

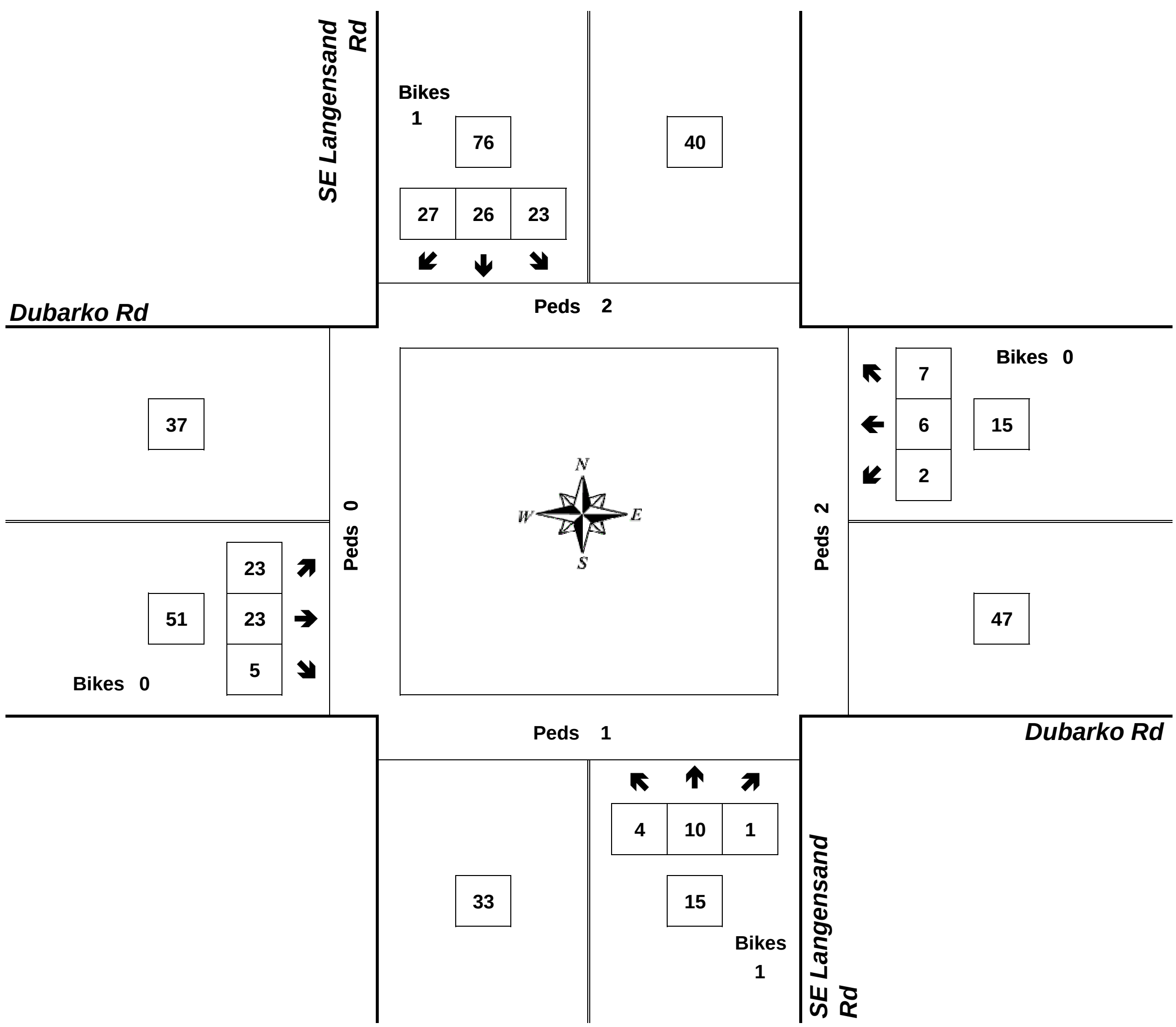
Interval Start Time	Northbound SE Langensand Rd				Southbound SE Langensand Rd				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	1	1	1	3	1	0	0	1	0	1	0	1	6
4:15 PM	0	0	0	0	1	1	1	3	1	0	0	1	0	1	0	1	5
4:30 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	2
4:45 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
5:00 PM	1	0	0	1	0	0	2	2	1	0	0	1	0	0	0	0	4

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

SE Langensand Rd & Dubarko Rd

4:55 PM to 5:55 PM
Tuesday, March 19, 2019



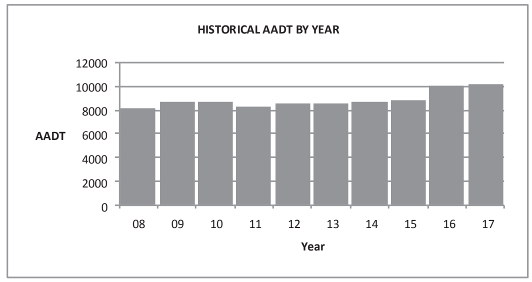
Approach	PHF	HV%	Volume
EB	0.71	2.0%	51
WB	0.47	0.0%	15
NB	0.54	6.7%	15
SB	0.73	2.6%	76
Intersection	0.91	2.5%	157

Count Period: 4:00 PM to 6:00 PM

Location:	US26; MP 46.38; MT. HOOD HIGHWAY NO. 26; 0.30 mile east of Camp Creek Rd (USFS 28)	Site Name:	Rhododendron (03-006)
		Installed:	August, 1995

HISTORICAL TRAFFIC DATA

		Percent of AADT				
Year	AADT	Max Day	Max Hour	10TH Hour	20TH Hour	30TH Hour
2008	8162	233	22.9	20.1	19.1	18.2
2009	8737	197	22.3	19.6	18.4	17.8
2010	8714	207	21.6	19.8	18.9	18.5
2011	8330	214	24.7	20.0	18.6	18.1
2012	8480	227	24.0	21.0	20.2	19.4
2013	8527	213	23.4	21.1	20.3	19.1
2014	8652	216	23.2	21.1	20.3	19.2
2015	8861	242	21.4	20.3	19.4	18.7
2016	10071	208	22.9	19.6	18.8	17.9
2017	10223	200	19.9	19.1	18.1	17.5



2017 TRAFFIC DATA

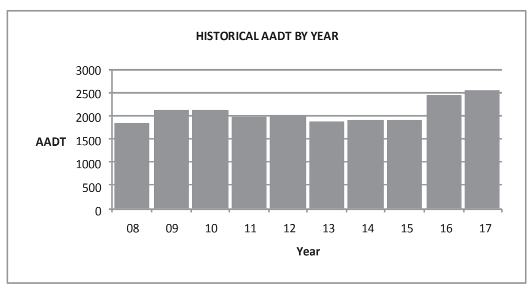
	Average Weekday Traffic	Percent of AADT	Average Daily Traffic	Percent of AADT
January	6744	66	9080	89
February	6533	64	9496	93
March	6763	66	9337	91
April	6166	60	8675	85
May	7675	75	9598	94
June	8568	84	10695	105
July	11291	110	13874	136
August	11738	115	13623	133
September	11300	111	12734	125
October	6589	64	8087	79
November	5493	54	7313	72
December	8753	86	10161	99

For Vehicle Classification data near your project, please go to the following web page: https://www.oregon.gov/ODOT/Data/Documents/TVT_2017.xlsx

Location:	OR35; MP 57.79; MT. HOOD HIGHWAY NO. 26; 0.02 mile east of Warm Springs Highway No. 53 (US26)	Site Name:	Mt. Hood Meadows (03-007)
		Installed:	September, 1995

HISTORICAL TRAFFIC DATA

		Percent of AADT				
Year	AADT	Max Day	Max Hour	10TH Hour	20TH Hour	30TH Hour
2008	1854	398	56.8	44.2	39.9	36.1
2009	2130	***	***	***	***	***
2010	2145	374	49.2	39.5	34.8	33.2
2011	1976	476	79.2	49.1	45.0	39.1
2012	2023	452	65.4	43.4	40.3	37.7
2013	1868	427	68.1	48.7	42.0	37.1
2014	1908	400	60.0	41.9	37.4	33.6
2015	1931	393	50.4	38.6	34.4	32.6
2016	2455	366	55.9	38.3	33.1	31.2
2017	2565	340	52.1	37.7	32.5	31.3



2017 TRAFFIC DATA

	Average Weekday Traffic	Percent of AADT	Average Daily Traffic	Percent of AADT
January	2449	95	3616	141
February	1978	77	3362	131
March	1781	69	2833	110
April	1116	44	2050	80
May	1202	47	1609	63
June	1794	70	2070	81
July	2405	94	2837	111
August	2302	90	2614	102
September	3956	154	3993	156
October	1387	54	1614	63
November	768	30	1156	45
December	2499	97	2966	116

For Vehicle Classification data near your project, please go to the following web page: https://www.oregon.gov/ODOT/Data/Documents/TVT_2017.xlsx

Site id	HWY	MP	DIR	HS	Description	2017	2018	2019	2039	RSQ
1778	026	22.72	1		0.02 mile northwest of SE 362nd Drive, west city limits of Sandy		33700		47300	MODEL
1779	026	23.85	1		0.02 mile west of Bluff Road		33300		47100	MODEL
1780	026	23.89	1		0.02 mile east of Bluff Road		15700		22400	MODEL
1781	026	24.02	1		0.02 mile west of Beers Avenue		16200		23100	MODEL
1782	026	24.35	1		0.05 mile west of Eagle Creek-Sandy Highway (OR211)		16000		23400	MODEL
1783	026	24.42	1		0.02 mile east of Eagle Creek-Sandy Highway (OR211)		12400		17700	MODEL
1784	026	24.59	1		0.02 mile west of Ten Eyck Road		12500		17800	MODEL
1785	026	23.89	2		0.02 mile east of Bluff Road		16600		23300	MODEL
1786	026	24.04	2		0.02 mile west of Beers Avenue		18300		25600	MODEL
1787	026	24.36	2		0.05 mile west of Eagle Creek-Sandy Highway (OR211)		15900		22700	MODEL
1788	026	24.40	2		0.02 mile east of Eagle Creek-Sandy Highway (OR211)		13700		19200	MODEL
1789	026	24.61	2		0.02 mile west of Ten Eyck Road		12600		17600	MODEL
1790	026	25.10	1		0.02 mile west of Langensand Road		20700		29200	MODEL
1791	026	25.66	1		0.10 mile east of Vista Loop Drive		23500		32900	MODEL

Site id	HWY	MP	DIR	HS	Description	2017	2018	2019	2039	RSQ
3563	172	-0.13	1		0.10 mile east of Clackamas Highway (OR224)			6000	9400	MODEL
3564	172	1.45	1		0.10 mile southwest of Judd Road			7100	11200	MODEL
3565	172	1.65	1		0.10 mile northeast of Judd Road			7400	11400	MODEL
3566	172	3.65	1		0.05 mile west of 362nd Drive			8000	12200	MODEL
3567	172	3.75	1		0.05 mile east of 362nd Drive			5900	8800	MODEL
3568	172	5.07	1		0.10 mile west of Bornstedt Road			4600	7600	MODEL
3569	172	5.29	1		0.10 mile south of Dubarko Road			6300	10300	MODEL
3570	172	5.50	1		0.11 mile north of Dubarko Road			5700	9200	MODEL
3571	172	5.83	1		0.05 mile south of Mt. Hood Highway (US26-EB)			7500	12100	MODEL
3572	172	5.92	1		0.02 mile south of Mt. Hood Highway (US26-WB)			4400	7100	MODEL

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	740	37	4	1083	10	136	11	3	16	4	148
Future Volume (vph)	58	740	37	4	1083	10	136	11	3	16	4	148
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.99		1.00	1.00	0.85		1.00			0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			1.00	
Satd. Flow (prot)	1484	2945		1568	3137	1356		1575			1464	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.55			0.97	
Satd. Flow (perm)	1484	2945		1568	3137	1356		902			1423	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	62	787	39	4	1152	11	145	12	3	17	4	157
RTOR Reduction (vph)	0	3	0	0	0	5	0	1	0	0	109	0
Lane Group Flow (vph)	62	823	0	4	1152	6	0	159	0	0	69	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	12%	12%	12%	6%	6%	6%	6%	6%	6%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	8.4	68.9		1.1	61.6	61.6		36.5			36.5	
Effective Green, g (s)	8.4	68.9		1.1	61.6	61.6		36.5			36.5	
Actuated g/C Ratio	0.07	0.57		0.01	0.51	0.51		0.30			0.30	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	103	1690		14	1610	696		274			432	
v/s Ratio Prot	c0.04	0.28		0.00	c0.37							
v/s Ratio Perm						0.00		c0.18			0.05	
v/c Ratio	0.60	0.49		0.29	0.72	0.01		0.58			0.16	
Uniform Delay, d1	54.2	15.1		59.1	22.5	14.3		35.3			30.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	9.5	1.0		10.9	2.8	0.0		8.7			0.2	
Delay (s)	63.7	16.1		70.0	25.2	14.3		44.0			30.7	
Level of Service	E	B		E	C	B		D			C	
Approach Delay (s)		19.4			25.3			44.0			30.7	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	740	37	4	1083	10	136	11	3	16	4	148
Future Volume (veh/h)	58	740	37	4	1083	10	136	11	3	16	4	148
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1586	1586	1586	1668	1668	1668	1668	1668	1668	1709	1709	1709
Adj Flow Rate, veh/h	62	787	39	4	1152	11	145	12	3	17	4	157
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	12	12	12	6	6	6	6	6	6	3	3	3
Cap, veh/h	76	1687	84	8	1689	735	323	25	6	57	29	396
Arrive On Green	0.05	0.58	0.58	0.01	0.53	0.53	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1511	2919	145	1589	3169	1379	874	82	18	80	94	1300
Grp Volume(v), veh/h	62	406	420	4	1152	11	160	0	0	178	0	0
Grp Sat Flow(s),veh/h/ln	1511	1507	1556	1589	1585	1379	974	0	0	1474	0	0
Q Serve(g_s), s	4.9	18.7	18.7	0.3	32.0	0.5	8.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.9	18.7	18.7	0.3	32.0	0.5	19.6	0.0	0.0	11.5	0.0	0.0
Prop In Lane	1.00		0.09	1.00		1.00	0.91		0.02	0.10		0.88
Lane Grp Cap(c), veh/h	76	871	900	8	1689	735	353	0	0	481	0	0
V/C Ratio(X)	0.82	0.47	0.47	0.48	0.68	0.01	0.45	0.00	0.00	0.37	0.00	0.00
Avail Cap(c_a), veh/h	145	871	900	73	1689	735	353	0	0	481	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	56.4	14.6	14.6	59.5	20.6	13.2	37.0	0.0	0.0	33.1	0.0	0.0
Incr Delay (d2), s/veh	18.5	1.8	1.7	38.0	2.2	0.0	4.1	0.0	0.0	0.5	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(50%),veh/ln	2.3	6.8	7.0	0.2	12.2	0.2	4.5	0.0	0.0	4.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.9	16.4	16.4	97.5	22.8	13.2	41.1	0.0	0.0	33.5	0.0	0.0
LnGrp LOS	E	B	B	F	C	B	D	A	A	C	A	A
Approach Vol, veh/h		888			1167			160			178	
Approach Delay, s/veh		20.5			23.0			41.1			33.5	
Approach LOS		C			C			D			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	73.9		41.0	10.5	68.5		41.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.5	64.5		36.5	11.5	58.5		36.5				
Max Q Clear Time (g_c+I1), s	2.3	20.7		21.6	6.9	34.0		13.5				
Green Ext Time (p_c), s	0.0	6.8		0.8	0.0	10.0		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			24.0									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	750	35	16	967	66	16
Future Vol, veh/h	750	35	16	967	66	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	13	13	7	7	4	4
Mvmt Flow	798	37	17	1029	70	17

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	835	0	1347	399
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	549	-
Critical Hdwy	-	-	4.24	-	6.88	6.98
Critical Hdwy Stg 1	-	-	-	-	5.88	-
Critical Hdwy Stg 2	-	-	-	-	5.88	-
Follow-up Hdwy	-	-	2.27	-	3.54	3.34
Pot Cap-1 Maneuver	-	-	763	-	140	595
Stage 1	-	-	-	-	399	-
Stage 2	-	-	-	-	537	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	763	-	137	595
Mov Cap-2 Maneuver	-	-	-	-	137	-
Stage 1	-	-	-	-	399	-
Stage 2	-	-	-	-	525	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	47.3
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	137	595	-	-	763	-
HCM Lane V/C Ratio	0.513	0.029	-	-	0.022	-
HCM Control Delay (s)	56.1	11.2	-	-	9.8	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	2.4	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	8	33	54	38	33	44	283	14	4	167	2
Future Vol, veh/h	8	8	33	54	38	33	44	283	14	4	167	2
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	9	9	37	60	42	37	49	314	16	4	186	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	658	626	188	640	620	326	190	0	0	332	0	0
Stage 1	196	196	-	422	422	-	-	-	-	-	-	-
Stage 2	462	430	-	218	198	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	379	402	857	384	400	708	1384	-	-	1211	-	-
Stage 1	808	740	-	604	583	-	-	-	-	-	-	-
Stage 2	582	585	-	778	732	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	316	381	855	347	379	705	1381	-	-	1209	-	-
Mov Cap-2 Maneuver	316	381	-	347	379	-	-	-	-	-	-	-
Stage 1	771	736	-	576	556	-	-	-	-	-	-	-
Stage 2	486	558	-	733	728	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.6	16.7	1	0.2
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1381	-	-	345	855	360	705	1209	-	-
HCM Lane V/C Ratio	0.035	-	-	0.052	0.043	0.284	0.052	0.004	-	-
HCM Control Delay (s)	7.7	0	-	16	9.4	18.9	10.4	8	0	-
HCM Lane LOS	A	A	-	C	A	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.1	1.1	0.2	0	-	-

Intersection												
Int Delay, s/veh	5.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	1	1	1	15	23	4	21	2	9	5	17
Future Vol, veh/h	19	1	1	1	15	23	4	21	2	9	5	17
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	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	18	18	18	8	8	8	23	23	23
Mvmt Flow	21	1	1	1	17	26	4	24	2	10	6	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	91	70	16	70	78	25	25	0	0	26	0	0
Stage 1	36	36	-	33	33	-	-	-	-	-	-	-
Stage 2	55	34	-	37	45	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.28	6.68	6.38	4.18	-	-	4.33	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.662	4.162	3.462	2.272	-	-	2.407	-	-
Pot Cap-1 Maneuver	886	815	1055	884	783	1007	1551	-	-	1462	-	-
Stage 1	972	859	-	944	837	-	-	-	-	-	-	-
Stage 2	950	861	-	939	827	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	843	807	1055	875	775	1007	1551	-	-	1462	-	-
Mov Cap-2 Maneuver	843	807	-	875	775	-	-	-	-	-	-	-
Stage 1	969	853	-	941	834	-	-	-	-	-	-	-
Stage 2	904	858	-	930	821	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	9.4			9.2			1.1			2.2		
HCM LOS	A			A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1551	-	-	843	914	900	1462	-	-
HCM Lane V/C Ratio	0.003	-	-	0.025	0.002	0.049	0.007	-	-
HCM Control Delay (s)	7.3	0	-	9.4	8.9	9.2	7.5	0	-
HCM Lane LOS	A	A	-	A	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0.2	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	1152	155	8	1041	22	133	16	14	38	14	115
Future Volume (vph)	155	1152	155	8	1041	22	133	16	14	38	14	115
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.98		1.00	1.00	0.85		0.99			0.91	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			0.99	
Satd. Flow (prot)	1614	3163		1554	3107	1343		1645			1461	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.57			0.91	
Satd. Flow (perm)	1614	3163		1554	3107	1343		983			1340	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	163	1213	163	8	1096	23	140	17	15	40	15	121
RTOR Reduction (vph)	0	8	0	0	0	12	0	3	0	0	66	0
Lane Group Flow (vph)	163	1368	0	8	1096	11	0	169	0	0	110	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	1%	1%	1%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	16.3	73.0		1.0	57.7	57.7		32.5			32.5	
Effective Green, g (s)	16.3	73.0		1.0	57.7	57.7		32.5			32.5	
Actuated g/C Ratio	0.14	0.61		0.01	0.48	0.48		0.27			0.27	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	219	1924		12	1493	645		266			362	
v/s Ratio Prot	c0.10	c0.43		0.01	0.35							
v/s Ratio Perm						0.01		c0.17			0.08	
v/c Ratio	0.74	0.71		0.67	0.73	0.02		0.64			0.30	
Uniform Delay, d1	49.8	16.2		59.3	25.0	16.3		38.5			34.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	12.8	2.3		89.5	3.2	0.0		11.1			0.5	
Delay (s)	62.7	18.5		148.8	28.2	16.4		49.6			35.2	
Level of Service	E	B		F	C	B		D			D	
Approach Delay (s)		23.2			28.8			49.6			35.2	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	80.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	1152	155	8	1041	22	133	16	14	38	14	115
Future Volume (veh/h)	155	1152	155	8	1041	22	133	16	14	38	14	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1709	1709	1709	1654	1654	1654	1736	1736	1736	1668	1668	1668
Adj Flow Rate, veh/h	163	1213	163	8	1096	23	140	17	15	40	15	121
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	7	7	7	1	1	1	6	6	6
Cap, veh/h	189	1742	233	15	1573	684	290	35	26	109	53	275
Arrive On Green	0.12	0.61	0.61	0.01	0.50	0.50	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1628	2870	384	1576	3143	1368	869	128	95	266	195	1014
Grp Volume(v), veh/h	163	684	692	8	1096	23	172	0	0	176	0	0
Grp Sat Flow(s),veh/h/ln	1628	1624	1630	1576	1572	1368	1092	0	0	1475	0	0
Q Serve(g_s), s	11.8	34.3	34.8	0.6	32.1	1.0	7.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	11.8	34.3	34.8	0.6	32.1	1.0	18.4	0.0	0.0	11.4	0.0	0.0
Prop In Lane	1.00		0.24	1.00		1.00	0.81		0.09	0.23		0.69
Lane Grp Cap(c), veh/h	189	985	989	15	1573	684	350	0	0	436	0	0
V/C Ratio(X)	0.86	0.69	0.70	0.52	0.70	0.03	0.49	0.00	0.00	0.40	0.00	0.00
Avail Cap(c_a), veh/h	264	985	989	67	1573	684	350	0	0	436	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	52.1	16.0	16.1	59.1	23.0	15.2	39.2	0.0	0.0	36.1	0.0	0.0
Incr Delay (d2), s/veh	18.3	4.0	4.1	24.7	2.6	0.1	4.9	0.0	0.0	0.6	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(50%),veh/ln	5.8	13.4	13.7	0.3	12.3	0.3	5.0	0.0	0.0	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.4	20.0	20.2	83.8	25.6	15.3	44.1	0.0	0.0	36.7	0.0	0.0
LnGrp LOS	E	C	C	F	C	B	D	A	A	D	A	A
Approach Vol, veh/h		1539			1127			172			176	
Approach Delay, s/veh		25.5			25.8			44.1			36.7	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	77.3		37.0	18.4	64.6		37.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	68.9		32.5	19.5	54.5		32.5				
Max Q Clear Time (g_c+I1), s	2.6	36.8		20.4	13.8	34.1		13.4				
Green Ext Time (p_c), s	0.0	13.3		0.8	0.2	8.7		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			27.3									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1107	83	17	1064	34	33
Future Vol, veh/h	1107	83	17	1064	34	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	7	7	3	3
Mvmt Flow	1165	87	18	1120	36	35

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1252	0	1761	583
Stage 1	-	-	-	-	1165	-
Stage 2	-	-	-	-	596	-
Critical Hdwy	-	-	4.24	-	6.86	6.96
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.27	-	3.53	3.33
Pot Cap-1 Maneuver	-	-	525	-	75	453
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	510	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	525	-	72	453
Mov Cap-2 Maneuver	-	-	-	-	72	-
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	493	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	55.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	72	453	-	-	525	-
HCM Lane V/C Ratio	0.497	0.077	-	-	0.034	-
HCM Control Delay (s)	96.7	13.6	-	-	12.1	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	2	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	47	54	26	50	26	60	272	54	10	327	11
Future Vol, veh/h	11	47	54	26	50	26	60	272	54	10	327	11
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	12	50	57	28	53	28	64	289	57	11	348	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	860	848	350	878	832	322	362	0	0	348	0	0
Stage 1	372	372	-	448	448	-	-	-	-	-	-	-
Stage 2	488	476	-	430	384	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	277	299	696	265	301	712	1197	-	-	1194	-	-
Stage 1	651	621	-	584	568	-	-	-	-	-	-	-
Stage 2	563	558	-	598	606	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	213	274	695	197	276	709	1195	-	-	1192	-	-
Mov Cap-2 Maneuver	213	274	-	197	276	-	-	-	-	-	-	-
Stage 1	606	612	-	544	529	-	-	-	-	-	-	-
Stage 2	453	519	-	498	598	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.1	22.7	1.3	0.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1195	-	-	260	695	243	709	1192	-	-
HCM Lane V/C Ratio	0.053	-	-	0.237	0.083	0.333	0.039	0.009	-	-
HCM Control Delay (s)	8.2	0	-	23.1	10.6	27	10.3	8	0	-
HCM Lane LOS	A	A	-	C	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.9	0.3	1.4	0.1	0	-	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	24	5	2	6	7	4	10	1	24	27	28
Future Vol, veh/h	24	24	5	2	6	7	4	10	1	24	27	28
Conflicting Peds, #/hr	2	0	1	3	0	4	1	0	3	4	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	3	3	3
Mvmt Flow	26	26	5	2	7	8	4	11	1	26	30	31

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	131	124	51	140	139	20	63	0	0	16	0	0
Stage 1	100	100	-	24	24	-	-	-	-	-	-	-
Stage 2	31	24	-	116	115	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.17	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.263	-	-	2.227	-	-
Pot Cap-1 Maneuver	841	766	1017	830	752	1058	1508	-	-	1595	-	-
Stage 1	906	812	-	994	875	-	-	-	-	-	-	-
Stage 2	986	875	-	889	800	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	812	746	1012	786	732	1050	1505	-	-	1589	-	-
Mov Cap-2 Maneuver	812	746	-	786	732	-	-	-	-	-	-	-
Stage 1	901	797	-	987	869	-	-	-	-	-	-	-
Stage 2	965	869	-	838	785	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	9.3	2	2.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1505	-	-	812	781	862	1589	-	-
HCM Lane V/C Ratio	0.003	-	-	0.032	0.041	0.019	0.017	-	-
HCM Control Delay (s)	7.4	0	-	9.6	9.8	9.3	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	0.1	-	-

Trip Generation Calculation Worksheet

Land Use Description:	Single-Family Detached Housing
ITE Land Use Code:	210
Independent Variable:	Dwelling Units
Quantity:	32 Dwelling Units

Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic

Trip Rate: 0.74 trips per dwelling unit

Directional Distribution: 25% Entering 75% Exiting

PM Peak Hour of Adjacent Street Traffic

Trip Rate: 0.99 trips per dwelling unit

Directional Distribution: 63% Entering 37% Exiting

Total Weekday Traffic

Trip Rate: 9.44 trips per dwelling unit

Directional Distribution: 50% Entering 50% Exiting

Site Trip Generation Calculations

32 Dwelling Units

	Entering	Exiting	Total
AM Peak Hour	6	18	24
PM Peak Hour	20	12	32
Weekday	151	151	302

Data Source: *Trip Generation Manual, 10th Edition* , Institute of Transportation Engineers, 2017

Trip Generation Calculation Worksheet

Land Use Description:	Multi-Family Housing (Low-Rise)
ITE Land Use Code:	220
Independent Variable:	Dwelling Units
Quantity:	120 Dwelling Units

Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic

Trip Rate: 0.46 trips per dwelling unit

Directional Distribution: 23% Entering 77% Exiting

PM Peak Hour of Adjacent Street Traffic

Trip Rate: 0.56 trips per dwelling unit

Directional Distribution: 63% Entering 37% Exiting

Total Weekday Traffic

Trip Rate: 7.32 trips per dwelling unit

Directional Distribution: 50% Entering 50% Exiting

Site Trip Generation Calculations

120 Dwelling Units

	Entering	Exiting	Total
AM Peak Hour	13	42	55
PM Peak Hour	42	25	67
Weekday	439	439	878

Data Source: *Trip Generation Manual, 10th Edition* , Institute of Transportation Engineers, 2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	796	38	4	1173	13	141	11	3	18	4	161
Future Volume (vph)	84	796	38	4	1173	13	141	11	3	18	4	161
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.99		1.00	1.00	0.85		1.00			0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			1.00	
Satd. Flow (prot)	1484	2946		1568	3137	1356		1575			1464	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.52			0.96	
Satd. Flow (perm)	1484	2946		1568	3137	1356		854			1418	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	88	838	40	4	1235	14	148	12	3	19	4	169
RTOR Reduction (vph)	0	2	0	0	0	7	0	1	0	0	115	0
Lane Group Flow (vph)	88	876	0	4	1235	7	0	162	0	0	77	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	12%	12%	12%	6%	6%	6%	6%	6%	6%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	11.0	71.0		1.0	61.0	61.0		34.5			34.5	
Effective Green, g (s)	11.0	71.0		1.0	61.0	61.0		34.5			34.5	
Actuated g/C Ratio	0.09	0.59		0.01	0.51	0.51		0.29			0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	136	1743		13	1594	689		245			407	
v/s Ratio Prot	c0.06	0.30		0.00	c0.39							
v/s Ratio Perm						0.01		c0.19			0.05	
v/c Ratio	0.65	0.50		0.31	0.77	0.01		0.66			0.19	
Uniform Delay, d1	52.6	14.2		59.2	23.9	14.6		37.6			32.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	10.1	1.0		13.0	3.7	0.0		13.3			0.2	
Delay (s)	62.8	15.3		72.2	27.7	14.6		50.9			32.4	
Level of Service	E	B		E	C	B		D			C	
Approach Delay (s)		19.6			27.7			50.9			32.4	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	84	796	38	4	1173	13	141	11	3	18	4	161
Future Volume (veh/h)	84	796	38	4	1173	13	141	11	3	18	4	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1586	1586	1586	1668	1668	1668	1668	1668	1668	1709	1709	1709
Adj Flow Rate, veh/h	88	838	40	4	1235	14	148	12	3	19	4	169
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	12	12	12	6	6	6	6	6	6	3	3	3
Cap, veh/h	107	1740	83	8	1678	730	295	22	5	57	27	379
Arrive On Green	0.07	0.59	0.59	0.01	0.53	0.53	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1511	2925	140	1589	3169	1379	825	77	17	84	95	1318
Grp Volume(v), veh/h	88	432	446	4	1235	14	163	0	0	192	0	0
Grp Sat Flow(s),veh/h/ln	1511	1507	1557	1589	1585	1379	919	0	0	1497	0	0
Q Serve(g_s), s	6.9	19.5	19.5	0.3	36.1	0.6	8.9	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.9	19.5	19.5	0.3	36.1	0.6	21.7	0.0	0.0	12.8	0.0	0.0
Prop In Lane	1.00		0.09	1.00		1.00	0.91		0.02	0.10		0.88
Lane Grp Cap(c), veh/h	107	896	926	8	1678	730	321	0	0	463	0	0
V/C Ratio(X)	0.82	0.48	0.48	0.48	0.74	0.02	0.51	0.00	0.00	0.41	0.00	0.00
Avail Cap(c_a), veh/h	157	896	926	68	1678	730	321	0	0	463	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.0	13.8	13.8	59.5	21.8	13.4	39.7	0.0	0.0	35.0	0.0	0.0
Incr Delay (d2), s/veh	19.6	1.9	1.8	38.0	2.9	0.0	5.6	0.0	0.0	0.6	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(50%),veh/ln	3.2	7.0	7.3	0.2	13.9	0.2	4.8	0.0	0.0	4.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.7	15.7	15.6	97.5	24.7	13.5	45.3	0.0	0.0	35.6	0.0	0.0
LnGrp LOS	E	B	B	F	C	B	D	A	A	D	A	A
Approach Vol, veh/h		966			1253			163			192	
Approach Delay, s/veh		21.0			24.8			45.3			35.6	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	75.9		39.0	13.0	68.0		39.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	66.9		34.5	12.5	59.5		34.5				
Max Q Clear Time (g_c+I1), s	2.3	21.5		23.7	8.9	38.1		14.8				
Green Ext Time (p_c), s	0.0	7.4		0.7	0.1	10.2		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			25.5									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	2.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	807	36	20	1056	69	26
Future Vol, veh/h	807	36	20	1056	69	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	13	13	7	7	4	4
Mvmt Flow	849	38	21	1112	73	27

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	887	0	1447	425
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	598	-
Critical Hdwy	-	-	4.24	-	6.88	6.98
Critical Hdwy Stg 1	-	-	-	-	5.88	-
Critical Hdwy Stg 2	-	-	-	-	5.88	-
Follow-up Hdwy	-	-	2.27	-	3.54	3.34
Pot Cap-1 Maneuver	-	-	728	-	120	572
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	506	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	728	-	117	572
Mov Cap-2 Maneuver	-	-	-	-	117	-
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	491	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	58.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	117	572	-	-	728	-
HCM Lane V/C Ratio	0.621	0.048	-	-	0.029	-
HCM Control Delay (s)	76.4	11.6	-	-	10.1	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	3.1	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	8	34	56	42	61	46	315	15	14	190	3
Future Vol, veh/h	11	8	34	56	42	61	46	315	15	14	190	3
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	12	9	38	62	47	68	51	350	17	16	211	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	765	716	213	731	711	363	216	0	0	369	0	0
Stage 1	245	245	-	463	463	-	-	-	-	-	-	-
Stage 2	520	471	-	268	248	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	321	357	830	334	354	675	1354	-	-	1173	-	-
Stage 1	761	705	-	573	559	-	-	-	-	-	-	-
Stage 2	541	561	-	731	696	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	244	333	828	297	330	672	1351	-	-	1171	-	-
Mov Cap-2 Maneuver	244	333	-	297	330	-	-	-	-	-	-	-
Stage 1	723	692	-	544	531	-	-	-	-	-	-	-
Stage 2	422	533	-	678	683	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13	18.3	1	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1351	-	-	275	828	310	672	1171	-	-
HCM Lane V/C Ratio	0.038	-	-	0.077	0.046	0.351	0.101	0.013	-	-
HCM Control Delay (s)	7.8	0	-	19.2	9.6	22.8	11	8.1	0	-
HCM Lane LOS	A	A	-	C	A	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.1	1.5	0.3	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	1	1	1	16	24	4	22	2	9	5	21
Future Vol, veh/h	29	1	1	1	16	24	4	22	2	9	5	21
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	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	18	18	18	8	8	8	23	23	23
Mvmt Flow	33	1	1	1	18	27	4	25	2	10	6	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	95	73	18	73	84	26	30	0	0	27	0	0
Stage 1	38	38	-	34	34	-	-	-	-	-	-	-
Stage 2	57	35	-	39	50	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.28	6.68	6.38	4.18	-	-	4.33	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.662	4.162	3.462	2.272	-	-	2.407	-	-
Pot Cap-1 Maneuver	881	812	1052	880	777	1006	1545	-	-	1461	-	-
Stage 1	970	857	-	943	836	-	-	-	-	-	-	-
Stage 2	947	860	-	937	823	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	836	804	1052	871	769	1006	1545	-	-	1461	-	-
Mov Cap-2 Maneuver	836	804	-	871	769	-	-	-	-	-	-	-
Stage 1	967	851	-	940	833	-	-	-	-	-	-	-
Stage 2	899	857	-	928	817	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	9.2	1	1.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1545	-	-	836	911	895	1461	-	-
HCM Lane V/C Ratio	0.003	-	-	0.039	0.002	0.051	0.007	-	-
HCM Control Delay (s)	7.3	0	-	9.5	9	9.2	7.5	0	-
HCM Lane LOS	A	A	-	A	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0.2	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	1255	161	8	1124	24	138	17	15	42	15	140
Future Volume (vph)	169	1255	161	8	1124	24	138	17	15	42	15	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.98		1.00	1.00	0.85		0.99			0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			0.99	
Satd. Flow (prot)	1614	3166		1554	3107	1343		1645			1456	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.53			0.91	
Satd. Flow (perm)	1614	3166		1554	3107	1343		906			1339	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	178	1321	169	8	1183	25	145	18	16	44	16	147
RTOR Reduction (vph)	0	8	0	0	0	13	0	3	0	0	74	0
Lane Group Flow (vph)	178	1482	0	8	1183	12	0	176	0	0	133	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	1%	1%	1%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	16.7	74.0		1.0	58.3	58.3		31.5			31.5	
Effective Green, g (s)	16.7	74.0		1.0	58.3	58.3		31.5			31.5	
Actuated g/C Ratio	0.14	0.62		0.01	0.49	0.49		0.26			0.26	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	224	1952		12	1509	652		237			351	
v/s Ratio Prot	c0.11	c0.47		0.01	0.38							
v/s Ratio Perm						0.01		c0.19			0.10	
v/c Ratio	0.79	0.76		0.67	0.78	0.02		0.74			0.38	
Uniform Delay, d1	50.0	16.6		59.3	25.6	16.0		40.5			36.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	17.4	2.8		89.5	4.2	0.1		18.9			0.7	
Delay (s)	67.4	19.4		148.8	29.8	16.1		59.4			36.9	
Level of Service	E	B		F	C	B		E			D	
Approach Delay (s)		24.5			30.3			59.4			36.9	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	29.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	1255	161	8	1124	24	138	17	15	42	15	140
Future Volume (veh/h)	169	1255	161	8	1124	24	138	17	15	42	15	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1709	1709	1709	1654	1654	1654	1736	1736	1736	1668	1668	1668
Adj Flow Rate, veh/h	178	1321	169	8	1183	25	145	18	16	44	16	147
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	7	7	7	1	1	1	6	6	6
Cap, veh/h	204	1778	226	15	1571	684	262	32	23	101	49	279
Arrive On Green	0.13	0.62	0.62	0.01	0.50	0.50	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1628	2890	367	1576	3143	1368	790	121	89	246	188	1064
Grp Volume(v), veh/h	178	738	752	8	1183	25	179	0	0	207	0	0
Grp Sat Flow(s),veh/h/ln	1628	1624	1634	1576	1572	1368	1001	0	0	1498	0	0
Q Serve(g_s), s	12.9	38.5	39.4	0.6	36.2	1.1	7.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	12.9	38.5	39.4	0.6	36.2	1.1	21.7	0.0	0.0	13.9	0.0	0.0
Prop In Lane	1.00		0.22	1.00		1.00	0.81		0.09	0.21		0.71
Lane Grp Cap(c), veh/h	204	999	1005	15	1571	684	317	0	0	430	0	0
V/C Ratio(X)	0.87	0.74	0.75	0.52	0.75	0.04	0.56	0.00	0.00	0.48	0.00	0.00
Avail Cap(c_a), veh/h	251	999	1005	66	1571	684	317	0	0	430	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	51.6	16.3	16.5	59.1	24.1	15.3	41.6	0.0	0.0	37.9	0.0	0.0
Incr Delay (d2), s/veh	23.6	4.9	5.1	24.7	3.4	0.1	7.1	0.0	0.0	0.8	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(50%),veh/ln	6.6	15.1	15.6	0.3	14.0	0.4	5.5	0.0	0.0	5.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.2	21.2	21.5	83.8	27.4	15.4	48.7	0.0	0.0	38.7	0.0	0.0
LnGrp LOS	E	C	C	F	C	B	D	A	A	D	A	A
Approach Vol, veh/h		1668			1216			179			207	
Approach Delay, s/veh		27.1			27.6			48.7			38.7	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	78.3		36.0	19.5	64.5		36.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.0	70.0		31.5	18.5	56.5		31.5				
Max Q Clear Time (g_c+I1), s	2.6	41.4		23.7	14.9	38.2		15.9				
Green Ext Time (p_c), s	0.0	14.2		0.6	0.2	9.0		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			29.2									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1210	86	27	1149	35	39
Future Vol, veh/h	1210	86	27	1149	35	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	7	7	3	3
Mvmt Flow	1274	91	28	1209	37	41

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1365	0	1935	637
Stage 1	-	-	-	-	1274	-
Stage 2	-	-	-	-	661	-
Critical Hdwy	-	-	4.24	-	6.86	6.96
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.27	-	3.53	3.33
Pot Cap-1 Maneuver	-	-	474	-	57	418
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	473	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	474	-	54	418
Mov Cap-2 Maneuver	-	-	-	-	54	-
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	445	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	83.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	54	418	-	-	474	-
HCM Lane V/C Ratio	0.682	0.098	-	-	0.06	-
HCM Control Delay (s)	160.1	14.5	-	-	13.1	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	2.8	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	51	56	27	54	45	62	307	56	40	366	14
Future Vol, veh/h	13	51	56	27	54	45	62	307	56	40	366	14
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	14	54	59	28	57	47	65	323	59	42	385	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1008	985	387	1018	971	357	402	0	0	384	0	0
Stage 1	471	471	-	485	485	-	-	-	-	-	-	-
Stage 2	537	514	-	533	486	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	220	249	663	213	250	680	1157	-	-	1158	-	-
Stage 1	575	561	-	558	547	-	-	-	-	-	-	-
Stage 2	530	537	-	525	546	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	149	219	662	144	220	677	1155	-	-	1156	-	-
Mov Cap-2 Maneuver	149	219	-	144	220	-	-	-	-	-	-	-
Stage 1	532	534	-	517	507	-	-	-	-	-	-	-
Stage 2	405	497	-	410	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.1	29.2	1.2	0.8
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1155	-	-	200	662	187	677	1156	-	-
HCM Lane V/C Ratio	0.057	-	-	0.337	0.089	0.456	0.07	0.036	-	-
HCM Control Delay (s)	8.3	0	-	31.9	11	39.4	10.7	8.2	0	-
HCM Lane LOS	A	A	-	D	B	E	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.4	0.3	2.2	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	25	5	2	6	7	4	10	1	25	28	38
Future Vol, veh/h	30	25	5	2	6	7	4	10	1	25	28	38
Conflicting Peds, #/hr	2	0	1	3	0	4	1	0	3	4	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	3	3	3
Mvmt Flow	33	27	5	2	7	8	4	11	1	27	31	42

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	139	132	57	149	153	20	75	0	0	16	0	0
Stage 1	108	108	-	24	24	-	-	-	-	-	-	-
Stage 2	31	24	-	125	129	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.17	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.263	-	-	2.227	-	-
Pot Cap-1 Maneuver	831	759	1009	819	739	1058	1493	-	-	1595	-	-
Stage 1	897	806	-	994	875	-	-	-	-	-	-	-
Stage 2	986	875	-	879	789	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	801	739	1004	774	719	1050	1490	-	-	1589	-	-
Mov Cap-2 Maneuver	801	739	-	774	719	-	-	-	-	-	-	-
Stage 1	893	790	-	987	869	-	-	-	-	-	-	-
Stage 2	965	869	-	826	773	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	9.3	2	2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1490	-	-	801	773	852	1589	-	-
HCM Lane V/C Ratio	0.003	-	-	0.041	0.043	0.019	0.017	-	-
HCM Control Delay (s)	7.4	0	-	9.7	9.9	9.3	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	808	38	4	1186	13	154	11	3	18	4	161
Future Volume (vph)	84	808	38	4	1186	13	154	11	3	18	4	161
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.99		1.00	1.00	0.85		1.00			0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			1.00	
Satd. Flow (prot)	1484	2946		1568	3137	1356		1575			1464	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.52			0.96	
Satd. Flow (perm)	1484	2946		1568	3137	1356		852			1416	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	88	851	40	4	1248	14	162	12	3	19	4	169
RTOR Reduction (vph)	0	2	0	0	0	7	0	1	0	0	115	0
Lane Group Flow (vph)	88	889	0	4	1248	7	0	176	0	0	77	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	12%	12%	12%	6%	6%	6%	6%	6%	6%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	11.0	71.0		1.0	61.0	61.0		34.5			34.5	
Effective Green, g (s)	11.0	71.0		1.0	61.0	61.0		34.5			34.5	
Actuated g/C Ratio	0.09	0.59		0.01	0.51	0.51		0.29			0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	136	1743		13	1594	689		244			407	
v/s Ratio Prot	c0.06	0.30		0.00	c0.40							
v/s Ratio Perm						0.01		c0.21			0.05	
v/c Ratio	0.65	0.51		0.31	0.78	0.01		0.72			0.19	
Uniform Delay, d1	52.6	14.3		59.2	24.1	14.6		38.4			32.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	10.1	1.1		13.0	3.9	0.0		16.9			0.2	
Delay (s)	62.8	15.4		72.2	28.0	14.6		55.4			32.4	
Level of Service	E	B		E	C	B		E			C	
Approach Delay (s)		19.7			28.0			55.4			32.4	
Approach LOS		B			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	84	808	38	4	1186	13	154	11	3	18	4	161
Future Volume (veh/h)	84	808	38	4	1186	13	154	11	3	18	4	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1586	1586	1586	1668	1668	1668	1668	1668	1668	1709	1709	1709
Adj Flow Rate, veh/h	88	851	40	4	1248	14	162	12	3	19	4	169
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	12	12	12	6	6	6	6	6	6	3	3	3
Cap, veh/h	107	1741	82	8	1678	730	296	20	4	58	27	382
Arrive On Green	0.07	0.59	0.59	0.01	0.53	0.53	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1511	2927	138	1589	3169	1379	830	70	16	85	96	1329
Grp Volume(v), veh/h	88	438	453	4	1248	14	177	0	0	192	0	0
Grp Sat Flow(s),veh/h/ln	1511	1507	1558	1589	1585	1379	915	0	0	1510	0	0
Q Serve(g_s), s	6.9	19.9	19.9	0.3	36.7	0.6	10.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.9	19.9	19.9	0.3	36.7	0.6	23.4	0.0	0.0	12.8	0.0	0.0
Prop In Lane	1.00		0.09	1.00		1.00	0.92		0.02	0.10		0.88
Lane Grp Cap(c), veh/h	107	896	927	8	1678	730	321	0	0	467	0	0
V/C Ratio(X)	0.82	0.49	0.49	0.48	0.74	0.02	0.55	0.00	0.00	0.41	0.00	0.00
Avail Cap(c_a), veh/h	157	896	927	68	1678	730	321	0	0	467	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.0	13.9	13.9	59.5	21.9	13.4	40.4	0.0	0.0	35.0	0.0	0.0
Incr Delay (d2), s/veh	19.6	1.9	1.8	38.0	3.0	0.0	6.7	0.0	0.0	0.6	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(50%),veh/ln	3.2	7.2	7.4	0.2	14.1	0.2	5.4	0.0	0.0	4.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.7	15.8	15.7	97.5	25.0	13.5	47.1	0.0	0.0	35.6	0.0	0.0
LnGrp LOS	E	B	B	F	C	B	D	A	A	D	A	A
Approach Vol, veh/h		979			1266			177			192	
Approach Delay, s/veh		21.1			25.1			47.1			35.6	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	75.9		39.0	13.0	68.0		39.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	66.9		34.5	12.5	59.5		34.5				
Max Q Clear Time (g_c+I1), s	2.3	21.9		25.4	8.9	38.7		14.8				
Green Ext Time (p_c), s	0.0	7.5		0.7	0.1	10.2		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			25.8									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	807	48	24	1056	82	38
Future Vol, veh/h	807	48	24	1056	82	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	13	13	7	7	4	4
Mvmt Flow	849	51	25	1112	86	40

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	900	0	1455	425
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	606	-
Critical Hdwy	-	-	4.24	-	6.88	6.98
Critical Hdwy Stg 1	-	-	-	-	5.88	-
Critical Hdwy Stg 2	-	-	-	-	5.88	-
Follow-up Hdwy	-	-	2.27	-	3.54	3.34
Pot Cap-1 Maneuver	-	-	720	-	119	572
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	502	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	720	-	115	572
Mov Cap-2 Maneuver	-	-	-	-	115	-
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	484	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	70.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	115	572	-	-	720	-
HCM Lane V/C Ratio	0.751	0.07	-	-	0.035	-
HCM Control Delay (s)	97.3	11.8	-	-	10.2	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	4.2	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	9	34	62	45	74	46	315	17	14	190	3
Future Vol, veh/h	11	9	34	62	45	74	46	315	17	14	190	3
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	12	10	38	69	50	82	51	350	19	16	211	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	775	718	213	733	712	364	216	0	0	371	0	0
Stage 1	245	245	-	464	464	-	-	-	-	-	-	-
Stage 2	530	473	-	269	248	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	316	356	830	332	354	674	1354	-	-	1171	-	-
Stage 1	761	705	-	573	558	-	-	-	-	-	-	-
Stage 2	534	560	-	730	696	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	233	332	828	294	330	671	1351	-	-	1169	-	-
Mov Cap-2 Maneuver	233	332	-	294	330	-	-	-	-	-	-	-
Stage 1	723	692	-	544	530	-	-	-	-	-	-	-
Stage 2	403	532	-	676	683	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.3	18.7	0.9	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1351	-	-	269	828	308	671	1169	-	-
HCM Lane V/C Ratio	0.038	-	-	0.083	0.046	0.386	0.123	0.013	-	-
HCM Control Delay (s)	7.8	0	-	19.6	9.6	23.9	11.1	8.1	0	-
HCM Lane LOS	A	A	-	C	A	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.1	1.8	0.4	0	-	-

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	4	1	1	38	62	4	22	2	25	5	21
Future Vol, veh/h	29	4	1	1	38	62	4	22	2	25	5	21
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	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	18	18	18	8	8	8	23	23	23
Mvmt Flow	33	4	1	1	43	70	4	25	2	28	6	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	165	109	18	111	120	26	30	0	0	27	0	0
Stage 1	74	74	-	34	34	-	-	-	-	-	-	-
Stage 2	91	35	-	77	86	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.28	6.68	6.38	4.18	-	-	4.33	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.28	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.662	4.162	3.462	2.272	-	-	2.407	-	-
Pot Cap-1 Maneuver	793	775	1052	831	741	1006	1545	-	-	1461	-	-
Stage 1	928	828	-	943	836	-	-	-	-	-	-	-
Stage 2	909	860	-	894	793	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	692	757	1052	812	724	1006	1545	-	-	1461	-	-
Mov Cap-2 Maneuver	692	757	-	812	724	-	-	-	-	-	-	-
Stage 1	925	811	-	940	833	-	-	-	-	-	-	-
Stage 2	800	857	-	870	777	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	9.7	1	3.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1545	-	-	692	802	876	1461	-	-
HCM Lane V/C Ratio	0.003	-	-	0.047	0.007	0.13	0.019	-	-
HCM Control Delay (s)	7.3	0	-	10.5	9.5	9.7	7.5	0	-
HCM Lane LOS	A	A	-	B	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0.4	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	1295	161	8	1132	24	149	17	15	42	15	140
Future Volume (vph)	169	1295	161	8	1132	24	149	17	15	42	15	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97		1.00			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Frt	1.00	0.98		1.00	1.00	0.85		0.99			0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.96			0.99	
Satd. Flow (prot)	1614	3167		1554	3107	1343		1645			1456	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.53			0.91	
Satd. Flow (perm)	1614	3167		1554	3107	1343		901			1338	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	178	1363	169	8	1192	25	157	18	16	44	16	147
RTOR Reduction (vph)	0	7	0	0	0	13	0	3	0	0	74	0
Lane Group Flow (vph)	178	1525	0	8	1192	12	0	188	0	0	133	0
Confl. Peds. (#/hr)						4						4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	3%	3%	3%	7%	7%	7%	1%	1%	1%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6	4			8		
Actuated Green, G (s)	16.7	74.0		1.0	58.3	58.3		31.5			31.5	
Effective Green, g (s)	16.7	74.0		1.0	58.3	58.3		31.5			31.5	
Actuated g/C Ratio	0.14	0.62		0.01	0.49	0.49		0.26			0.26	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	224	1952		12	1509	652		236			351	
v/s Ratio Prot	c0.11	c0.48		0.01	0.38							
v/s Ratio Perm						0.01		c0.21			0.10	
v/c Ratio	0.79	0.78		0.67	0.79	0.02		0.80			0.38	
Uniform Delay, d1	50.0	17.0		59.3	25.7	16.0		41.3			36.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	17.4	3.2		89.5	4.3	0.1		23.7			0.7	
Delay (s)	67.4	20.2		148.8	30.0	16.1		65.0			36.9	
Level of Service	E	C		F	C	B		E			D	
Approach Delay (s)		25.1			30.5			65.0			36.9	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	1295	161	8	1132	24	149	17	15	42	15	140
Future Volume (veh/h)	169	1295	161	8	1132	24	149	17	15	42	15	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	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	1709	1709	1709	1654	1654	1654	1736	1736	1736	1668	1668	1668
Adj Flow Rate, veh/h	178	1363	169	8	1192	25	157	18	16	44	16	147
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	7	7	7	1	1	1	6	6	6
Cap, veh/h	204	1786	220	15	1571	684	264	30	22	102	50	282
Arrive On Green	0.13	0.62	0.62	0.01	0.50	0.50	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1628	2902	357	1576	3143	1368	799	113	83	249	189	1072
Grp Volume(v), veh/h	178	758	774	8	1192	25	191	0	0	207	0	0
Grp Sat Flow(s),veh/h/ln	1628	1624	1636	1576	1572	1368	995	0	0	1510	0	0
Q Serve(g_s), s	12.9	40.4	41.5	0.6	36.7	1.1	9.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	12.9	40.4	41.5	0.6	36.7	1.1	23.1	0.0	0.0	13.8	0.0	0.0
Prop In Lane	1.00		0.22	1.00		1.00	0.82		0.08	0.21		0.71
Lane Grp Cap(c), veh/h	204	999	1006	15	1571	684	316	0	0	433	0	0
V/C Ratio(X)	0.87	0.76	0.77	0.52	0.76	0.04	0.60	0.00	0.00	0.48	0.00	0.00
Avail Cap(c_a), veh/h	251	999	1006	66	1571	684	316	0	0	433	0	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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	51.6	16.7	16.9	59.1	24.2	15.3	42.3	0.0	0.0	37.9	0.0	0.0
Incr Delay (d2), s/veh	23.6	5.4	5.7	24.7	3.5	0.1	8.3	0.0	0.0	0.8	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(50%),veh/ln	6.6	15.9	16.5	0.3	14.2	0.4	6.0	0.0	0.0	5.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.2	22.0	22.5	83.8	27.7	15.4	50.6	0.0	0.0	38.7	0.0	0.0
LnGrp LOS	E	C	C	F	C	B	D	A	A	D	A	A
Approach Vol, veh/h		1710			1225			191			207	
Approach Delay, s/veh		27.8			27.8			50.6			38.7	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	78.3		36.0	19.5	64.5		36.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.0	70.0		31.5	18.5	56.5		31.5				
Max Q Clear Time (g_c+I1), s	2.6	43.5		25.1	14.9	38.7		15.8				
Green Ext Time (p_c), s	0.0	14.2		0.6	0.2	8.9		1.1				

Intersection Summary			
HCM 6th Ctrl Delay			29.8
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1210	126	40	1149	40	46
Future Vol, veh/h	1210	126	40	1149	40	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	160	215	-	120	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	7	7	3	3
Mvmt Flow	1274	133	42	1209	42	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1407	0	1963	637
Stage 1	-	-	-	-	1274	-
Stage 2	-	-	-	-	689	-
Critical Hdwy	-	-	4.24	-	6.86	6.96
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.27	-	3.53	3.33
Pot Cap-1 Maneuver	-	-	456	-	55	418
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	457	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	456	-	50	418
Mov Cap-2 Maneuver	-	-	-	-	50	-
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	415	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	105.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	50	418	-	-	456	-
HCM Lane V/C Ratio	0.842	0.116	-	-	0.092	-
HCM Control Delay (s)	210.4	14.7	-	-	13.7	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	3.5	0.4	-	-	0.3	-

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	54	56	31	56	53	62	307	62	40	366	14
Future Vol, veh/h	13	54	56	31	56	53	62	307	62	40	366	14
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	90	-	-	125	-	-	-	-	-	330
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	14	57	59	33	59	56	65	323	65	42	385	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1016	991	387	1023	974	360	402	0	0	390	0	0
Stage 1	471	471	-	488	488	-	-	-	-	-	-	-
Stage 2	545	520	-	535	486	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.15	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.545	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	217	247	663	211	249	678	1157	-	-	1152	-	-
Stage 1	575	561	-	556	545	-	-	-	-	-	-	-
Stage 2	524	534	-	524	546	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	144	218	662	140	219	675	1155	-	-	1150	-	-
Mov Cap-2 Maneuver	144	218	-	140	219	-	-	-	-	-	-	-
Stage 1	532	534	-	515	505	-	-	-	-	-	-	-
Stage 2	393	494	-	406	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.9	31	1.2	0.8
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1155	-	-	198	662	182	675	1150	-	-
HCM Lane V/C Ratio	0.057	-	-	0.356	0.089	0.503	0.083	0.037	-	-
HCM Control Delay (s)	8.3	0	-	32.9	11	43.3	10.8	8.2	0	-
HCM Lane LOS	A	A	-	D	B	E	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.5	0.3	2.5	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	34	5	2	22	30	4	10	1	78	28	38
Future Vol, veh/h	30	34	5	2	22	30	4	10	1	78	28	38
Conflicting Peds, #/hr	2	0	1	3	0	4	1	0	3	4	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	115	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	3	3	3
Mvmt Flow	33	37	5	2	24	33	4	11	1	86	31	42

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	278	250	57	272	271	20	75	0	0	16	0	0
Stage 1	226	226	-	24	24	-	-	-	-	-	-	-
Stage 2	52	24	-	248	247	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.17	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.263	-	-	2.227	-	-
Pot Cap-1 Maneuver	674	653	1009	680	636	1058	1493	-	-	1595	-	-
Stage 1	777	717	-	994	875	-	-	-	-	-	-	-
Stage 2	961	875	-	756	702	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	601	611	1004	611	595	1050	1490	-	-	1589	-	-
Mov Cap-2 Maneuver	601	611	-	611	595	-	-	-	-	-	-	-
Stage 1	773	675	-	987	869	-	-	-	-	-	-	-
Stage 2	899	869	-	668	661	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	10	2	4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1490	-	-	601	643	785	1589	-	-
HCM Lane V/C Ratio	0.003	-	-	0.055	0.067	0.076	0.054	-	-
HCM Control Delay (s)	7.4	0	-	11.3	11	10	7.4	0	-
HCM Lane LOS	A	A	-	B	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0.2	0.2	-	-

Intersection	
Intersection Delay, s/veh	15.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	9	34	62	45	74	46	315	17	14	190	3
Future Vol, veh/h	11	9	34	62	45	74	46	315	17	14	190	3
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
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	12	10	38	69	50	82	51	350	19	16	211	3
Number of Lanes	0	1	1	0	1	1	0	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	9.6	10.7	19.5	12.2
HCM LOS	A	B	C	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	12%	55%	0%	58%	0%	7%	0%
Vol Thru, %	83%	45%	0%	42%	0%	93%	0%
Vol Right, %	4%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	378	20	34	107	74	204	3
LT Vol	46	11	0	62	0	14	0
Through Vol	315	9	0	45	0	190	0
RT Vol	17	0	34	0	74	0	3
Lane Flow Rate	420	22	38	119	82	227	3
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.667	0.044	0.064	0.227	0.134	0.377	0.005
Departure Headway (Hd)	5.72	7.087	6.09	6.862	5.854	5.992	5.248
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	630	504	586	523	612	601	681
Service Time	3.754	4.844	3.847	4.609	3.6	3.734	2.989
HCM Lane V/C Ratio	0.667	0.044	0.065	0.228	0.134	0.378	0.004
HCM Control Delay	19.5	10.2	9.3	11.6	9.5	12.3	8
HCM Lane LOS	C	B	A	B	A	B	A
HCM 95th-tile Q	5	0.1	0.2	0.9	0.5	1.7	0

Intersection	
Intersection Delay, s/veh	23.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	54	56	31	56	53	62	307	62	40	366	14
Future Vol, veh/h	13	54	56	31	56	53	62	307	62	40	366	14
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	5	5	5
Mvmt Flow	14	57	59	33	59	56	65	323	65	42	385	15
Number of Lanes	0	1	1	0	1	1	0	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	11.3	11.7	29.6	25.7
HCM LOS	B	B	D	D

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	14%	19%	0%	36%	0%	10%	0%
Vol Thru, %	71%	81%	0%	64%	0%	90%	0%
Vol Right, %	14%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	431	67	56	87	53	406	14
LT Vol	62	13	0	31	0	40	0
Through Vol	307	54	0	56	0	366	0
RT Vol	62	0	56	0	53	0	14
Lane Flow Rate	454	71	59	92	56	427	15
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.796	0.152	0.113	0.199	0.107	0.757	0.023
Departure Headway (Hd)	6.315	7.741	6.919	7.828	6.923	6.376	5.626
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	576	463	518	459	517	568	640
Service Time	4.329	5.491	4.668	5.577	4.671	4.088	3.326
HCM Lane V/C Ratio	0.788	0.153	0.114	0.2	0.108	0.752	0.023
HCM Control Delay	29.6	11.9	10.6	12.5	10.5	26.3	8.5
HCM Lane LOS	D	B	B	B	B	D	A
HCM 95th-tile Q	7.7	0.5	0.4	0.7	0.4	6.7	0.1

CITY OF SANDY, CLACKAMAS COUNTY

TEN EYCK RD at PROCTOR BLVD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 4 of 5 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D C / A E L C / D M R J U G S / S I N V / W C H L / O R K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V# SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P# PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
03911	N N N	10/27/2018	17	PROCTOR BLVD	INTER	5-LEG	N	N	UNK	S-1STOP	01 NONE 0	STRGHT									29
NONE		SA	0	SE TEN EYCK RD	NE		TRF SIGNAL	N	UNK	REAR	PRVTE	NE-SW								000	00
N		5P			06	0		N	DUSK	INJ	PSNGR CAR		01 DRVR	NONE	70	M	OR-Y		026	000	29
N		45 23 49.25	-122 15 19.74														OR<25				
											02 NONE 0	STOP									
											PRVTE	NE-SW								011	00
											PSNGR CAR		01 DRVR	INJC	55	F	OR-Y		000	000	00
																	OR<25				
03089	N N N	09/03/2018	14	PROCTOR BLVD	INTER	5-LEG	N	N	CLR	S-1STOP	01 NONE 0	STRGHT									29
NONE		MO		SE TEN EYCK RD	SE		TRF SIGNAL	N	DRY	REAR	UNKN	SE-NW								000	00
N		3P			06	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	00	F	UNK		026	000	29
N		45 23 49.25	-122 15 19.75	002600200S00													UNK				
											02 NONE 0	STOP									
											PRVTE	SE-NW								011	00
											PSNGR CAR		01 DRVR	INJC	25	F	OR-Y		000	000	00
																	OR>25				
03213	N N N	09/17/2019	14	PROCTOR BLVD	INTER	5-LEG	N	N	CLR	S-1STOP	01 NONE 0	STRGHT									29
NONE		TU		SE TEN EYCK RD	SE		TRF SIGNAL	N	DRY	REAR	PRVTE	SE-NW								000	00
N		3P			06	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	41	F	OTH-Y		026	000	29
N		45 23 49.26	-122 15 19.69	002600200S00													N-RES				
											02 NONE 0	STOP									
											PRVTE	SE-NW								011	00
											PSNGR CAR		01 DRVR	INJC	48	F	OR-Y		000	000	00
																	OR<25				
											02 NONE 0	STOP									
											PRVTE	SE-NW								011	00
											PSNGR CAR		02 PSNG	INJC	50	M			000	000	00
05173	N N N	11/08/2016	14	PROCTOR BLVD	INTER	5-LEG	N	N	CLR	ANGL-OTH	01 NONE 9	U-TURN									06
NONE		TU		SE TEN EYCK RD	W		TRF SIGNAL	N	DRY	TURN	N/A	W -W								000	00
N		5P			05	0		N	DUSK	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 49.25	-122 15 19.74	002600200S00		(02)											UNK				
											02 NONE 9	TURN-R									
											N/A	NE-W								000	00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
																	UNK				
04335	N N N	11/06/2018	14	PROCTOR BLVD	INTER	5-LEG	N	N	CLR	ANGL-OTH	01 NONE 9	STRGHT									02
NONE		TU		SE TEN EYCK RD	CN		TRF SIGNAL	N	DRY	TURN	N/A	SE-NW								000	00
N		2P			01	0		N	DAY	PDO	SEMI TOW		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 49.25	-122 15 19.72	002600200S00													UNK				

CITY OF SANDY, CLACKAMAS COUNTY

TEN EYCK RD at PROCTOR BLVD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

5 - 5 of 5 Crash records shown.

SER# INVEST RD DPT UNLOC?	S P E E D	A L C	D R U G	J U N V	S I C L	W O R K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
																02	NONE 9	TURN-R											
																	N/A	NE-NW									015		00
																	PSNGR CAR		01	DRVR	NONE	00	Unk	UNK UNK		000	000		00

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SANDY, CLACKAMAS COUNTY

TEN EYCK RD at PIONEER BLVD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 1 of 1 Crash records shown.

SER# INVEST RD DPT UNLOC?	S P E E D	A L C	D R U G S	M J I N V	S C H L	W O R K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
03787	N	N	N		N	N	09/15/2015	14	PIONEER BLVD	INTER	5-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											29
NONE							TU		SE TEN EYCK RD	E		TRF SIGNAL	N	DRY	REAR		PRVTE	E -W									000		00
N							1P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	71	M	OR-Y		026	000		29
N							45 23 49.24	-122 15 19.74	002600100S00															OR<25					
																02	NONE 0	STOP											
																	PRVTE	E -W									011		00
																	PSNGR CAR		01	DRVR	INJC	38	F	OTH-Y		000	000		00
																								N-RES					

05/31/2021

TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF SANDY, CLACKAMAS COUNTY

WOLF DR at PIONEER BLVD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 2 of 2 Crash records shown.

SER# INVEST RD DPT UNLOC?	S D M P R J S W E A U I C O E L G N H R D C S V L K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
01741	N N N N N	05/09/2015	14	PIONEER BLVD	INTER	5-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										04
NONE		SA		WOLF DR	CN		TRF SIGNAL	N	DRY	ANGL		PRVTE	S -N									000	00
N		6A			04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	25	M	OTH-Y		020	026	04
N		45 23 49.25	-122 15 19.74	002600100S00															OR<25				
											02	NONE 0	STRGHT										
												PRVTE	W -E									000	00
												PSNGR CAR		01	DRVR	NONE	51	F	OR-Y		000	000	00
																			OR<25				
00512	N N N N N	02/07/2017	14	PIONEER BLVD	INTER	5-LEG	N	N	RAIN	ANGL-OTH	01	NONE 0	TURN-L										04
CITY		TU		WOLF DR	CN		TRF SIGNAL	N	WET	TURN		PRVTE	S -W									000	00
N		4P			04	0		N	DUSK	INJ		PSNGR CAR		01	DRVR	INJC	55	F	OR-Y		000	000	00
N		45 23 49.25	-122 15 19.74	002600100S00															OR<25				
											02	NONE 0	STRGHT										
												PRVTE	W -E									000	00
												PSNGR CAR		01	DRVR	NONE	63	M	OR-Y		020	000	04
																			OR>25				

05/31/2021 TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SANDY, CLACKAMAS COUNTY

MT HOOD HY at LANGENSAND RD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 4 of 7 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S D M / P R J S W / E A U I C O / E L G N H R / D C S V L K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	SPCL USE / TRLR QTY / OWNER / V# TYPE	MOVE / FROM / TO	P# PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
05355	N N N	11/18/2016	14	LANGENSAND RD	INTER	3-LEG	N	N	RAIN	PED	01 NONE 0	TURN-R									19,02
CITY		FR		MT HOOD HY	S		UNKNOWN	N	WET	PED	PRVTE	S -SE								015	00
N		6P			06	0		N	DUSK	INJ	PSNGR CAR		01 DRVR	NONE	59	M	OR-Y		029	000	02
N		45 23 44.19	-122 15 .03	002600100S00													OR>25				
												-									
												STRGHT	01 PED	INJC	34	M		I XWK?	000	034	19
												SE NW									
05056	N N N	12/01/2017	14	LANGENSAND RD	INTER	3-LEG	N	N	RAIN	ANGL-STP	01 NONE 0	TURN-R									08
NONE		FR		MT HOOD HY	S		STOP SIGN	N	WET	TURN	PRVTE	NW-S								000	00
N		9P			06	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	NONE	27	F	OR-Y		001	000	08
N		45 23 44.19	-122 15 .03	002600100S00													OR<25				
											02 NONE 0	STOP									
											PRVTE	S -N								012	00
											PSNGR CAR		01 DRVR	INJC	27	F	OR-Y		000	000	00
																	OR<25				
											02 NONE 0	STOP									
											PRVTE	S -N								012	00
											PSNGR CAR		02 PSNG	INJC	25	M			000	000	00
01431	N N N	04/14/2017	14	LANGENSAND RD	INTER	3-LEG	N	N	CLR	O-1STOP	01 NONE 9	BACK									10
NONE		FR		MT HOOD HY	S		STOP SIGN	N	DRY	BACK	N/A	N -S								000	00
N		3P			06	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 44.19	-122 15 .03	002600100S00													UNK				
											02 NONE 9	STOP									
											N/A	S -N								012	00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
																	UNK				
00297	N N N N N	01/24/2015	14	LANGENSAND RD	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01 NONE 0	STRGHT									02,08
CITY		SA		MT HOOD HY	CN		UNKNOWN	N	DRY	TURN	PRVTE	NW-SE								000	00
N		4P			03	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	21	M	OR-Y		000	000	00
N		45 23 44.19	-122 15 .03	002600100S00													OR<25				
											01 NONE 0	STRGHT									
											PRVTE	NW-SE								000	00
											PSNGR CAR		02 PSNG	NO<5	01	F			000	000	00
											02 NONE 0	TURN-L									
											PRVTE	SE-S								000	00
											PSNGR CAR		01 DRVR	INJC	78	F	OR-Y		028,004	000	02,08
																	OR<25				

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SANDY, CLACKAMAS COUNTY

MT HOOD HY at LANGENSAND RD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

5 - 7 of 7 Crash records shown.

SER# INVEST RD DPT UNLOC?	S P E E D	A L C	D R U G S	J I N V	S C H L	M W O R K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	SPCL USE TRLR QTY OWNER V# TYPE	MOVE FROM TO	PRTC P# TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
04571	N	N	Y		N	N	10/05/2016	14	LANGENSAND RD	INTER	3-LEG	N	N	RAIN	ANGL-OTH	01 NONE 0	TURN-L									013	02,08
CITY							WE		MT HOOD HY	CN		STOP SIGN	N	WET	TURN	PRVTE	S -W								015		00
N							6P			04	0		N	DUSK	INJ	PSNGR CAR		01 DRVR	NONE	21	M	OR-Y		028	000		02
N							45 23 44.19	-122 15 .03	002600100S00													OR<25					
																02 NONE 0	STRGHT										
																PRVTE	W -E								000	013	00
																PSNGR CAR		01 DRVR	NONE	37	M	OR-Y		000	000		00
																						OR>25					
																03 NONE 0	STRGHT										
																PRVTE	E -W								022		00
																PSNGR CAR		01 DRVR	INJB	61	M	OR-Y		000	000		00
																						OR<25					
																03 NONE 0	STRGHT										
																PRVTE	E -W								022		00
																PSNGR CAR		02 PSNG	INJC	59	F			000	000		00
03612	N	N	N		N	N	10/16/2019	14	LANGENSAND RD	INTER	3-LEG	N	N	RAIN	ANGL-OTH	01 NONE 9	TURN-L										02
CITY							WE		MT HOOD HY	CN		STOP SIGN	N	WET	TURN	N/A	S -NW								015		00
N							2P			02	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
N							45 23 44.19	-122 15 .03	002600100S00													UNK					
																02 NONE 9	STRGHT										
																N/A	SE-NW								000		00
																PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
																						UNK					
04040	N	N	N				11/14/2019	14	LANGENSAND RD	INTER	3-LEG	N	N	CLR	ANGL-OTH	01 NONE 9	STRGHT										02
NONE							TH		MT HOOD HY	CN		STOP SIGN	N	DRY	TURN	N/A	E -W								000		00
N							8A			02	0		N	DAWN	PDO	SEMI TOW		01 DRVR	NONE	00	Unk	UNK		000	000		00
N							45 23 44.2	-122 15 .04	002600100S00													UNK					
																02 NONE 9	TURN-L										
																N/A	S -W								015		00
																PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
																						UNK					

CITY OF SANDY, CLACKAMAS COUNTY

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 4 of 27 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E A U I C O / D M R J S W / E L G N H R / D C S V L K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	SPCL USE / TRLR QTY / OWNER / V# TYPE	MOVE / FROM / TO	PRTC / P# TYPE	INJ / SVRTY	A / G / E	S / E / X	LICNS / RES	PED / LOC	ERROR	ACT EVENT	CAUSE
02296	N N N N N	07/06/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLR	S-1STOP	01 NONE 9	STRGHT									27,29,32
CITY		SA		EAGLE CRK-SANDY HY	N		NONE	N	DRY	REAR	N/A	NE-SW								000	00
N		11A			06	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 22.65	-122 15 48.74	017200100S00													UNK				
											02 NONE 9	STOP									
											N/A	NE-SW								011	00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK UNK		000	000	00
01165	N N N	03/10/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLR	O-1STOP	01 NONE 0	BACK									10
NONE		TH		EAGLE CRK-SANDY HY	E		STOP SIGN	N	DRY	BACK	PRVTE	W -E								000	00
N		6P			06	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	22	M	OR-Y		011	000	10
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25				
											02 NONE 0	STOP									
											PRVTE	E -W								012	00
											PSNGR CAR		01 DRVR	INJC	26	F	OR-Y OR<25		000	000	00
04008	N N N N N	11/02/2018	16	DUBARKO RD	INTER	CROSS	N	N	CLD	PED	01 NONE 0	STRGHT									02
CITY		FR		EAGLE CRK-SANDY HY	E		STOP SIGN	N	WET	PED	PRVTE	E -W								000	00
N		7P			06	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	NONE	74	M	OR-Y		029	000	02
N		45 23 22.54	-122 15 48.5	017200100S00													OR<25				
												- STRGHT N S	01 PED	INJC	36	M		I XWK?	000	034	00
03026	N N N	07/27/2015	16	DUBARKO RD	INTER	CROSS	N	N	CLR	S-1STOP	01 NONE 0	STRGHT									07,29
CITY		MO		EAGLE CRK-SANDY HY	SW		NONE	N	DRY	REAR	PRVTE	SW-NE								000	00
N		8P			06	0		N	DUSK	INJ	PSNGR CAR		01 DRVR	INJC	19	M	OR-Y		043,026	000	07,29
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25				
											02 NONE 0	STOP									
											PRVTE	SW-NE								012	00
											PSNGR CAR		01 DRVR	INJC	36	M	OR-Y OR<25		000	000	00
01095	N N N N N	03/04/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLD	S-1STOP	01 NONE 0	STRGHT									27,07,32
CITY		FR		EAGLE CRK-SANDY HY	SW		STOP SIGN	N	DRY	SS-O	PRVTE	NE-SW								000	00
N		4P			06	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	30	M	OR-Y		016,043,052	010	27,07,32
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25				
											01 NONE 0	STRGHT									
											PRVTE	NE-SW								000	00
											PSNGR CAR		02 PSNG	NO<5	01	F			000	000	00

CITY OF SANDY, CLACKAMAS COUNTY

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

5 - 8 of 27 Crash records shown.

SER# INVEST RD DPT UNLOC?	S D M P R J S W E A U I C O E L G N H R D C S V L K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	SPCL USE TRLR QTY OWNER V# TYPE	MOVE FROM TO	PRTC P# TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
											02 NONE 0	STOP									
											PRVTE	NE-SW								012	00
											PSNGR CAR		01 DRVR	NONE	18	F	OR-Y		000	000	00
																	OR<25				
											03 NONE 0	STRGHT									
											PRVTE	SW-NE								000	00
											PSNGR CAR		01 DRVR	INJB	26	M	OR-Y		000	000	00
																	OR<25				
00763	N N N N N	02/17/2016	16	DUBARKO RD	INTER	CROSS	N	N	RAIN	S-1STOP	01 NONE 9	STRGHT									07
CITY		WE		EAGLE CRK-SANDY HY	SW		NONE	N	WET	REAR	N/A	S -N								000	00
N		5P			06	0		N	DLIT	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 22.76	-122 15	017200100S00													UNK				
			48.39																		
											02 NONE 9	STOP									
											N/A	S -N								012	00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
																	UNK				
01324	N N N N N	04/19/2018	16	DUBARKO RD	INTER	CROSS	N	N	CLR	S-1STOP	01 NONE 0	STRGHT									29
CITY		TH		EAGLE CRK-SANDY HY	SW		UNKNOWN	N	DRY	REAR	PRVTE	SW-NE								000	00
N		6P			06	0		N	DAY	INJ	PSNGR CAR		01 DRVR	NONE	19	M	OR-Y		026	000	29
N		45 23 22.55	-122 15	017200100S00													OR<25				
			48.5																		
											02 NONE 0	STOP									
											PRVTE	SW-NE								012	00
											PSNGR CAR		01 DRVR	INJC	21	F	OR-Y		000	000	00
																	OR<25				
											02 NONE 0	STOP									
											PRVTE	SW-NE								012	00
											PSNGR CAR		02 PSNG	INJC	18	M			000	000	00
04952	N N N N N	11/22/2015	16	DUBARKO RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01 NONE 0	TURN-L									03
CITY		SU		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	TURN	PRVTE	W -NE								000	00
N		4P			03	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJB	53	F	OTH-Y		021	000	03
N		45 23 22.76	-122 15	017200100S00													OR<25				
			48.39																		
											02 NONE 0	STRGHT									
											PRVTE	NE-SW								000	00
											PSNGR CAR		01 DRVR	NONE	19	F	OR-Y		000	000	00
																	OR>25				
											03 NONE 0	STRGHT									
											PRVTE	SW-NE								000	00
											PSNGR CAR		01 DRVR	NONE	41	M	OR-Y		000	000	00
																	OR<25				

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

SER# / INVEST / RD DPT / UNLOC?	S D M / P R J S W / E A U I C O / E L G N H R / D C S V L K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	SPCL USE / TRLR QTY / OWNER / V# TYPE	MOVE / FROM / TO	PRTC / P# TYPE	INJ / SVRTY	A / G / E	S / E / X	LICNS / RES	PED / LOC	ERROR	ACT EVENT	CAUSE
05614	N N N N N	12/25/2015	16	DUBARKO RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01 NONE 0	STRGHT									02
CITY		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	WET	ANGL	PRVTE	N -S								000	00
N		6P			01	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	NONE	58	M	OR-Y		000	000	00
N		45 23 22.76	-122 15 48.39	017200100S00													OR>25				
											02 NONE 0	STRGHT									
											PRVTE	E -W								015	00
											PSNGR CAR		01 DRVR	INJC	53	M	OR-Y		028	000	02
																	OR<25				
02172	N N N	06/05/2015	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT									02
NONE		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	TURN	PRVTE	W -E								015	00
N		7A			04	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	24	M	OR-Y		028	000	02
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25				
											02 NONE 0	TURN-L									
											PRVTE	SW-W								000	00
											PSNGR CAR		01 DRVR	NONE	29	M	OR-Y		000	000	00
																	OR<25				
03589	N N N N N	08/05/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT									02
CITY		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	E -W								015	00
N		6P			01	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJC	77	M	OTH-Y		028	000	02
N		45 23 22.76	-122 15 48.39	017200100S00													N-RES				
											02 NONE 0	STRGHT									
											PRVTE	N -S								000	00
											PSNGR CAR		01 DRVR	NONE	40	M	OR-Y		000	000	00
																	OR<25				
03967	N N N N N	08/30/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT									02
CITY		TU		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	W -E								015	00
N		12P			04	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJC	61	F	OTH-Y		028	000	02
N		45 23 22.76	-122 15 48.39	017200100S00													N-RES				
											01 NONE 0	STRGHT									
											PRVTE	W -E								015	00
											PSNGR CAR		02 PSNG	INJC	06	F			000	000	00
											02 NONE 0	STRGHT									
											PRVTE	S -N								000	00
											PSNGR CAR		01 DRVR	INJB	53	F	OR-Y		000	000	00
																	OR<25				
02427	N N N	05/31/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 9	STRGHT									03,32
CITY		TU		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	UNK	ANGL	N/A	W -E								000	00
N		11A			03	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000	00
N		45 23 22.76	-122 15 48.39	017200100S00													UNK				

SER# / INVEST / RD DPT / UNLOC?	S / D M / P R J S W / E A U I C O / E L G N H R / D C S V L K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	SPCL USE / TRLR QTY / OWNER / V# TYPE	MOVE / FROM / TO	PRTC / P# TYPE	INJ / SVRTY	A / G / E	S / E / X	LICNS / RES	PED / LOC	ERROR	ACT	EVENT	CAUSE
											02 NONE 9	STRGHT										
											N/A	N -S								000		00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
																	UNK					
02031	N N N N N	05/06/2016	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 9	STRGHT										02
CITY		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	N/A	N -S								000		00
N		4P			01	0		N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
N		45 23 22.76	-122 15 48.39	017200100S00													UNK					
											02 NONE 9	STRGHT										
											N/A	E -W								000		00
											PSNGR CAR		01 DRVR	NONE	00	Unk	UNK		000	000		00
																	UNK					
00805	N N N N N	03/01/2017	16	DUBARKO RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01 NONE 0	STRGHT									082,013	02
CITY		WE		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	W -E								015		00
N		3P			04	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJC	17	F	OR-Y		028	000	082	02
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25					
											02 NONE 0	STRGHT										
											PRVTE	S -N								000	013	00
											PSNGR CAR		01 DRVR	INJC	43	M	OR-Y		000	000		00
																	OR<25					
											03 NONE 0	STOP										
											PRVTE	E -W								022		00
											PSNGR CAR		01 DRVR	INJB	27	F	OR-Y		000	000		00
																	OR<25					
00846	N N N N N	03/04/2017	16	DUBARKO RD	INTER	CROSS	N	N	RAIN	ANGL-OTH	01 NONE 0	STRGHT										02
CITY		SA		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	WET	ANGL	PRVTE	W -E								015		00
N		6P			04	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	NONE	21	M	OR-Y		028	000		02
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25					
											02 NONE 0	STRGHT										
											PRVTE	N -S								000		00
											PSNGR CAR		01 DRVR	INJC	21	F	OR-Y		000	000		00
																	OR<25					
02225	N N N	06/07/2017	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT										02
CITY		WE		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	S -N								000		00
N		4P			04	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJB	40	M	OR-Y		000	000		00
N		45 23 22.76	-122 15 48.39	017200100S00													OR<25					
											02 NONE 0	STRGHT										
											PRVTE	W -E								015		00
											PSNGR CAR		01 DRVR	INJC	38	M	OR-Y		028	000		02
																	OR<25					

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

18 - 21 of 27 Crash records shown.

SER# INVEST RD DPT UNLOC?	S D M / P R J S W / E A U I C O / E L G N H R / D C S V L K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
02958	N N N N N	07/21/2017	16	DUBARKO RD	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE 0	TURN-L											02
CITY		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	TURN		PRVTE	S -W									000		00
N		8P			01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	28	M	OR-Y		028	000		02
N		45 23 22.76	-122 15	017200100S00															OR<25					
			48.39																					
											02	NONE 0	STRGHT											
												PRVTE	N -S									000		00
												PSNGR CAR		01	DRVR	INJB	29	F	OR-Y		000	000		00
																			OR<25					
00647	N N N N N	02/18/2017	16	DUBARKO RD	INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 9	STRGHT											03
CITY		SA		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	WET	ANGL		N/A	W -E									000		00
N		7P			03	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00
N		45 23 22.76	-122 15	017200100S00															UNK					
			48.39																					
											02	NONE 9	STRGHT											
												N/A	N -S									000		00
												PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00
																			UNK					
03467	N N N N N	08/23/2017	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 9	STRGHT											02
CITY		WE		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL		N/A	NE-SW									000		00
N		8A			01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00
N		45 23 22.76	-122 15	017200100S00															UNK					
			48.39																					
											02	NONE 9	STRGHT											
												N/A	E -W									015		00
												PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00
																			UNK					
03265	N N N	09/14/2018	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L										082	02
CITY		FR		EAGLE CRK-SANDY HY	CN		FLASHBCN-R	N	DRY	TURN		PRVTE	W -N									015		00
N		9P			03	0		N	DARK	INJ		PSNGR CAR		01	DRVR	NONE	38	M	OR-Y		028	000	082	02
N		45 23 22.52	-122 15	017200100S00															OR<25					
			48.53																					
											01	NONE 0	TURN-L											
												PRVTE	W -N									015		00
												PSNGR CAR		01	PSNG	INJC	35	F			000	000		00
											01	NONE 0	TURN-L											
												PRVTE	W -N									015		00
												PSNGR CAR		02	PSNG	NONE	02	F			000	000		00
											02	NONE 0	STRGHT											
												PRVTE	N -S									000		00
												PSNGR CAR		01	DRVR	NONE	62	M	OR-Y		000	000		00
																			OR<25					

CITY OF SANDY, CLACKAMAS COUNTY

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

	S D M																					
SER#	P R J S W	DATE	CLASS	CITY STREET		INT-TYPE					SPCL USE											
INVEST	E A U I C O	DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE			A	S						
RD DPT	E L G N H R	TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED				
UNLOC?	D C S V L K	LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V# TYPE	TO	P# TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE
03281	N N N N N	09/23/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT										02
CITY		MO		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	NE-SW								000		00
N		7A			02	0		N	DAWN	INJ	PSNGR CAR		01 DRVR	NONE	31	M	OR-Y		000	000		00
N		45 23 22.59	-122 15	017200100S00													OR<25					
			48.49																			
											02 NONE 0	STRGHT										
											PRVTE	E -W								015		00
											PSNGR CAR		01 DRVR	INJC	17	F	OR-Y		028	000		02
																	OR<25					
											02 NONE 0	STRGHT										
											PRVTE	E -W								015		00
											PSNGR CAR		02 PSNG	INJA	12	F			000	000		00
00075	N N N N N	01/08/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT									013	27,02
CITY		TU		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	N -S								000		00
N		4P			03	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	INJB	52	M	OR-Y		000	000		00
N		45 23 22.54	-122 15	017200100S00													OR<25					
			48.5																			
											02 NONE 0	STRGHT										
											PRVTE	E -W								015	013	00
											PSNGR CAR		01 DRVR	INJC	16	F	OR-Y		028	000		27,02
																	OR<25					
											03 NONE 0	STOP										
											PRVTE	W -E								022		00
											PSNGR CAR		01 DRVR	NONE	21	M	OR-Y		000	000		00
																	OR<25					
00908	N N N	03/14/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT										02
NO RPT		TH		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	S -N								000		00
N		2P			04	0		N	DAY	INJ	SEMI TOW		01 DRVR	INJC	58	M	OR-Y		000	000		00
N		45 23 22.76	-122 15	017200100S00													OR<25					
			48.39																			
											02 NONE 0	STRGHT										
											PRVTE	W -E								015		00
											PSNGR CAR		01 DRVR	INJB	19	M	OR-Y		028	000		02
																	OR<25					
											02 NONE 0	STRGHT										
											PRVTE	W -E								015		00
											PSNGR CAR		02 PSNG	INJB	18	F			000	000		00
01291	N N N N N	04/22/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01 NONE 0	STRGHT										02
CITY		MO		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	S -N								000		00
N		5P			04	0		N	DAY	INJ	PSNGR CAR		01 DRVR	INJB	36	M	OR-Y		000	000		00
N		45 23 22.54	-122 15	017200100S00													OR<25					
			48.5																			

CITY OF SANDY, CLACKAMAS COUNTY

DUBARKO RD at EAGLE CRK-SANDY HY, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

SER# INVEST RD DPT UNLOC?	S P E D / D A L C / M R U G S / J I N V / S C H L / W O R K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	SPCL USE TRLR QTY OWNER V# TYPE	MOVE FROM TO	PRTC P# TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
											02 NONE 0	STRGHT									
											PRVTE	W -E								015	00
											PSNGR CAR		01 DRVR	NONE	37	M	OR-Y		028	000	02
																	OR<25				
03399	N N N N N	10/03/2019	16	DUBARKO RD	INTER	CROSS	N	N	RAIN	ANGL-OTH	01 NONE	STRGHT									02
CITY		TH		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	WET	ANGL	PRVTE	N -S								000	00
N		7P			03	2		N	DLIT	INJ	PSNGR CAR		01 DRVR	INJB	48	F	OR-Y		000	000	00
N		45 23 22.78	-122 15 48.4	017200100S00													OR<25				
											02 NONE	STRGHT									
											PRVTE	W -E								015	00
											PSNGR CAR		01 DRVR	NONE	19	M	OTH-Y		028	000	02
																	N-RES				
04270	N N N	11/29/2019	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01 NONE 0	STRGHT									02
CITY		FR		EAGLE CRK-SANDY HY	CN		STOP SIGN	N	DRY	ANGL	PRVTE	N -S								000	00
N		5P			01	0		N	DLIT	INJ	PSNGR CAR		01 DRVR	NONE	49	F	OR-Y		000	000	00
N		45 23 22.55	-122 15 48.51	017200100S00													OR<25				
											02 NONE 0	STRGHT									
											PRVTE	E -W								015	00
											PSNGR CAR		01 DRVR	INJC	59	F	OR-Y		028	000	02
																	OR<25				

URBAN NON-SYSTEM CRASH LISTING

CITY OF SANDY, CLACKAMAS COUNTY

LANGENSAND RD at DUBARKO RD, City of Sandy, Clackamas County, 01/01/2015 to 12/31/2019

1 - 1 of 1 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	SPEED / DAU / LCS	DRUGS / RJ / SH / VL	SWOR / W D / K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
03066	N	N N		06/09/2015	16	DUBARKO RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										083	02
NONE				TU	0	LANGENSAND RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE	N -S									000		00
N				12P			03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	23	M	OR-Y OR<25		000	000		00
N				45 23 23.89	-122 14 59.94																					
													02	NONE 0	STRGHT											
														PRVTE	W -E									015		00
														PSNGR CAR		01	DRVR	NONE	16	F	OR-Y OR<25		028	000	083	02

Preliminary Traffic Signal Warrant Analysis

Project Name: Deer Meadows Development
Intersection: Highway 26 at Langensand Road
Scenario: 2023 Background Plus Site Trips

Number of Major Street Lanes:	2	PM Peak Hour Volume	2485	(sum of both approaches)
Number of Minor Street Lanes	1	PM Peak Hour Volume	40	(highest-volume approach)[a]
Posted or 85th percentile speed > 40 mph:	Yes			
Isolated Population Less than 10,000:	No			

Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant Anaylsis Calculations	8th Highest Hour[b]	Minimum Volume	Warrant Satisfied?
Condition A - Minimum Vehicular Volume			
Major Street Volume	1404	420	
Minor Street Volume	23	105	**No**
Condition B - Interruption of Continuous Traffic			
Major Street Volume	1404	630	
Minor Street Volume	23	53	**No**
Combination Warrant[c]			
Major Street Volume	1404	504	
Minor Street Volume	23	84	**No**

[a] Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
[b] Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
[c] This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

Preliminary Traffic Signal Warrant Analysis

Project Name: Deer Meadows Development
Intersection: Highway 211 at Dubarko Road
Scenario: 2023 Background Plus Site Trips

Number of Major Street Lanes:	1	PM Peak Hour Volume	837	(sum of both approaches)
Number of Minor Street Lanes	1	PM Peak Hour Volume	87	(highest-volume approach)[a]
Posted or 85th percentile speed > 40 mph:	Yes			
Isolated Population Less than 10,000:	No			

Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant Anaylsis Calculations	8th Highest Hour[b]	Minimum Volume	Warrant Satisfied?
Condition A - Minimum Vehicular Volume			
Major Street Volume	473	350	
Minor Street Volume	49	105	**No**
Condition B - Interruption of Continuous Traffic			
Major Street Volume	473	525	
Minor Street Volume	49	53	**No**
Combination Warrant[c]			
Major Street Volume	473	420	
Minor Street Volume	49	84	**No**

[a] Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
[b] Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
[c] This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

Preliminary Traffic Signal Warrant Analysis

Project Name: Deer Meadows Development
Intersection: Dubarko Road at Langensand Road
Scenario: 2023 Background Plus Site Trips

Number of Major Street Lanes: 1 PM Peak Hour Volume 159 (sum of both approaches)
Number of Minor Street Lanes 1 PM Peak Hour Volume 68 (highest-volume approach)[a]
Posted or 85th percentile speed > 40 mph: No
Isolated Population Less than 10,000: No

Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on minor street (total of both approaches)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant Anaylsis Calculations	8th Highest Hour[b]	Minimum Volume	Warrant Satisfied?
Condition A - Minimum Vehicular Volume			
Major Street Volume	90	500	
Minor Street Volume	38	150	**No**
Condition B - Interruption of Continuous Traffic			
Major Street Volume	90	750	
Minor Street Volume	38	75	**No**
Combination Warrant[c]			
Major Street Volume	90	600	
Minor Street Volume	38	120	**No**

[a] Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
[b] Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
[c] This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

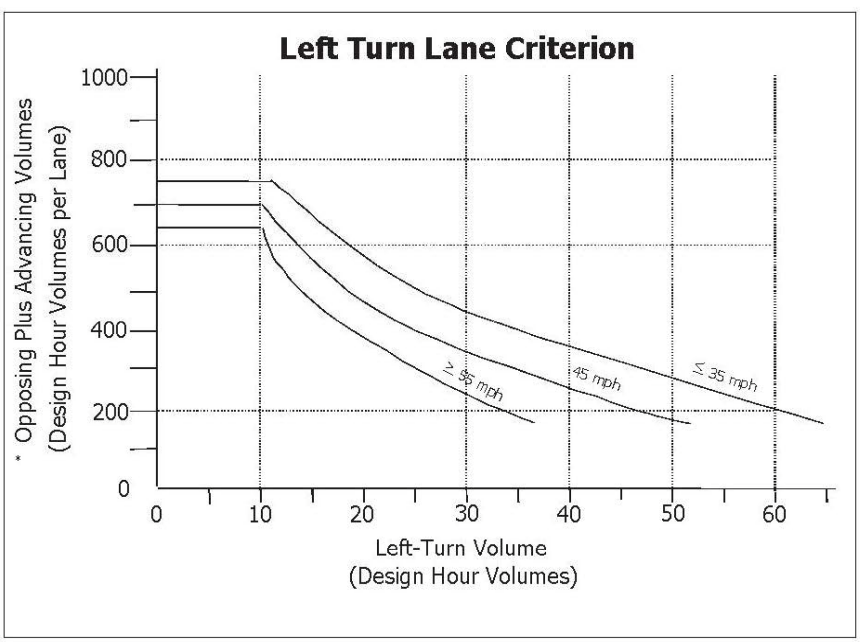
Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name:	Deer Meadows Development
Approach:	Highway 211 NB at Dubarko Road
Scenario:	2021 Existing Conditions

Number of Advancing Lanes:	1	
Number of Opposing Lanes:	1	
Major-Street Design Speed:	45	mph

	AM Volume	PM Volume
Advancing Volume for Design Hour:	341	386
Opposing Volume for Design Hour:	271	337
Design Hour Volume Per Lane:	612	723
Number of Left Turns per Hour:	44	61
Left-turn lane warrants satisfied?	**YES**	**YES**

Exhibit 7-1 Left Turn Lane Criterion (TTI)



*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Deer Meadows Development
Approach: Highway 211 Northbound at Dubarko Road
Scenario: 2021 Existing Conditions

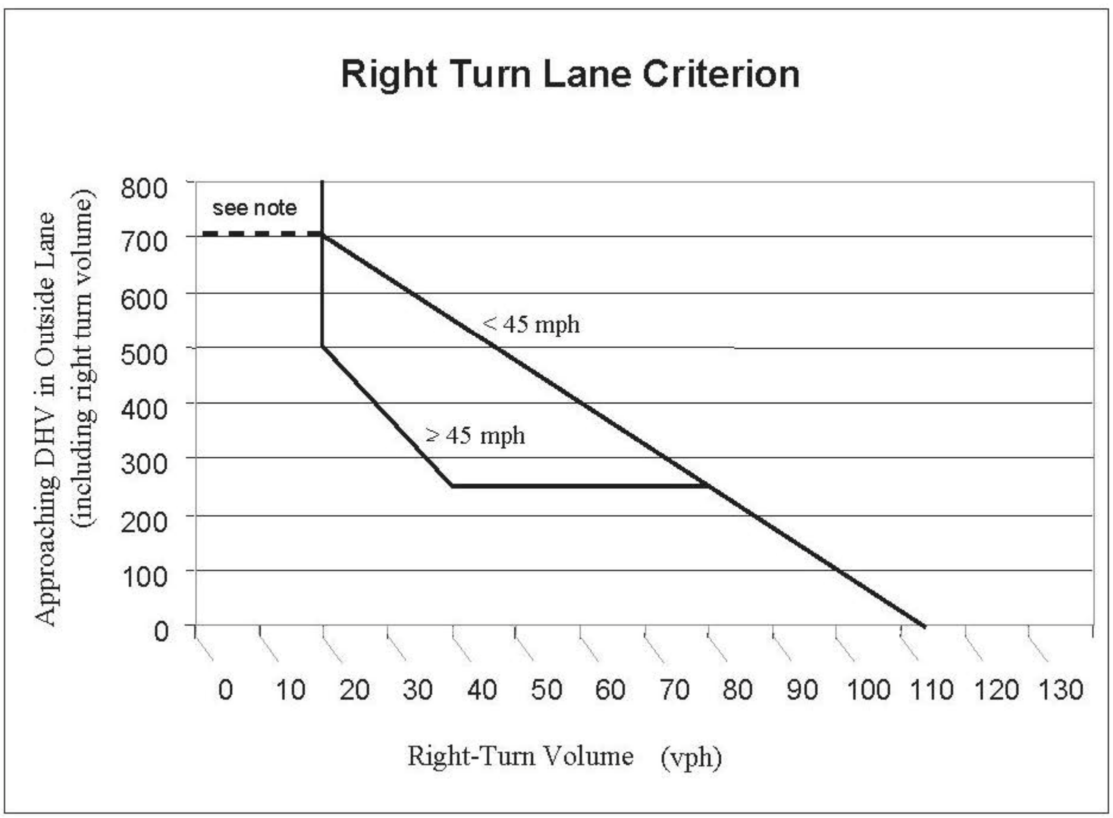
Major-Street Design Speed: 45 mph

	AM Volume	PM Volume
Number of Right Turns per Hour:	14	54
Approaching DVH in Outside Lane:	341	386
Calculated Turn Volume Threshold:	33	29
Right Turn Volume Exceeds Threshold?	**NO**	**YES**

Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

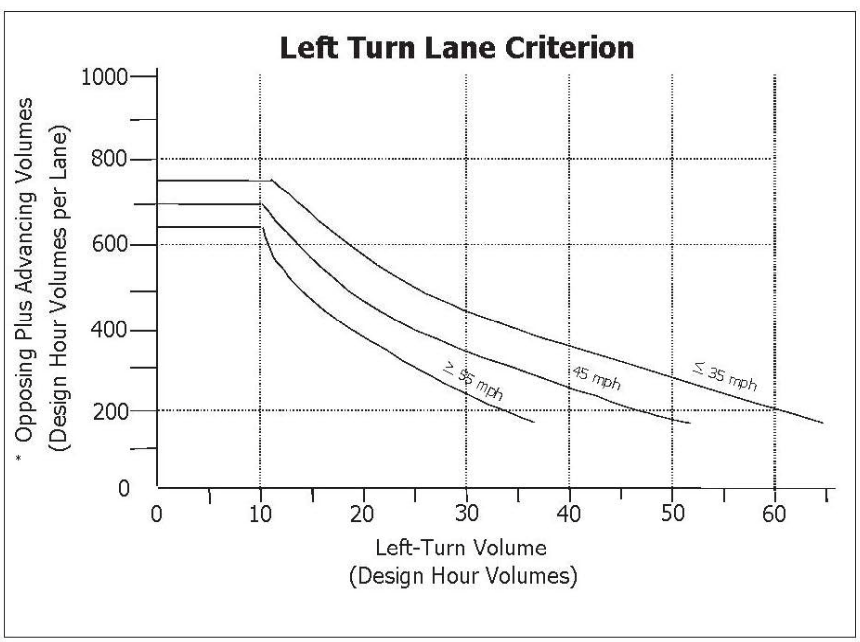
Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Deer Meadows Development
Approach: Dubarko Road westbound at Langensand Road
Scenario: 2023 Background plus Site Trips

Number of Advancing Lanes: 1
Number of Opposing Lanes: 1
Major-Street Design Speed: 25 mph

	AM Volume	PM Volume
Advancing Volume for Design Hour:	101	54
Opposing Volume for Design Hour:	34	69
Design Hour Volume Per Lane:	135	123
Number of Left Turns per Hour:	1	2
Left-turn lane warrants satisfied?	**NO**	**NO**

Exhibit 7-1 Left Turn Lane Criterion (TTI)



*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Deer Meadows Development
Approach: Dubarko Road Westbound at Langensand Road
Scenario: 2023 Background Plus Site Trips

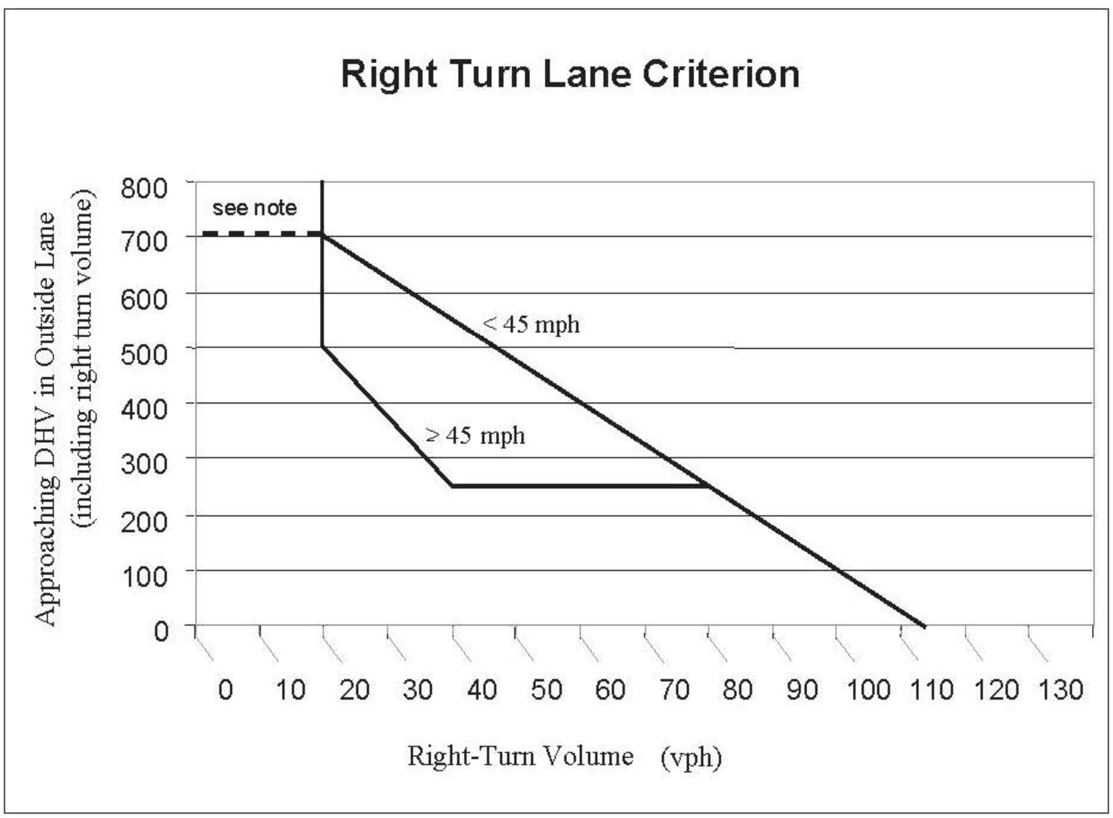
Major-Street Design Speed: 25 mph

	AM Volume	PM Volume
Number of Right Turns per Hour:	62	30
Approaching DVH in Outside Lane:	101	54
Calculated Turn Volume Threshold:	100	106
Right Turn Volume Exceeds Threshold?	**NO**	**NO**

Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Exhibit F
Arborist Report

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TERAGAN & ASSOCIATES, INC.
ARBORICULTURAL CONSULTANTS

MEMORANDUM

DATE: April 23, 2021

TO: Alex Reverman (Roll Tide Corporation)

FROM: Todd Prager, RCA #597, ISA Board Certified Master Arborist

RE: Tree Plan for the Deer Meadows Subdivision

Summary

This report includes tree removal, preservation, and protection recommendations for the proposed Deer Meadows Subdivision in Sandy, Oregon.

Background

Roll Tide Corporation is proposing to construct a 30-lot subdivision at the east end of Dubarko Road in Sandy, Oregon. An existing conditions map of the site and trees is provided in Attachment 1. The schematic site plan with the proposed tree retention area is provided in Attachment 2. A detail of the grove of trees to be retained along Highway 26 is provided in Attachment 3.

The assignment requested of our firm for this project was to:

- Assess the existing grove of trees along Highway 26;
- Identify the trees to be removed and retained in the grove; and
- Provide tree protection recommendations for the trees to be retained in the grove.

Tree Assessment

On September 12 and December 11, 2019 I completed the inventory of existing trees in the grove.

The complete inventory data for each tree is provided in Attachment 4 and includes the tree number, common name, scientific name, trunk diameter (DBH), crown radius, health condition, structural condition, pertinent comments, and whether it is an onsite 11-inch DBH or greater tree in good condition to be retained.[1]

[1] Section 17.102.50 of the City of Sandy Code requires three onsite trees over 11-inch DBH that are in good condition to be retained.

The tree numbers in the inventory in Attachment 4 correspond to the tree numbers on the plans in Attachments 1 and 3.

Note that since the site is 15.91 acres, Section 17.102.50 requires 48 trees over 11-inch DBH that are in good condition to be retained. My assignment was to identify at least 48 trees in the grove that meet these criteria.

Tree Removal and Retention

This section of the report includes tree removal and retention recommendations based on the proposed site plan.

Tree Removal

The standard tree protection requirements in the City of Sandy Code range from at least 10 feet from the trunks of retained trees (SDC 17.102.50.B.1) to five feet beyond the driplines (SDC 17.92.10.D) unless otherwise approved by the Planning Director.

A typical alternative minimum protection zone allows encroachments no closer than a radius from a tree of .5 feet per inch of DBH if no more than 25 percent of the critical root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept.

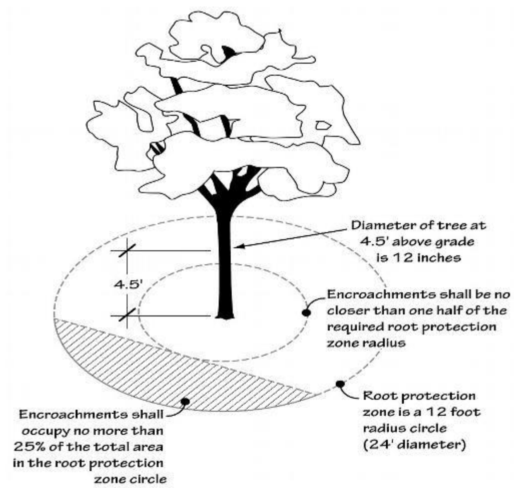


Figure 1: Alterative minimum protection zone

Using the criteria described above, while considering the tree locations relative to construction and other site improvements, 20 of the assessed trees are proposed for removal.

Tree Retention

Fifty-four (54) trees within the grove will be retained. Of the 54 trees to be retained, 48 are in good condition and over 11-inch DBH. Tree preservation has been maximized to the extent practicable with trees removed only as necessary for construction.

Section 17.102.50.A of the City of Sandy Code includes five criteria for tree retention with development. The five criteria followed by my findings in *italics* are listed below:

1. At least three trees 11 inches DBH or greater are to be retained for every one-acre of contiguous ownership.

Finding: The site is 15.91 acres in size so 48 trees over 11-inch DBH in good condition are required to be retained. The proposed preservation includes 48 trees over 11-inch DBH in good condition within the grove along Highway 26 to be retained. This criterion is met.

2. Retained trees can be located anywhere on the site at the landowner's discretion before the harvest begins. Clusters of trees are encouraged.

Finding: The retained trees are clustered within the grove of trees along Highway 26. This criterion is met.

3. Trees proposed for retention shall be healthy and likely to grow to maturity, and be located to minimize the potential for blow-down following the harvest.

Finding: All of the trees subject to this standard are in good health condition and likely to grow to maturity. Future selective thinning of the grove is recommended to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

Trees along portions of the southwest, east, and north sides of the grove are proposed for removal for construction. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high wind events to ensure they do not pose a high risk. Since the bulk of the grove will be retained, I anticipate that the overall grove will remain viable. However, selective thinning of trees within the grove should be delayed until the changes in wind dynamics from edge tree removal is more thoroughly assessed. Retaining more of the interior trees will help to protect the overall integrity of grove from blow-down during the near term. It will also be very important to protect the root zones of the trees in the grove from construction impacts with tree protection fencing and other measures to further minimize the risk of blow-down. Tree protection measures are further described in the next section of this report.

Since the bulk of the grove will be retained and measures to monitor and protect the trees in the grove will be implemented, this criterion is met.

4. If possible, at least two of the required trees per acre must be of conifer species.

Finding: All 48 trees over 11-inch DBH and in good condition are conifer species. This criterion is met.

5. Trees within the required protected setback areas may be counted towards the tree retention standard if they meet these requirements.

Finding: Any retained trees that are over 11-inch DBH and in good condition that are within protected setback areas will be counted towards the tree retention standards. This criterion is met.

Tree Protection Recommendations

The standard tree protection requirements in the City of Sandy Code range from at least 10 feet from the trunks of retained trees (SDC 17.102.50.B.1) to five feet beyond the driplines (SDC 17.92.10.D) unless otherwise approved by the Planning Director.

A typical alternative minimum protection zone allows encroachments no closer than a radius from a tree of .5 feet per inch of DBH if no more than 25 percent of the critical root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept.

The reason for using this alternative is because it allows the tree protection zone to better relate to the size of the tree and its root zone. For example, a 10-foot tree protection setback would not be adequate for a 36-inch DBH tree which should have a minimum setback of at least 18 feet. Also, driplines can be highly variable based on species growth habits and onsite conditions such as the presence of adjacent trees or past pruning.

The critical root zone radii of 1 foot per inch of DBH is shown for the trees to be retained on the plan sheet in Attachments 3. The trees to be retained can be adequately protected by placing tree protection fencing as shown in Attachment 3. The tree protection fencing will protect at least 75 percent of their critical roots zones and avoid any encroachments closer than a radius of .5 feet per inch of DBH to a tree to be retained. No grading, stockpiling, storage, disposal, or any other construction related activity shall occur in the tree protection zones unless specifically reviewed and approved by the project arborist.

The following additional protection measures shall apply to the trees at the site:

- *Tree Protection Fencing*: Establish tree protection fencing in the locations shown in Attachment 3. Required fencing shall be a minimum of six feet tall supported with metal posts placed no farther than ten feet apart installed flush with the initial undisturbed grade.
- *Directional Felling*: Fell the trees to be removed away from the trees to be retained so they do not contact or otherwise damage the trunks or branches of the trees to be retained. No vehicles or heavy equipment shall be permitted within the tree protection zones during tree removal operations.
- *Stump Removal*: The stumps of the trees to be removed from within the tree protection zones shall either be retained in place or stump ground to protect the root systems of the trees to be retained.
- *Protect Tree Crowns*: Care will need to be taken to not contact or otherwise damage the crowns of the trees that may extend into the construction area.
- *Monitoring of New Grove Edges*: Trees along portions of the southwest, east, and north sides of the grove are proposed for removal for construction. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high

wind events to ensure they do not pose a high risk. This monitoring should occur for the next two to three storm seasons following site clearing.

- *Selective Thinning of Grove Trees*: Selective thinning of the grove is recommended to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

  Any thinning of trees within the grove should be delayed until the changes in wind dynamics from edge tree removal is more thoroughly assessed. Retaining more of the interior trees will help to protect the overall integrity of the grove from blow-down during the near term. After, site adaptations of the trees are better understood in the following two to three storm seasons following disturbance, the project arborist may prescribe a selective thinning treatment.

Additional tree protection recommendations for the trees to be retained are provided in Attachment 5.

Conclusion

Forty-eight (48) trees over 11-inch DBH in good condition are proposed to be retained within the grove of trees along Highway 26. The required tree retention for the 15.91 acre site is 48 trees.

While the grove of trees will have areas of disturbance along the edges, I anticipate that the overall grove will remain viable. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high wind events to ensure they do not pose a high risk.

Once the grove is stabilized, I recommend selective thinning of trees to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

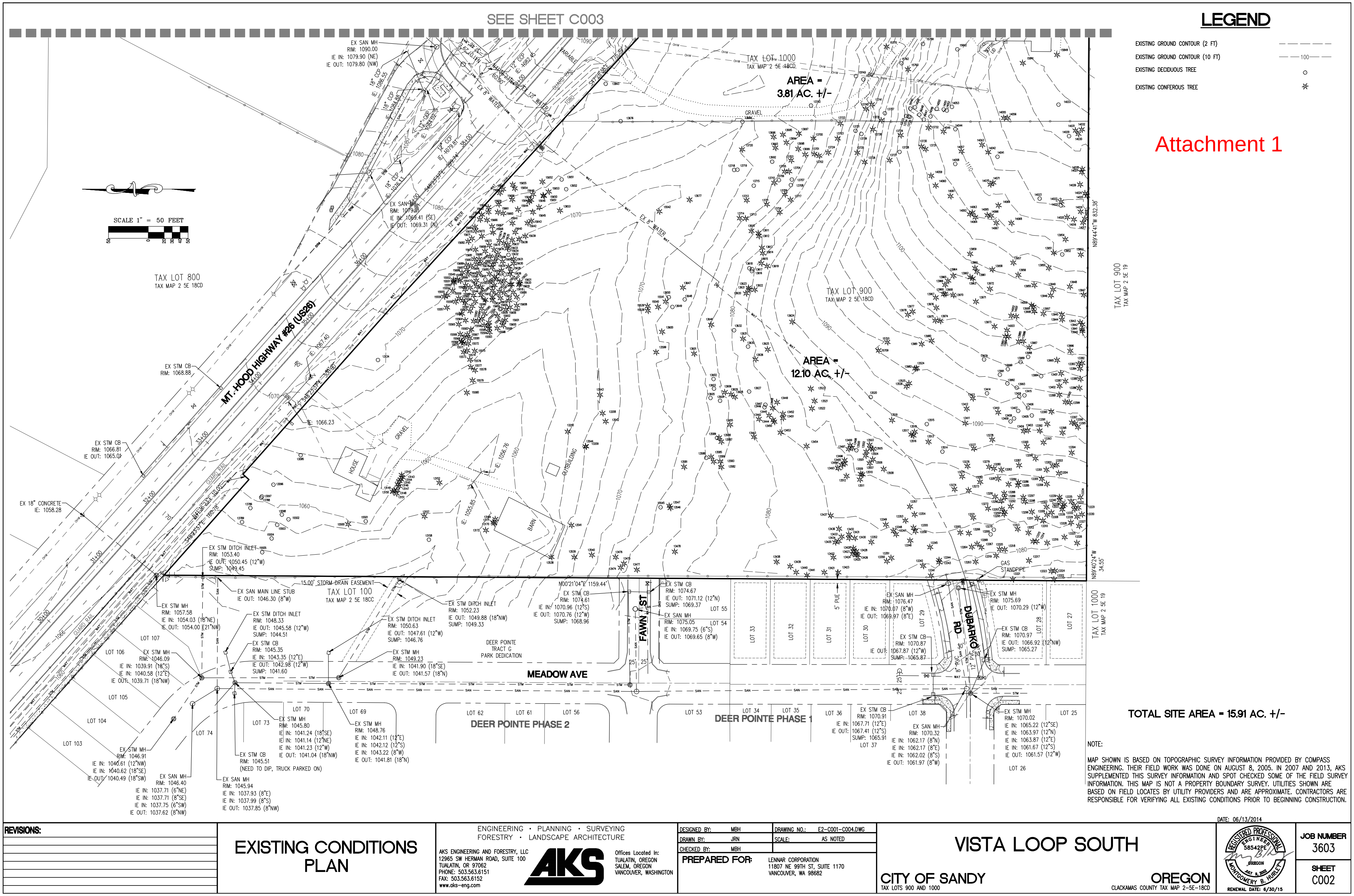
Please contact me if you have questions, concerns, or need any additional information.

Sincerely,

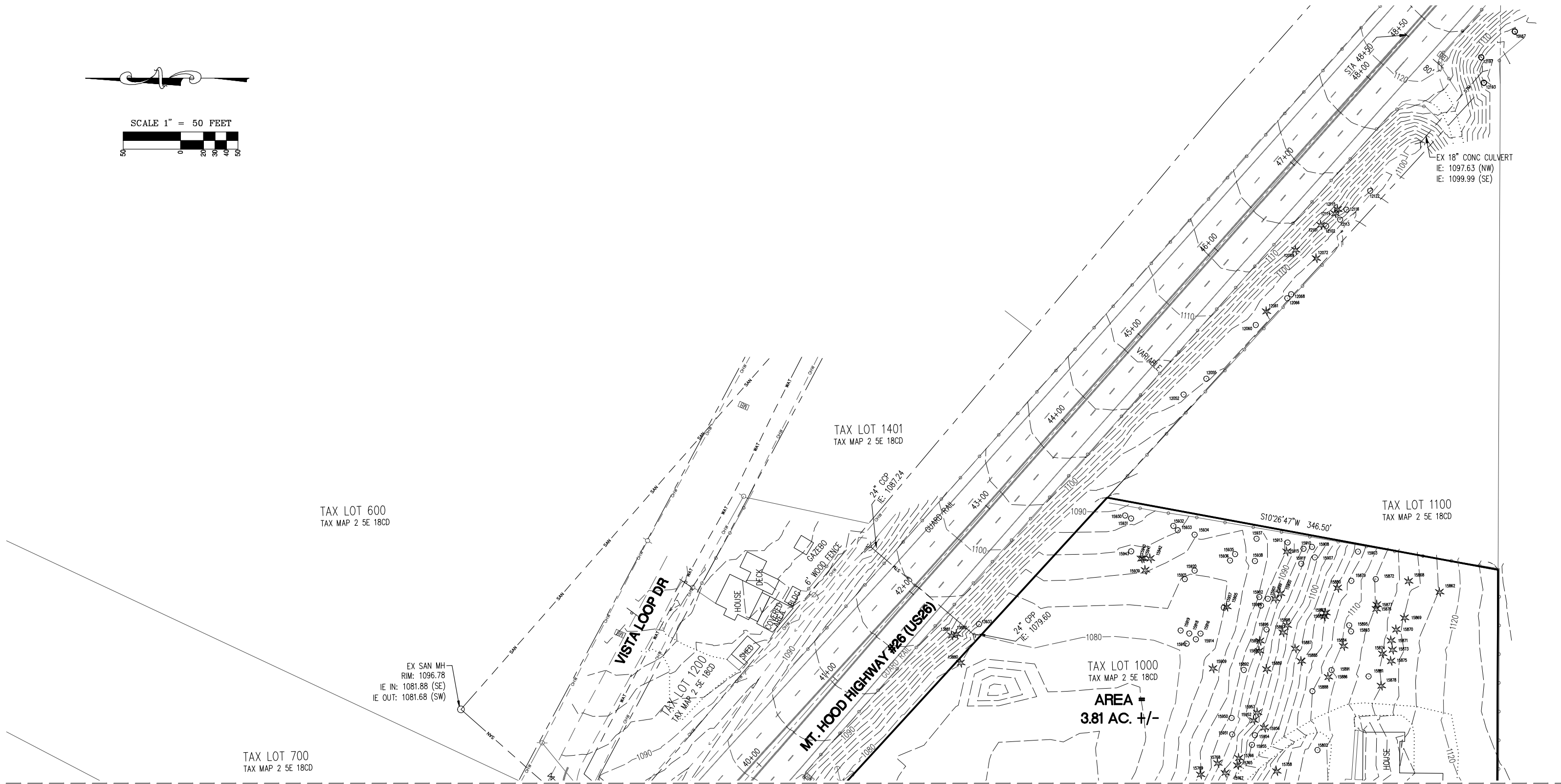
Todd Prager

Todd Prager
ASCA Registered Consulting Arborist #597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association

Attachments: Attachment 1 - Existing Site Conditions with Existing Trees
Attachment 2 - Conceptual Site Plan with Trees Retention Area
Attachment 3 - Grove Detail with Tree Protection
Attachment 4 - Tree Inventory
Attachment 5 - Tree Protection Recommendations
Attachment 6 - Assumptions and Limiting Conditions


SEE SHEET C003
LEGEND
EXISTING GROUND CONTOUR (2 FT)
EXISTING GROUND CONTOUR (10 FT)
EXISTING DECIDUOUS TREE
EXISTING CONIFEROUS TREE
Attachment 1
SCALE 1" = 50 FEET
TAX LOT 1000
TAX MAP 2 5E 18CD
AREA = 3.81 AC. +/-
TAX LOT 800
TAX MAP 2 5E 18CD
MT. HOOD HIGHWAY #26 (US26)
TAX LOT 900
TAX MAP 2 5E 18CD
AREA = 12.10 AC. +/-
TAX LOT 900
TAX MAP 2 5E 19
TAX LOT 1000
TAX MAP 2 5E 19
HOUSE
BARN
OUTBUILDING
GRAVEL
TAX LOT 100
TAX MAP 2 5E 18CC
15.00' STORM DRAIN EASEMENT
DEER POINTE TRACT G PARK DEDICATION
MEADOW AVE
FAWN ST
DUBARKO RD
DEER POINTE PHASE 2
DEER POINTE PHASE 1
TOTAL SITE AREA = 15.91 AC. +/-
NOTE:
MAP SHOWN IS BASED ON TOPOGRAPHIC SURVEY INFORMATION PROVIDED BY COMPASS ENGINEERING. THEIR FIELD WORK WAS DONE ON AUGUST 8, 2005. IN 2007 AND 2013, AKS SUPPLEMENTED THIS SURVEY INFORMATION AND SPOT CHECKED SOME OF THE FIELD SURVEY INFORMATION. THIS MAP IS NOT A PROPERTY BOUNDARY SURVEY. UTILITIES SHOWN ARE BASED ON FIELD LOCATES BY UTILITY PROVIDERS AND ARE APPROXIMATE. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
DATE: 06/13/2014
REVISIONS:
EXISTING CONDITIONS PLAN
ENGINEERING • PLANNING • SURVEYING
FORESTRY • LANDSCAPE ARCHITECTURE
AKS ENGINEERING AND FORESTRY, LLC
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
PHONE: 503.563.6151
FAX: 503.563.6152
www.aks-eng.com
AKS
Offices Located In: TUALATIN, OREGON SALEM, OREGON VANCOUVER, WASHINGTON
DESIGNED BY: MBH
DRAWN BY: JRN
CHECKED BY: MBH
DRAWING NO.: E2-C001-C004.DWG
SCALE: AS NOTED
PREPARED FOR: LENNAR CORPORATION 11807 NE 99TH ST, SUITE 1170 VANCOUVER, WA 98682
VISTA LOOP SOUTH
CITY OF SANDY
TAX LOTS 900 AND 1000
OREGON
CLACKAMAS COUNTY TAX MAP 2-5E-18CD
JOB NUMBER 3603
SHEET C002

Attachment 1



SEE SHEET C002

TOTAL SITE AREA = 15.91 AC. +/-

NOTE:

MAP SHOWN IS BASED ON TOPOGRAPHIC SURVEY INFORMATION PROVIDED BY COMPASS ENGINEERING. THEIR FIELD WORK WAS DONE ON AUGUST 8, 2005. IN 2007 AND 2013, AKS SUPPLEMENTED THIS SURVEY INFORMATION AND SPOT CHECKED SOME OF THE FIELD SURVEY INFORMATION. THIS MAP IS NOT A PROPERTY BOUNDARY SURVEY. UTILITIES SHOWN ARE BASED ON FIELD LOCATES BY UTILITY PROVIDERS AND ARE APPROXIMATE. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.

DATE: 06/13/2014

REVISIONS:

EXISTING CONDITIONS PLAN

ENGINEERING • PLANNING • SURVEYING
FORESTRY • LANDSCAPE ARCHITECTURE

AKS ENGINEERING AND FORESTRY, LLC
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Offices Located In:
TUALATIN, OREGON
SALEM, OREGON
VANCOUVER, WASHINGTON

DESIGNED BY:	MBH	DRAWING NO.:	E2-C001-C004.DWG
DRAWN BY:	JRN	SCALE:	AS NOTED
CHECKED BY:	MBH		

PREPARED FOR: LENNAR CORPORATION
11807 NE 99TH ST, SUITE 1170
VANCOUVER, WA 98682

VISTA LOOP SOUTH

CITY OF SANDY
TAX LOTS 900 AND 1000

OREGON
CLACKAMAS COUNTY TAX MAP 2-5E-18CD

REGISTERED PROFESSIONAL ENGINEER
58542PE
OREGON
JULY 9, 2002
MONTGOMERY B. HURLEY
RENEWAL DATE: 6/30/15

JOB NUMBER
3603

SHEET
C003

Attachment 1

TREE NUMBER	SPECIES	DBH (IN)
12052	MAPLE	17,18
12055	MAPLE	38
12060	MAPLE	29
12061	CEDAR	26
12066	UNKNOWN DECID.	5
12068	UNKNOWN DECID.	13
12069	DOUGLAS FIR	27
12072	CEDAR	17
12101	DOUGLAS FIR	19
12102	MAPLE	7
12113	MAPLE	14,21
12114	DOUGLAS FIR	22
12115	DOUGLAS FIR	25
12116	MAPLE	12
12122	MAPLE	7,8,15
12157	MAPLE	5,6
12193	UNKNOWN DECID.	12
12197	MAPLE	9
13095	BIG LEAF MAPLE	20
13096	PEAR	12
13097	PEAR	10
13098	FILBERT	8
13134	BIG LEAF MAPLE	52
13142	DOUGLAS FIR	19
13143	DOUGLAS FIR	10
13144	DOUGLAS FIR	36
13145	DOUGLAS FIR	12
13146	DOUGLAS FIR	21
13147	DOUGLAS FIR	13
13148	DOUGLAS FIR	21
13149	DOUGLAS FIR	15
13150	DOUGLAS FIR	19
13151	DOUGLAS FIR	23
13152	DOUGLAS FIR	35
13157	PINE	18
13158	APPLE	22
13169	DOUGLAS FIR	20
13170	DOUGLAS FIR	15
13171	CEDAR	20
13172	CEDAR	20,26
13208	DOUGLAS FIR	22
13209	DOUGLAS FIR	17
13210	DOUGLAS FIR	44
13253	CEDAR	24
13254	CEDAR	10
13255	CEDAR	15
13256	CEDAR	24
13257	DOUGLAS FIR	21
13258	DOUGLAS FIR	17
13259	ALDER	8
13270	ALDER	10
13271	CEDAR	12
13272	CEDAR	12
13273	CEDAR	19
13274	CEDAR	19
13275	DOUGLAS FIR	24
13276	CEDAR	11
13277	CEDAR	36
13278	CEDAR	48
13279	CEDAR	18
13280	DOUGLAS FIR	22
13281	DOUGLAS FIR	16
13282	DOUGLAS FIR	17
13283	CEDAR	32
13284	DOUGLAS FIR	15
13285	DOUGLAS FIR	20
13286	DOUGLAS FIR	20
13287	DOUGLAS FIR	17
13288	CEDAR	12
13289	CEDAR	12
13290	CEDAR	13
13291	CEDAR	40
13292	CEDAR	37
13293	CEDAR	9
13294	CEDAR	6
13295	CEDAR	13
13296	CEDAR	13
13297	CEDAR	13
13298	CEDAR	16
13299	CEDAR	57
13300	SPRUCE	12
13301	CEDAR	8
13302	CEDAR	8
13303	CEDAR	13
13304	DOUGLAS FIR	18
13305	DOUGLAS FIR	12
13306	CEDAR	17
13307	DOUGLAS FIR	27
13308	CEDAR	12
13309	CEDAR	8
13310	CEDAR	8
13311	CEDAR	31
13312	CEDAR	32
13313	CEDAR	13
13314	CEDAR	37
13315	DOUGLAS FIR	13
13316	DOUGLAS FIR	26
13317	DOUGLAS FIR	14
13318	DOUGLAS FIR	28
13319	DOUGLAS FIR	16
13320	CEDAR	13
13321	DOUGLAS FIR	15
13322	CEDAR	40
13323	CEDAR	30
13324	DOUGLAS FIR	16
13325	CEDAR	46
13326	DOUGLAS FIR	26
13327	DOUGLAS FIR	25
13328	CEDAR	11

TREE NUMBER	SPECIES	DBH (IN)
13329	CEDAR	16
13330	CEDAR	19
13331	CEDAR	12
13332	CEDAR	8
13333	DOUGLAS FIR	13
13334	CEDAR	10
13335	CEDAR	11
13336	CEDAR	10
13337	CEDAR	13
13338	CEDAR	11
13339	CEDAR	14
13340	DOUGLAS FIR	15
13341	DOUGLAS FIR	26
13342	DOUGLAS FIR	13
13343	DOUGLAS FIR	12
13344	DOUGLAS FIR	17
13345	DOUGLAS FIR	27
13346	DOUGLAS FIR	32
13347	DOUGLAS FIR	21
13348	DOUGLAS FIR	12
13349	DOUGLAS FIR	16
13350	DOUGLAS FIR	31
13351	DOUGLAS FIR	11
13352	DOUGLAS FIR	26
13353	DOUGLAS FIR	19
13354	DOUGLAS FIR	24
13355	DOUGLAS FIR	18
13356	DOUGLAS FIR	12
13357	DOUGLAS FIR	13
13382	DOUGLAS FIR	12
13383	DOUGLAS FIR	14
13384	DOUGLAS FIR	14
13385	DOUGLAS FIR	8
13386	DOUGLAS FIR	18
13387	DOUGLAS FIR	18
13388	DOUGLAS FIR	16
13390	DOUGLAS FIR	26
13391	DOUGLAS FIR	24
13392	DOUGLAS FIR	28
13393	DOUGLAS FIR	28
13394	DOUGLAS FIR	12
13395	DOUGLAS FIR	8
13396	DOUGLAS FIR	16
13397	DOUGLAS FIR	14
13398	DOUGLAS FIR	14
13399	DOUGLAS FIR	8
13400	DOUGLAS FIR	9
13401	CEDAR	19
13402	CEDAR	38
13403	CEDAR	12
13404	CEDAR	8
13405	ALDER	11
13406	ALDER	6
13407	ALDER	6
13408	ALDER	6
13409	ALDER	6
13410	DOUGLAS FIR	39
13411	CEDAR	26
13412	CEDAR	26
13413	DOUGLAS FIR	29
13414	ALDER	10
13415	ALDER	10
13416	ALDER	6
13421	DOUGLAS FIR	29
13422	DOUGLAS FIR	13
13423	DOUGLAS FIR	36
13424	DOUGLAS FIR	24
13425	DOUGLAS FIR	22
13426	DOUGLAS FIR	17
13427	DOUGLAS FIR	8
13428	DOUGLAS FIR	8
13429	DOUGLAS FIR	8
13430	DOUGLAS FIR	11
13431	DOUGLAS FIR	22
13432	DOUGLAS FIR	22
13433	DOUGLAS FIR	22
13434	CEDAR	14
13435	CEDAR	22
13436	DOUGLAS FIR	24
13437	DOUGLAS FIR	14
13438	DOUGLAS FIR	40
13439	DOUGLAS FIR	8
13440	DOUGLAS FIR	32
13441	DOUGLAS FIR	12
13442	CEDAR	52
13443	DOUGLAS FIR	29
13444	DOUGLAS FIR	17
13445	DOUGLAS FIR	8
13446	ALDER	6
13447	ALDER	8
13448	CEDAR	12
13449	DOUGLAS FIR	17
13450	CEDAR	9
13451	DOUGLAS FIR	29
13452	CEDAR	8
13453	DOUGLAS FIR	27
13454	DOUGLAS FIR	19
13455	DOUGLAS FIR	30
13474	DOUGLAS FIR	13
13475	DOUGLAS FIR	16
13476	DOUGLAS FIR	26
13477	DOUGLAS FIR	48
13478	DOUGLAS FIR	48
13493	DOUGLAS FIR	16
13494	DOUGLAS FIR	12
13495	BIG LEAF MAPLE	12
13496	DOUGLAS FIR	12
13497	DOUGLAS FIR	19
13498	DOUGLAS FIR	24

TREE NUMBER	SPECIES	DBH (IN)
13499	DOUGLAS FIR	15
13500	ALDER	9
13501	CEDAR	13
13502	DOUGLAS FIR	22
13503	CEDAR	9
13504	DOUGLAS FIR	13
13505	DOUGLAS FIR	10
13506	CEDAR	8
13507	CEDAR	16
13508	CEDAR	18
13509	CEDAR	17
13510	DOUGLAS FIR	10
13511	DOUGLAS FIR	20
13512	CEDAR	16
13513	CEDAR	27
13514	ALDER	14
13515	ALDER	8
13516	DOUGLAS FIR	22
13517	CEDAR	13
13518	CEDAR	25
13519	CEDAR	25
13520	ALDER	24
13521	DOUGLAS FIR	26
13522	DOUGLAS FIR	8
13523	DOUGLAS FIR	18
13524	DOUGLAS FIR	17
13525	CEDAR	9
13526	CEDAR	16
13538	CEDAR	27
13539	DOUGLAS FIR	31
13540	CEDAR	28,32
13541	CEDAR	17
13542	DOUGLAS FIR	15
13543	DOUGLAS FIR	25
13544	DOUGLAS FIR	18
13545	FRUIT	26
13546	DOUGLAS FIR	31
13547	DOUGLAS FIR	31
13581	DOUGLAS FIR	30
13582	DOUGLAS FIR	28
13583	DOUGLAS FIR	14
13584	DOUGLAS FIR	17
13585	DOUGLAS FIR	17
13586	HOLLY	10
13587	CEDAR	12
13588	CEDAR	12
13589	ALDER	12
13599	DOUGLAS FIR	14
13600	DOUGLAS FIR	25
13601	DOUGLAS FIR	25
13602	ALDER	15
13603	ALDER	13
13604	ALDER	12
13605	ALDER	12
13606	DOUGLAS FIR	23
13610	DOUGLAS FIR	17
13611	CEDAR	10
13612	CEDAR	10
13613	CEDAR	25
13614	CEDAR	25
13615	DOUGLAS FIR	29
13616	DOUGLAS FIR	19
13617	ALDER	6
13618	ALDER	6
13619	DOUGLAS FIR	14
13620	CEDAR	29
13621	DOUGLAS FIR	10
13622	DOUGLAS FIR	34
13623	DOUGLAS FIR	6
13624	DOUGLAS FIR	34
13625	DOUGLAS FIR	34
13626	DOUGLAS FIR	25
13627	ALDER	13
13628	DOUGLAS FIR	24
13629	DOUGLAS FIR	19
13630	HOLLY	8
13631	DOUGLAS FIR	30
13632	ALDER	11
13646	DOUGLAS FIR	32
13647	DOUGLAS FIR	32
13648	HOLLY	8
13649	HOLLY	9
13650	HOLLY	7
13651	ALDER	9
13652	HOLLY	10
13653	DOUGLAS FIR	6
13676	APPLE	17
13677	DOUGLAS FIR	20
13684	BIG LEAF MAPLE	12
13692	CHERRY	8
13693	CEDAR	40
13694	CEDAR	20
13695	DOUGLAS FIR	15
13696	DOUGLAS FIR	22
13697	CEDAR	16
13698	CEDAR	24
13699	CEDAR	16
13700	CEDAR	50
13701	CEDAR	14
13702	CEDAR	15
13703	CEDAR	17
13704	CEDAR	12
13705	CEDAR	15
13706	ALDER	14
13707	ALDER	6
13708	ALDER	6
13709	CEDAR	15
13710	CEDAR	24
13711	CEDAR	30

TREE NUMBER	SPECIES	DBH (IN)
13712	CEDAR	46
13713	CEDAR	25
13714	DOUGLAS FIR	17
13715	ALDER	24
13716	DOUGLAS FIR	36
13717	DOUGLAS FIR	12
13718	BIG LEAF MAPLE	42
13719	BIG LEAF MAPLE	6
13720	CEDAR	12
13721	BIG LEAF MAPLE	18
13722	DOUGLAS FIR	17
13723	CEDAR	15
13724	CEDAR	17
13725	DOUGLAS FIR	18
13726	DOUGLAS FIR	34
13727	DOUGLAS FIR	19
13728	FRUIT	36
13729	DOUGLAS FIR	36
13730	DOUGLAS FIR	22
13731	DOUGLAS FIR	34
13732	DOUGLAS FIR	22
13733	ALDER	13
13734	ALDER	14
13735	ALDER	10
13736	DOUGLAS FIR	15
13737	ALDER	12
13738	DOUGLAS FIR	12
13739	BIG LEAF MAPLE	20
13740	CEDAR	18
13741	DOUGLAS FIR	33
13742	BIG LEAF MAPLE	16
13743	ALDER	9
13744	ALDER	8
13736	PEAR	8
13738	PEAR	9
13739	PEAR	8
13843	BIG LEAF MAPLE	12
13880	DOUGLAS FIR	24,24
13881	DOUGLAS FIR	18
13882	DOUGLAS FIR	18,16
13933	BIG LEAF MAPLE	12,16
13940	DOUGLAS FIR	17
13941	DOUGLAS FIR	23
13942	DOUGLAS FIR	14
13943	DOUGLAS FIR	31
13944	DOUGLAS FIR	17
13945	DOUGLAS FIR	6
13946	DOUGLAS FIR	12
13947	DOUGLAS FIR	35
13948	DOUGLAS FIR	9
13949	DOUGLAS FIR	18
13950	DOUGLAS FIR	16
13951	DOUGLAS FIR	20
13952	BIG LEAF MAPLE	24
13953	DOUGLAS FIR	21
13954	DOUGLAS FIR	20
13955	DOUGLAS FIR	40
13956	DOUGLAS FIR	28
13957	DOUGLAS FIR	28
13958	DOUGLAS FIR	20
13959	DOUGLAS FIR	36
13960	CEDAR	6
13961	CEDAR	6
13962	DOUGLAS FIR	24
13963	DOUGLAS FIR	22
13964	DOUGLAS FIR	28
13965	DOUGLAS FIR	28
13966	DOUGLAS FIR	14
13967	DOUGLAS FIR	30
13968	DOUGLAS FIR	8
13969	DOUGLAS FIR	8
13970	DOUGLAS FIR	26
13971	DOUGLAS FIR	16
13972	DOUGLAS FIR	30
13973	DOUGLAS FIR	22
13974	DOUGLAS FIR	18
13975	DOUGLAS FIR	24
13976	CEDAR	10
13977	DOUGLAS FIR	30
13978	DOUGLAS FIR	24
13979	ALDER	12
13980	DOUGLAS FIR	24
13981	DOUGLAS FIR	18
13982	DOUGLAS FIR	18
13983	DOUGLAS FIR	24
13984	DOUGLAS FIR	32
13985	ALDER	16
13986	DOUGLAS FIR	28
13987	DOUGLAS FIR	20
13988	ALDER	8
13989	ALDER	6
13990	ALDER	8
13991	ALDER	8
13992	ALDER	8
13993	ALDER	8
13994	ALDER	8
13995	DOUGLAS FIR	30
13996	DOUGLAS FIR	6
13997	DOUGLAS FIR	28
13998	DOUGLAS FIR	18
13999	DOUGLAS FIR	18
14000	DOUGLAS FIR	16
14001	DOUGLAS FIR	28
14002	DOUGLAS FIR	28
14003	DOUGLAS FIR	6
14016	DOUGLAS FIR	6
14017	DOUGLAS FIR	24
14018	DOUGLAS FIR	26
14019	DOUGLAS FIR	28

TREE NUMBER	SPECIES	DBH(IN)
14020	CEDAR	8
14021	BIG LEAF MAPLE	25
14022	DOUGLAS FIR	6
14023	BIG LEAF MAPLE	8
14024	DOUGLAS FIR	14
14025	DOUGLAS FIR	32
14026	DOUGLAS FIR	42
14027	DOUGLAS FIR	24
14028	DOUGLAS FIR	32
14029	BIG LEAF MAPLE	24
14030	DOUGLAS FIR	26
14031	DOUGLAS FIR	18
14032	DOUGLAS FIR	24
14033	BIG LEAF MAPLE	16
14041	BIG LEAF MAPLE	28
14042	DOUGLAS FIR	6
14043	DOUGLAS FIR	32
14044	ALDER	8
14045	DOUGLAS FIR	28
14046	BIG LEAF MAPLE	16
14047	ALDER	14
14048	ALDER	8
14049	ALDER	12
14050	ALDER	6
14051	ALDER	8
14052	ALDER	8
14053	ALDER	8
14055	DOUGLAS FIR	18
14056	DOUGLAS FIR	20
14057	DOUGLAS FIR	12
14058	ALDER	14
14059	DOUGLAS FIR	18
14060	DOUGLAS FIR	39
14061	DOUGLAS FIR	39
14062	DOUGLAS FIR	24
14063	DOUGLAS FIR	20
14064	DOUGLAS FIR	16
14065	DOUGLAS FIR	20
14066	DOUGLAS FIR	22
14067	DOUGLAS FIR	12
14068	DOUGLAS FIR	24
14069	DOUGLAS FIR	14
14070	DOUGLAS FIR	22
14071	DOUGLAS FIR	36
15500	DOUGLAS FIR	28
15501	BIG LEAF MAPLE	18
15502	HAZELNUT	6
15503	HAZELNUT	6
15504	HAZELNUT	6
15505	HAZELNUT	6
15538	DOUGLAS FIR	6
15539	DOUGLAS FIR	15
15540	DOUGLAS FIR	24
15541	DOUGLAS FIR	20
15542	CEDAR	15
15543	DOUGLAS FIR	6
15544	DOUGLAS FIR	6
15545	DOUGLAS FIR	8
15546	DOUGLAS FIR	10
15547	DOUGLAS FIR	6
15548	DOUGLAS FIR	6
15549	DOUGLAS FIR	6
15550	DOUGLAS FIR	6
15551	DOUGLAS FIR	10
15552	DOUGLAS FIR	15
15553	DOUGLAS FIR	10
15554	DOUGLAS FIR	10
15555	DOUGLAS FIR	21
15556	DOUGLAS FIR	10
15557	DOUGLAS FIR	15
15558	DOUGLAS FIR	10
15559	DOUGLAS FIR	8
15560	DOUGLAS FIR	8
15561	DOUGLAS FIR	8
15562	DOUGLAS FIR	16
15563	DOUGLAS FIR	8
15564	DOUGLAS FIR	10
15565	DOUGLAS FIR	8
15566	DOUGLAS FIR	15
15567	DOUGLAS FIR	12
15568	DOUGLAS FIR	6
15569	DOUGLAS FIR	10
15570	DOUGLAS FIR	10
15571	DOUGLAS FIR	6
15572	DOUGLAS FIR	10
15573	DOUGLAS FIR	15
15574	DOUGLAS FIR	6
15575	DOUGLAS FIR	12
15576	DOUGLAS FIR	15
15577	DOUGLAS FIR	10
15578	DOUGLAS FIR	15
15579	DOUGLAS FIR	24
15580	DOUGLAS FIR	30
15581	DOUGLAS FIR	6
15582	DOUGLAS FIR	8
15583	DOUGLAS FIR	8
15584	DOUGLAS FIR	10
15585	DOUGLAS FIR	6
15586	DOUGLAS FIR	6
15587	DOUGLAS FIR	6
15588	DOUGLAS FIR	8
15589	DOUGLAS FIR	12
15590	DOUGLAS FIR	10
15591	DOUGLAS FIR	10
15592	DOUGLAS FIR	6
15593	DOUGLAS FIR	12
15594	DOUGLAS FIR	8
15595	DOUGLAS FIR	10
15596	DOUGLAS FIR	6

TREE NUMBER	SPECIES	DBH (IN)
15597	DOUGLAS FIR	6
15598	DOUGLAS FIR	12
15599	DOUGLAS FIR	12
15600	DOUGLAS FIR	6
15601	DOUGLAS FIR	14
15602	DOUGLAS FIR	6
15603	ALDER	6
15604	ALDER	8
15605	ALDER	8
15606	DOUGLAS FIR	12
15607	DOUGLAS FIR	10
15608	DOUGLAS FIR	18
15609	DOUGLAS FIR	17
15610	DOUGLAS FIR	12
15611	DOUGLAS FIR	8
15612	DOUGLAS FIR	8
15613	DOUGLAS FIR	10
15614	DOUGLAS FIR	6
15615	DOUGLAS FIR	10
15616	DOUGLAS FIR	6
15617	DOUGLAS FIR	6
15618	DOUGLAS FIR	8
15619	DOUGLAS FIR	12
15620	DOUGLAS FIR	15
15621	DOUGLAS FIR	12
15622	DOUGLAS FIR	6
15623	DOUGLAS FIR	6
15624	DOUGLAS FIR	6
15625	DOUGLAS FIR	8
15626	DOUGLAS FIR	10
15627	ALDER	6
15628	DOUGLAS FIR	8
15629	DOUGLAS FIR	8
15630	DOUGLAS FIR	12
15631	DOUGLAS FIR	13
15632	DOUGLAS FIR	10
15633	DOUGLAS FIR	8
15634	ALDER	8
15635	DOUGLAS FIR	6
15636	DOUGLAS FIR	8
15637	DOUGLAS FIR	10
15638	DOUGLAS FIR	15
15639	DOUGLAS FIR	10
15640	DOUGLAS FIR	10
15641	DOUGLAS FIR	12
15642	DOUGLAS FIR	12
15643	DOUGLAS FIR	10
15644	DOUGLAS FIR	12
15645	DOUGLAS FIR	12
15646	DOUGLAS FIR	10
15647	DOUGLAS FIR	10
15648	DOUGLAS FIR	10
15649	DOUGLAS FIR	12
15650	DOUGLAS FIR	12
15651	DOUGLAS FIR	18
15652	DOUGLAS FIR	24
15653	DOUGLAS FIR	12
15654	DOUGLAS FIR	15
15655	DOUGLAS FIR	16
15656	DOUGLAS FIR	14
15657	DOUGLAS FIR	18
15658	DOUGLAS FIR	15
15659	DOUGLAS FIR	18
15660	DOUGLAS FIR	15
15661	DOUGLAS FIR	8
15662	DOUGLAS FIR	6
15663	DOUGLAS FIR	12
15664	DOUGLAS FIR	12
15665	DOUGLAS FIR	15
15666	DOUGLAS FIR	10
15667	DOUGLAS FIR	10
15668	DOUGLAS FIR	10
15669	DOUGLAS FIR	10
15670	DOUGLAS FIR	12
15671	DOUGLAS FIR	8
15672	DOUGLAS FIR	10
15673	DOUGLAS FIR	10
15674	DOUGLAS FIR	10
15675	DOUGLAS FIR	8
15676	DOUGLAS FIR	6
15677	DOUGLAS FIR	8
15678	DOUGLAS FIR	8
15679	DOUGLAS FIR	10
15680	DOUGLAS FIR	8
15681	DOUGLAS FIR	11
15682	DOUGLAS FIR	12
15683	DOUGLAS FIR	6
15684	DOUGLAS FIR	6
15685	DOUGLAS FIR	6
15686	DOUGLAS FIR	17
15687	DOUGLAS FIR	11
15688	DOUGLAS FIR	15
15689	DOUGLAS FIR	8
15690	DOUGLAS FIR	12
15691	DOUGLAS FIR	6
15692	DOUGLAS FIR	8
15693	DOUGLAS FIR	6
15694	DOUGLAS FIR	6
15695	DOUGLAS FIR	6
15696	DOUGLAS FIR	6
15697	DOUGLAS FIR	6
15698	DOUGLAS FIR	6
15699	DOUGLAS FIR	6
15700	ALDER	6
15709	PINE	18
15710	DOUGLAS FIR	32
15740	ALDER	12
15758	UNKNOWN DECID.	9
15759	BIG LEAF MAPLE	12

TREE NUMBER	SPECIES	DBH (IN)
15762	ALDER	12
15763	UNKNOWN DECID.	10
15765	CEDAR	12
15766	UNKNOWN DECID.	8
15767	DOUGLAS FIR	17
15768	CEDAR	24
15769	DOUGLAS FIR	14
15770	DOUGLAS FIR	25
15802	ELM	8
15841	UNKNOWN DECID.	8
15842	BIG LEAF MAPLE	48
15849	CEDAR	17
15862	CEDAR	12
15868	CEDAR	16
15869	PINE	11
15870	PINE	23
15871	PINE	17
15872	BIG LEAF MAPLE	16
15873	DOUGLAS FIR	20
15874	PINE	12
15875	DOUGLAS FIR	22
15876	DOUGLAS FIR	24
15877	DOUGLAS FIR	16
15878	CEDAR	17
15879	ALDER	17
15880	DOUGLAS FIR	18
15881	BIRCH	15
15882	DOUGLAS FIR	20
15883	DOUGLAS FIR	24
15884	PINE	23
15885	DOUGLAS FIR	18
15886	UNKNOWN DECID.	13
15887	DOUGLAS FIR	25
15888	ALDER	13
15889	DOUGLAS FIR	16
15890	DOUGLAS FIR	36
15891	HOLLY	8
15892	ALDER	13
15893	ALDER	19
15894	DOUGLAS FIR	24
15895	ALDER	19
15896	BIG LEAF MAPLE	16
15897	DOUGLAS FIR	36
15898	DOUGLAS FIR	33
15899	DOUGLAS FIR	30
15900	DOUGLAS FIR	10
15901	BIG LEAF MAPLE	10
15902	BIG LEAF MAPLE	31
15903	BIG LEAF MAPLE	14
15904	BIG LEAF MAPLE	23
15905	CEDAR	10
15907	BIG LEAF MAPLE	17
15908	BIG LEAF MAPLE	20
15909	UNKNOWN DECID.	17
15910	BIG LEAF MAPLE	14,15
15911	ALDER	19
15912	ALDER	18
15913	BIG LEAF MAPLE	9,11,19,16
15914	ALDER	8
15915	CEDAR	17
15916	ALDER	16
15918	ALDER	22
15919	ALDER	36
15920	ALDER	10
15921	ALDER	11
15930	BIG LEAF MAPLE	22
15931	BIG LEAF MAPLE	24
15932	BIG LEAF MAPLE	27
15933	BIG LEAF MAPLE	24
15934	BIG LEAF MAPLE	19
15935	BIG LEAF MAPLE	30
15936	BIG LEAF MAPLE	19
15937	ALDER	17
15938	BIG LEAF MAPLE	19
15939	UNKNOWN DECID.	12
15940	UNKNOWN DECID.	12
15941	UNKNOWN DECID.	12
15942	UNKNOWN DECID.	12
15943	ALDER	14
15950	ALDER	16
15951	BIG LEAF MAPLE	20
15952	DOUGLAS FIR	12
15953	DOUGLAS FIR	18
15954	ALDER	10
15955	ALDER	11
15956	DOUGLAS FIR	17
15957	CHERRY	8

REVISIONS:

EXISTING CONDITIONS TREE TABLE

ENGINEERING • PLANNING • SURVEYING
FORESTRY • LANDSCAPE ARCHITECTURE

AKS ENGINEERING AND FORESTRY, LLC
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
PHONE: 503.563.6151
FAX: 503.563.6152
www.aks-eng.com

AKS

Offices Located In:
TUALATIN, OREGON
SALEM, OREGON
VANCOUVER, WASHINGTON

DESIGNED BY: MBH
DRAWN BY: JRN
CHECKED BY: MBH
DRAWING NO.: E2-C001-C004.DWG
SCALE: AS NOTED

PREPARED FOR: LENNAR CORPORATION
11807 NE 99TH ST, SUITE 1170
VANCOUVER, WA 98682

VISTA LOOP SOUTH

CITY OF SANDY
TAX LOTS 900 AND 1000

OREGON
CLACKAMAS COUNTY TAX MAP 2-5E-18CD

DATE: 06/13/2014

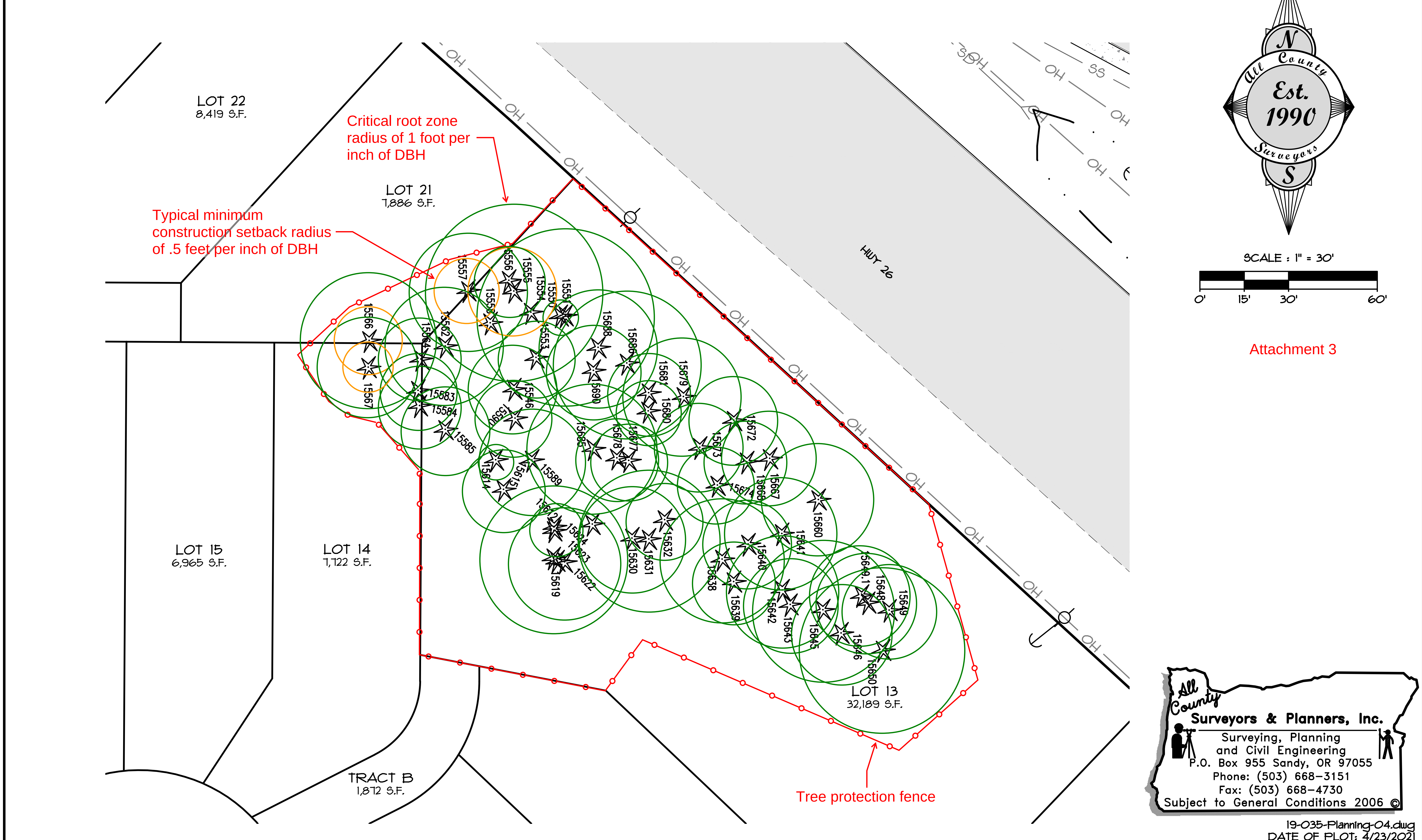
REGISTERED PROFESSIONAL ENGINEER 58542PE
OREGON
JULY 8, 2003
MONTGOMERY B. HURLEY
RENEWAL DATE: 6/30/15

JOB NUMBER
3603

SHEET
C004


Attachment 2
SHEET 1 OF X
BULL RUN TERRACE PLAN B SUBDIVISION
32 LOT SUBDIVISION
40808 & 41010 HWY 26, SANDY, OR 97055
SCALE: VERT: N/A HORIZ: 1"=60'
DATE: 1-14-21
FILE:19-035-Planning-04.dwg
LEGAL: SECTION 18 TWP. 2S RANGE 5E
DESIGNED: RLM
DRAWN: RLM
CHECKED: DLH
APPROVED: RLM
RENEWAL DATE: 12/31/2022
All County Surveyors & Planners, Inc.
Surveying, Planning and Civil Engineering
P.O. Box 955 Sandy, OR 97055
Phone: (503) 668-3151
Fax: (503) 668-4730
CLIENT: ROLL TIDE PROPERTIES CORPORATION
PO BOX 703
CORNELIUS, OR 97113
TREE RETENTION NOTES
TREES REQUIRED TO BE RETAINED:
3 TREES/ACRE X 15.91 ACRES = 48 TREES
NUMBER OF TREES PROPOSED FOR RETENTION: 48 TREES
LEGEND
R-1 ZONE
R-2 ZONE
C-3 ZONE
SCALE : 1" = 60'
NET C-3 AREA 123,763.14 SF (2.84 ACRES)
NET R-2 AREA 196,668.90 SF (4.51 ACRES)
LOT 32 320,432 S.F.
48 PROPOSED RETENTION TREES
PROPOSED TREE PRESERVATION EASEMENT
EXISTING 15.00' WIDE WATERLINE EASEMENT PER DOC. NO. 2004-110340
15' PUBLIC STORM EASEMENT
TRACT C 18,928 S.F. DETENTION POND
TRACT A 3,567 S.F.
MT. HOOD HIGHWAY 26
SE VISTA LOOP DRIVE
STREET A
STREET B
STREET C
FAWN ST
BUCK ST
DUBARKO RD
MEADOW AVE
EXISTING PARK

GROVE DETAIL



Attachment 4

Tree No	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Condition[3]	Structure[3]	Comments	Treatment	Onsite Trees >11" DBH in Good Cond. to be Retained
13653	Douglas-fir	*Pseudotsuga menziesii*	11	15	fair	fair	thin crown, large wound at lower trunk	remove	
15546	Douglas-fir	*Pseudotsuga menziesii*	15	15	good	poor	25% live crown ratio, poor trunk taper	retain	x
15550	Douglas-fir	*Pseudotsuga menziesii*	6	0	very poor	very poor	dead	retain	
15551	Douglas-fir	*Pseudotsuga menziesii*	30	15	good	fair	codominant at 1', west stem has 33% live crown ratio	retain	x
15552	n/a	n/a	n/a	n/a	n/a	n/a	same as tree 15551	n/a	n/a
15553	Douglas-fir	*Pseudotsuga menziesii*	13	15	good	poor	25% live crown ratio, poor trunk taper	retain	x
15554	Douglas-fir	*Pseudotsuga menziesii*	11	10	fair	poor	poor trunk taper, suppressed	remove	
15555	Douglas-fir	*Pseudotsuga menziesii*	30	25	good	fair	moderately one sided	retain	x
15556	Douglas-fir	*Pseudotsuga menziesii*	12	10	poor	poor	overtopped by adjacent trees, suppressed	retain	
15557	grand fir	*Abies grandis*	22	20	good	fair	one sided, codominant at 30' with included bark	retain	x
15558	Douglas-fir	*Pseudotsuga menziesii*	12	15	good	poor	33% live crown ratio, poor trunk taper	retain	x
15562	Douglas-fir	*Pseudotsuga menziesii*	20	15	good	fair	40% live crown ratio, marginal trunk taper	retain	x
15564	Douglas-fir	*Pseudotsuga menziesii*	14	15	good	poor	marginal trunk taper, 33% live crown ratio	retain	x
15565	Douglas-fir	*Pseudotsuga menziesii*	11	15	fair	fair	one sided, marginal trunk taper, 5" codominant dead stem at 3'	remove	
15566	Douglas-fir	*Pseudotsuga menziesii*	23	20	good	fair	one sided	retain	x
15567	Douglas-fir	*Pseudotsuga menziesii*	17	15	good	fair	marginal trunk taper, 40% live crown ratio	retain	x
15568	Douglas-fir	*Pseudotsuga menziesii*	7	0	very poor	very poor	dead	remove	
15569	Douglas-fir	*Pseudotsuga menziesii*	11	8	fair	poor	poor trunk taper	remove	
15570	Douglas-fir	*Pseudotsuga menziesii*	14	15	fair	fair	one sided, overtopped by adjacent trees	remove	
15571	Douglas-fir	*Pseudotsuga menziesii*	9	5	fair	poor	poor trunk taper, suppressed	remove	
15582	Douglas-fir	*Pseudotsuga menziesii*	10	5	fair	poor	poor trunk taper, suppressed	remove	
15583	Douglas-fir	*Pseudotsuga menziesii*	13	15	good	poor	poor trunk taper, 25% live crown ratio	retain	x
15584	Douglas-fir	*Pseudotsuga menziesii*	14	15	good	fair	marginal trunk taper, 40% live crown ratio	retain	x
15584.1	Douglas-fir	*Pseudotsuga menziesii*	8	0	very poor	very poor	dead	remove	
15585	Douglas-fir	*Pseudotsuga menziesii*	15	20	good	poor	35% live crown ratio, poor trunk taper	retain	x
15589	Douglas-fir	*Pseudotsuga menziesii*	18	20	good	poor	33% live crown ratio, marginal trunk taper	retain	x
15590	Douglas-fir	*Pseudotsuga menziesii*	13	15	good	poor	35% live crown ratio, poor trunk taper	retain	x
15612	Douglas-fir	*Pseudotsuga menziesii*	9	0	very poor	very poor	dead	retain	
15614	Douglas-fir	*Pseudotsuga menziesii*	9	10	fair	poor	25% live crown ratio, poor trunk taper	retain	
15615	Douglas-fir	*Pseudotsuga menziesii*	14	15	good	poor	25% live crown ratio, poor trunk taper	retain	x
15619	Douglas-fir	*Pseudotsuga menziesii*	20,16	20	good	fair	codominant at ground level with included bark, marginal trunk taper	retain	x
15620	n/a	n/a	n/a	n/a	n/a	n/a	same as tree 15619	n/a	n/a
15621	n/a	n/a	n/a	n/a	n/a	n/a	duplicate tree point?	n/a	n/a

Attachment 4

Tree No	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Condition[3]	Structure[3]	Comments	Treatment	Onsite Trees >11" DBH in Good Cond. to be Retained
15622	Douglas-fir	*Pseudotsuga menziesii*	19	20	good	fair	one sided, bowed trunk, marginal trunk taper	retain	x
15623	Douglas-fir	*Pseudotsuga menziesii*	8	10	good	poor	one sided, poor trunk taper	retain	
15624	Douglas-fir	*Pseudotsuga menziesii*	9	0	very poor	very poor	dead	retain	
15630	Douglas-fir	*Pseudotsuga menziesii*	18	20	good	fair	one sided	retain	x
15631	Douglas-fir	*Pseudotsuga menziesii*	24	20	good	fair	one sided	retain	x
15632	Douglas-fir	*Pseudotsuga menziesii*	13	15	good	poor	40% live crown ratio, poor trunk taper	retain	x
15638	Douglas-fir	*Pseudotsuga menziesii*	21	20	good	fair	one sided	retain	x
15639	Douglas-fir	*Pseudotsuga menziesii*	14	15	good	fair	one sided, marginal trunk taper, bowed trunk	retain	x
15640	Douglas-fir	*Pseudotsuga menziesii*	15	15	good	fair	one sided, 70% live crown ratio, marginal trunk taper	retain	x
15641	Douglas-fir	*Pseudotsuga menziesii*	19	20	good	fair	40% live crown ratio, marginal trunk taper	retain	x
15642	Douglas-fir	*Pseudotsuga menziesii*	19	15	good	fair	moderately one sided, marginal trunk taper, 50% live crown ratio	retain	x
15643	Douglas-fir	*Pseudotsuga menziesii*	16	15	good	fair	one sided	retain	x
15644	Douglas-fir	*Pseudotsuga menziesii*	17	20	good	poor	33% live crown ratio, marginal trunk taper	remove	
15645	Douglas-fir	*Pseudotsuga menziesii*	24	25	good	fair	one sided	retain	x
15646	Douglas-fir	*Pseudotsuga menziesii*	16	15	good	fair	one sided	retain	x
15648	Douglas-fir	*Pseudotsuga menziesii*	17	15	good	fair	one sided, 60% live crown ratio, marginal trunk taper	retain	x
15649	Douglas-fir	*Pseudotsuga menziesii*	16	20	good	fair	one sided, marginal trunk taper	retain	x
15649.1	Douglas-fir	*Pseudotsuga menziesii*	17	20	good	fair	moderately one sided, marginal trunk taper	retain	x
15650	Douglas-fir	*Pseudotsuga menziesii*	23,16	25	good	fair	codominant at ground level, north stem has poor trunk taper	retain	x
15651	n/a	n/a	n/a	n/a	n/a	n/a	same as tree 15650	n/a	n/a
15654	Douglas-fir	*Pseudotsuga menziesii*	21	20	good	fair	one sided, codominant at 12' with included bark	remove	
15655	Douglas-fir	*Pseudotsuga menziesii*	24	25	good	fair	one sided	remove	
15656	Douglas-fir	*Pseudotsuga menziesii*	16	15	good	fair	marginal trunk taper, 40% live crown ratio	remove	
15659	Douglas-fir	*Pseudotsuga menziesii*	21	20	good	fair	moderately one sided, 6" dead codominant stem at base of trunk	remove	
15660	Douglas-fir	*Pseudotsuga menziesii*	19	20	good	fair	35% live crown ratio, marginal trunk taper, dead 8" codominant stem at 15'	retain	x
15662	Douglas-fir	*Pseudotsuga menziesii*	8	0	very poor	very poor	dead	remove	
15666	Douglas-fir	*Pseudotsuga menziesii*	13	15	good	fair	marginal trunk taper, 35% live crown ratio	remove	
15667	Douglas-fir	*Pseudotsuga menziesii*	16	15	good	fair	40% live crown ratio, marginal trunk taper	retain	x
15668	Douglas-fir	*Pseudotsuga menziesii*	14	15	good	fair	40% live crown ratio, marginal trunk taper	retain	x

TERAGAN & ASSOCIATES, INC.
ARBORICULTURAL CONSULTANTS

Attachment 4

Tree No	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Condition[3]	Structure[3]	Comments	Treatment	Onsite Trees >11" DBH in Good Cond. to be Retained
15669	Douglas-fir	*Pseudotsuga menziesii*	15	15	good	fair	one sided, overtopped by adjacent trees	remove	
15670	Douglas-fir	*Pseudotsuga menziesii*	23	20	good	fair	moderately one sided	remove	
15671	Douglas-fir	*Pseudotsuga menziesii*	10	10	good	poor	one sided, poor trunk taper	remove	
15672	Douglas-fir	*Pseudotsuga menziesii*	15	20	good	poor	33% live crown ratio, marginal trunk taper	retain	x
15673	Douglas-fir	*Pseudotsuga menziesii*	15	15	good	fair	35% live crown ration, marginal trunk taper	retain	x
15674	Douglas-fir	*Pseudotsuga menziesii*	13	10	good	poor	25% live crown ratio, poor trunk taper	retain	x
15677	Douglas-fir	*Pseudotsuga menziesii*	13	10	good	poor	25% live crown ratio, poor trunk taper	retain	x
15678	Douglas-fir	*Pseudotsuga menziesii*	14	10	good	poor	33% live crown ratio, poor trunk taper	retain	x
15679	Douglas-fir	*Pseudotsuga menziesii*	16,12	20	good	fair	codominant at ground level with included bark, south stem has marginal trunk taper with 25% live crown ratio	retain	x
15680	Douglas-fir	*Pseudotsuga menziesii*	11	10	good	poor	25% live crown ratio, poor trunk taper	retain	x
15681	Douglas-fir	*Pseudotsuga menziesii*	14	10	good	poor	poor trunk taper, 20% live crown ratio	retain	x
15682	Douglas-fir	*Pseudotsuga menziesii*	26	20	good	fair	one sided	remove	
15685	Douglas-fir	*Pseudotsuga menziesii*	22	20	good	fair	moderately one sided	retain	x
15686	Douglas-fir	*Pseudotsuga menziesii*	25	25	good	fair	one sided	retain	x
15688	Douglas-fir	*Pseudotsuga menziesii*	20	20	good	fair	marginal trunk taper, 50% live crown ratio	retain	x
15690	Douglas-fir	*Pseudotsuga menziesii*	16	20	good	poor	33% live crown ratio, poor trunk taper	retain	x

[1]**DBH** is the trunk diameter in inches measured in accordance with International Society of Arboriculture standards.

[2]**C-Rad** is the approximate crown radius in feet.

[2]**Condition** and **Structure** ratings range from very poor, poor, fair, to good.

Teragan Associates, Inc.
3145 Westview Circle • Lake Oswego, OR 97034
Phone: 971.295.4835 • Fax: 503.697.1976
Email: todd@teragan.com • Website: teragan.com

Attachment 5
Additional Tree Protection Recommendations

The following recommendations meet or exceed City of Sandy Code requirements:

<u>Before Construction Begins</u>

1. Notify all contractors of tree protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection.
    a. Hold a tree protection meeting with all contractors to explain the goals of tree protection.
    c. Have all contractors sign memoranda of understanding regarding the goals of tree protection. The memoranda should include a penalty for violating the tree protection plan. The penalty should equal the resulting fines issued by the local jurisdiction plus the appraised value of the tree(s) within the violated tree protection zone per the current Trunk Formula Method as outline in the current edition of the ***Guide for Plant Appraisal*** by the Council of Tree & Landscape Appraisers. The penalty should be paid to the owner of the property.
2. Fencing
    a. Trees to remain in the grove should be protected by installation of tree protection fencing as shown in Attachments 2 and 3.
    b. The fencing should be put in place before the ground is cleared in order to protect the trees and the soil around the trees from disturbances.
    c. Fencing should be established by the project arborist based on the needs of the trees to be protected and to facilitate construction.
    d. Fencing should consist of 6-foot high steel fencing on concrete blocks or 6-foot metal fencing secured to the ground with 8-foot metal posts placed no farther than ten feet apart to prevent it from being moved by contractors, sagging, or falling down.
    e. Fencing should remain in the position that is established by the project arborist and not be moved without approval from the project arborist until final project approval.
3. Signage
    a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

> **TREE PROTECTION ZONE**
>
> **<u>DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION FENCING.</u>**
>
> Please contact the project arborist if alterations to the approved location of the tree protection fencing are necessary.
>
> Todd Prager, Project Arborist - 971-295-4835

    b. Signage should be placed every 75-feet or less.

During Construction

1. Protection Guidelines Within the Tree Protection Zones:
    a. No new buildings; grade change or cut and fill, during or after construction; new impervious surfaces; or utility or drainage field placement should be allowed within the tree protection zones.
    b. No traffic should be allowed within the tree protection zones. This includes but is not limited to vehicle, heavy equipment, or even repeated foot traffic.
    c. No storage of materials including but not limiting to soil, construction material, or waste from the site should be permitted within the tree protection zones. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
    d. Construction trailers should not to be parked/placed within the tree protection zones.
    e. No vehicles should be allowed to park within the tree protection zones.
    f. No other activities should be allowed that will cause soil compaction within the tree protection zones.
2. The trees should be protected from any cutting, skinning or breaking of branches, trunks or woody roots.
3. The project arborist should be notified prior to the cutting of woody roots from trees that are to be retained to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots should be immediately covered with soil or mulch to prevent them from drying out.
4. Trees that have roots cut should be provided supplemental water during the summer months.
5. Any necessary passage of utilities through the tree protection zones should be by means of tunneling under woody roots by hand digging or boring with oversight by the project arborist.
6. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

After Construction

1. Carefully landscape the areas within the tree protection zones. Do not allow trenching for irrigation or other utilities within the tree protection zones.
2. Carefully plant new plants within the tree protection zones. Avoid cutting the woody roots of trees that are retained.
3. Do not install permanent irrigation within the tree protection zones unless it is drip irrigation to support a specific planting or the irrigation is approved by the project arborist.
4. Provide adequate drainage within the tree protection zones and do not alter soil hydrology significantly from existing conditions for the trees to be retained.
5. Provide for the ongoing inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. The retained trees may need to be fertilized if recommended by the project arborist.
7. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

Attachment 6
Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. The site plans and other information provided by Roll Tide Corporation and their consultants was the basis of the information provided in this report.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultant's role is only to make recommendations. Inaction on the part of those receiving the report is not the responsibility of the consultant.
7. The purpose of this report is to:
   - Assess the existing grove of trees along Highway 26;
   - Identify the trees to be removed and retained in the grove; and
   - Provide tree protection recommendations for the trees to be retained in the grove.

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Exhibit G & H
Wetland Determination
DSL Offsite
Mccormick Ct
Buck St
Fawn St
Therese St
Langensand Rd
Rd
White Tail Ave
26
SE Vista Loop Dr

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May 3, 2019

Carey Sheldon
PO Box 883
Fairview, OR 97024

RE: Dubarko Road Subdivision – Wetland Determination

Carey:

This letter provides findings of a wetlands determination conducted by Environmental Science & Assessment, LLC (ES&A) at 40808 & 41010 Highway 26 in Sandy, Oregon (TL# 25E18CD00900 & TL#25E18CD01000) to evaluate the existing conditions. The 16.12-acre site is located directly east of a subdivision near Dubarko Road and Meadows Avenue and south of Highway 26 in the east end of Sandy, Oregon (Figure 1; Attachment A). The parcel boundaries and base topographic survey were provided by All County Surveyors and Planners, Inc.

A 6-lot subdivision and 216-unit condominium complex site is planned for the project. The project developer contracted ES&A to determine the presence of jurisdictional resources on site and determine the presence or absence of potential stream or wetland within the site.

METHODOLOGY

Potential wetland areas on the parcel were evaluated using the methodology provided in the Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, (U.S. Army Corps of Engineers, 2010). This methodology defines criteria for hydrology, soils, and vegetation to identify wetland areas.

Two levels of investigation were used to evaluate the presence or absence of Sensitive Areas. The first level included a review of existing and available background data. The second level consisted of an on-site field investigation.

Reviewed background data included the following information:

- Aerial Photography (Google Earth, 2018)
- City of Sandy Local Wetland Inventory (Sri/Shapiro AGCO Inc., 1997)
- USFWS National Wetland Inventory (NWI) (USFWS, 2019)
- Natural Resource Conservation Service (NRCS) Soil Survey of Clackamas County, Oregon (Web Soil Survey, 2019)
- Topography (Metro Data Resource Center's MetroMap, 2018)

The lots within site are currently undeveloped, but a small structure was located on TL 1000 in 2012 based on the available 2012 aerial photos (Figure 2). The only evidence of water or wetland resources on site is an intermittent stream mapped on the City of Sandy Local Wetland Inventory (LWI) extending east to west through the site. The USFWS NWI does not map wetland or waters within the site (Figure 3) and the NRCS soil survey does not map hydric soils on site (Figure 4).

ES&A wetland scientist, Jack Dalton, conducted the site assessment on March 23, 2019, with a preliminary site visit on June 8, 2018. Three (3) wetland determination data plots were established to document existing conditions on-site (Figure 5). The data sheets are included in Appendix C of this report. Data plot locations were mapped in the field using a hand-held resource grade GPS unit and transferred to a base topographic survey provided by All County Surveyors and Planners, Inc. (Attachment A).

EXISTING CONDITIONS

The 16.12-acre site located at 40808 & 41010 Highway 26, Sandy, Oregon (TL# 25E18CD00900 & TL#25E18CD01000) is bordered by Highway 26 to the north and a neighborhood to the west. Agricultural land is located east of the site and a single-family residence is located on the lot directly east (Figure 1). A stub for Dubarko Road and a second road stub for Fawn Street are located along the west site boundary (Figure 2).

The investigation found no water feature at the mapped location in the middle of the site. While there is a narrow linear depression extending roughly east to west through the site, no defined channel bed or bank is present, as documented by site data plot locations (Figure 5). No evidence of ponding was observed in the lowest points in the west end of the site and no evidence of seasonal surface water flow was observed in the area of the mapped stream. The plant community is primarily a weedy cleared field dominated by Himalayan blackberry (*Rubus armeniacus*, FAC) and pasture grasses. The tree groves on site are primarily Douglas fit (*Pseudotsuga menziesii*, FACU) with small clusters of western red-cedar (*Thuja plicata*, FAC). No wetland vegetation is present on site. Soils sampled at the three data plots all lacked hydric soil indicators and showed no evidence of sub-surface saturation, high seasonal groundwater, saturation or other hydrology indicators. Photos documenting the existing conditions and plant community are provided in Attachment B. Detailed plant and soil data is provided in Attachment C.

It is my conclusion that the intermittent stream feature mapped on the LWI mapping is not longer accurate and no stream feature or wetland is currently present on site. Any historic drainage that may have extended through the site has is no longer present and was altered by past land use or a change in the surrounding basin hydrology up slope of site. There is no evidence of any surface water entering the site from the east and no evidence of wetland or seasonal ponded water features was observed in the lowest topographic point of site where wetland or were most likely to be located.

If you have any questions about the findings presented in this letter, I would be happy to discuss the determination findings further.

Sincerely,

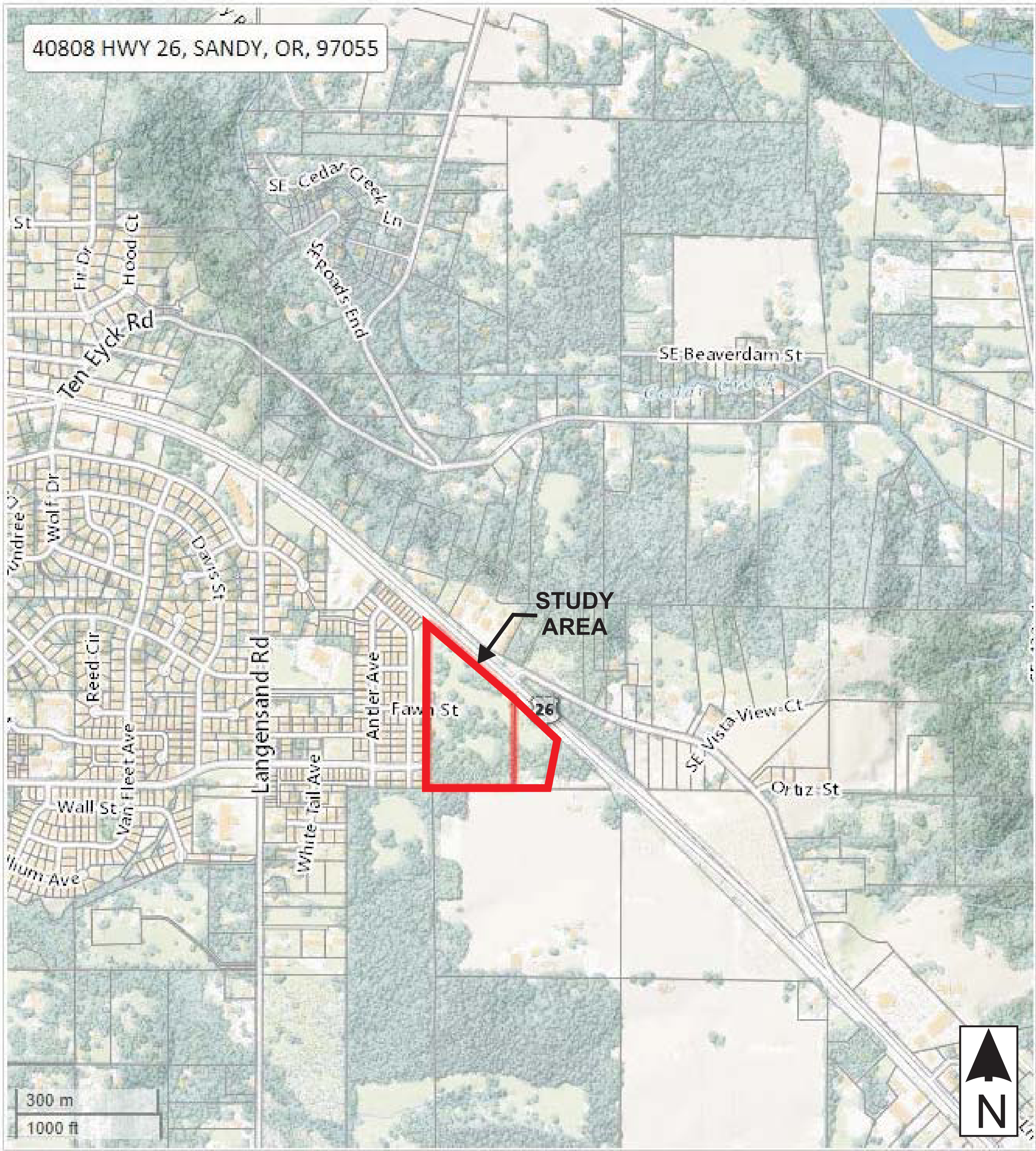
Jack Dalton
Environmental Science & Assessment, LLC

Cc: Alex Reverman (via email)
Ray Moore (via email)

Attachments

A – Figures
B – Site Photos
C - Wetland Determination Data

ATTACHMENT A: FIGURES



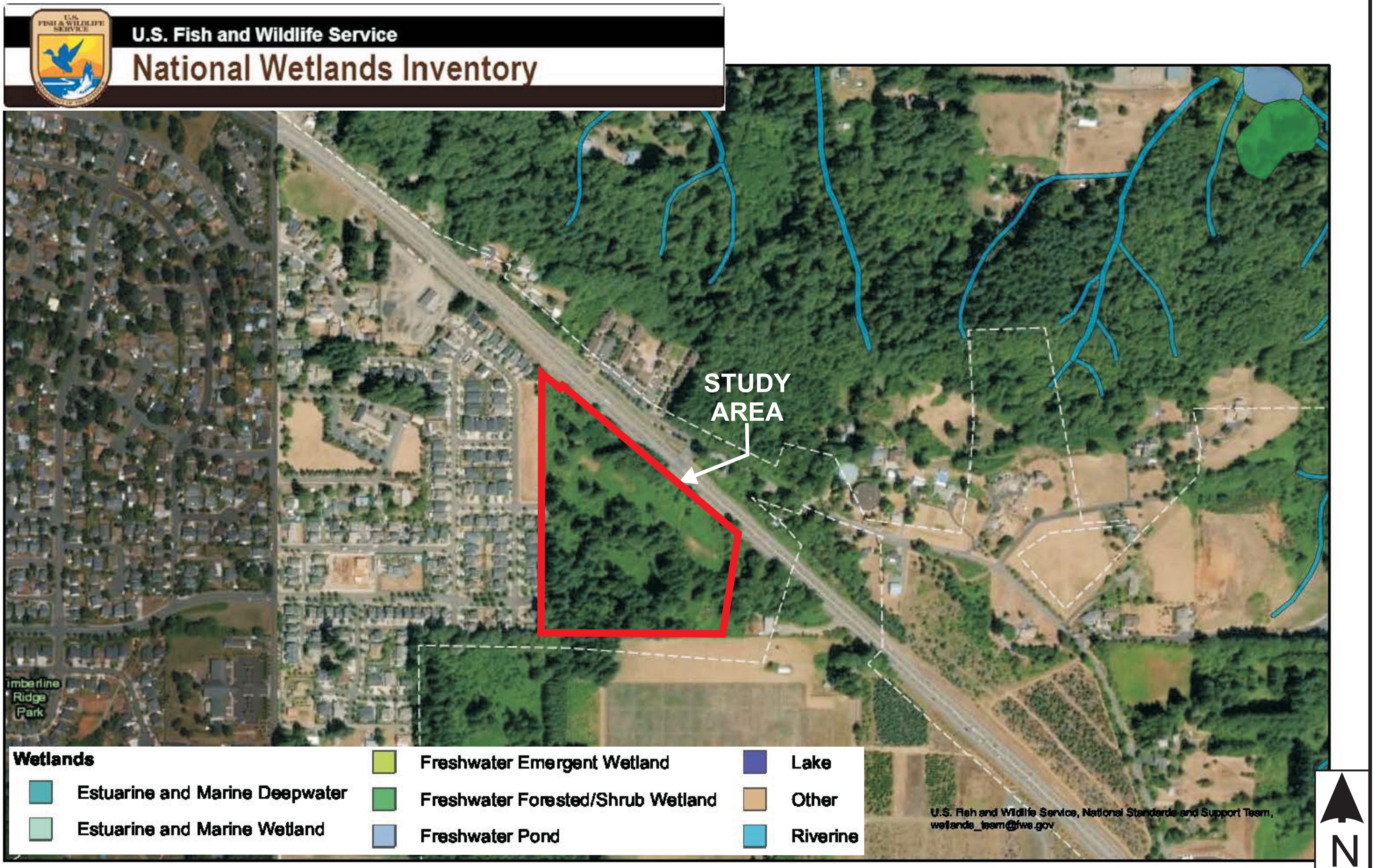
Source: Metro Data Resource Center. http://gis.oregonmetro.gov/metromap/

Environmental Science & Assessment, LLC	Vicinity Map Dubarko Road Subdivision Sandy, Oregon	Figure 1 Approx. Scale: 1in. = 100 ft.

Source: Google Earth

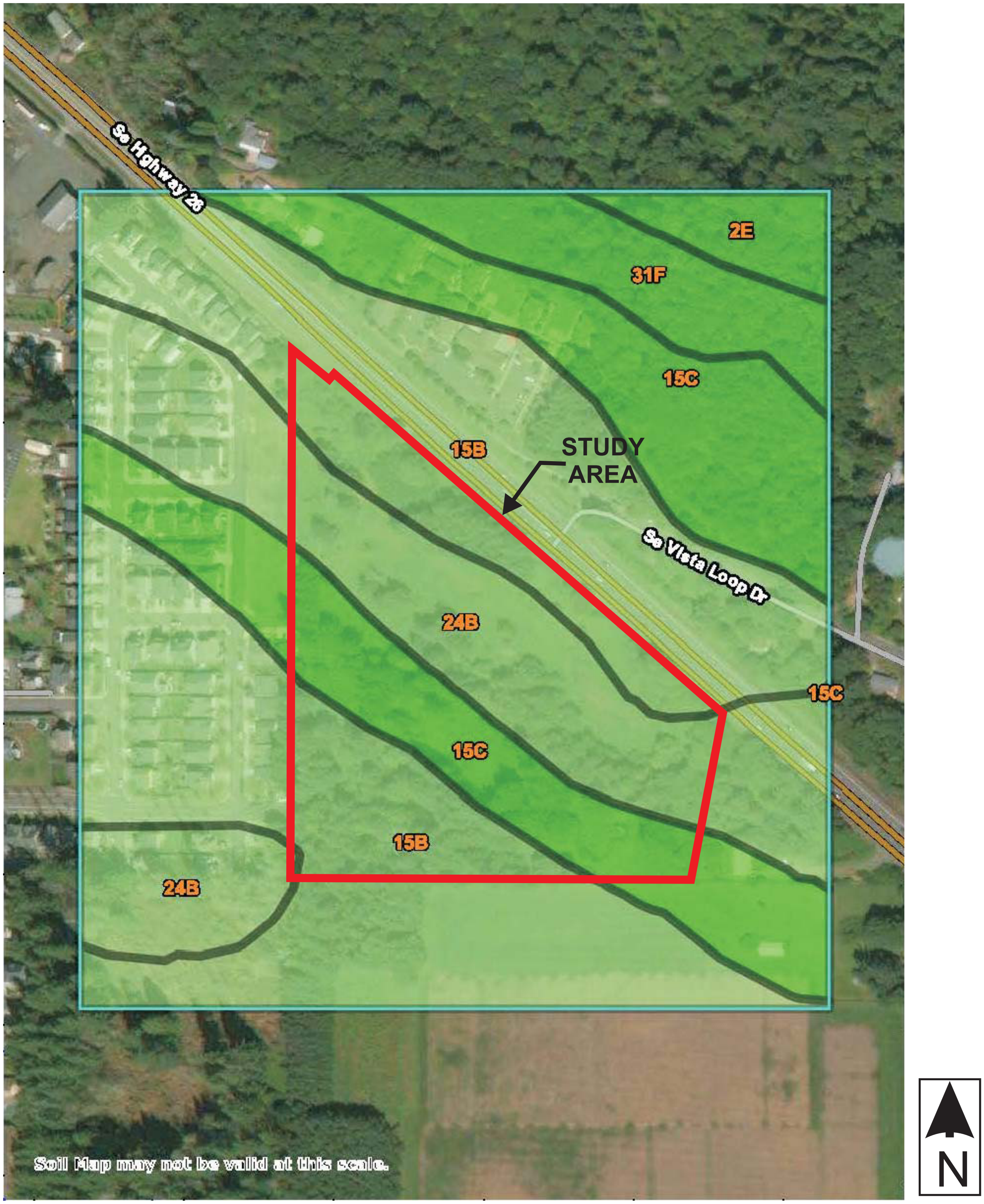
Image Date: 9/3/2018

Environmental Science & Assessment, LLC	Aerial Photograph Dubarko Road Subdivision Sandy, Oregon	Approx. Scale: 1in. = 345ft.	Figure 2



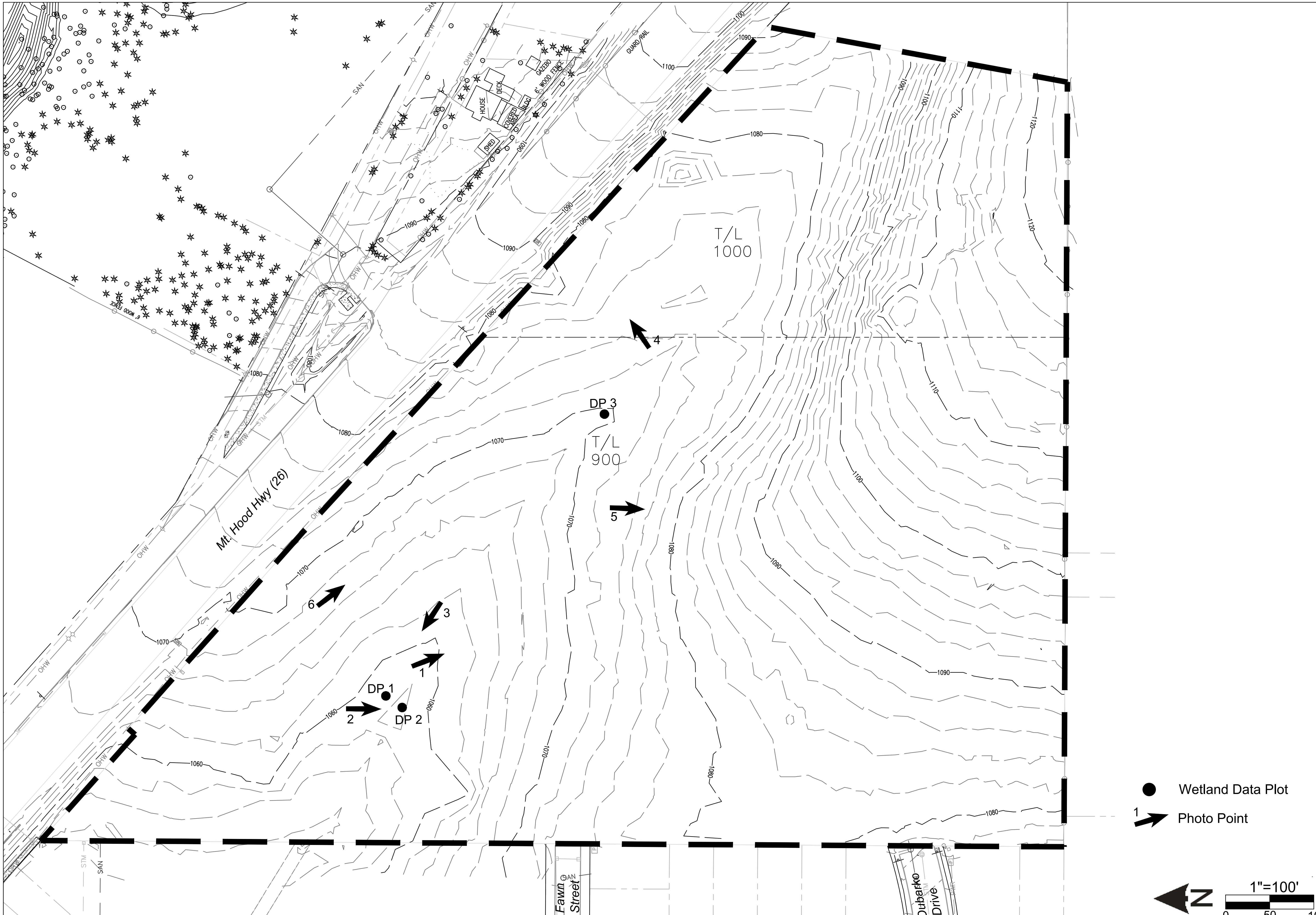
Source: National Wetlands Inventory https://www.fws.gov/wetlands/data/mapper.HTML

Environmental Science & Assessment, LLC	NWI Map Dubarko Road Subdivision Sandy, Oregon	Not to Scale	Figure 3



Source: NRCS Web Soil Survey https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Environmental Science & Assessment, LLC esa	NRCS Soil Map Dubarko Road Subdivision Sandy, Oregon	Figure 4 Not to Scale



Environmental Science & Assessment, LLC

e s & a

107 SE Washington St., Suite 249
Portland, OR 97214
Phone: 503.478.0424
www.esapdx.com

Existing Conditions Map
Dubarko Road Subdivision
40808, 41010 HWY 26
Sandy, Oregon

Base Map Source: All County Surveyors & Planners, Inc.

Modified By:	KR
Date:	4/19
Job:	18042
Rev:	00/00

Figure 5

ATTACHMENT B: SITE PHOTOS

Photo 1: View SE of low point in the middle of the site.

Photo 2: View S by DP-1 and DP-2. Shallow swale with no offsite connection.

Photo 3: View NW of the middle of the site.

Photo 4: View NE of overgrown blackberry area.

Photo 5: View S of Doug fir forest in SW corner.

Photo 6: View NE of doug fir grove at N end.

ATTACHMENT C: WETLAND DETERMINATION DATA SHEETS

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Dubarko Road Subdivision City/County: Sandy/Clackamas Sampling Date: 3/28/19

Applicant/Owner: Roll Tide Properties Corp State: OR Sampling Point: DP-1

Investigator(s): Jack Dalton Section, Township, Range: S18 T2S R5E

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): ______

Subregion (LRR): A-Northwest Forests and Coasts Lat: 45.392061° Long: -122.244803° Datum: N/A

Soil Map Unit Name: Cottrell silty clay loam (24B) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: Data point taken at grassy, flat area in the lower topo in west end.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30' diameter)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1. Rubus armeniacus	25	yes	FAC
2.			
3.			
4.			
5.			
= Total Cover	25		
Herb Stratum (Plot size: ______)			
1. Schedonorus arundinaceus	50	yes	FAC
2. Agrostis sp.	20	yes	UPL
3. Dactylis glomerata	20	yes	FACU
4. Poa sp.	10		FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	60	x 3 = 180
FACU species	45	x 4 = 180
UPL species	20	x 5 = 100
Column Totals:	125 (A)	460 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5 YR 3/2	100			C	M	silt loam	no redox
12-16	7.5YR 4/4	99	7.5YR 4/6	1	C	M	silt loam	
16-20	7.5YR 3/4	99	7.5YR 4/6	1	C	M	silt clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______________
Water Table Present? Yes ______ No ✓ Depth (inches): ______________
Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______________

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No saturation/O.R. or evidence of surface flow.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Dubarko Road Subdivision City/County: Sandy/Clackamas Sampling Date: 3/28/19

Applicant/Owner: Roll Tide Properties Corp State: OR Sampling Point: DP-2

Investigator(s): Jack Dalton Section, Township, Range: S18 T2S R5E

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): ______

Subregion (LRR): A-Northwest Forests and Coasts Lat: 45.392061° Long: -122.244803° Datum: N/A

Soil Map Unit Name: Cottrell silty clay loam (24B) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: Data point taken at low point in linear swale in the west end - no evidence of wetland hydrology.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' diameter)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. Rubus armeniacus	50	yes	FAC
2.			
3.			
4.			
5.			
= Total Cover	50		
Herb Stratum (Plot size: ____)			
1. Schedonorus arundinaceus	50	yes	FAC
2. Agrostis sp.	30	yes	UPL
3. Holcus lanatus	15		FAC
4. Galium aparine	5		FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	115	x 3 = 345
FACU species	5	x 4 = 20
UPL species	30	x 5 = 150
Column Totals:	150 (A)	515 (B)

Prevalence Index = B/A = 3.43

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Veg meets dominance test, but fails prevalence index test - marginal FAC dominated community that lacks FACW or OBL veg.

SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	7.5 YR 3/2	100			C	M	silt loam	no redox, 10% pebbles
9-12	7.5YR 3/2	99	7.5YR 3/4	1	C	M	silt loam	
12-16	7.5YR 4/4	80	7.5YR 3/2	18	C	M		
			7.5YR 3/4	2	C	M		
16-20	7.5YR 4/4	90	7.5YR 4/6	10	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______
Water Table Present? Yes ______ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No saturation, O.R. or evidence of surface flow.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Dubarko Road Subdivision City/County: Sandy/Clackamas Sampling Date: 3/28/19

Applicant/Owner: Roll Tide Properties Corp State: OR Sampling Point: DP-3

Investigator(s): Jack Dalton Section, Township, Range: S18 T2S R5E

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______

Subregion (LRR): A-Northwest Forests and Coasts Lat: 45.392061° Long: -122.244803° Datum: N/A

Soil Map Unit Name: Cottrell silty clay loam (24B) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: Data point taken up linear depression in middle of site - no wetland hydrology evident.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30' diameter)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1. Rubus armeniacus	50	yes	FAC
2.			
3.			
4.			
5.			
= Total Cover	50		
Herb Stratum (Plot size: ___)			
1. Holcus lanatus	35	yes	FAC
2. Anthoxanthum odoratum	30	yes	FACU
3. Agrostis sp.	30	yes	UPL
4. Schedonorus arundinaceus	5		FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	40	x 3 = 120
FACU species	80	x 4 = 320
UPL species	30	x 5 = 150
Column Totals:	150 (A)	590 (B)

Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: Marginal degraded plant community - lacks FACW or greater plants.

SOIL

Sampling Point: DP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5 YR 3/3	100			C	M	silt loam	no redox,
10-13	7.5YR 4/3	98	10YR 3/6	2	C	M		
13-15	10YR 4/4	95	7.5YR 4/6	5	C	M		
15-20	10YR 4/3	80	7.5YR 4/6	10	C	M		
			10YR 4/4	10				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: faint O.R. at 13"

OFFSITE WETLAND DETERMINATION REPORT **BATCH**
OREGON DEPARTMENT OF STATE LANDS **WD#:** 2019-0386

775 Summer Street NE, Suite 100, Salem OR 97301-1279 Phone: (503) 986-5200

At your request, an offsite wetland determination has been conducted on the property described below.

County: Clackamas City: Sandy

Agent Name & Address: Tracy Brown, Tracy Brown Planning Consultants, LLC, 17075 Fir Dr., Sandy, OR 97055

Township: 2S Range: 5E Section: 18 Q/Q: CD Tax Lot(s): 900, 1000

Project Name: Site Evaluation

Site Address/Location: 40808 and 41010 Highway 26, Sandy, OR

☐ The National Wetlands Inventory or Local Wetlands Inventory shows a wetland on the property.

☐ The county soil survey shows hydric (wet) soils on the property. Hydric soils indicate that there may be wetlands.

☒ It is unlikely that there are jurisdictional wetlands or waterways on the property based upon a review of wetlands maps, the county soil survey and other information. An onsite investigation by a qualified professional is the only way to be certain that there are no wetlands.

☐ There may be wetlands/waterways on the property that are subject to the state Removal-Fill Law.

- ☒ A state permit is required for ≥ 50 cubic yards of fill, removal, or ground alteration in the wetlands or waterways.
- ☐ A state permit may be required for any amount of fill, removal, or other ground alteration in the Essential Salmonid Habitat and hydrologically associated wetlands.

☐ A state permit will be/will not be required for project because/if .

☐ The proposed parcel division may create a lot that is largely wetland and thus create future development problems.

☐ A wetland delineation by a qualified wetland consultant is recommended prior to site development. The wetland delineation report should be submitted to DSL for review and approval.

☐ A permit may be required by the Army Corps of Engineers: (503) 808-4373

Note: This report is for the state Removal-Fill Law only. City or County permits may be required for the proposed activity.

Comments: Based on a review of the available information, there are no jurisdictional wetlands or waters on the property.

Determination by: ______________________ Date: 7/03/19

☐ This jurisdictional determination is valid for five years from the above date, unless new information necessitates a revision. Circumstances under which the Department may change a determination and procedures for renewal of an expired determination are found in OAR 141-090-0045 (available on our web site or upon request). The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months from the above date.

☒ **This is a preliminary jurisdictional determination and is advisory only.**

Copy To: ☐ Other ☒ Enclosures: email: tbrownplan@gmail.com
☐ City of Sandy

FOR OFFICE USE ONLY

Entire Lot(s) Checked? ☒ Yes ☐ No **Waters Present** ☐ Yes ☒ No ☐ Maybe **Request Received:** 6/27/2019

LWI Area: Sandy **LWI Code:** N/A **Latitude:** 45.390763 **Longitude:** -122.244278 **Related DSL File #** N/A

Has Wetlands? ☐Y ☒N ☐Unk **ESH?** ☐Y ☒N **Wild & Scenic?** ☐Y ☒N **State Scenic?** ☐Y ☒N **Coast Zone?** ☐Y ☒N ☐Unk

Adjacent Waterbody: N/A **NWI Quad:** Sandy ☒ Scanned ☒ Mailings Completed ☒ Data Entry Completed

proj.# 78454

Exhibit I & J
Geotech Investigation
Supplemental Review

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed Vista Loop Apartments Site

Tax Lot No's. 900 and 1000

40808 and 41010 Highway 26

Sandy (Clackamas County), Oregon

for

Roll Tide Property Corporation

Project No. 1861.001.G
November 23, 2020

November 23, 2020

Mr. Dave Vandehey
Roll Tide Property Corporation
P.O. Box 703
Cornelius, Oregon 97113

Dear Mr. Vandehey:

Re: Geotechnical Investigation and Consultation Services,
Proposed Vista Loop Apartments Development Site, Tax Lot No's. 900 and 1000,
40808 and 41010 Highway 26, Sandy (Clackamas County), Oregon

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed Vista Loop Apartments Development Site, Tax Lot No's. 900 and 1000, 40808 and 41010 Highway 26, Sandy (Clackamas County), Oregon". The scope of our services was outlined in our formal discussions with Mr. Carey Sheldon of Sheldon Development, Inc. October 12, 2020. Authorization of our services was provided by Mr. Dave Vandehey of Roll Tide Property Corporation on October 20, 2020.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

REGISTERED PROFESSIONAL ENGINEER 12309 OREGON July 15, 1983 DANIEL M. REDMOND
Exp. 12-31-20

Cc: Mr. Ray Moore
All County Surveyors & Planners, Inc.

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GEOTECHNICAL INVESTIGATION AND CONSULTATION SERVICES
PROPOSED VISTA LOOP APARTMENTS DEVELOPMENT SITE
TAX LOT NO'S. 900 AND 1000
40808 AND 41010 HIGHWAY 26
SANDY (CLACKAMAS COUNTY) OREGON

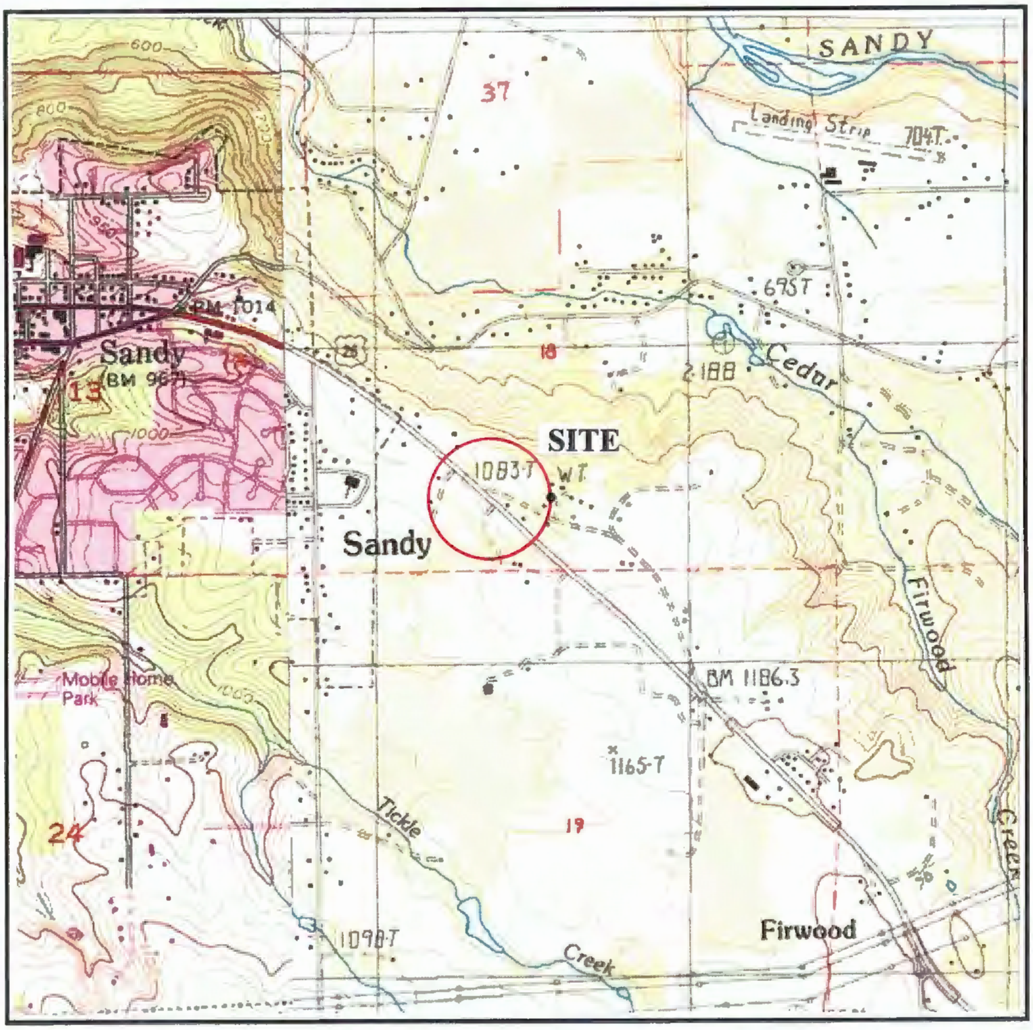
INTRODUCTION

Redmond Geotechnical Services, LLC is please to submit to you the results of our Geotechnical Investigation and Consultation Services at the site of the proposed new Vista Loop Apartments development project located to the southwest of Highway 26 and the intersection of SE Vista Loop Drive in Sandy (Clackamas County), Oregon. The general location of the subject site is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation and consultation services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to evaluate any potential concerns with regard to development at the site as well as to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed new Vista Loop Apartments development project.

PROJECT DESCRIPTION

Based on a review of the proposed site development plan(s), we understand that present plans for the project will consist primarily of the construction of new multi-family apartments. However, due to the current site zoning, the site development may also include the construction of new single-family residential homes as well as some mixed use and/or commercial structures. We understand that the multi-family apartments will likely be two- and/or three-story wood-frame structures with a concrete slab-on-grade floor system. However, the single-family lots will likely be developed with new single- and/or two-story wood-frame residential structures with raised wooden post and beam floors. Construction and/or development within the mixed use and/or commercial zoned portion of the property is unknown at this time but is anticipated to result in single- and/or two-story wood-frame structures with concrete slab-on-grade floors.

Support of the proposed new multi-family residential structures is anticipated to consist primarily of conventional shallow continuous (strip) footings although some individual (spread) column-type footings may also be required. Additionally, due to the existing sloping site grades and/or the finish slope grades following the site grading activities for the project, we anticipate that some of the proposed new residential homes and/or multi-family structures may be constructed with partial and/or below levels. As such, construction of some below grade retaining walls is also anticipated for the project.



BULL RUN QUADRANGLE
OREGON
7.5-MINUTE SERIES

SCALE 1:24 000

KILOMETERS: 1 | 0.5 | 0 | 1 | 2
METERS: 1000 | 500 | 0 | 1000 | 2000
MILES: 1 | 0.5 | 0 | 1
FEET: 1000 | 0 | 1000 | 2000 | 3000 | 4000 | 5000 | 6000 | 7000 | 8000 | 9000 | 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

SITE VICINITY MAP

Project No. 1861.001.G	**VISTA LOOP APARTMENTS** **Tax Lots 600, 700, 900 and 1000**	Figure No. 1

Structural loading information, although unavailable at this time, is anticipated to be fairly typical for this type of single- and/or three-story wood-frame structure and is expected to result in maximum dead plus live continuous (strip) and individual (column) footing loads on the order of about 1.5 to 4.0 kips per lineal foot (klf) and 10 to 50 kips, respectively.

Other associated site improvements for the project will include construction of new paved public streets and/or private access drives and parking areas. Additionally, the project will include the construction of new underground utility services as well as new concrete curbs and sidewalks. Further, we understand that development of the site will also include the collection of storm water from hard and/or impervious surfaces (i.e., roofs and pavements) for on-site treatment and disposal within various storm water detention facilities designed by the Civil Engineer.

Earthwork and grading operations for the project to bring the subject property to finish design grades and/or elevations are unknown at this time. However, based on our past experience with similar types of projects, we envision that the site grading and earthwork for the project will include cuts and/or fills of between five (5) and ten (10) feet.

SCOPE OF WORK

The purpose of our geotechnical studies was to evaluate the overall subsurface soil and/or groundwater conditions underlying the subject site with regard to the proposed new residential development and construction at the site and any associated impacts or concerns with respect to development at the site as well as provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation included the following scope of work items:

1. Review of available and relevant geologic and/or geotechnical investigation reports for the subject site and/or area including a Geotechnical and Slope Stability Investigation for the proposed Vista Loop North and Vista Loop South Subdivisions prepared by GeoPacific Engineering, Inc. dated August 16, 2005.

2. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of eight (8) exploratory test pit excavations. The exploratory test pits were excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades at the approximate locations as shown on the Site Exploration Plan, Figure No. 2. Additionally, field infiltration testing was also performed within various test pits excavated across the subject site.

3. Laboratory testing to evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics, as well as (remolded) direct shear strength and "R"-value tests.

4. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

5. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new residential structures. Recommendations include maximum design allowable contact bearing pressure(s), depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, construction and/or permanent subsurface water drainage considerations have also been prepared. Further, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation, pavement and/or floor slab subgrades.

6. Flexible pavement design and construction recommendations for the proposed new public streets and private access drives and parking area improvements.

7. A quantitative limit equilibrium slope stability analysis.

SITE CONDITIONS

Regional and Site Geology

The subject site and/or area is located on the eastern margin of the Portland Basin near where the basin meets the western edge of the Cascade Mountains physiographic province (Orr and Orr, 1999). Bedrock in this region consists of volcanic rocks emplaced tens of millions of years ago, associated with the Columbia River Basalt Group and with volcanics from the Western Cascades province (Gannet and Caldwell, 1998).

The volcanic basement is overlain by silts, sands and gravels of Miocene to Pleistocene age which form the majority of the basin fill in the area. The basin fill sediments generally are mapped as Sandy River Mudstone towards the lower portion of the assemblage inturn overlain by the Troutdale Formation, a series of gravels, sands and silts deposited by the ancestral Columbia River and smaller rivers flowing from the Cascade Mountains (Schlicker and Finlayson, 1979). In the vicinity of Sandy, the Troutdale Formation is overlain by the Springwater Formation, a conglomerate with some volcaniclastic sands, silts, and debris flows derived from the Cascade Range. The conglomerate consists of gravels, cobbles, and boulders of volcanic composition that are strongly and deeply weathered to completely decomposed residual soils often producing a red, fine-grained soil up to 75 feet deep.

Surface Conditions

The proposed new Vista Loop Apartments development property consists of two (2) generally irregular shaped tax lots (TL's 900 and 1000) which encompass a total plan area of approximately 15.04 acres. The proposed Vista Loop Apartments development property is roughly located to the southwest of Highway 26 and to the southwest of the intersection with SE Vista Loop Drive. The subject property is presently unimproved. However, we understand that the subject property was previously improved and contained two (2) single-family residential homes the northwesterly and southeasterly portions of the subject site. Surface vegetation across the site generally consists of a light to moderate growth of grass, weeds and brush as well as numerous small to large sized trees. Additionally, the northeasterly portion of the subject property contains an existing seasonal drainage basin.

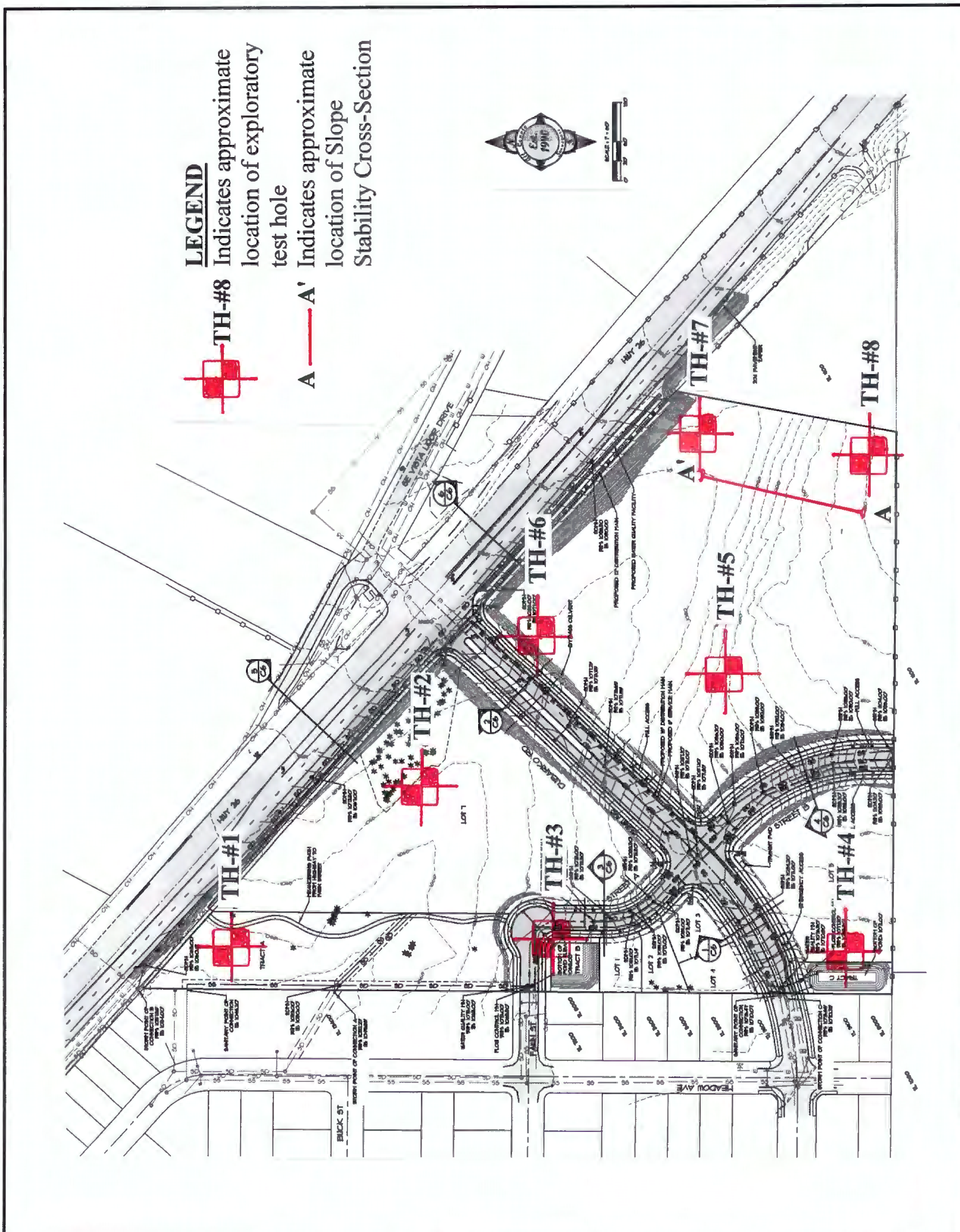
Topographically, the subject site is characterized as gently sloping terrain (i.e., 5 to 30 percent) descending downward towards the north and/or northwest with overall topographic relief estimated at about seventy (70) feet and ranges from a low about Elevation 1052 feet near the northwesterly corner of the subject site to a high of about Elevation 1123 near the southeasterly corner of the site.

Subsurface Soil Conditions

Our understanding of the subsurface soil conditions underlying the site was developed by means of eight (8) exploratory test pits excavated to depths ranging from about six (6) to seven (7) feet beneath existing site grades on October 20, 2020 with a John Deere 200C track-mounted excavator. The location of the exploratory test pits were located in the field by marking off distances from existing and/or known site features and are shown in relation to the existing site features and/or site improvements on the Site Exploration Plan, Figure No. 2. Detailed logs of the test pit explorations, presenting conditions encountered at each location explored, are presented in the Appendix, Figure No's. A-4 through A-7.

The exploratory test pit excavations were observed by staff from Redmond Geotechnical Services, LLC who logged each of the test pit explorations and obtained representative samples of the subsurface soils encountered across the site. Additionally, the elevation of the exploratory test pit excavations were referenced from a site topographic survey and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test pit excavations were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-3.

The test pit explorations revealed that the subject site is underlain by native soil deposits comprised of residual soils and/or highly weathered bedrock deposits composed of a surficial layer of dark brown, wet, soft , organic, sandy, clayey silt topsoil materials to depths of about 10 to 16 inches. These surficial topsoil materials were inturn underlain by medium to reddish-brown, very moist, medium stiff to stiff, sandy, clayey silt to the maximum depth explored of about seven (7) feet beneath the existing site and/or surface grades.



SITE EXPLORATION PLAN

Project No. 1861.001.G	**VISTA LOOP APARTMENTS** **Tax Lot's 600, 700, 900 and 1000**	Figure No. 2

These sandy, clayey silt subgrade soils and/or residual soils (highly weathered bedrock deposits) are best characterized by relatively moderate strength and low to moderate compressibility.

Groundwater

Groundwater was not encountered within any of the exploratory test pit explorations (TH-#1 through TH-#8) at the time of excavation to depths of at least 7.0 feet beneath existing surface grades except. However, the northerly portion of the subject property contain existing seasonal drainage basin. In this regard, groundwater elevations at the site may fluctuate seasonally in accordance with rainfall conditions and/or associated with runoff across the site as well as changes in site utilization. As such, we are generally of the opinion that the static water levels and/or surface water ponding observed and/or not observed during our recent field exploration work generally reflect the seasonal groundwater level(s) at and/or beneath the site.

INFILTRATION TESTING

We performed two (2) field infiltration tests at the site on October 20, 2020. The infiltration tests were performed in test holes TH-#3 and TH-#4 at depths of between four (4) and five (5) feet beneath the existing site and/or surface grades. The subgrade soils encountered in the infiltration test hole consisted of sandy, clayey silt. The infiltration testing was performed in general conformance with current EPA and/or the City of Sandy/Clackamas County Encased Falling Head test method which consisted of advancing a 6-inch diameter PVC pipe approximately 6 inches into the exposed soil horizon at each test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate and saturate the subgrade soils. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturating period, water was again added into the PVC pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each measurable drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing at the site, we have found that the native sandy, clayey silt subgrade soil deposits posses an ultimate infiltration rate on the order of about 0.1 to 0.2 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from various test pit excavations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, gradation analyses and Atterberg Limits as well as direct shear strength and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-12.

SEISMICITY AND EARTHQUAKE SOURCES

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

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes. Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study by Geomatrix (1995) and/or USGS (2008) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9. This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ. However, the 2008 USGS report has assigned a probability of 0.67 for a Mw 9 earthquake and a probability of 0.33 for a Mw 8.3 earthquake. For the purpose of this study an earthquake of Mw 9.0 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range. Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

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

Liquefaction

Seismic induced soil liquefaction is a phenomenon in which lose, granular soils and some silty soils, located below the water table, develop high pore water pressures and lose strength due to ground vibrations induced by earthquakes. Soil liquefaction can result in lateral flow of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the ground water table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

Our review of the subsurface soil test pit logs from our exploratory field explorations (TH-#1 through TH-#8) and laboratory test results indicate that the site is generally underlain by medium stiff to stiff, sandy, clayey silt residual soils and/or highly weathered bedrock deposits to depths of at least 7.0 feet beneath existing site grades. Additionally, groundwater was generally not encountered within any of the exploratory test pit excavations (TH-#1 through TH-#8) at the site during our field exploration work.

As such, due to the medium stiff to stiff and/or cohesive nature of the sandy, clayey silt subgrade soils and/or highly weathered bedrock deposits beneath the site, it is our opinion that the native clayey, sandy silt subgrade soil and/or highly weathered bedrock deposits located beneath the subject site have a very low potential for liquefaction during the design earthquake motions previously described.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, the subject property does not contain any steep slopes (i.e., greater than 40 percent). As such, development of the subject site into the planned residential development does not appear to present a potential geologic and/or landslide hazard provided that the site grading and development activities conform with the recommendations presented within this report.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Clackamas County and Sandy. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new residential structures and site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Clackamas County requirements for the 100-year flood levels of any nearby creeks, streams and/or drainage basins.

SLOPE STABILITY ANALYSIS

For the purpose of evaluating slope stability at the subject site, we performed quantitative slope stability modeling and analyses based upon the existing site conditions and/or the proposed site development plan.

Quantitative slope stability modeling and analyses were performed to evaluate slope stability on the site under the existing and/or post construction in-situ conditions using Slide 7.0 computer program developed by Rocscience, Inc. of Toronto, Ontario, Canada. This numerical analysis program utilizes a two-dimensional limiting equilibrium method to calculate the factor of safety of a potential slip surface, and incorporates search routines to identify the most critical potential failure surfaces for the case(s) analyzed. Factors of safety were calculated using Bishop and Janbu method of slices.

Proposed residential development at the subject site is anticipated to be constructed at and/or above the existing in-situ soil conditions of the existing gently descending slope(s) at the site and were modeled as a two (2) layer system with the upper layer as native, stiff, sandy, clayey silt soil and the lower layer as the existing (native) very moist, very stiff, sandy, clayey silt and/or residual soils encountered in test holes TH-#1 through TH-#8. Site and slope topography, subsurface geometry, and other site conditions modeled in the analyses are based on a topographic map provided by the client and/or our field measurements. In our analysis, we considered potential groundwater levels to be located greater than 30 feet beneath the site.

For stability calculations, the potential failure model was considered primarily as circular sliding along a basal shear surface. Shear strength parameters used in the model were selected based on soil conditions encountered in the test pits, SPT N-value correlations, and our local experience with similar soil types and geologic conditions. The results of our slope stability analyses for the proposed single-family residential structures constructed above the in-situ subgrade soil conditions on structural fill soils are summarized in Table 2. The slope stability analyses cross-section is presented as an attachment to this report in Appendix B. The location of the cross-section used is indicated on the Site Exploration Plan, Figure No. 2.

Table 1 - Summary of Estimated In-Situ/Fill Soil Strength Parameters

Geologic Unit	Wet Unit Weight (pcf)	Friction Angle	Cohesion (psf)
Stiff, andy, clayey SILT (ML)	110	24	450
Very stiff, sandy, clayey SILT (ML)	110	26	350

Table 2 - Summary of Slope Stability Analyses for In-Situ/Fill Soil Conditions with Proposed Development

Pre-Construction	**Factor of Safety (Static)**	**Factor of Safety (Seismic)**
Cross-Section A-A'	4.626	1.857

The results of the quantitative slope stability modeling and analysis performed using Slide 7.0 computer program indicated an existing in-situ and/or post construction slope stability factor of safety (FS) under static and seismic loading greater than 1.5 and 1.2 (see Slope Stability Results in Appendix B). In our opinion, the calculated factor of safety is adequate for the proposed residential construction and development of the subject site as we understand it.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our opinion that the site is presently stable and suitable for the proposed new Vista Loop Apartments development and its associated site improvements provided that the recommendations contained within this report are properly incorporated into the design and construction of the Vista Loop Apartments development project.

The primary features of concern at the site are 1) the presence of highly moisture sensitive clayey and silty subgrade soils across the site, 2) the presence of gently steep sloping site conditions across the site and 3) the relatively low infiltration rates anticipated within the near surface clayey and silty subgrade soils.

With regard to the moisture sensitive clayey and silty subgrade soils, we are generally of the opinion that all site grading and earthwork activities be scheduled for the drier summer months which is typically June through September.

In regards to the gently sloping site conditions across the site, we are of the opinion that site grading and/or structural fill placement should be minimized where possible and should generally limit cuts and/or fills to about ten (10) feet unless approved by the Geotechnical Engineer. Additionally, where existing site slopes and/or surface grades exceed about 20 percent (1V:5H) and in order to construct the proposed new site improvements, benching and keying of all fills into the natural site slopes will be required. Further, due to the presence of the existing seasonal drainage basin across the northerly portion of the site, the use of subdrains may be required beneath all structural fills and/or within all fill slopes

With regard to the relatively low infiltration rates anticipated within the clayey and silty subgrade soils beneath the site, we generally do not recommend any storm water detention and/or infiltration within structural and/or embankment fills. However, storm water detention and some infiltration may be feasible within storm water detention basins excavated into the existing medium stiff to stiff, sandy, clayey silt residual soils across the lower westerly portion of the site. In this regard, we recommend that all proposed storm water detention and/or infiltration systems for the project be reviewed and approved by Redmond Geotechnical Services, LLC.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new Vista Loop Apartments development project.

Site Preparation

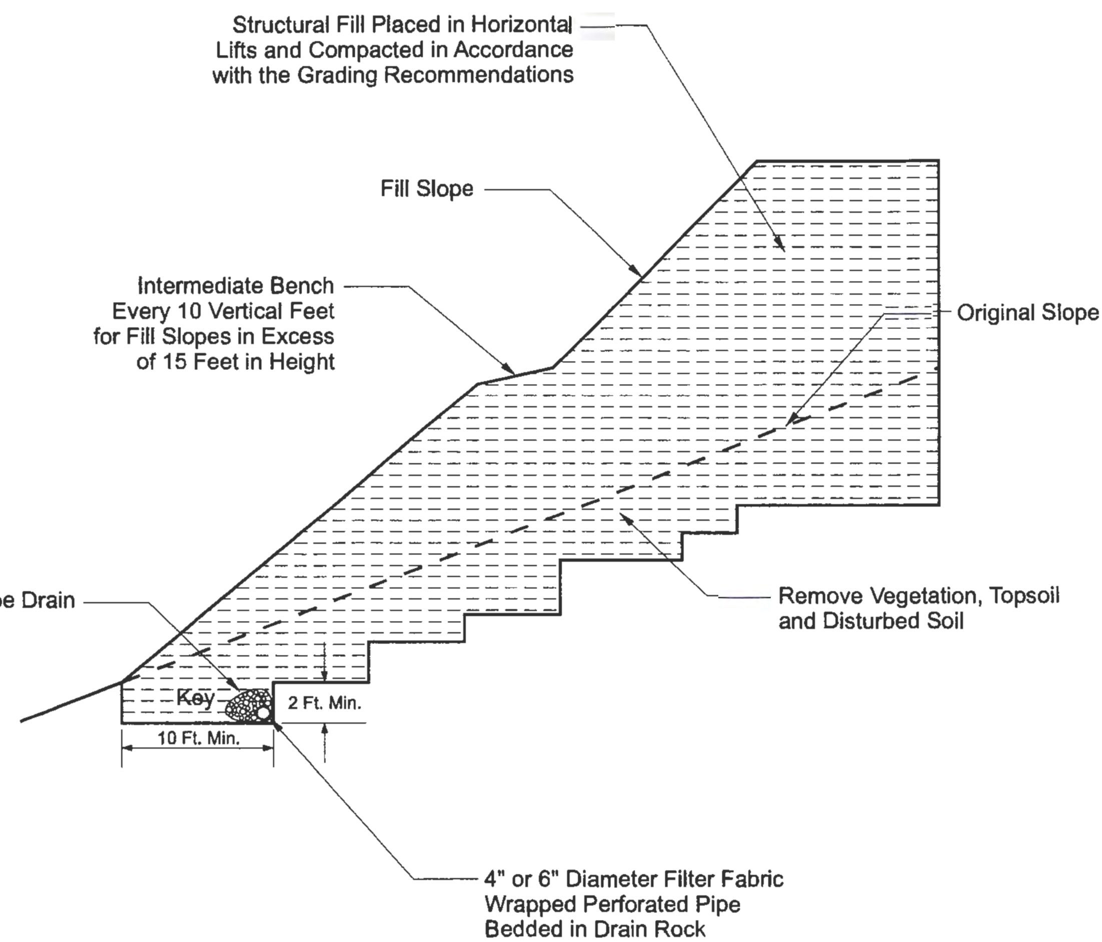
As an initial step in site preparation, we recommend that the proposed new Vista Loop Apartments development site as well as any associated structural and/or site improvement area(s) be stripped and cleared of all existing improvements, any existing unsuitable fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, we envision that the site stripping to remove existing vegetation and topsoil materials will generally be about 10 to 14 inches. However, localized areas requiring deeper removals, such as any existing undocumented and/or unsuitable fill materials as well as old foundation remnants, will likely be encountered and should be evaluated at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site native sandy, clayey silt subgrade soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of some of the on-site native soil materials which contain significant silt and clay sized particles will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping of topsoil materials be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction. In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock. Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed within the new building and/or pavement areas should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. Additionally, all fill materials placed within five (5) lineal feet of the perimeter (limits) of the proposed single-family and/or multi-family structures and/or pavements should be considered structural fill. Additionally, due to the sloping site conditions, we recommend that all structural fill materials planned in areas where existing surface and/or slope gradients exceed about 20 percent (1V:5H) be properly benched and/or keyed into the native (natural) slope subgrade soils. In general, a bench width of about eight (8) to ten (10) feet and a keyway depth of about one (1) to one and one-half (1.5) feet is recommended (see Typical Key and Bench Fill Slope Detail, Figure No. 3). However, the actual bench width and keyway depth should be determined at the time of construction by the Geotechnical Engineer. Further, all fill slopes should be constructed with a finish slope surface gradient no steeper than about 2H:1V. All aspects of the site grading, including a review of the proposed site grading plan(s), should be approved and/or monitored by a representative of Redmond Geotechnical Services, LLC.



TYPICAL KEY AND BENCH FILL SLOPE DETAIL

Project No. 1861.001.G	VISTA LOOP APARTMENTS Tax Lot's 600, 700, 900 and 1000	Figure No. 3

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new Vista Loop Apartments development is suitable for support of the planned single- and/or three-story wood-frame structures provided that the following foundation design recommendations are followed. The following sections of this report present specific foundation design and construction recommendations for the planned new single-family and/or multi-family structures.

Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) column footings may be supported by approved native (untreated) subgrade soil materials and/or clayey silt structural fill soils based on an allowable contact bearing pressure of about 2,000 pounds per square foot (psf). This recommended allowable contact bearing pressure is intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads. In general, continuous strip footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual column footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches. Additionally, if foundation excavation and construction work is planned to be performed during wet and/or inclement weather conditions, we recommend that a 2- to 4-inch layer of compacted crushed rock be used to help protect the exposed foundation bearing surfaces until the placement of concrete.

Total and differential settlements of foundations constructed as recommended above and supported by approved native subgrade soils or by properly compacted structural fill materials are expected to be well within the tolerable limits for this type of wood-frame structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.30 and 0.45 for native silty subgrade soils and/or import gravel fill materials, respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 300 pounds per cubic foot (pcf). This recommended value includes a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 6 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab.

However, additional moisture protection can be provided by using a 10-mil polyolefin geo-membrane sheet such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 150 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	45	35
3H:1V	65	60
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher. For seismic loading, we recommend an additional uniform earth pressure of 8H where H is the height of the wall in feet.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the proposed new public street improvements as well as the proposed new private drives and parking area improvements for the Vista Loop Apartments development was determined in accordance with the City of Sandy and/or Clackamas County Department of Public Works standards.

The subgrade soil samples collected at the site were tested in the laboratory in accordance with the ASTM Vol. 4.08 Part D-2844-69 (AASHTO T-190-93) test method for the determination of the subgrade soil "R"-value and expansion pressure. The results of the "R"-value testing was then converted to an equivalent Resilient Modulus (M_{RSG}) in accordance with current AASHTO methodology. The results of the laboratory "R"-value tests revealed that the subgrade soils have an apparent "R"-value of between 29 and 31 with an average "R"-value of 30 (see Figure No. A-12). Using the current AASHTO methodology for converting "R"-value to Resilient Modulus (M_{RSG}), the subgrade soils have a Resilient Modulus (M_{RSG}) of about 6,070 psi which is classified a "Fair" (M_{RSG} = 5,000 psi to 10,000 psi). Based on the above, we recommend that the asphaltic concrete pavement section(s) for the new The Views planned development areas at the site consist of the following:

Collector Streets

The following documents and/or design input parameters were used to help determine the flexible pavement section design for improvements to new and/or existing Collector Streets:

- **Street Classification:** Collector Street
- **Design Life:** 20 years
- **Serviceability:** 4.2 initial, 2.5 terminal
- **Traffic Loading Data:** 1,000,000 18-kip EAL's
- **Reliability Level:** 90%
- **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
- **Asphalt Structural Coefficient:** 0.41
- **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 4.1 was determined. In this regard, we recommend the following flexible pavement section for the new improvements to new and/or existing Collector Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	5.0
Aggregate Base Rock	14.0

Local Residential Streets

The following documents and/or design input parameters were used to help determine the flexible pavement section design for new local residential streets:

- **Street Classification:** Local Residential Street
- **Design Life:** 25 years
- **Serviceability:** 4.2 initial, 2.5 terminal
- **Traffic Loading Data:** 100,000 18-kip EAL's
- **Reliability Level:** 90%
- **Drainage Coefficient:** 1.0 (asphalt), 0.8 (aggregate)
- **Asphalt Structural Coefficient:** 0.41
- **Aggregate Structural Coefficient:** 0.10

Based on the above design input parameters and using the design procedures contained within the AASHTO 1993 Design of Pavement Structures Manual, a Structural Number (SN) of 2.6 was determined. In this regard, we recommend the following flexible pavement section for the construction of new Local Residential Streets:

Material Type	Pavement Section (inches)
Asphaltic Concrete	4.0
Aggregate Base Rock	10.0

Private Access Drives and Parking Areas

We recommend that the asphaltic concrete pavement section(s) for any private access drives and parking areas associated with The Views planned development areas consist of the following:

	Asphaltic Concrete Thickness (inches)	Crushed Base Rock Thickness (inches)
Automobile Parking Areas	3.0	8.0
Automobile Drive Areas	3.5	10.0

Note: Where heavy vehicle traffic is anticipated such as those required for fire and/or garbage trucks, we recommend that the automobile drive area pavement section be increased by adding 0.5 inches of asphaltic concrete and 2.0 inches of aggregate base rock. Additionally, the above recommended flexible pavement section(s) assumes a design life of 20 years.

Pavement Subgrade, Base Course & Asphalt Materials

The above recommended pavement section(s) were based on the design assumptions listed herein and on the assumption that construction of the pavement section(s) will be completed during an extended period of reasonably dry weather. All thicknesses given are intended to be the minimum acceptable. Increased base rock sections and the use of a woven geotextile fabric may be required during wet and/or inclement weather conditions and/or in order to adequately support construction traffic and protect the subgrade during construction. Additionally, the above recommended pavement section(s) assume that the subgrade will be prepared as recommended herein, that the exposed subgrade soils will be properly protected from rain and construction traffic, and that the subgrade is firm and unyielding at the time of paving. Further, it assumes that the subgrade is graded to prevent any ponding of water which may tend to accumulate in the base course.

Pavement base course materials should consist of well-graded 1-1/2 inch and/or 3/4-inch minus crushed base rock having less than 5 percent fine materials passing the No. 200 sieve. The base course and asphaltic concrete materials should conform to the requirements set forth in the latest edition of the Oregon Department of Transportation, Standard Specifications for Highway Construction. The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. The asphaltic concrete paving materials should be compacted to at least 92 percent of the theoretical maximum density as determined by the ASTM D-2041 (Rice Gravity) test method.

Wet Weather Grading and Soft Spot Mitigation

Construction of the proposed new paved site improvements is generally recommended during dry weather. However, during wet weather grading and construction, excavation to subgrade can proceed during periods of light to moderate rainfall provided that the subgrade remains covered with aggregate. A total aggregate thickness of 8- to 12-inches may be necessary to protect the subgrade soils from heavy construction traffic. Construction traffic should not be allowed directly on the exposed subgrade but only atop a sufficient compacted base rock thickness to help mitigate subgrade pumping. If the subgrade becomes wet and pumps, no construction traffic shall be allowed on the road alignment. Positive site drainage shall be maintained if site paving will not occur before the on-set of the wet season.

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observations can either be removed and replaced with properly dried and compacted fill soils or removed and replaced with compacted crushed aggregate. However, and where approved by the Geotechnical Engineer, the soft area may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Soil Shrink-Swell and Frost Heave

The results of the laboratory "R"-value tests indicate that the native subgrade soils possess a low to moderate expansion potential. As such, the exposed subgrade soils should not be allowed to completely dry and should be moistened to near optimum moisture content (plus or minus 3 percent) at the time of the placement of the crushed aggregate base rock materials. Additionally, exposure of the subgrade soils to freezing weather may result in frost heave and softening of the subgrade. As such, all subgrade soils exposed to freezing weather should be evaluated and approved by the Geotechnical Engineer prior to the placement of the crushed aggregate base rock materials.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavation bracing for the project should be the responsibility of the excavation contractor. Permanent slopes should be constructed no steeper than about 2H to 1V unless approved by the Geotechnical Engineer.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level. If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation.

Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

We recommend that positive measures be taken to properly finish grade the site so that drainage waters from the residential structures and landscaping areas as well as adjacent properties or buildings are directed away from the new single- and/or multi-family residential structures foundations and/or floor slabs. All roof drainage should be directed into conduits that carry runoff water away from the residential structures to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the proposed new residential structures.

Groundwater was not encountered at the site within any of the exploratory test pits excavated at the site at the time of excavation to depths of up to 8.0 feet beneath existing site grades. However, the northerly, easterly and southerly portion(s) of the site contain existing seasonal drainage basins. Further, groundwater elevations in the area and/or across the subject property may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall.

As such, based on our current understand of the possible site grading required to bring the subject site to finish design grade(s), we are of the opinion that an underslab drainage system is generally not required for the proposed multi-family residential structures. However, a perimeter foundation drain is recommended for any perimeter footings and/or below grade retaining walls. A typical recommended perimeter footing/retaining wall drain detail is shown on Figure No. 4. Additionally, a subdrain is recommended beneath and/or within all structural fills which are constructed within and/or above the existing seasonal drainage basins. Further, due to our understanding that various storm water detention and/or infiltration basins will be utilized for the project as well as the relatively low infiltration rates of the near surface sandy, clayey silt subgrade soils and/or highly weathered bedrock deposits anticipated within and/or near to the foundation bearing level of the proposed residential structures, we are generally of the opinion that storm water detention basins and/or infiltration systems should not be utilized around and/or up-gradient of the proposed residential structures unless approved by the Geotechnical Engineer.

Design Infiltration Rates

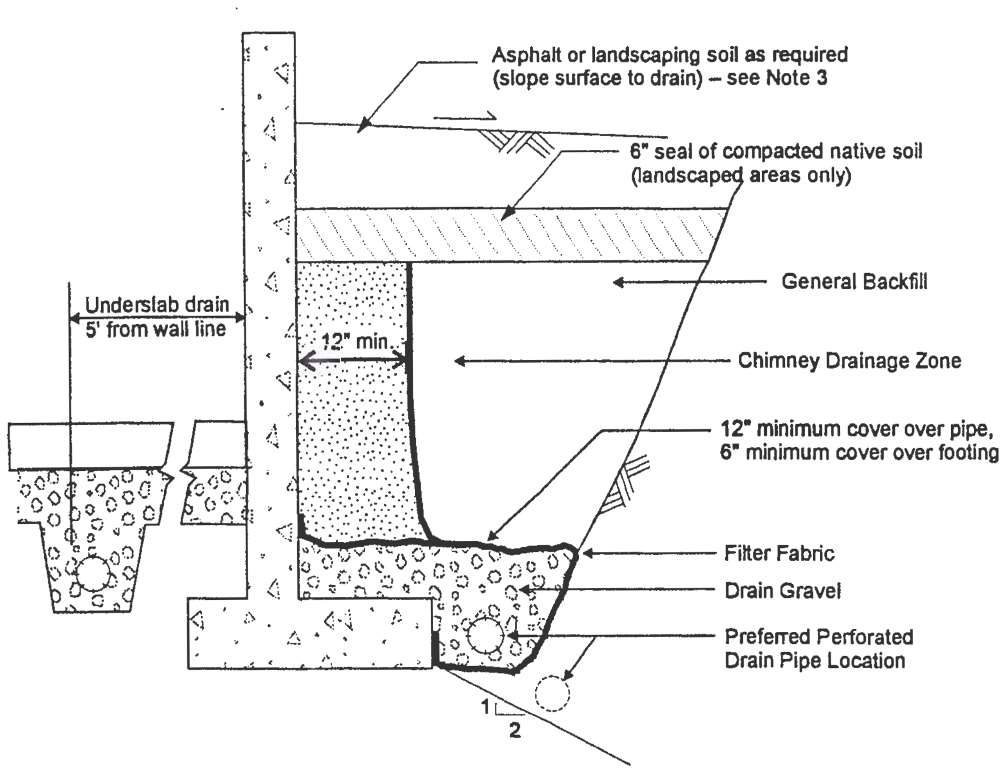
Based on the results of our field infiltration testing, we recommend using the following infiltration rate to design any on-site near surface storm water infiltration and/or disposal systems for the project:

Subgrade Soil Type	Recommended Infiltration Rate
sandy, clayey SILT (ML)	less than 0.1 inches per hour (in/hr)

Note: A safety factor of two (2) was used to calculate the above recommended design infiltration rate. Additionally, given the gradational variability of the on-site sandy, clayey sit subgrade soils beneath the site as well as the anticipation of some site grading for the project, it is generally recommended that field testing be performed during and/or following construction of any on-site storm water infiltration system(s) in order to confirm that the above recommended design infiltration rates are appropriate.

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the 2019 and/or latest edition of the State of Oregon Structural Specialty Code (OSSC), ASCE 7-16 and/or Amendments to the 2018 International Building Code (IBC).



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.
3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed ¾" to 1½" gravel.
5. General backfill to be on-site gravels, or ¾""-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).
6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL

Project No. 1861.001.G	**VISTA LOOP APARTMENTS** **Tax Lot's 600, 700, 900 and 1000**	Figure No. 4

The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Oregon Structural Specialty Code, ASCE 7-16 and/or from the 2015 National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. We recommend Site Class "D" be used for design. Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from the 2018 IBC and/or ASCE 7-16 to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:

Table 1. ASCE 7-16 Seismic Design Parameters

Site Class	S_S	S_1	Fa	Fv	S_{MS}	S_{M1}	S_{DS}	S_{D1}
D	0.705	0.314	1.236	1.986	0.871	0.623	0.581	0.416

Notes: 1. S_s and S_1 were established based on the ASCE 7-16 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. Fa and Fv were established based on the ASCE 7-16 using the selected S_s and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new Vista Loop Apartments development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations. It is important that our representative meet with the contractor prior to any site grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation and stripping, structural fill placement, footing excavations and construction as well as retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new single- and/or multi-family residential structures and their associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or at other locations across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes.

We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site inspections and constriction monitoring services for this project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection and/or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

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Appendix "A"

Test Pit Logs and Laboratory Test Data

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site were explored by excavating eight (8) exploratory test pits (TH-#1 through TH-#8) on October 20, 2020. The approximate location of the test pit explorations are shown in relation to the existing site features and/or site improvements on the Site Exploration Plan, Figure No. 2.

The test pits were excavated using track-mounted excavating equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test pits were excavated to depths ranging from about 6.0 to 7.0 feet beneath existing site grades. Detailed logs of the test pits are presented on the Log of Test Pits, Figure No's. A-4 through A-7. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-3.

The exploration program was coordinated by a field engineer who monitored the excavating and exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was not encountered within any of the exploratory test pits (TH-#1 through TH-#8) at the time of excavating to depths of up to 7.0 feet beneath existing surface grades.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as direct shear strength and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test pit explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

Two (2) Maximum Dry Density and Optimum Moisture Content tests were performed on representative samples of the on-site sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-1557. This test was conducted to help establish various engineering properties for use as structural fill. The test results are presented on Figure No. A-8.

Atterberg Limits

Two (2) Liquid Limit (LL) and Plastic Limit (PL) tests were performed on representative samples of the sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. These tests were conducted to facilitate classification of the soils and for correlation purposes. The test results appear on Figure No. A-9.

Gradation Analysis

Two (2) Gradation analyses were performed on representative samples of the sandy, clayey silt subsurface soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Direct Shear Strength Test

One (1) Direct Shear Strength test was performed on an undisturbed and/or remolded sample of the sandy, clayey silt subgrade soils at a continuous rate of shearing deflection (0.02 inches per minute) in accordance with ASTM Vol. 4.08 Part D-3080-79. The test results were used to determine engineering strength properties and are shown graphically on Figure No. A-11.

"R"-Value Tests

Two (2) "R"-value tests were performed on remolded samples of the sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No. A-12.

The following figures are attached and complete the Appendix:

Figure No. A-3	Key To Exploratory Test Pit Logs
Figure No's. A-4 through A-7	Log of Test Pits
Figure No. A-8	Maximum Dry Density
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No. A-11	Direct Shear Strength Test Results
Figure No. A-12	Results of "R"-Value Tests
Figure No's. A-13 and A-14	Field Infiltration Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or 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.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE: 200, 40, 10, 4
CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).
‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

REDMOND GEOTECHNICAL SERVICES
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VISTA LOOP APARTMENTS
40808 and 41010 Highway 26

PROJECT NO.	DATE	Figure
1861.001.G	11/23/20	A-3

BACKHOE COMPANY: Inland Company BUCKET SIZE: 24 inches DATE: 10/20/20

TEST PIT NO. TH-#1 ELEVATION 1058'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			35.5	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5	X			40.3		Becomes very stiff
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#2 ELEVATION 1067'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1861.001.G VISTA LOOP APARTMENTS FIGURE NO. A-4

Redmond Geotechnical Services

BACKHOE COMPANY: Inland Company BUCKET SIZE: 24 inches DATE: 10/20/20

SOIL DESCRIPTION

TEST PIT NO. TH-#3 ELEVATION 1075'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			36.1	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
	X			41.7		
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#4 ELEVATION 1082'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, very soft, highly organic, sandy, clayey SILT (Topsoil)
	X			35.5	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1861.001.G | VISTA LOOP APARTMENTS | FIGURE NO. A-5

BACKHOE COMPANY: Inland Company BUCKET SIZE: 24 inches DATE: 10/20/20

SOIL DESCRIPTION

TEST PIT NO. TH-#5 ELEVATION 1095'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#6 ELEVATION 1075'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			34.9	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5	X			41.4		Becomes very stiff
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1861.001.G | VISTA LOOP APARTMENTS | FIGURE NO. A-6

BACKHOE COMPANY: Inland Company **BUCKET SIZE:** 24 inches **DATE:** 10/20/20

SOIL DESCRIPTION

TEST PIT NO. TH-#7 **ELEVATION** 1085'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			35.7	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
						Total Depth = 6.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#8 **ELEVATION** 1120'±

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet, soft, organic, sandy, clayey SILT (Topsoil)
	X			36.7	ML	Medium to reddish-brown, very moist, stiff, sandy, clayey SILT
5						Becomes very stiff
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1861.001.G | VISTA LOOP APARTMENTS | **FIGURE NO.** A-7

MAXIMUM DENSITY TEST RESULTS

SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#3 @ 2.5'	Medium to reddish-brown, sandy, clayey, SILT (ML)	104.0	28.0

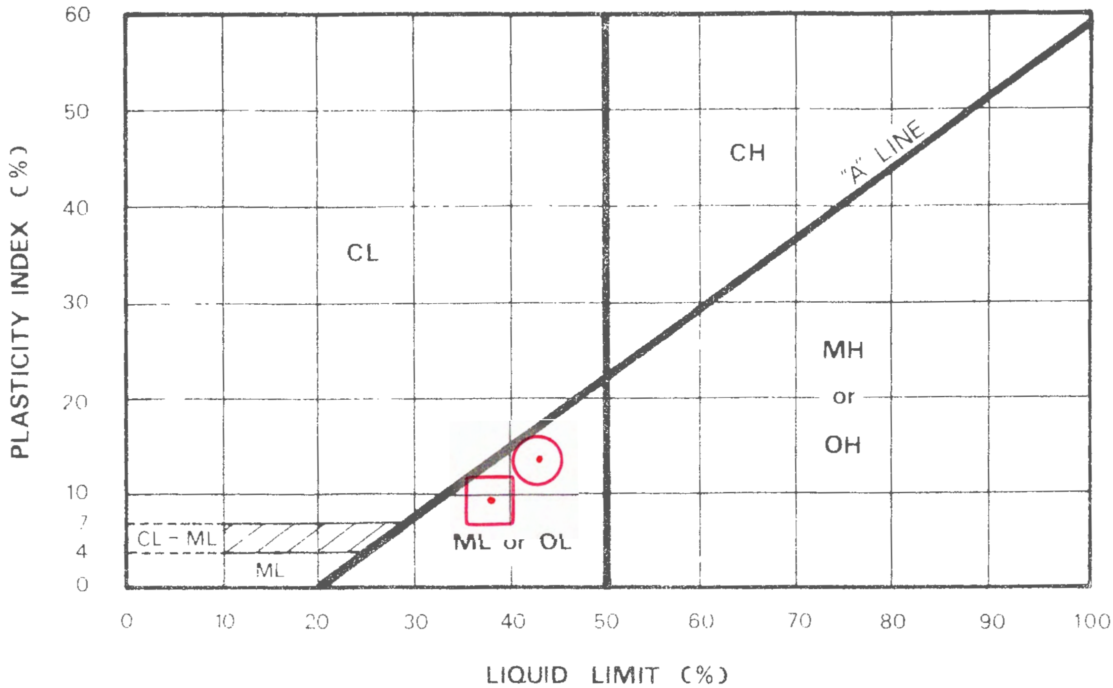
EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: ~~1861.001.G~~	~~VISTA LOOP APARTMENTS~~	FIGURE NO.: A-8

REDMOND GEOTECHNICAL SERVICES



KEY SYMBOL	BORING NO	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
⊡	TH-#1	2.0	35.5	38.2	9.9	77.3		ML
⊙	TH-#1	5.0	40.3	42.6	12.7	85.5		ML

PLASTICITY CHART AND DATA

VISTA LOOP APARTMENTS
40808 and 41010 Highway 26

REDMOND GEOTECHNICAL SERVICES
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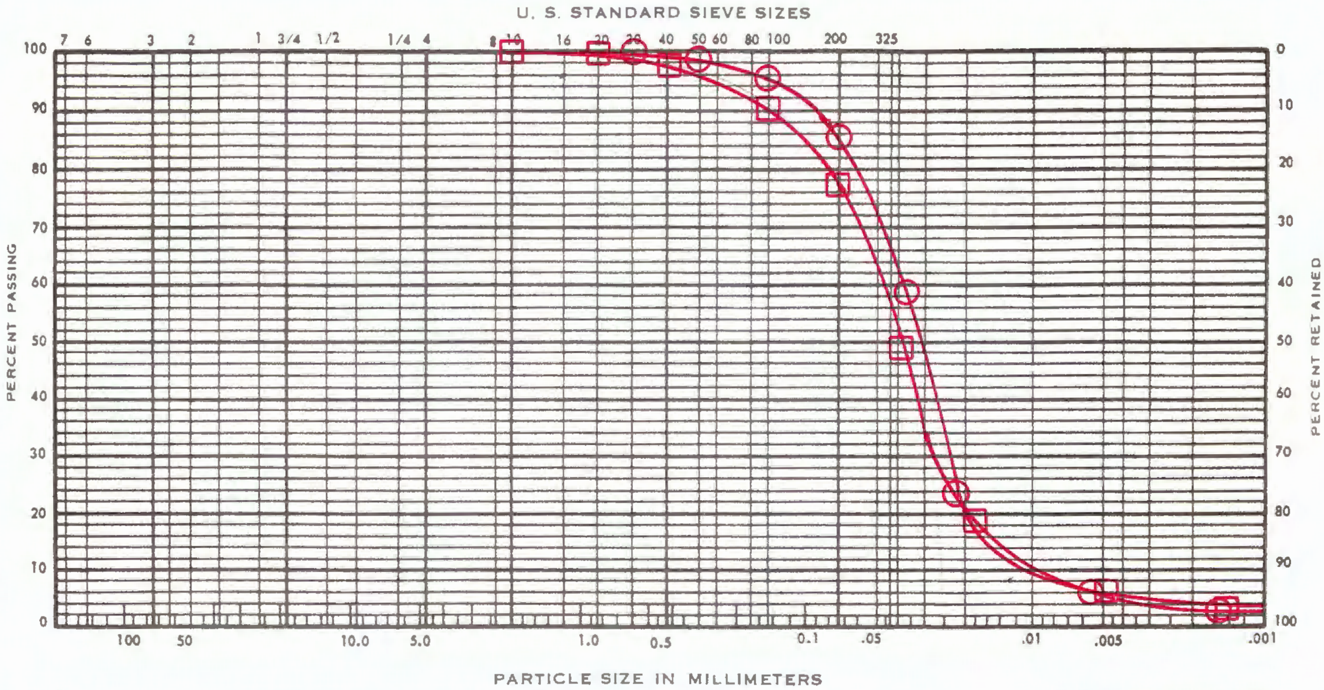
PROJECT NO	DATE	
1861.001.G	11/23/20	Figure A-9

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
─□─	TH-#1	2.0		ML	Medium to reddish-brown, sandy, clayey SILT
─○─	TH-#1	5.0		ML	Medium to reddish-brown, sandy, clayey SILT

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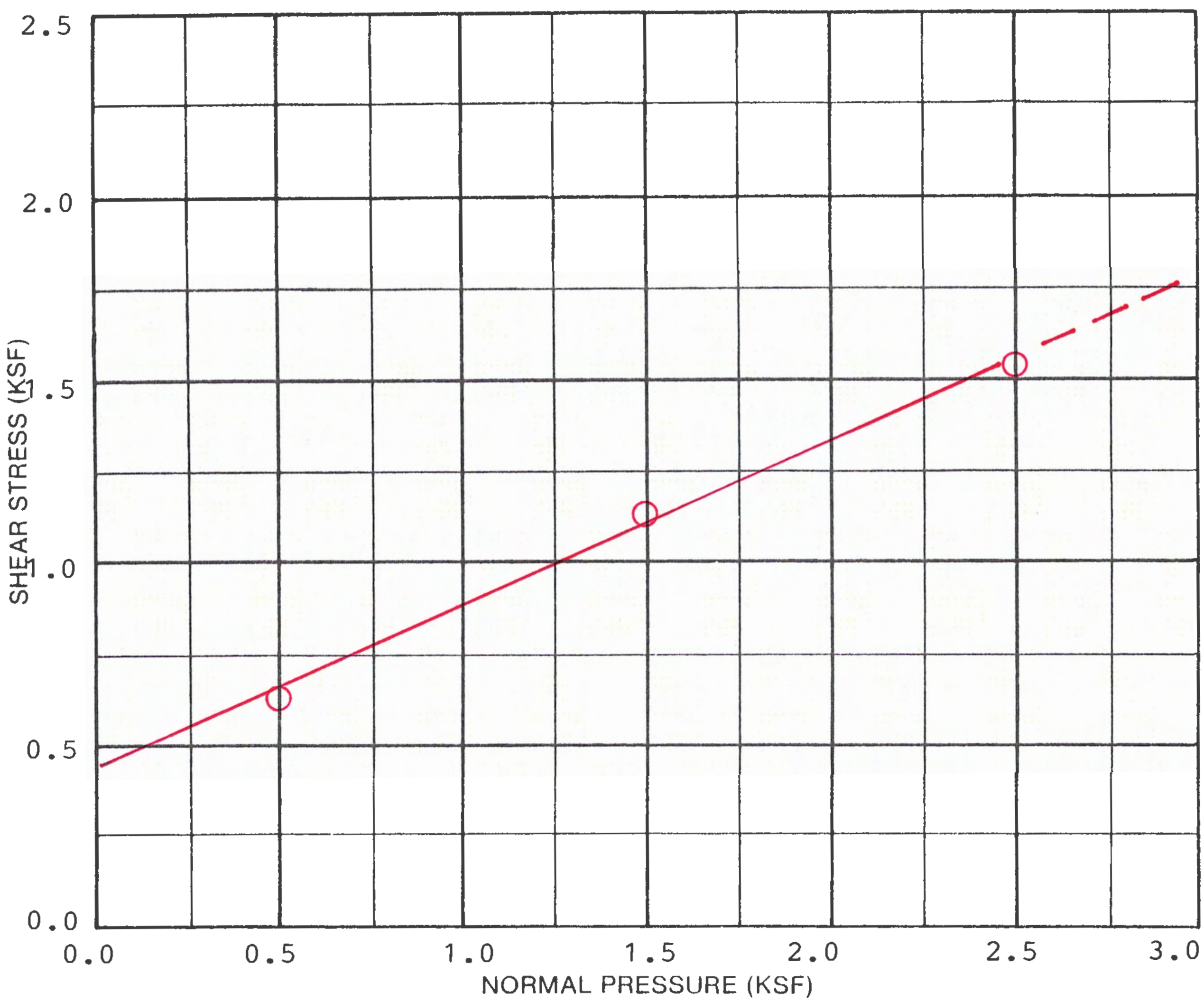
GRADATION TEST DATA

VISTA LOOP APARTMENTS
40808 and 41010 Highway 26

PROJECT NO.	DATE	FIGURE
1861.001.G	11/23/20	A-10



SAMPLE DATA	
DESCRIPTION: Medium to reddish-brown sandy, clayey SILT (ML) (Remolded)	
BORING NO.: TH-#3	
DEPTH (ft.): 2.5	ELEVATION (ft):
TEST RESULTS	
APPARENT COHESION (C): 450 psf	
APPARENT ANGLE OF INTERNAL FRICTION (φ): 24°	

TEST DATA				
TEST NUMBER	1	2	3	4
NORMAL PRESSURE (KSF)	0.5	1.5	2.5	
SHEAR STRENGTH (KSF)	0.6	1.1	1.5	
INITIAL H_2O CONTENT (%)	28.0	28.0	28.0	
FINAL H_2O CONTENT (%)	28.9	23.2	16.6	
INITIAL DRY DENSITY (PCF)	95.0	95.0	95.0	
FINAL DRY DENSITY (PCF)	95.7	98.9	103.3	
STRAIN RATE: 0.02 inches per minute				

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DIRECT SHEAR TEST DATA		
VISTA LOOP APARTMENTS 40808 and 41010 Highway 26		
PROJECT NO.	DATE	Figure A-11
1861.001.G	11/23/20	

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#3

SAMPLE DEPTH: 2.5 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	329	431
Expansion Dial (o.ooo1”)	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	17.6	14.4	11.1
Dry Density (pcf)	93.4	98.2	102.6
Resistance Value, “R”	17	30	41
“R”-Value at 300 psi Exudation Pressure = 29			

SAMPLE LOCATION: TH-#6

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	208	326	439
Expansion Dial (0.0001”)	0	1	2
Expansion Pressure (psf)	0	3	8
Moisture Content (%)	17.3	14.1	10.7
Dry Density (pcf)	94.9	99.1	103.7
Resistance Value “R”	19	32	43
“R”-Value at 300 psi Exudation Pressure = 31			

Division 004 Appendix C - Infiltration Testing

Location: Vista Loop Apartments	**Date:** October 20, 2020	**Test Hole:** TH-#3
Depth to Bottom of Hole: 4.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head
Tester's Name: Daniel M. Redmond, P.E., G.E. **Tester's Company:** Redmond Geotechnical Services, LLC	**Tester's Contact Number:** 503-285-0598	

Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-4.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
11:00	0	48.00	----		Filled w/12" water
11:20	20	48.20	0.20	0.60	
11:40	20	48.34	0.14	0.42	
12:00	20	48.45	0.11	0.33	
12:20	20	48.54	0.09	0.27	
12:40	20	48.62	0.08	0.24	
1:00	20	48.69	0.07	0.21	
1:20	20	48.76	0.07	0.21	
1:40	20	48.83	0.07	0.21	

Infiltration Test Data Table

Figure No. A-13

Division 004 Appendix C - Infiltration Testing

Location: Vista Loop Apartments	**Date:** October 20, 2020	**Test Hole:** TH-#4
Depth to Bottom of Hole: 5.0 feet	**Hole Diameter:** 6 inches	**Test Method:** Encased Falling Head

Tester's Name: Daniel M. Redmond, P.E., G.E.

Tester's Company: Redmond Geotechnical Services, LLC **Tester's Contact Number:** 503-285-0598

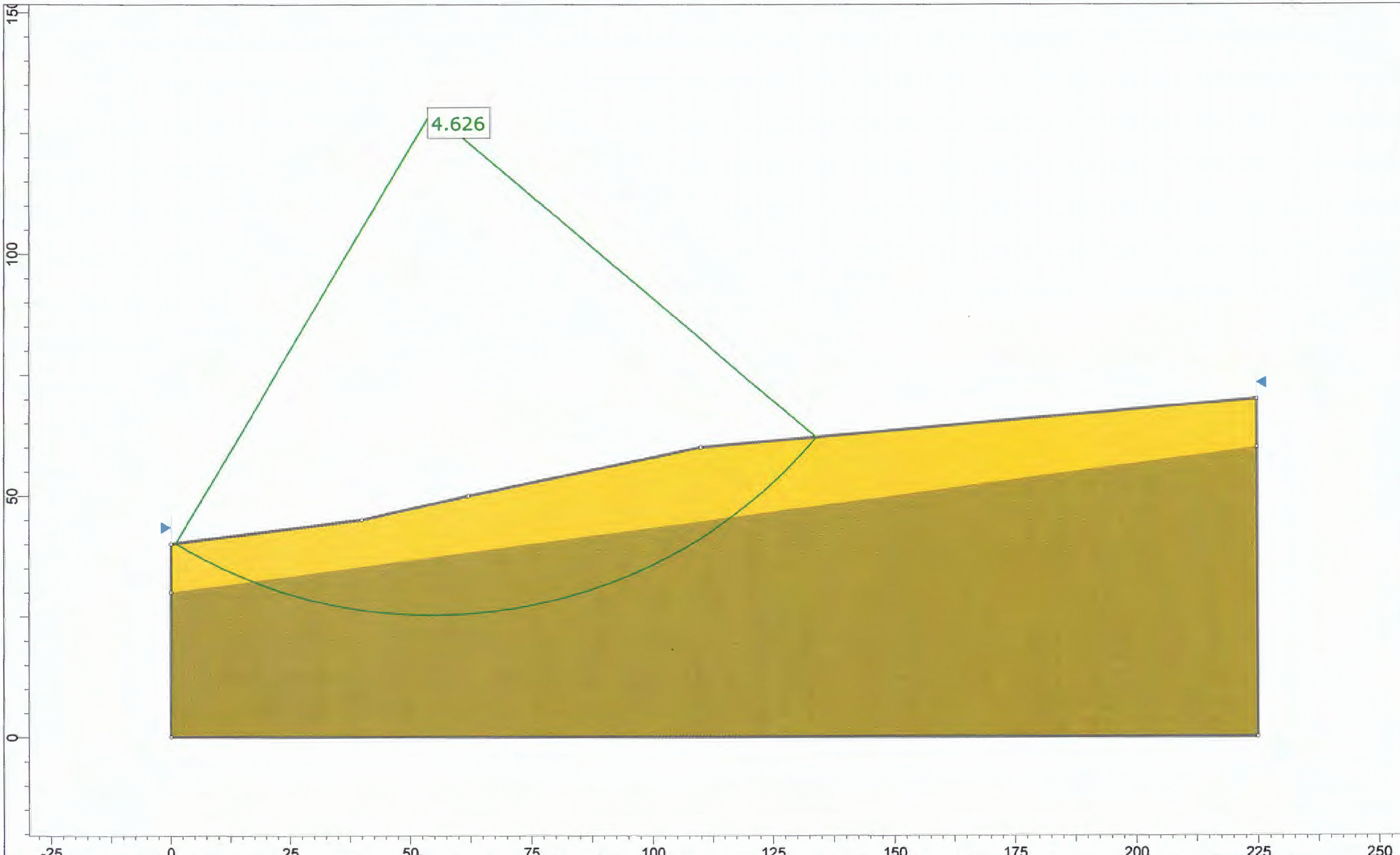
Depth (feet)	Soil Characteristics
0-1.0	Dark brown Topsoil
1.0-5.0	Medium to reddish-brown, sandy, clayey SILT (ML)

Time	Time Interval (Minutes)	Measurement (inches)	Drop in Water (inches)	Infiltration Rate (inches/hour)	Remarks
11:30	0	60.00	----		Filled w/12" water
11:50	20	60.15	0.15	0.45	
12:10	20	60.25	0.10	0.30	
12:30	20	60.32	0.07	0.21	
12:50	20	60.37	0.05	0.15	
1:10	20	60.41	0.04	0.12	
1:30	20	60.44	0.03	0.09	
1:50	20	60.47	0.03	0.09	
2:10	20	60.50	0.03	0.09	

Infiltration Test Data Table

Appendix "B"

Slope Stability Analysis



rocscience

SLIDEINTERPRET 8.020

Project	Vista Loop Apartments		
Analysis Description			
Drawn By	Daniel M. Redmond, P.E., G.E.	Scale	1:333
Company	Redmond Geotechnical Services, LLC		
Date	November 21, 2020	File Name	Vista Loop Apartments Static.slmd

Slide Analysis Information

Vista Loop Apartments Static

Project Summary

File Name:	Vista Loop Apartments Static.slmd
Slide Modeler Version:	8.02
Compute Time:	00h:00m:01.150s
Project Title:	Vista Loop Apartments
Author:	Daniel M. Redmond, P.E., G.E.
Company:	Redmond Geotechnical Services, LLC
Date Created:	November 21, 2020

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	Janbu simplified
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Material 1	Material 5
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	110	110
Cohesion [psf]	450	350
Friction Angle [°]	24	26
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: bishop simplified

FS	4.626110
Center:	54.656, 129.596
Radius:	104.317
Left Slip Surface Endpoint:	1.015, 40.127
Right Slip Surface Endpoint:	134.197, 62.104
Resisting Moment:	1.90519e+07 lb-ft
Driving Moment:	4.11834e+06 lb-ft
Total Slice Area:	2301.38 ft2
Surface Horizontal Width:	133.182 ft
Surface Average Height:	17.28 ft

Method: janbu simplified

FS	4.243600
Center:	58.497, 104.803
Radius:	81.443
Left Slip Surface Endpoint:	7.895, 40.987
Right Slip Surface Endpoint:	127.487, 61.521
Resisting Horizontal Force:	162738 lb
Driving Horizontal Force:	38349 lb
Total Slice Area:	2275.47 ft2
Surface Horizontal Width:	119.591 ft
Surface Average Height:	19.027 ft

Valid/Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	12126
Number of Invalid Surfaces:	44

Error Codes:

Error Code -112 reported for 44 surfaces

Method: janbu simplified

Number of Valid Surfaces:	11229
Number of Invalid Surfaces:	941

Error Codes:

Error Code -108 reported for 342 surfaces
Error Code -111 reported for 599 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 4.62611**

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.67883	278.075	-30.0942	Material 1	450	24	113.6	525.528	169.639	0	169.639
2	2.67883	818.959	-28.4075	Material 1	450	24	133.654	618.297	378.003	0	378.003
3	2.67883	1330.02	-26.7473	Material 1	450	24	152.452	705.26	573.323	0	573.323
4	2.67883	1812.58	-25.1109	Material 1	450	24	170.066	786.742	756.335	0	756.335
5	2.67883	2267.82	-23.4962	Material 1	450	24	186.555	863.025	927.668	0	927.668
6	2.67883	2696.74	-21.9011	Material 1	450	24	201.974	934.356	1087.88	0	1087.88
7	2.68435	3107.05	-20.322	Material 5	350	26	205.722	951.694	1233.66	0	1233.66
8	2.68435	3487.49	-18.7573	Material 5	350	26	220.528	1020.18	1374.08	0	1374.08
9	2.68435	3843.89	-17.207	Material 5	350	26	234.279	1083.8	1504.51	0	1504.51
10	2.68435	4176.87	-15.6696	Material 5	350	26	247.013	1142.71	1625.3	0	1625.3
11	2.68435	4486.99	-14.1437	Material 5	350	26	258.763	1197.07	1736.74	0	1736.74
12	2.68435	4774.73	-12.628	Material 5	350	26	269.557	1247	1839.12	0	1839.12
13	2.68435	5040.51	-11.1212	Material 5	350	26	279.419	1292.62	1932.66	0	1932.66
14	2.68435	5284.68	-9.62213	Material 5	350	26	288.373	1334.04	2017.59	0	2017.59
15	2.68435	5516.31	-8.12971	Material 5	350	26	296.785	1372.96	2097.39	0	2097.39
16	2.68435	5787.61	-6.64283	Material 5	350	26	306.737	1419	2191.78	0	2191.78
17	2.68435	6049.7	-5.16044	Material 5	350	26	316.277	1463.13	2282.25	0	2282.25
18	2.68435	6291.13	-3.6815	Material 5	350	26	324.951	1503.26	2364.54	0	2364.54
19	2.68435	6512.03	-2.20502	Material 5	350	26	332.774	1539.45	2438.74	0	2438.74
20	2.68435	6712.49	-0.729997	Material 5	350	26	339.754	1571.74	2504.93	0	2504.93
21	2.68435	6892.53	0.744538	Material 5	350	26	345.895	1600.15	2563.18	0	2563.18
22	2.68435	7052.16	2.21957	Material 5	350	26	351.202	1624.7	2613.53	0	2613.53
23	2.68435	7190.8	3.69607	Material 5	350	26	355.662	1645.33	2655.81	0	2655.81

24	2.68435	7298.45	5.17504	Material 5	350	26	358.885	1660.24	2686.39	0	2686.39
25	2.68435	7381.43	6.65747	Material 5	350	26	361.126	1670.61	2707.65	0	2707.65
26	2.68435	7443.58	8.1444	Material 5	350	26	362.542	1677.16	2721.07	0	2721.07
27	2.68435	7484.7	9.63688	Material 5	350	26	363.126	1679.86	2726.62	0	2726.62
28	2.68435	7504.53	11.136	Material 5	350	26	362.875	1678.7	2724.23	0	2724.23
29	2.68435	7502.75	12.6429	Material 5	350	26	361.779	1673.63	2713.85	0	2713.85
30	2.68435	7479	14.1587	Material 5	350	26	359.831	1664.62	2695.38	0	2695.38
31	2.68435	7432.87	15.6847	Material 5	350	26	357.021	1651.62	2668.72	0	2668.72
32	2.68435	7363.87	17.2223	Material 5	350	26	353.334	1634.56	2633.74	0	2633.74
33	2.68435	7271.44	18.7727	Material 5	350	26	348.753	1613.37	2590.29	0	2590.29
34	2.68435	7154.97	20.3376	Material 5	350	26	343.262	1587.97	2538.21	0	2538.21
35	2.68435	7013.74	21.9184	Material 5	350	26	336.84	1558.26	2477.3	0	2477.3
36	2.68435	6846.94	23.5171	Material 5	350	26	329.463	1524.13	2407.32	0	2407.32
37	2.68435	6653.67	25.1354	Material 5	350	26	321.103	1485.46	2328.04	0	2328.04
38	2.68435	6432.87	26.7754	Material 5	350	26	311.731	1442.1	2239.14	0	2239.14
39	2.68435	6183.38	28.4396	Material 5	350	26	301.311	1393.9	2140.31	0	2140.31
40	2.68435	5903.86	30.1304	Material 5	350	26	289.805	1340.67	2031.17	0	2031.17
41	2.68435	5585.54	31.8506	Material 5	350	26	276.899	1280.97	1908.76	0	1908.76
42	2.68435	5162.95	33.6037	Material 5	350	26	260.208	1203.75	1750.45	0	1750.45
43	2.68435	4686.95	35.3931	Material 5	350	26	241.642	1117.86	1574.35	0	1574.35
44	2.5412	3964.63	37.1733	Material 1	450	24	230.597	1066.77	1385.28	0	1385.28
45	2.5412	3470	38.9466	Material 1	450	24	212.188	981.604	1194	0	1194
46	2.5412	2938.5	40.7654	Material 1	450	24	192.584	890.917	990.316	0	990.316
47	2.5412	2367.06	42.6355	Material 1	450	24	171.707	794.335	773.39	0	773.39
48	2.5412	1752.02	44.5637	Material 1	450	24	149.461	691.424	542.247	0	542.247

49	2.5412	1088.94	46.5583	Material 1	450	24	125.738	581.676	295.749	0	295.749
50	2.5412	372.395	48.6292	Material 1	450	24	100.406	464.488	32.5414	0	32.5414

- **Global Minimum Query (janbu simplified) - Safety Factor: 4.2436**

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.53101	312.373	-37.2927	Material 1	450	24	129.324	548.801	221.911	0	221.911
2	2.53101	916.276	-35.0855	Material 1	450	24	155.483	659.808	471.238	0	471.238
3	2.53101	1480.1	-32.9366	Material 1	450	24	179.604	762.168	701.141	0	701.141
4	2.53101	2006.79	-30.8388	Material 1	450	24	201.875	856.675	913.408	0	913.408
5	2.53101	2498.8	-28.786	Material 1	450	24	222.448	943.98	1109.5	0	1109.5
6	2.39611	2789.74	-26.8256	Material 5	350	26	229.639	974.496	1280.41	0	1280.41
7	2.39611	3175.29	-24.9514	Material 5	350	26	248.05	1052.63	1440.6	0	1440.6
8	2.39611	3535.88	-23.1054	Material 5	350	26	265.08	1124.89	1588.77	0	1588.77
9	2.39611	3872.56	-21.2844	Material 5	350	26	280.805	1191.62	1725.58	0	1725.58
10	2.39611	4186.26	-19.4858	Material 5	350	26	295.287	1253.08	1851.59	0	1851.59
11	2.39611	4477.75	-17.7069	Material 5	350	26	308.584	1309.51	1967.28	0	1967.28
12	2.39611	4747.73	-15.9455	Material 5	350	26	320.744	1361.11	2073.08	0	2073.08
13	2.39611	4996.8	-14.1995	Material 5	350	26	331.808	1408.06	2169.34	0	2169.34
14	2.39611	5250.62	-12.4668	Material 5	350	26	343.051	1455.77	2267.16	0	2267.16
15	2.39611	5523.46	-10.7457	Material 5	350	26	355.165	1507.18	2372.58	0	2372.58
16	2.39611	5777.12	-9.0343	Material 5	350	26	366.281	1554.35	2469.28	0	2469.28
17	2.39611	6011.49	-7.33102	Material 5	350	26	376.395	1597.27	2557.28	0	2557.28
18	2.39611	6226.8	-5.63424	Material 5	350	26	385.529	1636.03	2636.75	0	2636.75
19	2.39611	6423.25	-3.94241	Material 5	350	26	393.699	1670.7	2707.83	0	2707.83
20	2.39611	6600.97	-2.25402	Material 5	350	26	400.919	1701.34	2770.65	0	2770.65
21	2.39611	6760.06	-0.567591	Material 5	350	26	407.199	1727.99	2825.3	0	2825.3
22	2.39611	6900.56	1.11835	Material 5	350	26	412.548	1750.69	2871.85	0	2871.85
23	2.39611	7019.52	2.80526	Material 5	350	26	416.832	1768.87	2909.12	0	2909.12

24	2.39611	7111.33	4.49461	Material 5	350	26	419.792	1781.43	2934.87	0	2934.87
25	2.39611	7183.84	6.18789	Material 5	350	26	421.807	1789.98	2952.4	0	2952.4
26	2.39611	7237.43	7.88662	Material 5	350	26	422.9	1794.62	2961.92	0	2961.92
27	2.39611	7271.9	9.59236	Material 5	350	26	423.07	1795.34	2963.38	0	2963.38
28	2.39611	7286.97	11.3067	Material 5	350	26	422.304	1792.09	2956.73	0	2956.73
29	2.39611	7282.32	13.0314	Material 5	350	26	420.598	1784.85	2941.88	0	2941.88
30	2.39611	7257.56	14.7683	Material 5	350	26	417.938	1773.56	2918.72	0	2918.72
31	2.39611	7212.24	16.5191	Material 5	350	26	414.304	1758.14	2887.11	0	2887.11
32	2.39611	7145.82	18.2859	Material 5	350	26	409.68	1738.52	2846.88	0	2846.88
33	2.39611	7057.67	20.071	Material 5	350	26	404.044	1714.6	2797.84	0	2797.84
34	2.39611	6947.07	21.8767	Material 5	350	26	397.368	1686.27	2739.76	0	2739.76
35	2.39611	6813.2	23.7055	Material 5	350	26	389.622	1653.4	2672.37	0	2672.37
36	2.39611	6655.1	25.5604	Material 5	350	26	380.771	1615.84	2595.35	0	2595.35
37	2.39611	6471.66	27.4444	Material 5	350	26	370.77	1573.4	2508.35	0	2508.35
38	2.39611	6261.59	29.3613	Material 5	350	26	359.574	1525.89	2410.94	0	2410.94
39	2.39611	6023.4	31.315	Material 5	350	26	347.13	1473.08	2302.65	0	2302.65
40	2.39611	5755.36	33.3102	Material 5	350	26	333.366	1414.67	2182.9	0	2182.9
41	2.39611	5455.42	35.3522	Material 5	350	26	318.211	1350.36	2051.04	0	2051.04
42	2.39611	5121.14	37.4474	Material 5	350	26	301.576	1279.77	1906.31	0	1906.31
43	2.39611	4732.47	39.603	Material 5	350	26	282.605	1199.26	1741.25	0	1741.25
44	2.39611	4247.71	41.8282	Material 5	350	26	259.53	1101.34	1540.48	0	1540.48
45	2.24803	3501.02	44.0598	Material 1	450	24	244.603	1038	1320.66	0	1320.66
46	2.24803	2989.47	46.305	Material 1	450	24	221.266	938.966	1098.24	0	1098.24
47	2.24803	2431.11	48.6467	Material 1	450	24	196.126	832.279	858.613	0	858.613
48	2.24803	1819.15	51.103	Material 1	450	24	168.971	717.044	599.791	0	599.791

49	2.24803	1144.63	53.6982	Material 1	450	24	139.535	592.13	319.227	0	319.227
50	2.24803	395.219	56.4655	Material 1	450	24	107.474	456.075	13.6445	0	13.6445

Interslice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 4.62611**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	1.01512	40.1269	0	0	0
2	3.69395	38.5744	567.672	0	0
3	6.37278	37.1255	1473.38	0	0
4	9.0516	35.7754	2655.79	0	0
5	11.7304	34.5199	4060.92	0	0
6	14.4093	33.3554	5640.99	0	0
7	17.0881	32.2784	7353.62	0	0
8	19.7724	31.2843	9132.26	0	0
9	22.4568	30.3727	10976.8	0	0
10	25.1411	29.5414	12856.4	0	0
11	27.8255	28.7884	14743.3	0	0
12	30.5098	28.1119	16612.7	0	0
13	33.1942	27.5105	18442.3	0	0
14	35.8785	26.9828	20212.2	0	0
15	38.5629	26.5278	21904.4	0	0
16	41.2472	26.1443	23505.3	0	0
17	43.9316	25.8317	25013.9	0	0
18	46.6159	25.5892	26416.1	0	0
19	49.3003	25.4165	27696.8	0	0
20	51.9846	25.3132	28842.1	0	0
21	54.669	25.279	29839.8	0	0
22	57.3533	25.3139	30678.8	0	0
23	60.0377	25.4179	31349.6	0	0
24	62.722	25.5913	31843.8	0	0
25	65.4064	25.8344	32154	0	0
26	68.0907	26.1477	32275	0	0
27	70.7751	26.5319	32202.9	0	0
28	73.4594	26.9877	31934.8	0	0
29	76.1438	27.5161	31469.4	0	0
30	78.8281	28.1182	30806.4	0	0
31	81.5125	28.7954	29947	0	0
32	84.1968	29.5492	28893.7	0	0
33	86.8812	30.3813	27650.7	0	0
34	89.5655	31.2937	26223.5	0	0
35	92.2498	32.2886	24619.4	0	0
36	94.9342	33.3687	22847.8	0	0
37	97.6185	34.5369	20920.1	0	0
38	100.303	35.7963	18850	0	0
39	102.987	37.1509	16653.8	0	0
40	105.672	38.6047	14350.9	0	0
41	108.356	40.1626	11964.4	0	0
42	111.04	41.8303	9524.49	0	0
43	113.725	43.614	7100.64	0	0

44	116.409	45.5212	4746.69	0	0
45	118.95	47.4482	2663.21	0	0
46	121.491	49.5021	750.037	0	0
47	124.033	51.6929	-930.196	0	0
48	126.574	54.0326	-2303.34	0	0
49	129.115	56.5354	-3280.67	0	0
50	131.656	59.2187	-3754.75	0	0
51	134.197	62.1041	0	0	0

- **Global Minimum Query (janbu simplified) - Safety Factor: 4.2436**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	7.89535	40.9869	0	0	0
2	10.4264	39.0593	755.076	0	0
3	12.9574	37.2815	1986.4	0	0
4	15.4884	35.6418	3590.62	0	0
5	18.0194	34.1307	5481.81	0	0
6	20.5504	32.7401	7587.73	0	0
7	22.9465	31.5283	9689.44	0	0
8	25.3426	30.4135	11889.8	0	0
9	27.7387	29.3912	14149.2	0	0
10	30.1348	28.4577	16432.8	0	0
11	32.5309	27.6099	18710.2	0	0
12	34.927	26.8449	20954.6	0	0
13	37.3231	26.1603	23142.3	0	0
14	39.7193	25.554	25252.6	0	0
15	42.1154	25.0243	27275.6	0	0
16	44.5115	24.5695	29205.5	0	0
17	46.9076	24.1886	31023.9	0	0
18	49.3037	23.8803	32714.1	0	0
19	51.6998	23.6439	34261.2	0	0
20	54.0959	23.4788	35651.7	0	0
21	56.492	23.3845	36873.6	0	0
22	58.8881	23.3607	37916.4	0	0
23	61.2842	23.4075	38770.5	0	0
24	63.6803	23.5249	39427.7	0	0
25	66.0764	23.7133	39880.8	0	0
26	68.4726	23.973	40124.5	0	0
27	70.8687	24.305	40154.7	0	0
28	73.2648	24.7099	39968.4	0	0
29	75.6609	25.189	39563.8	0	0
30	78.057	25.7436	38940.1	0	0
31	80.4531	26.3752	38097.9	0	0
32	82.8492	27.0858	37039	0	0
33	85.2453	27.8776	35766.5	0	0
34	87.6414	28.7531	34285.2	0	0
35	90.0375	29.7152	32601.4	0	0
36	92.4336	30.7673	30723.4	0	0
37	94.8298	31.9133	28661.5	0	0
38	97.2259	33.1577	26428.6	0	0
39	99.622	34.5057	24040.2	0	0
40	102.018	35.9634	21515.3	0	0
41	104.414	37.5379	18877	0	0
42	106.81	39.2378	16153.1	0	0
43	109.206	41.0729	13377.4	0	0

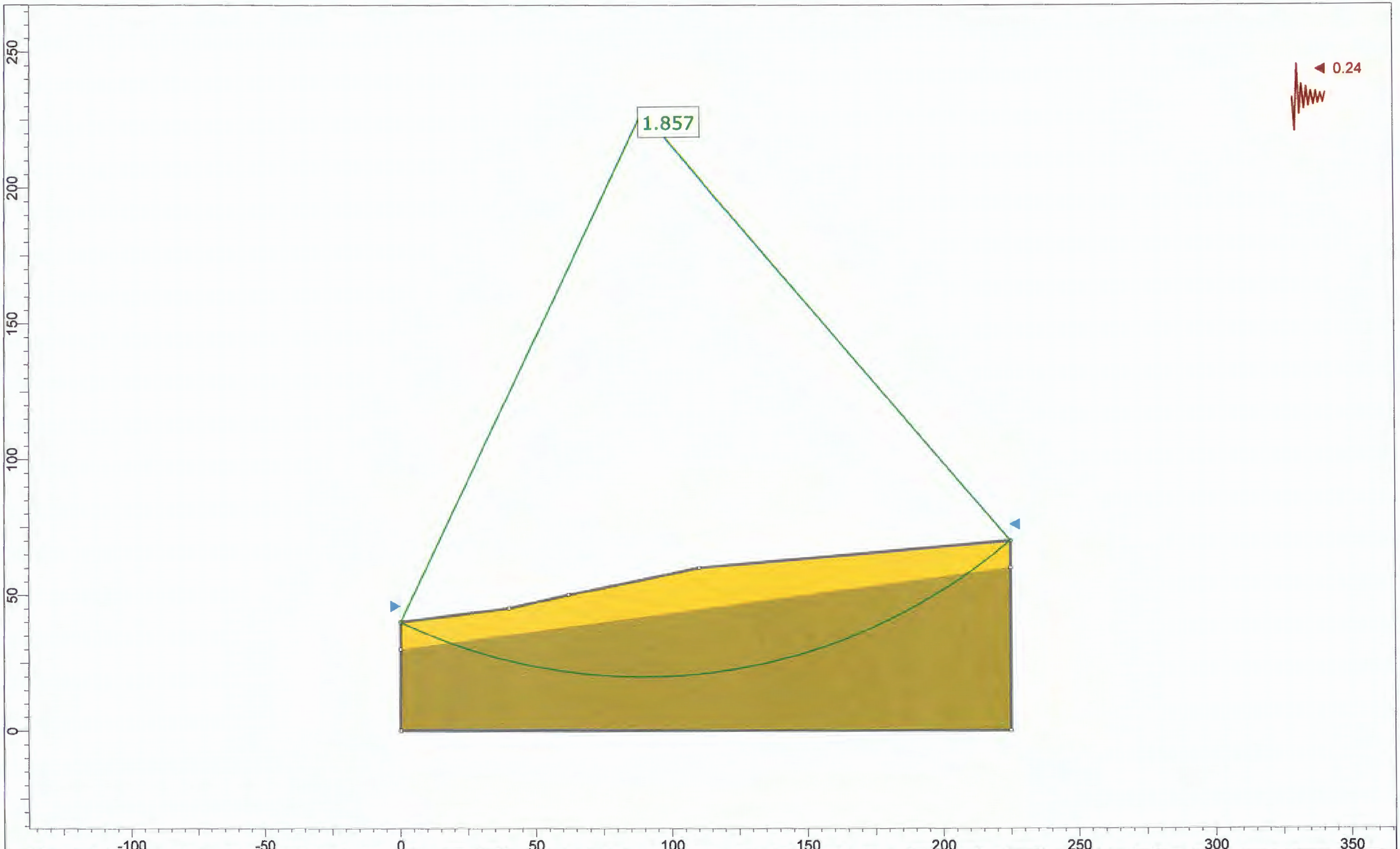
44	111.603	43.0553	10602.6	0	0
45	113.999	45.1998	7920.92	0	0
46	116.247	47.3753	5597.76	0	0
47	118.495	49.7281	3511.2	0	0
48	120.743	52.2822	1759.13	0	0
49	122.991	55.0685	467.77	0	0
50	125.239	58.1286	-195.43	0	0
51	127.487	61.5206	0	0	0

Entity Information

Group: Group 1

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	225	0
	225	60
	225	70
	110	60
	62	50
	40	45
	0	40
	0	30
	0	0
Material Boundary	0	30
	225	60



rocscience	Project	Vista Loop Apartments		
	Analysis Description			
	Drawn By Daniel M. Redmond, P.E., G.E.	Scale 1:587	Company	Redmond Geotechnical Services, LLC
SLIDEINTERPRET 8.020	Date November 21, 2020		File Name	Vista Loop Apartments Seismic.slmd

Slide Analysis Information

Vista Loop Apartments Seismic

Project Summary

File Name:	Vista Loop Apartments Seismic.slmd
Slide Modeler Version:	8.02
Compute Time:	00h:00m:00.963s
Project Title:	Vista Loop Apartments
Author:	Daniel M. Redmond, P.E., G.E.
Company:	Redmond Geotechnical Services, LLC
Date Created:	November 21, 2020

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	Janbu simplified
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.24

Materials

Property	Material 1	Material 5
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	110	110
Cohesion [psf]	450	350
Friction Angle [°]	24	26
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: bishop simplified

FS	1.856590
Center:	89.369, 228.460
Radius:	208.568
Left Slip Surface Endpoint:	0.015, 40.002
Right Slip Surface Endpoint:	224.980, 69.998
Resisting Moment:	8.13211e+07 lb-ft
Driving Moment:	4.38013e+07 lb-ft
Total Slice Area:	5650.2 ft2
Surface Horizontal Width:	224.966 ft
Surface Average Height:	25.1158 ft

Method: janbu simplified

FS	1.731380
Center:	95.068, 183.089
Radius:	171.782
Left Slip Surface Endpoint:	0.015, 40.002
Right Slip Surface Endpoint:	224.322, 69.941
Resisting Horizontal Force:	446877 lb
Driving Horizontal Force:	258104 lb
Total Slice Area:	7072.08 ft2
Surface Horizontal Width:	224.307 ft
Surface Average Height:	31.5286 ft

Valid/Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	11493
Number of Invalid Surfaces:	0

Method: janbu simplified

Number of Valid Surfaces: 11438
Number of Invalid Surfaces: 55

Error Codes:

Error Code -108 reported for 41 surfaces
Error Code -111 reported for 4 surfaces
Error Code -112 reported for 10 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.85659**

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.53789	662.052	-24.6812	Material 1	450	24	311.709	578.715	289.1	0	289.1
2	4.53789	1953.83	-23.3164	Material 1	450	24	385.462	715.645	596.65	0	596.65
3	4.53789	3181.93	-21.9656	Material 1	450	24	454.478	843.78	884.444	0	884.444
4	4.53789	4348.21	-20.6274	Material 1	450	24	519.003	963.575	1153.51	0	1153.51
5	4.4484	5336.64	-19.314	Material 5	350	26	554.736	1029.92	1394.04	0	1394.04
6	4.4484	6344.29	-18.0239	Material 5	350	26	615.808	1143.3	1626.51	0	1626.51
7	4.4484	7297.93	-16.7433	Material 5	350	26	672.648	1248.83	1842.88	0	1842.88
8	4.4484	8198.68	-15.4712	Material 5	350	26	725.429	1346.83	2043.79	0	2043.79
9	4.4484	9048.48	-14.207	Material 5	350	26	774.371	1437.69	2230.09	0	2230.09
10	4.4484	9977.17	-12.9497	Material 5	350	26	827.711	1536.72	2433.13	0	2433.13
11	4.4484	10947.5	-11.6987	Material 5	350	26	883.054	1639.47	2643.79	0	2643.79
12	4.4484	11868.4	-10.4534	Material 5	350	26	934.703	1735.36	2840.4	0	2840.4
13	4.4484	12740.4	-9.21307	Material 5	350	26	982.775	1824.61	3023.41	0	3023.41
14	4.4484	13563.7	-7.97707	Material 5	350	26	1027.34	1907.35	3193.04	0	3193.04
15	4.4484	14313.4	-6.74479	Material 5	350	26	1066.95	1980.88	3343.82	0	3343.82
16	4.4484	15000.7	-5.51565	Material 5	350	26	1102.35	2046.62	3478.58	0	3478.58
17	4.4484	15640.9	-4.28904	Material 5	350	26	1134.55	2106.4	3601.14	0	3601.14
18	4.4484	16234.3	-3.06441	Material 5	350	26	1163.61	2160.34	3711.75	0	3711.75
19	4.4484	16781	-1.84117	Material 5	350	26	1189.58	2208.56	3810.62	0	3810.62
20	4.4484	17281.3	-0.618778	Material 5	350	26	1212.51	2251.14	3897.92	0	3897.92
21	4.4484	17735	0.603335	Material 5	350	26	1232.46	2288.18	3973.86	0	3973.86
22	4.4484	18142.4	1.82572	Material 5	350	26	1249.47	2319.75	4038.59	0	4038.59
23	4.4484	18503.2	3.04895	Material 5	350	26	1263.56	2345.91	4092.24	0	4092.24

24	4.4484	18817.4	4.27356	Material 5	350	26	1274.77	2366.73	4134.91	0	4134.91
25	4.4484	19068	5.50013	Material 5	350	26	1282.17	2380.46	4163.06	0	4163.06
26	4.4484	19078.9	6.72924	Material 5	350	26	1275.7	2368.46	4138.45	0	4138.45
27	4.4484	18987.5	7.96147	Material 5	350	26	1263.43	2345.68	4091.75	0	4091.75
28	4.4484	18848.4	9.19742	Material 5	350	26	1248.53	2318.01	4035.01	0	4035.01
29	4.4484	18660.9	10.4377	Material 5	350	26	1231	2285.46	3968.28	0	3968.28
30	4.4484	18424.7	11.683	Material 5	350	26	1210.84	2248.04	3891.55	0	3891.55
31	4.4484	18139	12.9338	Material 5	350	26	1188.07	2205.76	3804.88	0	3804.88
32	4.4484	17803.1	14.191	Material 5	350	26	1162.67	2158.61	3708.2	0	3708.2
33	4.4484	17416.2	15.4552	Material 5	350	26	1134.66	2106.59	3601.55	0	3601.55
34	4.4484	16977.5	16.7272	Material 5	350	26	1104	2049.68	3484.86	0	3484.86
35	4.4484	16485.9	18.0077	Material 5	350	26	1070.7	1987.85	3358.08	0	3358.08
36	4.4484	15940.3	19.2976	Material 5	350	26	1034.73	1921.07	3221.18	0	3221.18
37	4.4484	15339.5	20.5978	Material 5	350	26	996.084	1849.32	3074.06	0	3074.06
38	4.4484	14682	21.9091	Material 5	350	26	954.734	1772.55	2916.65	0	2916.65
39	4.4484	13966.4	23.2326	Material 5	350	26	910.648	1690.7	2748.84	0	2748.84
40	4.4484	13190.9	24.5694	Material 5	350	26	863.799	1603.72	2570.5	0	2570.5
41	4.4484	12353.6	25.9207	Material 5	350	26	814.149	1511.54	2381.52	0	2381.52
42	4.4484	11452.5	27.2876	Material 5	350	26	761.66	1414.09	2181.72	0	2181.72
43	4.4484	10485.2	28.6715	Material 5	350	26	706.292	1311.3	1970.95	0	1970.95
44	4.4484	9449.05	30.074	Material 5	350	26	647.991	1203.05	1749.02	0	1749.02
45	4.4484	8341.23	31.4967	Material 5	350	26	586.704	1089.27	1515.73	0	1515.73
46	4.4484	7158.45	32.9414	Material 5	350	26	522.372	969.831	1270.84	0	1270.84
47	4.4484	5897.03	34.4101	Material 5	350	26	454.932	844.622	1014.13	0	1014.13
48	5.17765	5161.99	36.0301	Material 1	450	24	409.975	761.156	698.868	0	698.868

49	5.17765	3201.89	37.8098	Material 1	450	24	329.402	611.564	362.879	0	362.879
50	5.17765	1093	39.6335	Material 1	450	24	244.462	453.865	8.68085	0	8.68085

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.73138**

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	4.54862	872.643	-32.6947	Material 1	450	24	370.438	641.369	429.822	0	429.822
2	4.54862	2568.82	-30.9091	Material 1	450	24	478.934	829.217	851.736	0	851.736
3	4.54862	4169.44	-29.1563	Material 1	450	24	578.719	1001.98	1239.77	0	1239.77
4	4.43565	5521.15	-27.454	Material 5	350	26	647.664	1121.35	1581.5	0	1581.5
5	4.43565	6876.98	-25.7987	Material 5	350	26	739.714	1280.73	1908.27	0	1908.27
6	4.43565	8156.16	-24.1663	Material 5	350	26	824.441	1427.42	2209.03	0	2209.03
7	4.43565	9361.69	-22.5545	Material 5	350	26	902.367	1562.34	2485.65	0	2485.65
8	4.43565	10496.2	-20.9613	Material 5	350	26	973.946	1686.27	2739.75	0	2739.75
9	4.43565	11562.5	-19.3849	Material 5	350	26	1039.6	1799.94	2972.81	0	2972.81
10	4.43565	12685.6	-17.8236	Material 5	350	26	1108.26	1918.82	3216.55	0	3216.55
11	4.43565	13841.4	-16.2759	Material 5	350	26	1178.18	2039.88	3464.76	0	3464.76
12	4.43565	14933.9	-14.7404	Material 5	350	26	1242.77	2151.7	3694.05	0	3694.05
13	4.43565	15964.6	-13.2156	Material 5	350	26	1302.26	2254.71	3905.24	0	3905.24
14	4.43565	16934.5	-11.7003	Material 5	350	26	1356.86	2349.24	4099.04	0	4099.04
15	4.43565	17820.5	-10.1932	Material 5	350	26	1405.15	2432.84	4270.46	0	4270.46
16	4.43565	18631.5	-8.69326	Material 5	350	26	1447.82	2506.73	4421.96	0	4421.96
17	4.43565	19384.5	-7.19928	Material 5	350	26	1486.16	2573.11	4558.06	0	4558.06
18	4.43565	20080.3	-5.71022	Material 5	350	26	1520.28	2632.18	4679.18	0	4679.18
19	4.43565	20719.3	-4.22502	Material 5	350	26	1550.3	2684.15	4785.72	0	4785.72
20	4.43565	21302	-2.74266	Material 5	350	26	1576.3	2729.17	4878.02	0	4878.02
21	4.43565	21828.5	-1.26213	Material 5	350	26	1598.38	2767.4	4956.41	0	4956.41
22	4.43565	22299.1	0.217548	Material 5	350	26	1616.61	2798.96	5021.13	0	5021.13
23	4.43565	22713.9	1.69737	Material 5	350	26	1631.05	2823.96	5072.39	0	5072.39

24	4.43565	23072.6	3.17833	Material 5	350		26	1641.75	2842.5	5110.39	0	5110.39
25	4.43565	23364.8	4.66143	Material 5	350		26	1648.12	2853.53	5133.01	0	5133.01
26	4.43565	23416.2	6.14766	Material 5	350		26	1639.49	2838.58	5102.34	0	5102.34
27	4.43565	23342.7	7.63805	Material 5	350		26	1623.24	2810.44	5044.65	0	5044.65
28	4.43565	23211.8	9.13367	Material 5	350		26	1603.61	2776.45	4974.97	0	4974.97
29	4.43565	23022.8	10.6356	Material 5	350		26	1580.61	2736.64	4893.34	0	4893.34
30	4.43565	22774.9	12.145	Material 5	350		26	1554.25	2690.99	4799.75	0	4799.75
31	4.43565	22467.2	13.6629	Material 5	350		26	1524.52	2639.53	4694.23	0	4694.23
32	4.43565	22098.5	15.1908	Material 5	350		26	1491.42	2582.22	4576.71	0	4576.71
33	4.43565	21667.6	16.7297	Material 5	350		26	1454.93	2519.04	4447.19	0	4447.19
34	4.43565	21173.1	18.2813	Material 5	350		26	1415.02	2449.94	4305.52	0	4305.52
35	4.43565	20613.2	19.8468	Material 5	350		26	1371.67	2374.89	4151.65	0	4151.65
36	4.43565	19986.1	21.4279	Material 5	350		26	1324.84	2293.81	3985.4	0	3985.4
37	4.43565	19289.7	23.0264	Material 5	350		26	1274.49	2206.62	3806.64	0	3806.64
38	4.43565	18521.5	24.6441	Material 5	350		26	1220.55	2113.24	3615.17	0	3615.17
39	4.43565	17678.8	26.283	Material 5	350		26	1162.97	2013.55	3410.79	0	3410.79
40	4.43565	16758.6	27.9455	Material 5	350		26	1101.69	1907.44	3193.22	0	3193.22
41	4.43565	15757.1	29.634	Material 5	350		26	1036.61	1794.76	2962.19	0	2962.19
42	4.43565	14670.5	31.3513	Material 5	350		26	967.639	1675.35	2717.38	0	2717.38
43	4.43565	13494	33.1006	Material 5	350		26	894.691	1549.05	2458.4	0	2458.4
44	4.43565	12222.2	34.8854	Material 5	350		26	817.637	1415.64	2184.87	0	2184.87
45	4.43565	10849	36.71	Material 5	350		26	736.353	1274.91	1896.35	0	1896.35
46	4.43565	9367.16	38.5791	Material 5	350		26	650.7	1126.61	1592.28	0	1592.28
47	4.43565	7767.99	40.4982	Material 5	350		26	560.518	970.47	1272.15	0	1272.15
48	4.43565	6041.34	42.474	Material 5	350		26	465.638	806.196	935.34	0	935.34

49	5.52855	4890.6	44.7759	Material 1	450	24	388.242	672.195	499.057	0	499.057
50	5.52855	1684.4	47.438	Material 1	450	24	264.207	457.444	16.7184	0	16.7184

Interslice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.85659**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	0.0146863	40.0018	0	0	0
2	4.55258	37.9164	1858.09	0	0
3	9.09047	35.9606	4304.83	0	0
4	13.6284	34.1303	7221.71	0	0
5	18.1662	32.4222	10503	0	0
6	22.6146	30.8631	13862.6	0	0
7	27.063	29.4157	17432.8	0	0
8	31.5114	28.0775	21138.9	0	0
9	35.9598	26.8462	24913.7	0	0
10	40.4082	25.72	28697.3	0	0
11	44.8566	24.6971	32472.5	0	0
12	49.305	23.776	36207.4	0	0
13	53.7534	22.9553	39846.9	0	0
14	58.2018	22.2338	43341.2	0	0
15	62.6502	21.6104	46645.1	0	0
16	67.0986	21.0843	49713.9	0	0
17	71.547	20.6548	52510.3	0	0
18	75.9954	20.3211	55003.4	0	0
19	80.4438	20.083	57165.8	0	0
20	84.8922	19.94	58973.5	0	0
21	89.3406	19.892	60405.5	0	0
22	93.789	19.9388	61443.9	0	0
23	98.2374	20.0806	62073.6	0	0
24	102.686	20.3175	62282.4	0	0
25	107.134	20.65	62060.9	0	0
26	111.583	21.0783	61403.3	0	0
27	116.031	21.6032	60325.5	0	0
28	120.479	22.2253	58841.5	0	0
29	124.928	22.9456	56963.9	0	0
30	129.376	23.765	54707.9	0	0
31	133.825	24.6849	52091.1	0	0
32	138.273	25.7065	49134.3	0	0
33	142.721	26.8313	45860.9	0	0
34	147.17	28.0612	42297.4	0	0
35	151.618	29.3981	38473.6	0	0
36	156.067	30.8442	34422.6	0	0
37	160.515	32.4018	30181.2	0	0
38	164.963	34.0736	25790.1	0	0
39	169.412	35.8627	21294.1	0	0
40	173.86	37.7723	16742.8	0	0
41	178.309	39.806	12190.7	0	0
42	182.757	41.968	7697.59	0	0
43	187.205	44.2628	3329.68	0	0

44	191.654	46.6953	-840.208	0	0
45	196.102	49.2713	-4731.66	0	0
46	200.551	51.9969	-8255.71	0	0
47	204.999	54.8793	-11313.7	0	0
48	209.447	57.9263	-13795.9	0	0
49	214.625	61.6923	-15544.6	0	0
50	219.803	65.7099	-16065.9	0	0
51	224.98	69.9983	0	0	0

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.73138**

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	0.0146863	40.0018	0	0	0
2	4.5633	37.0823	2731.9	0	0
3	9.11192	34.359	6615.27	0	0
4	13.6605	31.8214	11395.3	0	0
5	18.0962	29.5169	16590.1	0	0
6	22.5318	27.3727	22315.2	0	0
7	26.9675	25.3824	28414.5	0	0
8	31.4031	23.5402	34752.9	0	0
9	35.8388	21.8409	41213.2	0	0
10	40.2744	20.2802	47693.2	0	0
11	44.7101	18.854	54156.1	0	0
12	49.1457	17.559	60551.7	0	0
13	53.5814	16.392	66795.8	0	0
14	58.017	15.3503	72813.6	0	0
15	62.4526	14.4317	78538.5	0	0
16	66.8883	13.6342	83905.6	0	0
17	71.3239	12.956	88860.6	0	0
18	75.7596	12.3957	93360	0	0
19	80.1952	11.9521	97365.4	0	0
20	84.6309	11.6244	100843	0	0
21	89.0665	11.412	103765	0	0
22	93.5022	11.3142	106107	0	0
23	97.9378	11.3311	107847	0	0
24	102.373	11.4625	108970	0	0
25	106.809	11.7088	109463	0	0
26	111.245	12.0705	109316	0	0
27	115.68	12.5483	108537	0	0
28	120.116	13.1431	107140	0	0
29	124.552	13.8562	105140	0	0
30	128.987	14.6892	102556	0	0
31	133.423	15.6438	99408.4	0	0
32	137.859	16.722	95722.8	0	0
33	142.294	17.9264	91528.3	0	0
34	146.73	19.2597	86857.9	0	0
35	151.166	20.725	81749.3	0	0
36	155.601	22.326	76244.7	0	0
37	160.037	24.0668	70391.9	0	0
38	164.473	25.9521	64244	0	0
39	168.908	27.987	57860.9	0	0
40	173.344	30.1776	51309.3	0	0
41	177.779	32.5307	44664.3	0	0
42	182.215	35.0539	38010.2	0	0
43	186.651	37.7563	31441.8	0	0

44	191.086	40.6479	25066.4	0	0
45	195.522	43.7406	19005.8	0	0
46	199.958	47.048	13399	0	0
47	204.393	50.5863	8405.74	0	0
48	208.829	54.3745	4210.72	0	0
49	213.265	58.4353	1029.74	0	0
50	218.793	63.9208	-733.296	0	0
51	224.322	69.941	0	0	0

Entity Information

Group: Group 1

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	225	0
	225	60
	225	70
	110	60
	62	50
	40	45
	0	40
	0	30
	0	0
Material Boundary	0	30
	225	60

Mr. Dave Vandehey
Roll Tide Property Corporation
P.O. Box 703
Cornelius, Oregon 97113

Dear Mr. Vandehey:

Re: Supplemental Geotechnical Consultation Services, Proposed Deer Meadows Residential Subdivision, Tax Lot No's. 9000 and 1000, 40808 and 41010 Highway 26, Sandy (Clackamas County), Oregon

In accordance with your request, we have completed our review of the proposed site development plans for the above subject Deer Meadows (previously Vista Loop Apartments) residential subdivision project. As you are aware, we previously performed a Geotechnical Investigation and Consultation Services for the proposed Vista Loop Apartments development the results of which were presented in our formal report dated November 23, 2020.

Specifically, we understand that present plans are to development subject property by constructing thirty-two (32) new single-family residential homes at the site as well as new public street improvements. Reportedly, the new residential homes will be single- and/or two-story wood frame structures constructed with wood-framing and raised wooden post and beam floors.

Earthwork and site grading for the project is anticipated to result in cuts and/or fills of about five (5) feet or less.

In this regard, based on the results of our previous Geotechnical Investigation report as well as the results of our review of the currently proposed Deer Meadows residential subdivision project, it is our professional opinion that the findings, conclusions and/or recommendations presented in the above subject Geotechnical report are applicable and/or suitable for use with the proposed Deer Meadows residential subdivision site and/or project. As such, we take no exceptions at this time with regard to the proposed Deer Meadows residential subdivision project plans.

We appreciate this opportunity to be of service to you at this time and trust that the above information is suitable to your present needs. Should you have any questions or require any additional information, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

REGISTERED PROFESSIONAL
ENGINEER
12,309
OREGON
July 15, 1983
DANIEL M. REDMOND
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