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# MEMORANDUM

| | | |
|---|---|---|
| Date: | May 15, 2015 | Project #: 17808 |
| To: | Ken Rencher and Jabra Kasho, PE, City of Beaverton | |
| cc: | Jinde Zhu, Washington County DLUT | |
| From: | Marc Butorac, PE, PTOE; Kelly Laustsen and Anais Malinge | |
| Project: | South Cooper Mountain Heights | |
| Subject: | Traffic Impact Analysis | |


West Hills Development is proposing to develop a new subdivision in Beaverton's South Cooper Mountain Concept Plan area. The proposed development will be located northeast of the SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road intersection. Access is proposed via two new roadway connections to SW 175th Avenue, with future access to SW Scholls Ferry Road via SW Loon Lane anticipated. The current proposal calls for 682 residential units, including 308 detached single-family homes, 104 townhomes, and 270 apartment units. Based on the anticipated site generated trips, a Traffic Impact Analysis (TIA) is required per City of Beaverton Development Code Section 60.55.20.

In addition to the near-term build out analysis contained herein, a year 2017 cumulative impact analysis assuming full build-out of the nine near-term development applications within the River Terrace Community and South Cooper Mountain Concept Plan areas is also available under separate cover.

Based on the analysis herein, the following recommendations are associated with the proposed development of the South Cooper Mountain Heights subdivision. All recommended improvements are consistent with the *175th Avenue – Roy Rogers Road 15% Design Report* to minimize throwaway improvements (Reference 1).[1]

- SW 175th Avenue/SW Kemmer Road – Provide a proportional share contribution per the 2017 Cumulative Impact Analysis to the Washington County led project which will result in the installation of a new traffic signal and exclusive northbound and southbound left-turn lanes with protected phasing.
- SW 175th Avenue/Planned Collector 6b, 6c – Provide a stop-controlled intersection with a new 100-foot southbound left-turn lane and exclusive westbound right- and left-turn lanes.

[1] The Report analyzes 2035 conditions along the SW 175th Avenue – SW Roy Rogers Road corridor and determines ultimate lane configurations and traffic control devices, and right-of-way dedication requirements.

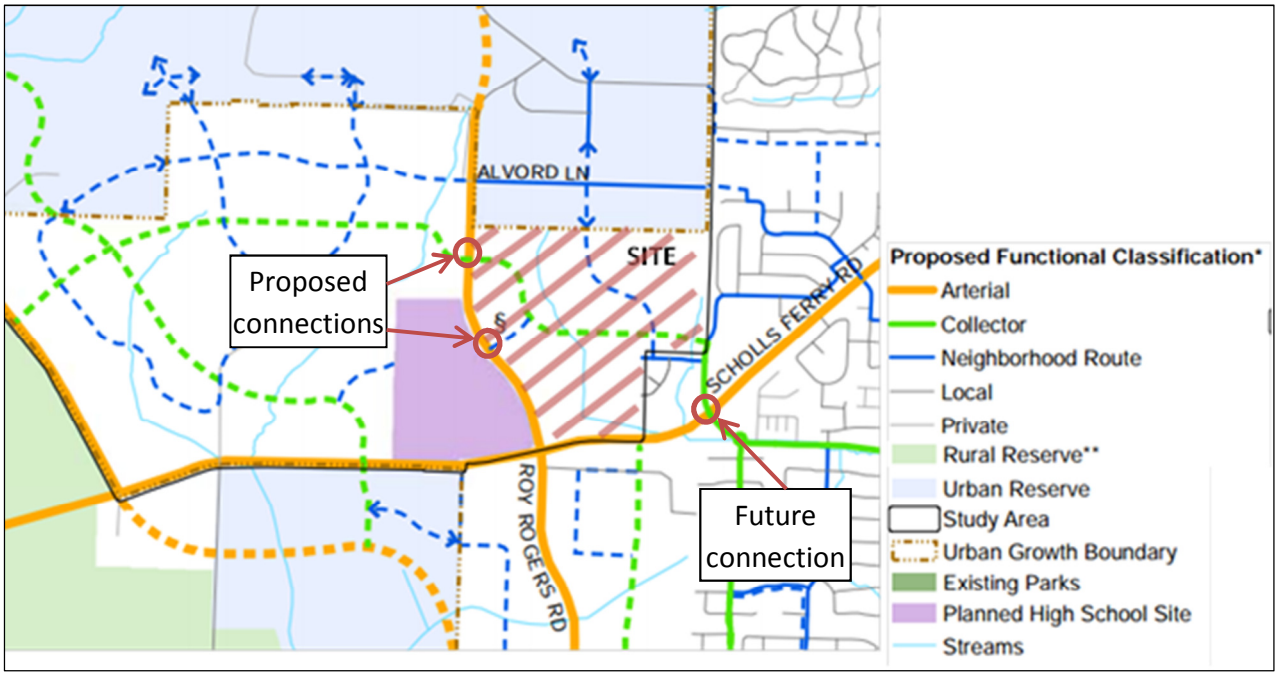
- SW 175th Avenue/High School–South Site Access – Install a traffic signal (or modify the conditioned High School Site-Access traffic signal) with a 100-foot southbound left-turn lane and exclusive westbound shared through-right and left-turn lanes.
- SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road – Optimize signal timing to provide additional green time to the northbound and southbound movements.
- Any future landscaping, above-ground utilities, and site signage should be located and maintained such that they provide minimum required sight lines in either direction at all access locations.

## INTRODUCTION

West Hills Development is proposing to develop a new subdivision in Beaverton's South Cooper Mountain Concept Plan area northeast of the SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road intersection. Figure 1 shows the site vicinity of the proposed development and Figure 2 shows the proposed site plan. The proposed development includes 682 residential units, including 308 detached single-family homes, 104 townhomes, and 270 apartment units.

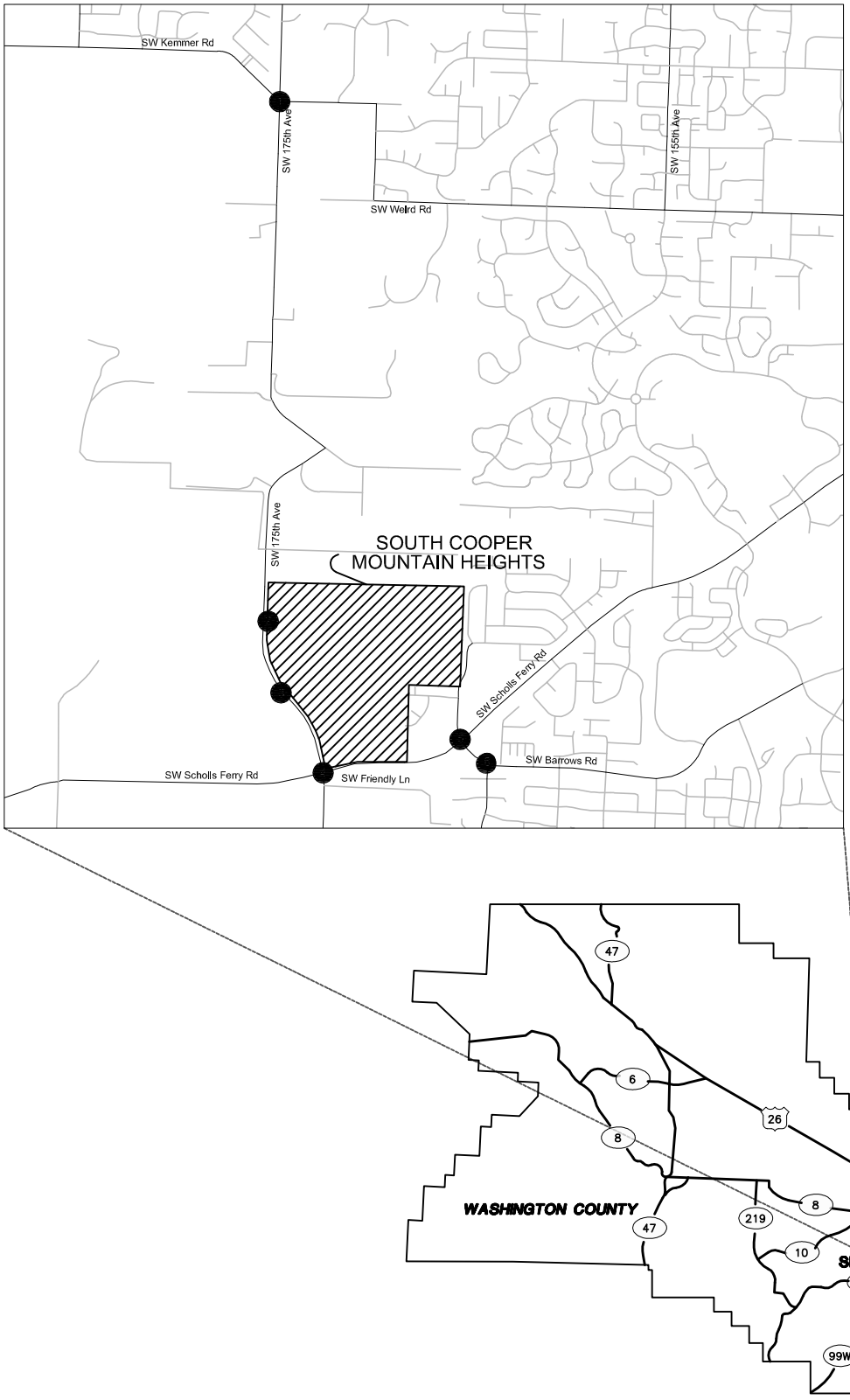
In the near-term, access is proposed via two new roadway connections to SW 175th Avenue. The northern access is part of a collector roadway (planned collector 6b, 6c) planned for the area in the South Cooper Mountain Concept Plan, shown in Exhibit 1. As shown in the South Cooper Mountain Concept Plan (Exhibit 1), future access to SW Scholls Ferry Road is anticipated via SW Loon Lane when the surrounding area develops.

**Exhibit 1 Site Area and Planned Roadways**




Source: South Cooper Mountain Concept Plan, Figure ES-4

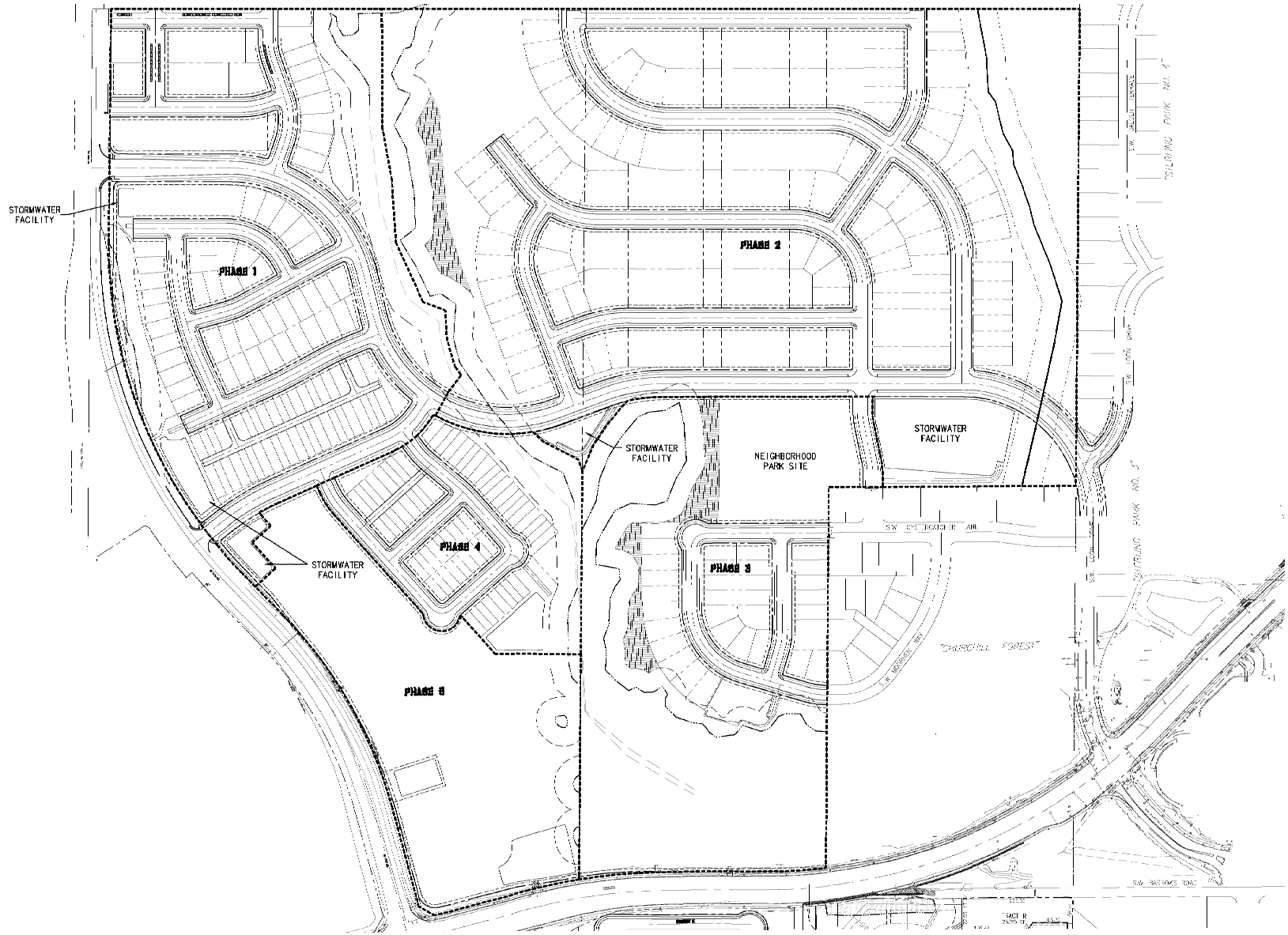
As seen in Exhibit 1, a new Beaverton high school is planned immediately west of the site. Additional roadway connections are planned in the area surrounding the site with future development.




● - Study Intersections

Site Vicinity
Beaverton, Oregon

Figure
1




Site plan provided by OTAK on May 13, 2015

Proposed Site Plan
Beaverton, OR

Figure
2

## SCOPE OF THE REPORT

This report identifies the transportation-related impacts associated with the proposed South Cooper Mountain Heights development and was prepared in accordance with City of Beaverton Development Code Section 60.55.20. The study intersections were selected and the scope developed in consultation with City and County staff. The study intersections include neighborhood routes, collectors, and arterials within 1,000 feet of the site, those intersections through which site-generated trips contribute five percent or more of existing volumes, as well as intersections immediately adjacent to the proposed site access. The proposed development will abut SW 175th Avenue, an arterial street to the west. The closest arterial and collector streets that intersect SW 175th Avenue in the projects' vicinity are SW Scholls Ferry Road, SW Barrows Road, and SW Kemmer Road. Accordingly, operational analyses were performed at the following study intersections during the weekday AM and PM peak periods:

- SW 175th Avenue/SW Kemmer Road
- SW 175th Avenue/Future East-West Collector 6b, 6c (future site access)
- SW 175th Avenue/Future East-West Roadway (future site access)
- SW Roy Rogers Road/SW Scholls Ferry Road
- SW Barrows Road/SW Scholls Ferry Road
- SW Barrows Road/SW Roshak Road

This report evaluates the following transportation issues:

- Existing land use and transportation system conditions within the site vicinity during the weekday AM and PM peak periods;
- Build-out year 2016 background traffic conditions during the weekday AM and PM peak periods, considering in-process developments and planned transportation improvements in the study area;
- Trip generation and distribution estimates for the proposed development;
- Build-out year 2016 total traffic conditions during the weekday AM and PM peak assuming full build-out of the proposed development;
- Future year 2035 total traffic conditions during the weekday AM and PM peak assuming full build-out of the proposed development; and,
- Recommended improvements/intersection considerations.

*Appendix "A" includes the scoping memorandum submitted to the City of Beaverton and Washington County.*

## Analysis Methodology

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (HCM) (Reference 2). The peak 15-minute flow rates were used in the evaluation of all intersection levels of service (LOS) and volume-to-capacity ratios. For this reason, the analyses reflect conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during typical weekday hours are expected to operate with lower levels of delay than those described in this report. The operations and queuing analyses presented in this report were completed using Synchro 8 software. A description of level of service and the criteria by which they are determined is presented in Appendix "B". Appendix "B" also indicates how level of service is measured and what is generally considered the acceptable range of level of service.

## Operating Standards

### *City of Beaverton*

The City of Beaverton's Development Code sets operating standards for signalized and unsignalized intersections, found in Section 60.55.10. The standards require an average control delay of no more than 65 seconds per vehicle for signalized intersections. In addition, the volume-to-capacity ratio for each lane group must not exceed 0.98. For two-way and all-way stop-controlled intersections, the City of Beaverton standards require an average control delay of no more than 45 seconds per vehicle.

### *Washington County*

Washington County sets operating standards for both signalized and unsignalized intersections with a v/c no greater than 0.99. Within the study area, Washington County maintains jurisdiction over SW 175$^{th}$ Avenue and SW Scholls Ferry Road.

# EXISTING CONDITIONS

This section summarizes the existing characteristics of the transportation system and adjacent land uses in the vicinity of the proposed development, including an inventory of the existing multi-modal transportation facilities and options, an evaluation of existing intersection operations for motor vehicles at the study intersections, a summary of recent crash history, and intersection sight distance evaluation.

## Site Conditions and Adjacent Land Uses

The proposed school site is located northeast of the SW Roy Rogers Road-SW 175$^{th}$ Avenue/SW Scholls Ferry Road intersection. The area immediately east of the site contains existing single-family residential homes. The areas to the south and west are currently vacant, but there are several development applications underway within the South Cooper Mountain Concept Plan Area and within the River

Terrace Community Plan Area. A new Beaverton School District high school is also planned in the northwest corner of the SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road intersection.

## Transportation Facilities

Access to South Cooper Mountain Heights is proposed via SW 175th Avenue. The development also abuts SW Scholls Ferry Road. Table 1 summarizes the attributes of the arterial and collector roadways within the influence area. Figure 3 illustrates the existing lane configurations and traffic control at the study intersections.

**Table 1: Street Characteristics in Site Vicinity**

| Street | Jurisdiction | Classification[1] | Vehicle Travel Lanes | Posted Speed (mph) | Pedestrian Facilities | Bicycle Facilities |
|---|---|---|---|---|---|---|
| SW Kemmer Road (E of SW 175th Ave) | Washington County | Arterial | 2 | 25 | None | None |
| SW Kemmer Road (W of SW 175th Ave) | Washington County | Collector | 2 | 40 | Sidewalk (N side) | None |
| SW 175th Avenue/ SW Roy Rogers Road | Washington County | Arterial | 2 | 45 | None | Shoulder (S of Scholls) |
| SW Scholls Ferry Road | Washington County | Arterial | 2-4[2] | 40 | Sidewalk (E of 175th) | Bike lanes (E of 175th) |
| SW Barrows Road | City of Beaverton | Collector | 3 | 25 | Sidewalk (N side) | Bike lanes (E of Roshak) |

[1]Per the City of Beaverton Transportation System Plan.
[2]SW Scholls Ferry Road is 4 lanes east of SW 175th Avenue and 2 lanes west of SW 175th Avenue

### *Pedestrian Facilities*

Sidewalks are provided on portions of the roadways in the study area; however, many gaps exist throughout the study area. SW Scholls Ferry Road east of SW 175th Avenue has a sidewalk. There is a sidewalk on the north side of SW Barrows Road and on the north side of SW Kemmer Road west of SW 175th Avenue.

### *Bicycle Facilities*

Bike lanes are provided along SW Scholls Ferry Road east of SW 175th Avenue. In addition, bike lanes are provided on SW Barrows Road east of SW Roshak Road. SW 175th Avenue south of SW Scholls Ferry Road has shoulders that serve as a bicycle facility.

### *Transit Facilities*

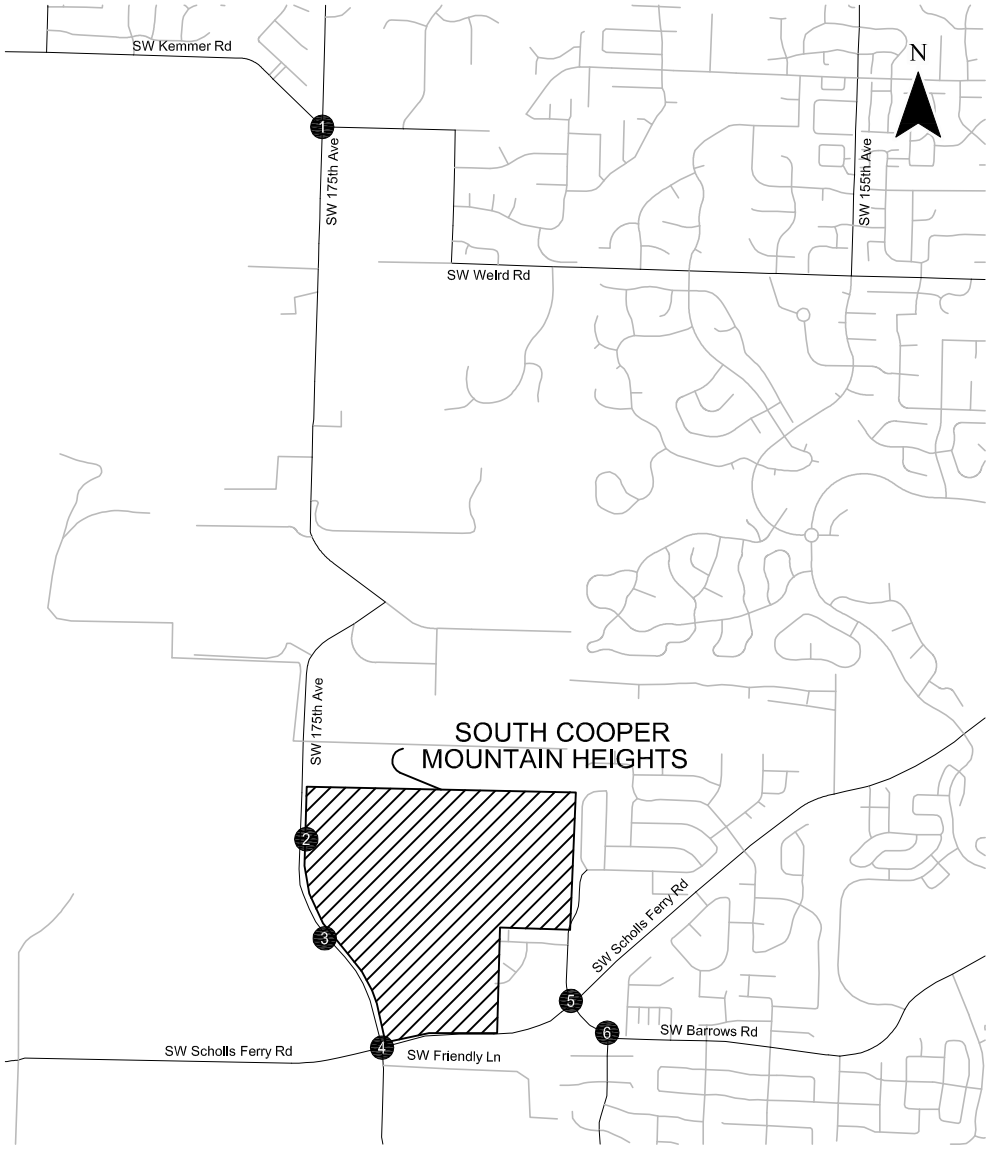
The site is located near the border of the TriMet transit district. The nearest bus line is Route 92, the South Beaverton Express, which stops at the intersection of SW Scholls Ferry Road/SW Teal Blvd/SW Horizon Blvd (approximately 1.25 miles east of the project site). Route 92 provides weekday rush-hour

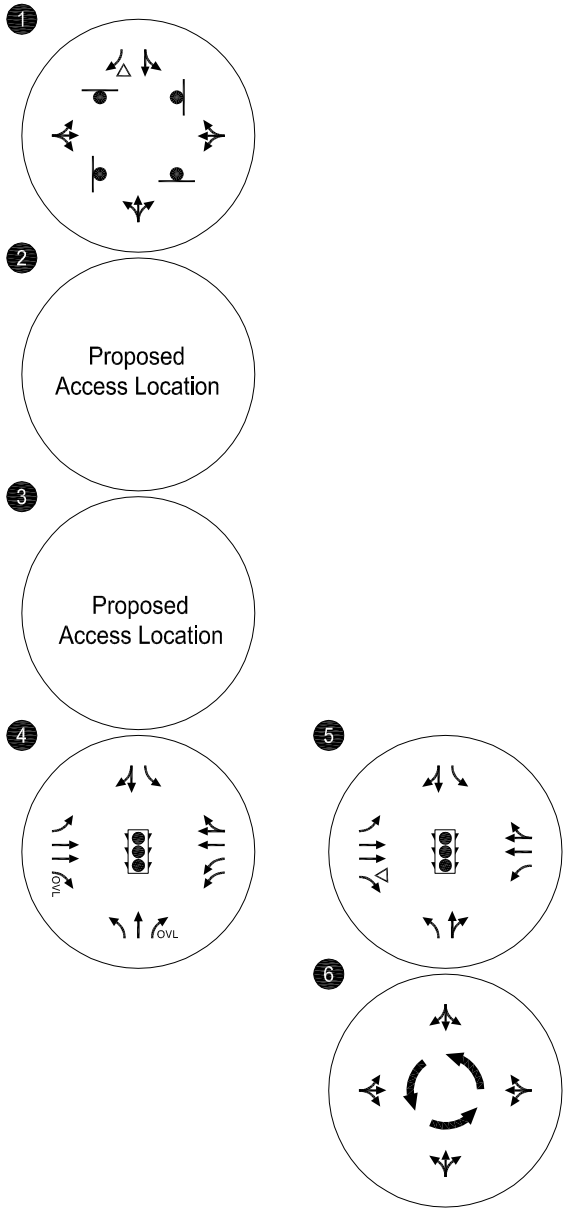
service between Beaverton and the Portland City Center, including a stop at the Progress Ridge Park & Ride.

## Existing Conditions Operational Analysis

Manual turning movement counts were collected at the study intersections in January 2015. Traffic counts were collected for three mid-week days, in accordance with the City of Beaverton's Traffic Impact Analysis requirements for the morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak time periods. The day experiencing the highest collective volumes during the peak hours was selected for the operational analysis (i.e., Tuesday for the AM and Thursday for the PM peak). *Appendix "C" contains the traffic count worksheets.*

Figure 4 summarizes the operational analysis for the study intersections during the weekday AM and PM peak hours. SW 175$^{th}$ Avenue/SW Kemmer Road intersection does not meet standards during the weekday AM or PM peak hour. The northbound approach operates over capacity and with long delays during both peak hours. In addition, the southbound shared through-right and westbound left movements at the SW Roy Rogers Road-SW 175$^{th}$ Avenue/SW Scholls Ferry Road intersection operate over capacity during the weekday PM peak period and the northbound left movement operates over capacity during the weekday AM peak period. It should be noted that signal timing modifications reflecting the emerging traffic patterns can allow the intersection to meet operational standards. *Appendix "D" includes the operations analysis worksheets for the Existing Conditions analysis.*

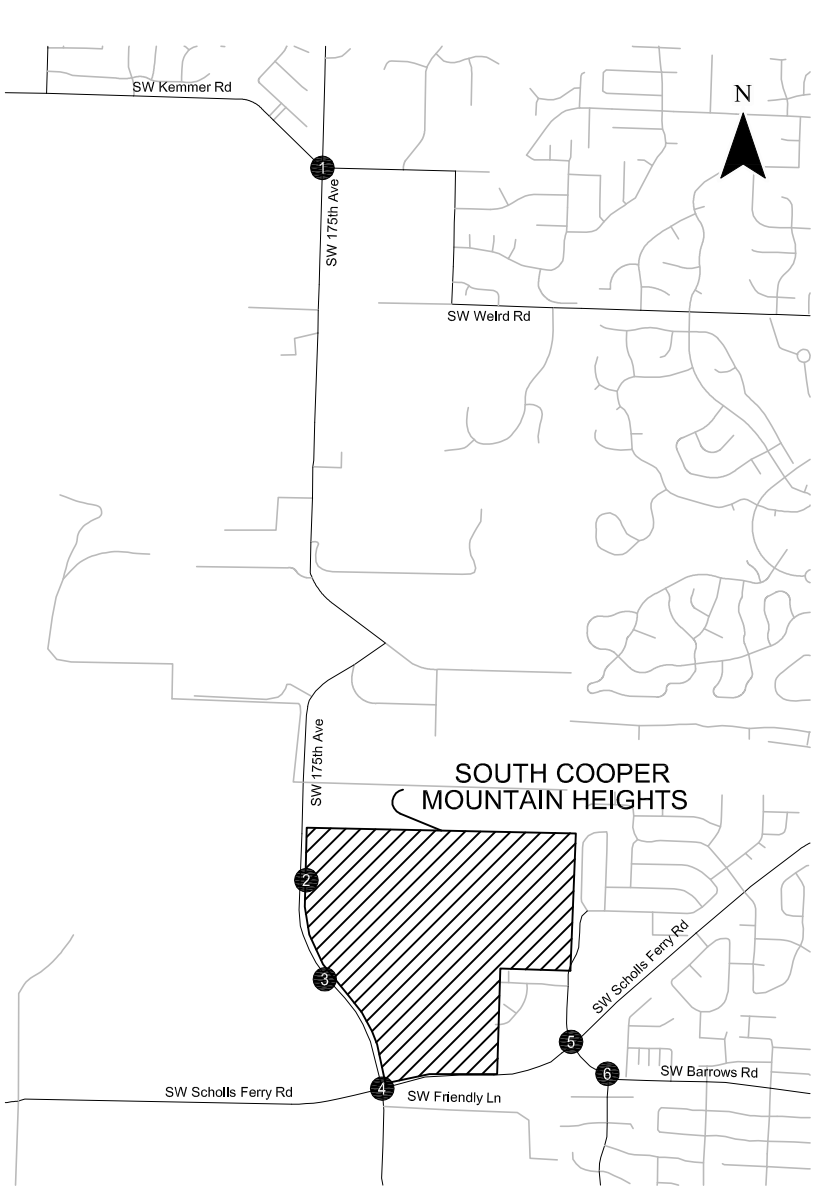


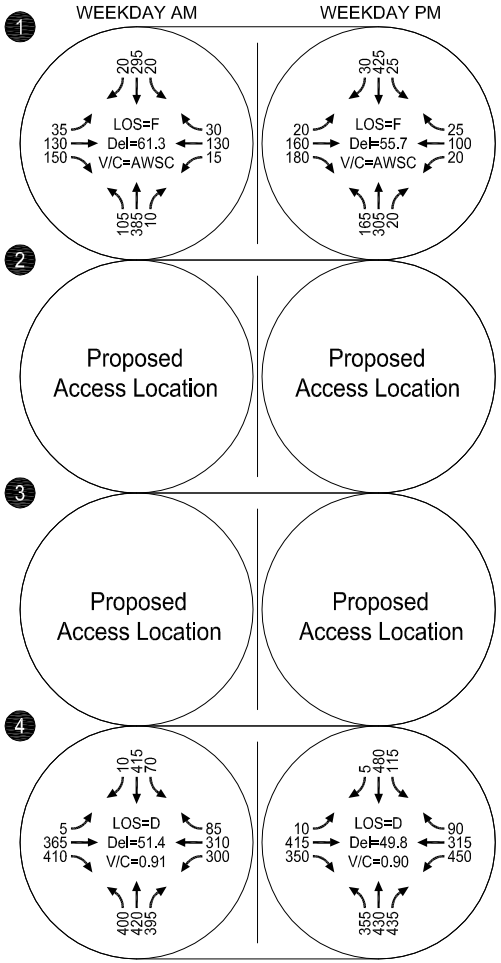



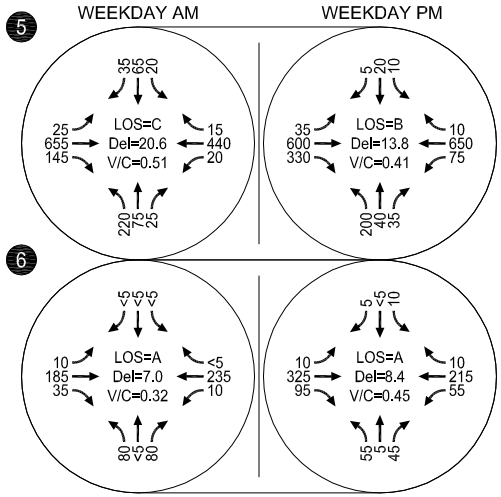

OVL - OVERLAP
- STOP SIGN
- TRAFFIC SIGNAL
- YIELD

## Year 2015 Existing Conditions
## Lane Configurations and Traffic Control Devices
## Beaverton, OR

Figure
3




CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/ CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

# Year 2015 Existing Conditions Weekday AM and PM Peak Hours Beaverton, OR

Figure 4

## Traffic Safety

Washington County maintains a Safety Priority Index System (SPIS) list to identify existing hazardous intersections for potential safety improvements. Intersections are included in the SPIS list if they have three or more crashes or if they have one or more severe injury or fatal crashes within three consecutive years. The intersections of SW Roy Rogers Road/SW Scholls Ferry Road and SW Barrows Road/SW Scholls Ferry Road appear on the most recent Washington County SPIS list (2010-2012) (Reference 3). The SPIS list notes that there was a MSTIP project constructed to widen SW Scholls Ferry Road and SW 175th Avenue was widened in 2010. In addition, the traffic control for the left-turn lane movements were changed from protected-permitted to protected only at the SW Barrows Road/SW Scholls Ferry Road intersection in 2009. The SPIS list offers no additional improvement recommendations for the two intersections.

In addition to reviewing the Washington County SPIS list, the crash histories of the each study intersection were reviewed in an effort to identify potential intersection safety issues. Crash data for the study intersections were obtained from the Oregon Department of Transportation (ODOT) for the five-year period from January 1, 2009 through December 31, 2013. Table 2 illustrates the crashes reported at the study intersections. The majority of crashes observed at both the SW Roy Rogers Road/SW Scholls Ferry Road and SW Barrows Road/SW Scholls Ferry Road intersections were rear-end crashes. *Appendix "E" contains the ODOT crash data.*

**Table 2: Intersection Crash History (January 1, 2009 through December 31, 2013)**

| Location | Collision Type | | | | Severity | | Total Crashes |
|---|---|---|---|---|---|---|---|
| | Rear-end | Turning | Angle | Fixed Object | PDO[1] | Injury | |
| SW 175th Avenue & SW Kemmer Road | 1 | 2 | 5 | 0 | 3 | 5 | 8 |
| SW 175th Avenue/SW Roy Rogers Road &SW Scholls Ferry Road | 15 | 5 | 2 | 2 | 13 | 11 | 24 |
| SW Barrows Road & SW Scholls Ferry Road | 10 | 5 | 0 | 0 | 7 | 8 | 15 |

[1]PDO – Property damage only

Critical crash rates were calculated for each of the study intersections following the analysis methodology presented in ODOT's *SPR 667 Assessment of Statewide Intersection Safety Performance (*Reference 4). SPR 667 provided average crash rates at a variety of intersection configurations in Oregon based on number of approaches and traffic control types. The average crash rate represents the approximate number of crashes that are "expected" at a study intersection. Additionally, this average crash rate was used to calculate the critical crash rate for each study intersection, based on the *Highway Safety Manual* methodology (Reference 5). The critical crash rate is calculated for each intersection based on the average crash rate for each facility and serves as a threshold for further analysis.

Table 3 summarizes the critical crash rate for each intersection and compares those values to the observed crash rate. Per ODOT methodology, if the observed crash rate at the study location exceeds the critical crash rate, it may be an indication that the location is exceeding average crash rates.

**Table 3: Intersection Crash Rate Assessment**

| Location | Total Crashes | Critical Crash Rate by Intersection | Critical Crash Rate by Volume | Observed Crash Rate at Intersection | Observed Crash Rate>Critical Crash Rate? |
|---|---|---|---|---|---|
| SW 175th Avenue & SW Kemmer Road | 8 | 0.36 | 0.37 | 0.30 | No |
| SW 175th Avenue/SW Roy Rogers Road & SW Scholls Ferry Road | 24 | 0.63 | 0.54 | 0.38 | No |
| SW Barrows Road & SW Scholls Ferry Road | 15 | 0.68 | 0.44 | 0.42 | No |

As shown in Table 3, none of the observed crash rates exceed the critical crash rates.

### *Crash Data Implications*

The intersections of SW Roy Rogers Road/SW Scholls Ferry Road and SW Barrows Road/SW Scholls Ferry Road each appear on the most recent Washington County SPIS list; however, none of the observed crash rates exceed the critical crash rates. Given that SW Scholls Ferry Road and SW 175th Avenue were recently widened and left-turns at the intersection of SW Barrows Road/SW Scholls Ferry Road were made protected only, no additional safety-based mitigation is recommended at the three intersections in conjunction with the proposed South Cooper Mountain Heights development.

## Intersection Sight Distance

Intersection sight distance was measured at the future SW 175th Avenue/Planned Collector 6b, 6c and SW 175th Avenue/High School–South Site Access intersections and was found to be adequate. SW 175th Avenue has a posted speed of 45 miles per hour (mph); however, currently observed 85th percentile speeds are approximately 50 mph. Washington County requires a minimum of 500 feet of intersection sight distance for 50 mph travel. The 2011 AASHTO publication *A Policy on Geometric Design of Highways and Streets* suggests an intersection sight distance of 555 feet (Reference 6). Table 4 summarizes the measured intersection sight distance available.

**Table 4: Sight Distance Summary**

| Location | Measured Sight Distance (Facing Left) | Measured Sight Distance (Facing Right) | Sight Distance Required per WACO | Sight Distance Required per WACO | Adequate Sight Distance? |
|---|---|---|---|---|---|
| SW 175th Avenue/Planned Collector 6b, 6c | >600 ft | >600 ft | 500 | 555 | Yes |
| SW 175th Avenue/High School – S Site Access | 575 ft | >600 ft | 500 | 555 | Yes |

# TRAFFIC IMPACT ANALYSIS

The traffic impact analysis identifies how the study area's transportation system will operate in the build-out year 2016 when the development is expected to be occupied. In addition, it assesses 2035 operations consistent with roadway improvements documented in the *175th Avenue – Roy Rogers Road 15% Design Report*.

This section of the report includes the following:

- Build-out year 2016 background traffic conditions during the weekday AM and PM peak periods, considering in-process developments and planned transportation improvements in the study area;
- Trip generation and distribution estimates for the proposed development;
- Build-out year 2016 total traffic conditions during the weekday AM and PM peak assuming full build-out of the proposed development;
- Future year 2035 total traffic conditions during the weekday AM and PM peak assuming full build-out of the proposed development; and,
- Recommended improvements/intersection considerations.
- Transportation policy review and compliance analysis

## 2016 Background Operational Analysis

Background traffic volumes include changes in volumes due to added trips from new development in the vicinity as well as general regional growth. City of Beaverton staff indicated that no in-process developments are approved that should be included in the study.[2] The year 2015 analyses include a background annual growth rate of 1.5 percent at each study intersection. One planned improvement is anticipated in the site vicinity by 2016.

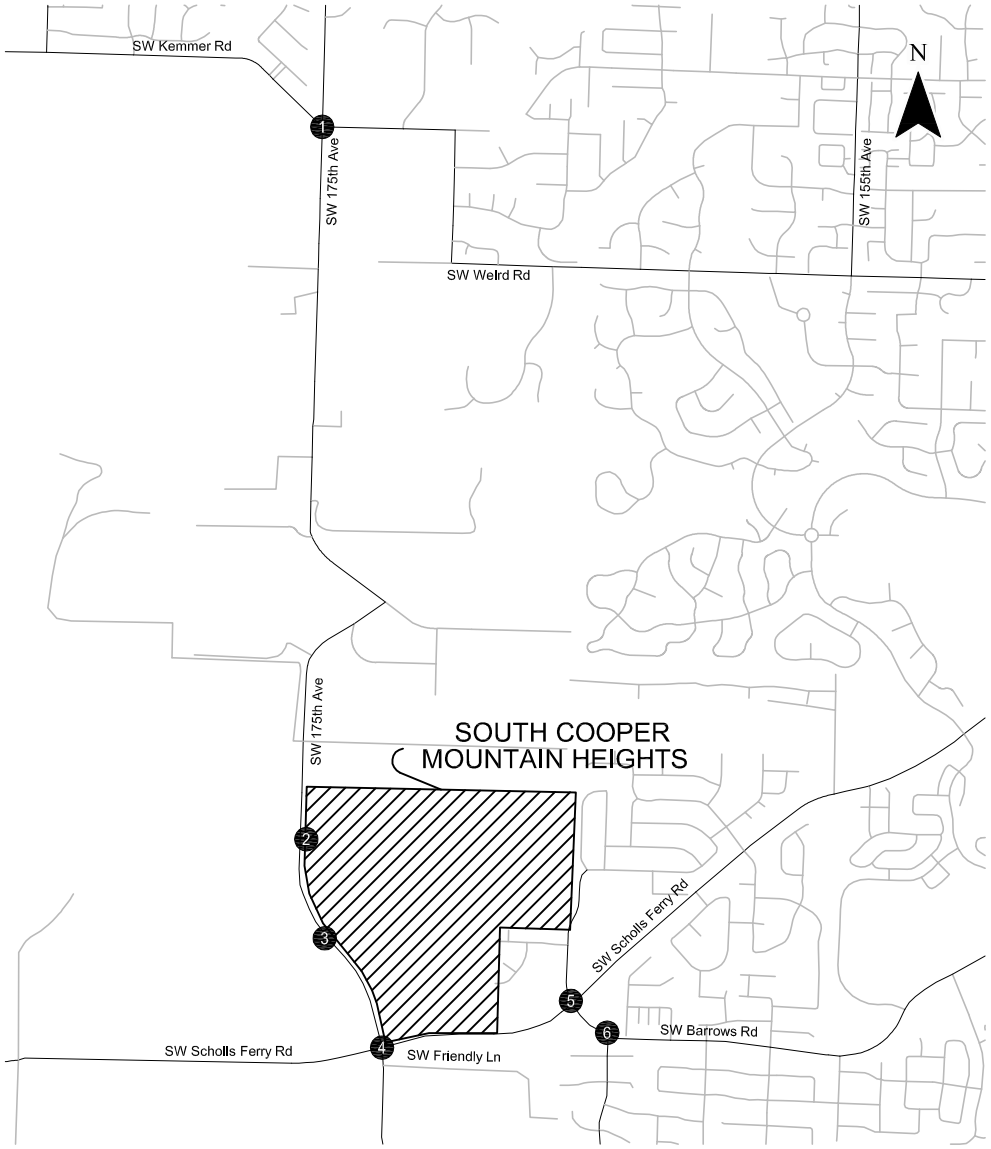
### *SW 175th Avenue/SW Kemmer Road*

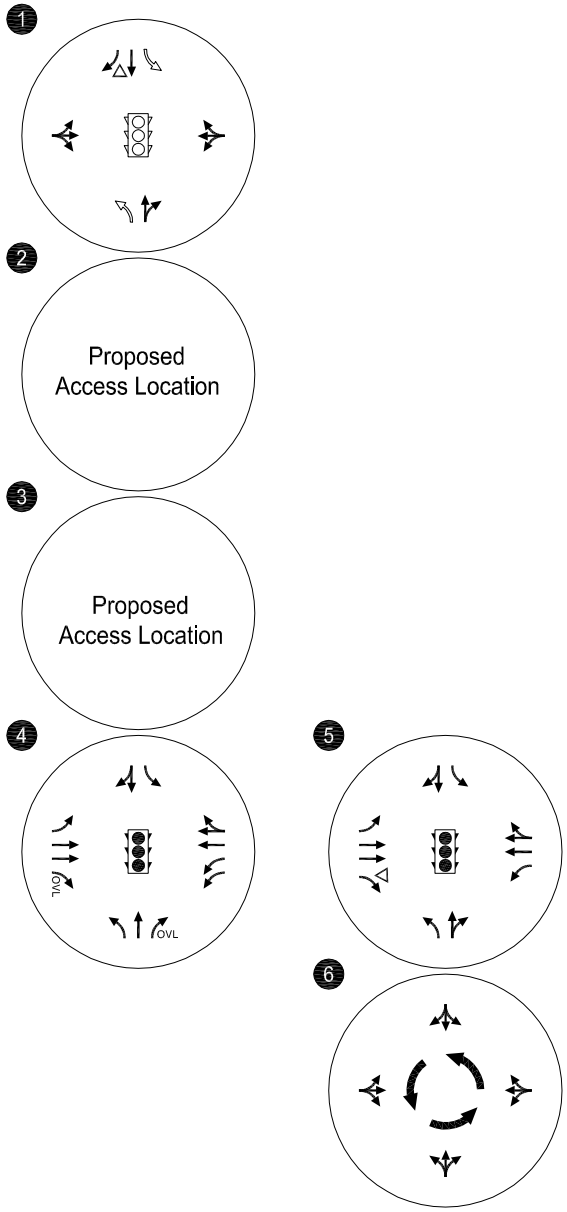
Washington County has identified the SW 175th Avenue/SW Kemmer Road intersection as a Major Streets Transportation Improvement Program (MSTIP) project, and has allocated $2.5 million for improvements, consistent with the South Cooper Mountain Concept Plan.

[2] The year 2017 Cumulative Impact Analysis was completed under separate cover to analyze near-term traffic conditions assuming the build-out of the nine proposed development with both the South Cooper Mountain Concept Plan and River Terrace Community Plan areas.

As documented in the 2015 existing traffic conditions, the northbound approach at the SW 175th Avenue/SW Kemmer Road intersection operates over capacity and with long delays during both the AM and PM peak hour. Signal warrants were assessed for this location and showed that a signal is warranted with existing traffic volumes. In order to meet standards, turn lanes are also needed on the northbound and southbound approaches. Due to the vertical profile of the intersection, protected left-turn phasing is recommended north/south and split phasing is recommended east/west. As documented in the Cumulative Impact Analysis, a proportional share methodology, to which South Cooper Mountain Heights will participate, has been developed in conjunction with Washington County staff to help fund the future County-led project at this intersection.

Figure 5 and 6 summarizes the lane configurations and operational analysis for the study intersections during the weekday AM and PM peak hour background traffic conditions. The southbound shared through-right and westbound left movements at the SW Roy Rogers Road-SW 175h Avenue/SW Scholls Ferry Road intersection continue to operate over capacity during the weekday PM peak period, and the northbound left movement continues to operate over capacity during the weekday AM peak period. As discussed in the existing conditions analysis, signal timing modifications reflecting the emerging traffic patterns can allow the intersection to meet operational standards. *Appendix "F" includes the operations analysis worksheets for the 2016 Background Conditions analysis.*



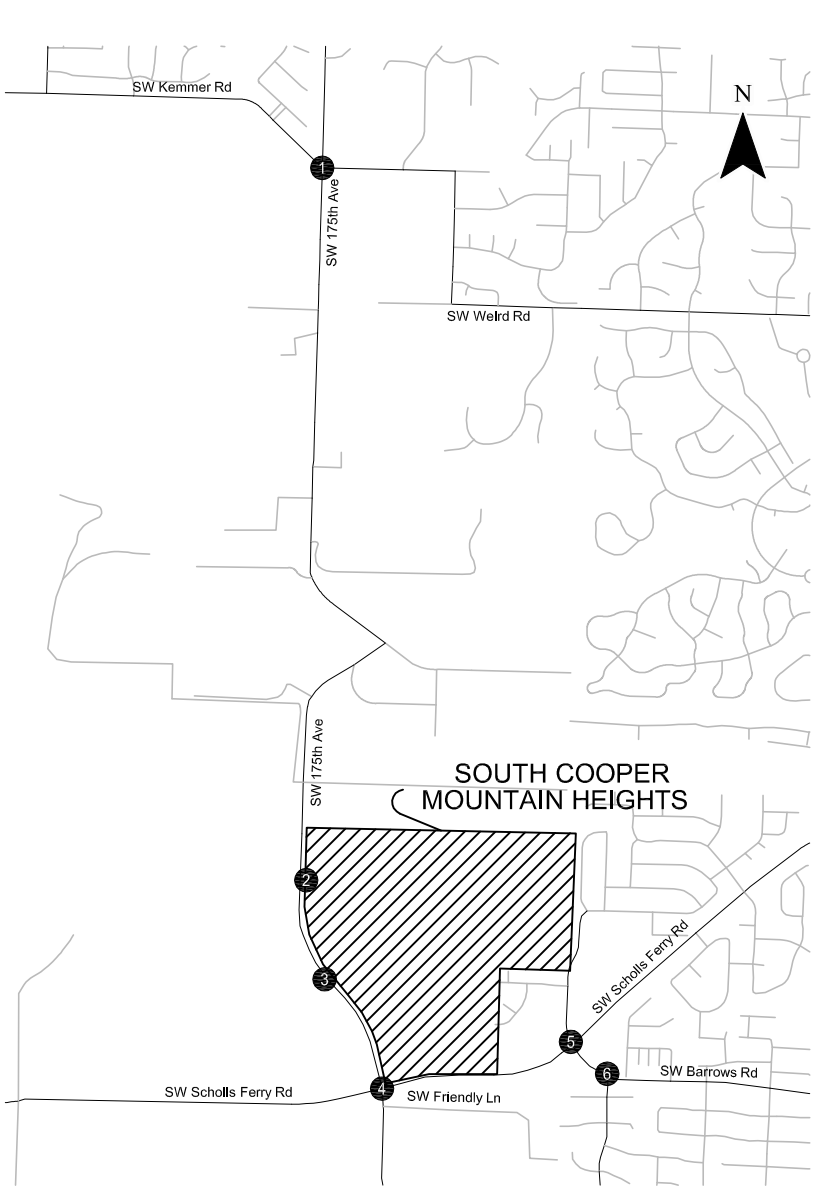



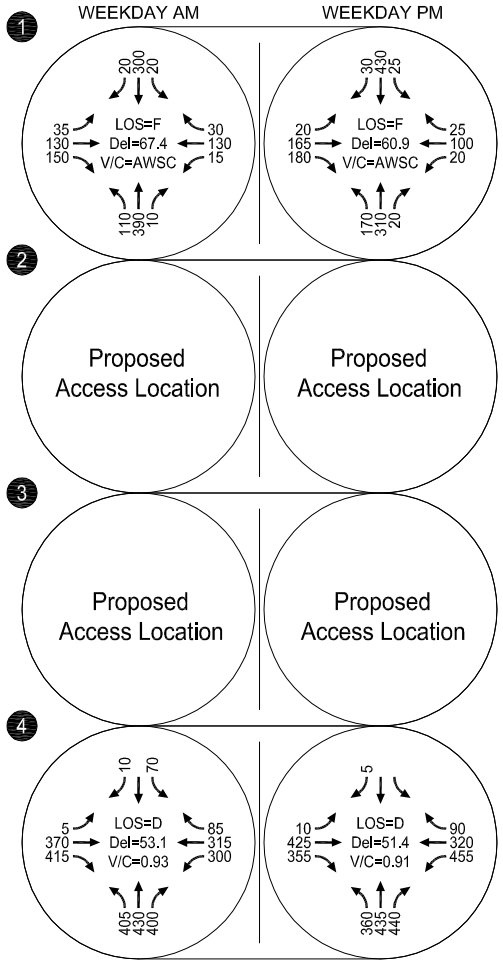

OVL - OVERLAP

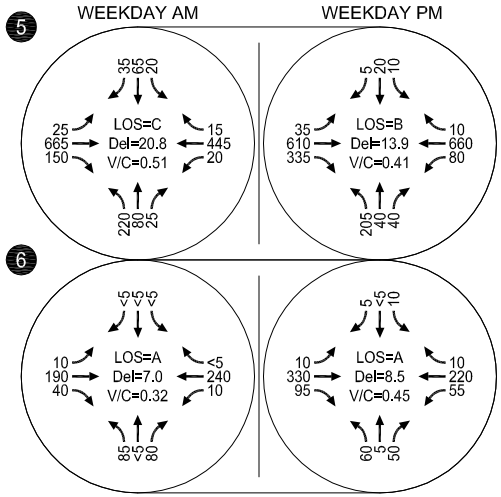
- STOP SIGN
- TRAFFIC SIGNAL
- YIELD
- IMPROVEMENT

# Year 2016 Background Conditions
# Lane Configurations and Traffic Control Devices
# Beaverton, OR

Figure
5

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# Year 2016 Background Conditions Weekday AM and PM Peak Hours Beaverton, OR

Figure 6

## Trip Generation Estimate

Trip generation estimates were developed based on the standard reference manual published by the Institute of Transportation Engineers, *Trip Generation*, 9th Edition (Reference 7). The estimated trip generation is shown in Table 5 (daily trips were rounded to the nearest 10).

**Table 5: Estimated Trip Generation**

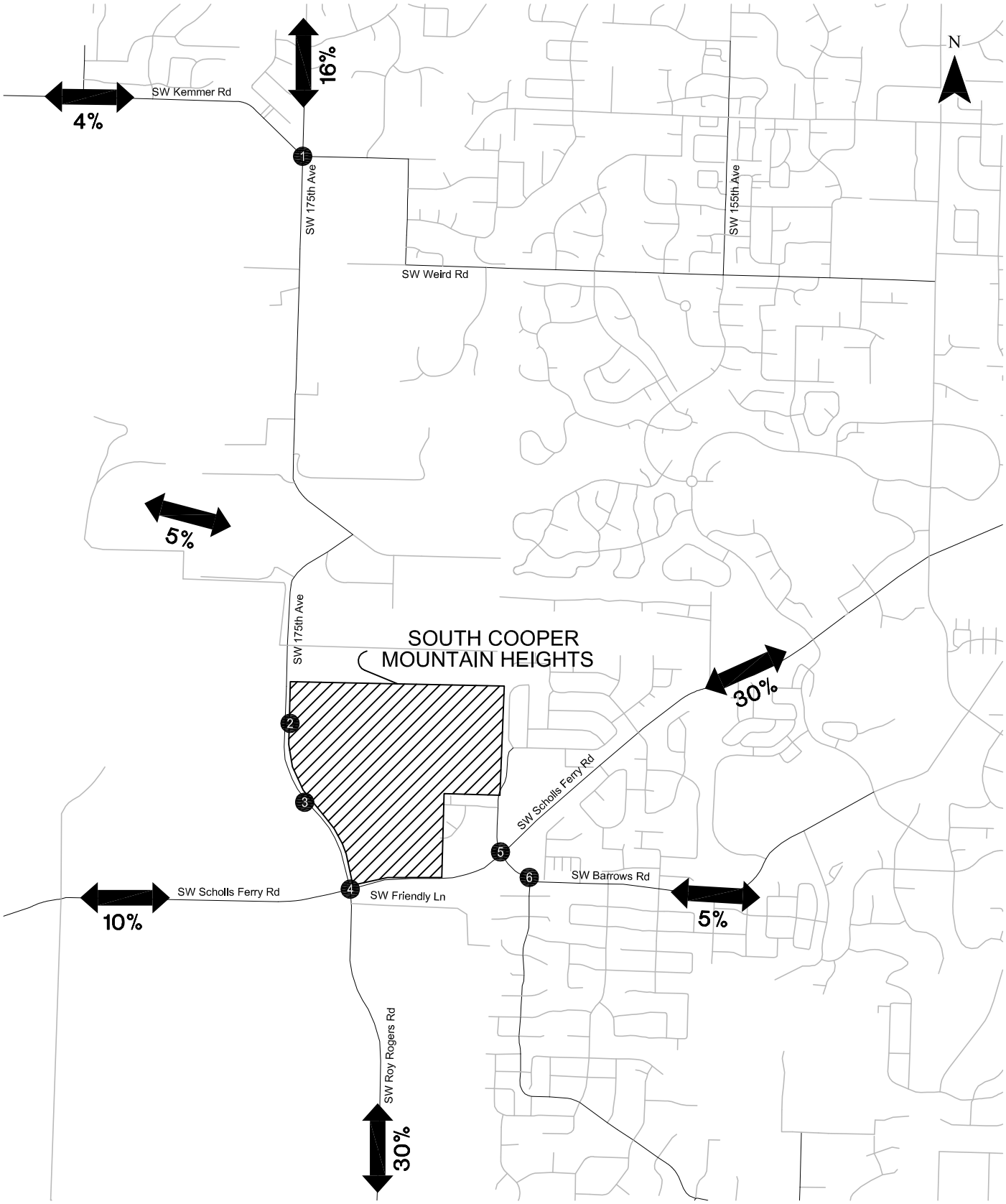
| Land Use | ITE Code | Size (Units) | Total Daily Trips | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | In | Out | Total | In | Out |
| Single Family Detached Housing | 210 | 308 | 2,930 | 230 | 60 | 170 | 319 | 195 | 115 |
| Townhome | 230 | 104 | 600 | 45 | 10 | 35 | 55 | 35 | 20 |
| Apartment | 220 | 270 | 1,800 | 140 | 30 | 110 | 165 | 105 | 60 |
| **Total Net-New Trips** | | **682** | **5,330** | **415** | **100** | **315** | **530** | **335** | **195** |

As shown, the development is expected to generate a total of 415 trips during the weekday AM peak hour (100 in, 315 out) and 530 trips during the weekday PM peak hour (335 in, 195 out).

## Trip Distribution and Assignment

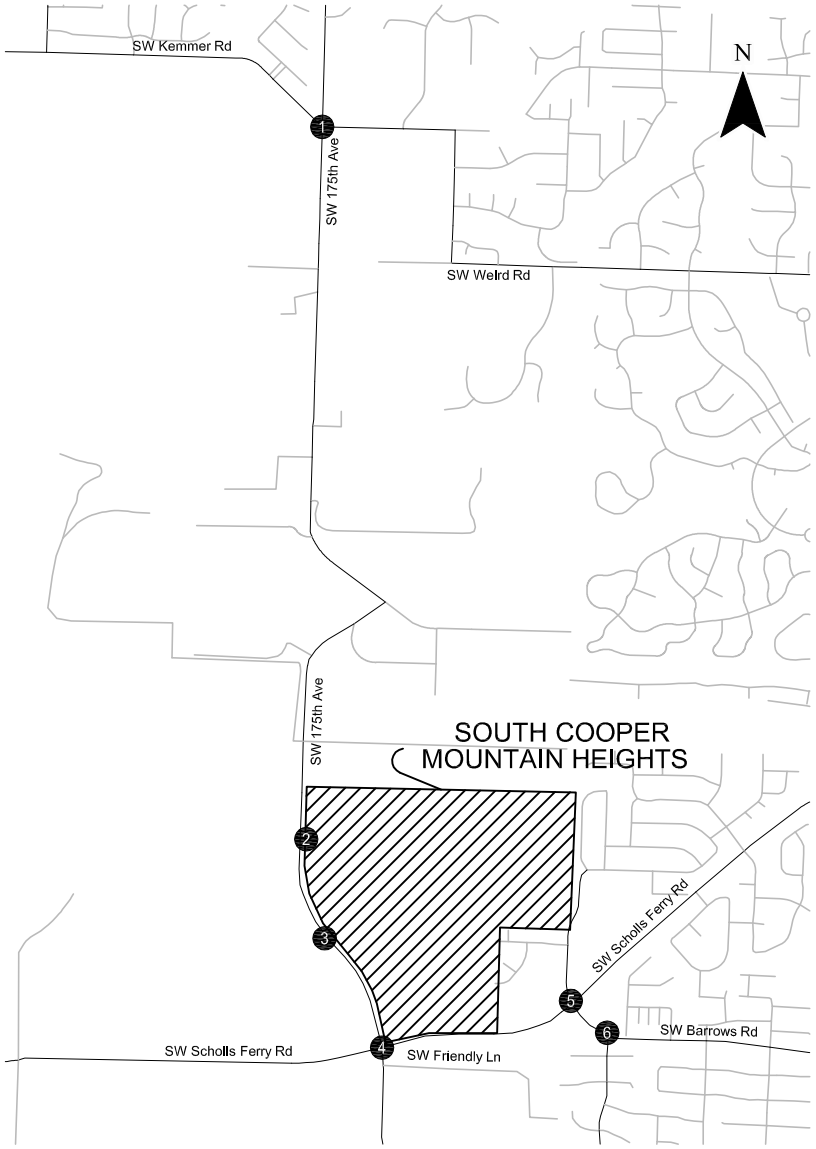
Figure 7 illustrates the estimated trip distribution pattern for the development based on a select zone analysis of the Washington County Travel Demand Model, and in accordance with Washington County staff direction. Existing turn movement patterns and local and regional traffic patterns were also reviewed to confirm the proposed trip distribution.

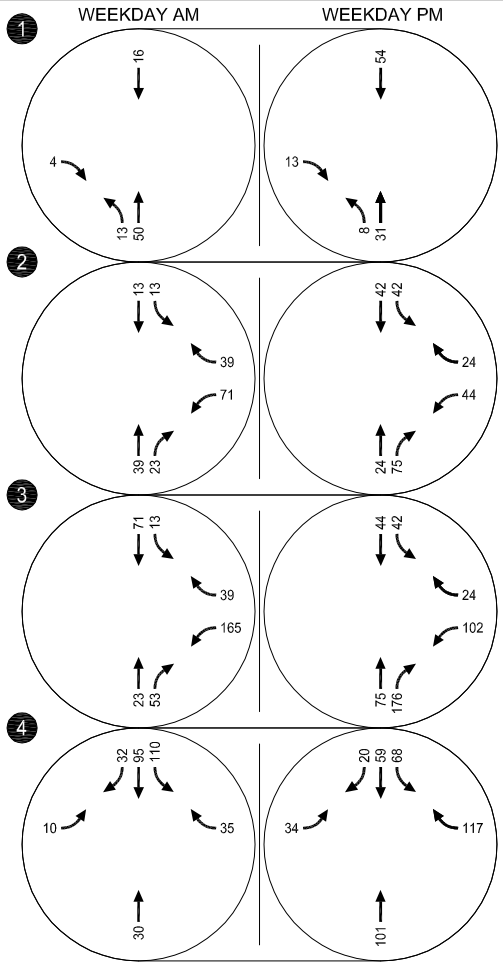
The estimated site-generated trips were assigned to the network by distributing the trips shown in Table 6 according to the trip distribution pattern. Figure 8 shows the net site-generated trips that are expected to use the surrounding roadway system during the peak hour periods.

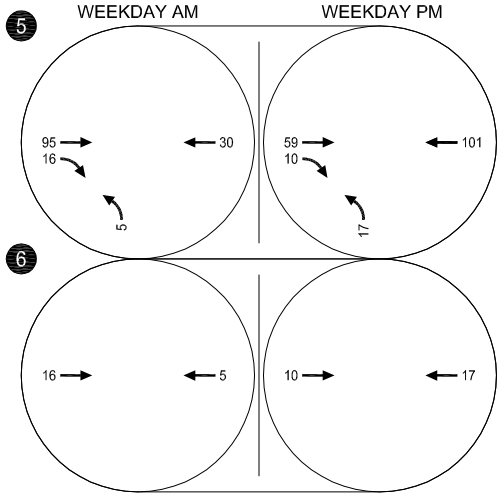



Trip Distribution
Beaverton, Oregon

Figure
7



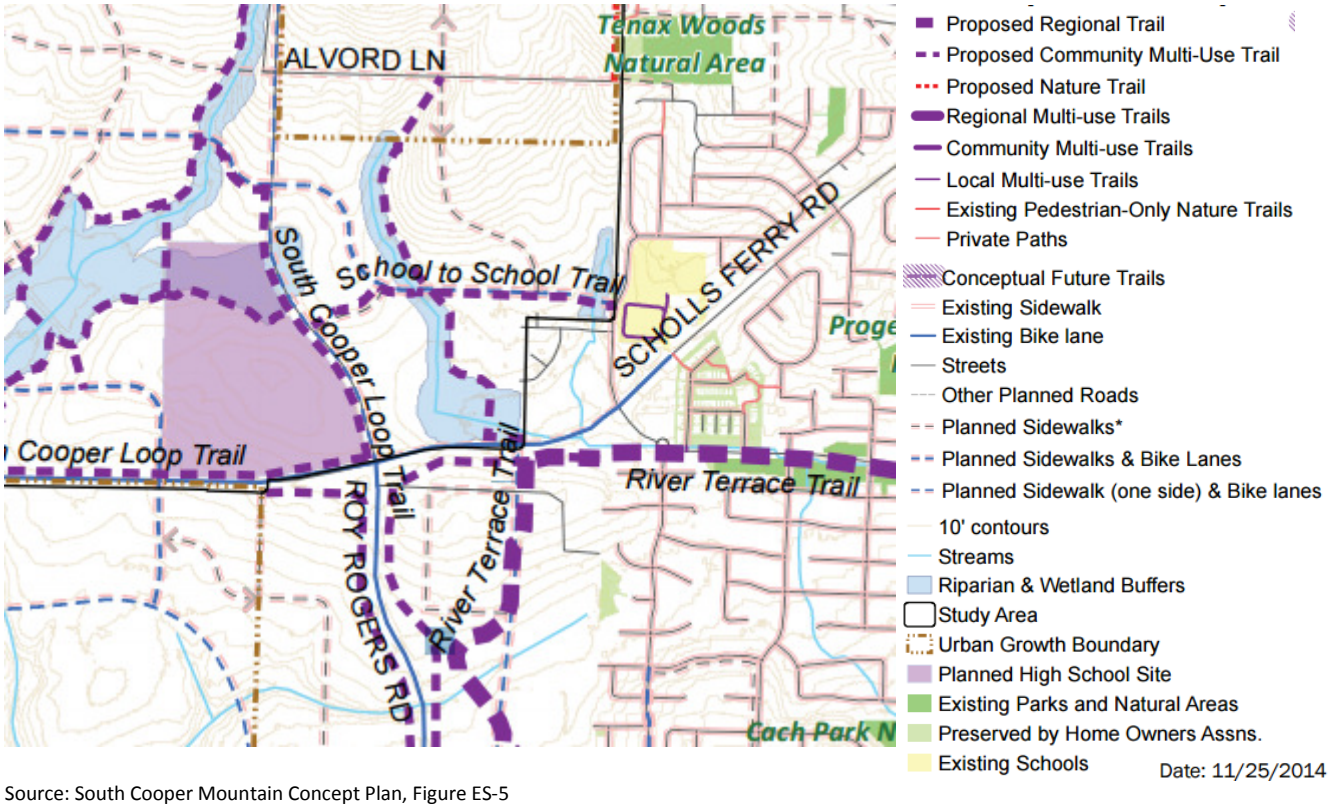

Site-Generated Trips
Weekday AM and PM Peak Hours
Beaverton, OR

Figure
8

## ON-SITE CIRCULATION AND OPERATIONS

Internal circulation and site access phasing was evaluated to ensure that the site provides sufficient on-site circulation for vehicular, pedestrian, bicycle and emergency service vehicles. Figure 2 illustrates the proposed site development plan. Exhibit 2 shows the planned bicycle and pedestrian framework for the South Cooper Mountain Concept Plan area. As shown, a community multi-use trail is proposed east-west along the planned neighborhood route, providing access from the proposed Beaverton High School to the existing Scholls Heights Elementary School. In addition, a north-south community multi-use trail is proposed along the creek corridor.

**Exhibit 2 Concept Plan Bicycle and Pedestrian Framework**




Source: South Cooper Mountain Concept Plan, Figure ES-5

Sidewalks will be provided along the site frontage and throughout the development. In addition, to ensure adequate sight distance between modes, on-site landscaping, signage and any above-ground utilities should be provided appropriately to ensure that adequate sight distance is provided and maintained.

### Site Access Phasing

As shown in Figure 2, the proposed South Cooper Mountain Heights development assumes two new site access roadways along SW 175$^{th}$ Avenue upon year 2016 build-out. Site access for the proposed South Cooper Mountain Heights development will ultimately be provided via three access locations upon full build-out of the South Cooper Mountain Concept Plan area, as described below.

- SW 175th Avenue/Planned Collector 6b, 6c – the planned collector provides full access to the proposed South Cooper Mountain Heights development, and is stop controlled in the near-term build-out year 2016. This intersection is anticipated to be signalized in the longer term as the South Cooper Mountain Concept Plan area develops, particularly to the west of SW 175th Avenue, and when connection to SW Loon Drive is realized.
- SW 175th Avenue/High School Site Access – South Site Access – the proposed South Cooper Mountain Heights south site access provides full signalized access and shares access with the proposed Beaverton High School. In the near-term build-out year 2016, a majority of trips bound for the SW Roy Rogers Road/SW Scholls Ferry Road intersection travel through this intersection; however, vehicles will be more evenly distributed to the other two site access locations in the longer term.
- SW Loon Drive/ Planned Collector 6b, 6c – the City of Beaverton is currently evaluating options to construct the portion of the Planned Collector 6b, 6c that lies east of the proposed South Cooper Mountain Heights development. Upon construction, an additional site access will be provided via the SW Loon Drive/Planned Collector 6b, 6c.

## Transportation Policy Review and Compliance Analysis

The proposed South Cooper Mountain Heights development and the associated transportation network were reviewed and found to comply with the Transportation Element of the City of Beaverton Comprehensive Plan and the South Cooper Mountain Concept Plan. *Appendix "G" includes the relevant policies of each plan.*

## 2016 Total Traffic Operational Analysis

Total traffic volumes include the site-generated trips in addition to the 2016 background traffic volumes. Figures 9 and 10 illustrate the recommended lane configurations and traffic control devices and operations at the study intersection under total traffic conditions during the weekday AM and PM peak periods, respectively. All study intersection meet operational standards under 2016 total traffic conditions with the proposed mitigations in place. *Appendix "H" includes the year 2016 total traffic operations worksheets.*

## Year 2016 Proposed Mitigations

Each study intersection and associated proposed mitigations upon full build-out of the site are discussed below. The proposed mitigations are consistent with the *175th Avenue – Roy Rogers Road 15% Design Report* which identifies the ultimate roadway cross-section along the corridor, including lane configurations and traffic control devices.

### *SW 175th Avenue/Planned Collector 6b, 6c*

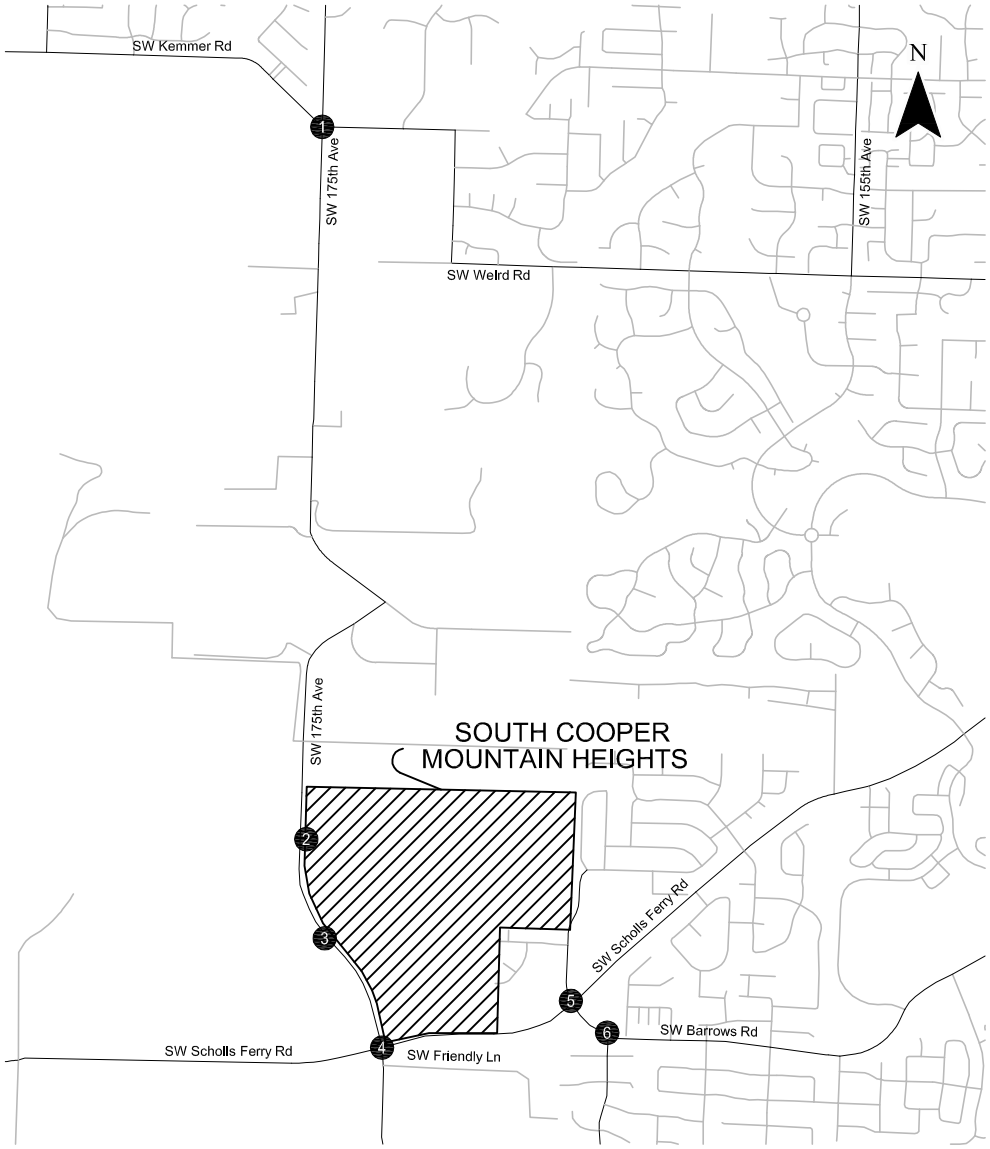
The SW 175th Avenue/Planned Collector 6b, 6c intersection operates within operational thresholds assuming two-way stop-control for the new minor street approach with exclusive right- and left-run lane and a separate southbound 100-foot left-turn lane.

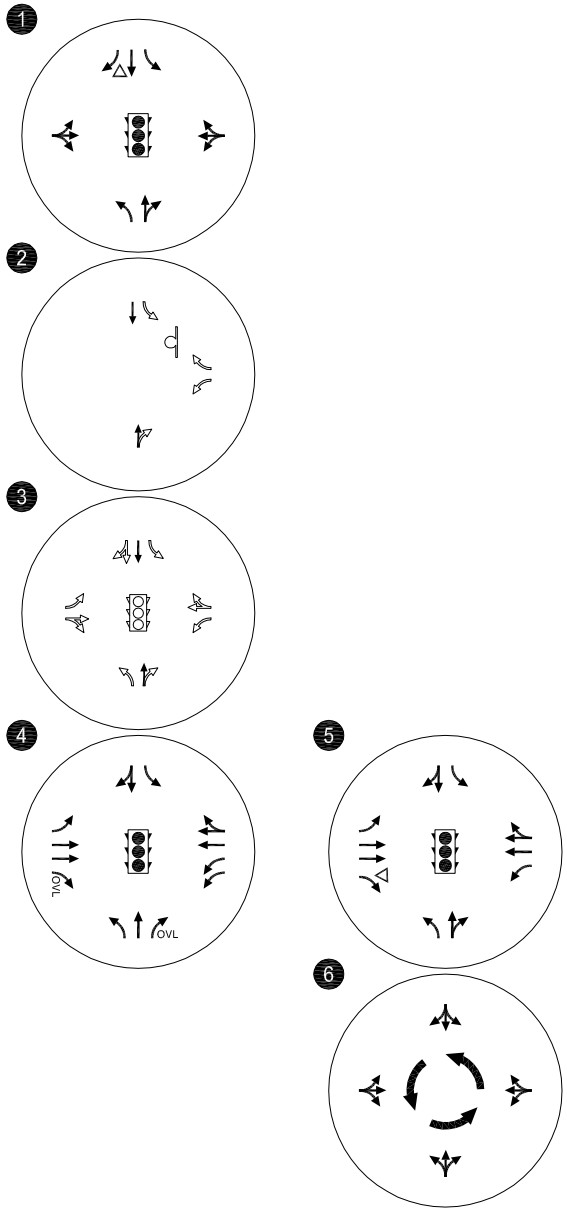
### *SW 175th Avenue/High School – South Site Access*

The SW 175th Avenue/High School–South Site Access intersection meets signal warrants, as shown in *Appendix "I"*. Based on the warrants provided in the Manual of Uniform Traffic Control Devices (MUTCD), volumes meet the eight-hour vehicular volume warrant, four-hour vehicular volume warrant, and peak hour warrant. Therefore, a signal is recommended at the southern access with site development. Based on the South Cooper Mountain Concept Plan, a future high school is planned on the west side of SW 175th Avenue with primary access directly across from the southern access for the South Cooper Mountain Heights development. Therefore, the signal should be designed to accommodate buildout of both the high school and South Cooper Mountain Heights development.

### *SW Roy Rogers Road/SW Scholls Ferry Road*

The SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road intersection does not meet applicable standards under existing or 2016 background conditions, for the southbound through-right movement. Similar to these conditions, 2017 total traffic operations at the intersection can meet operational standards through signal timing optimization reflecting the emerging traffic patterns at the intersection by providing additional green time to the northbound and southbound movements at the intersection.

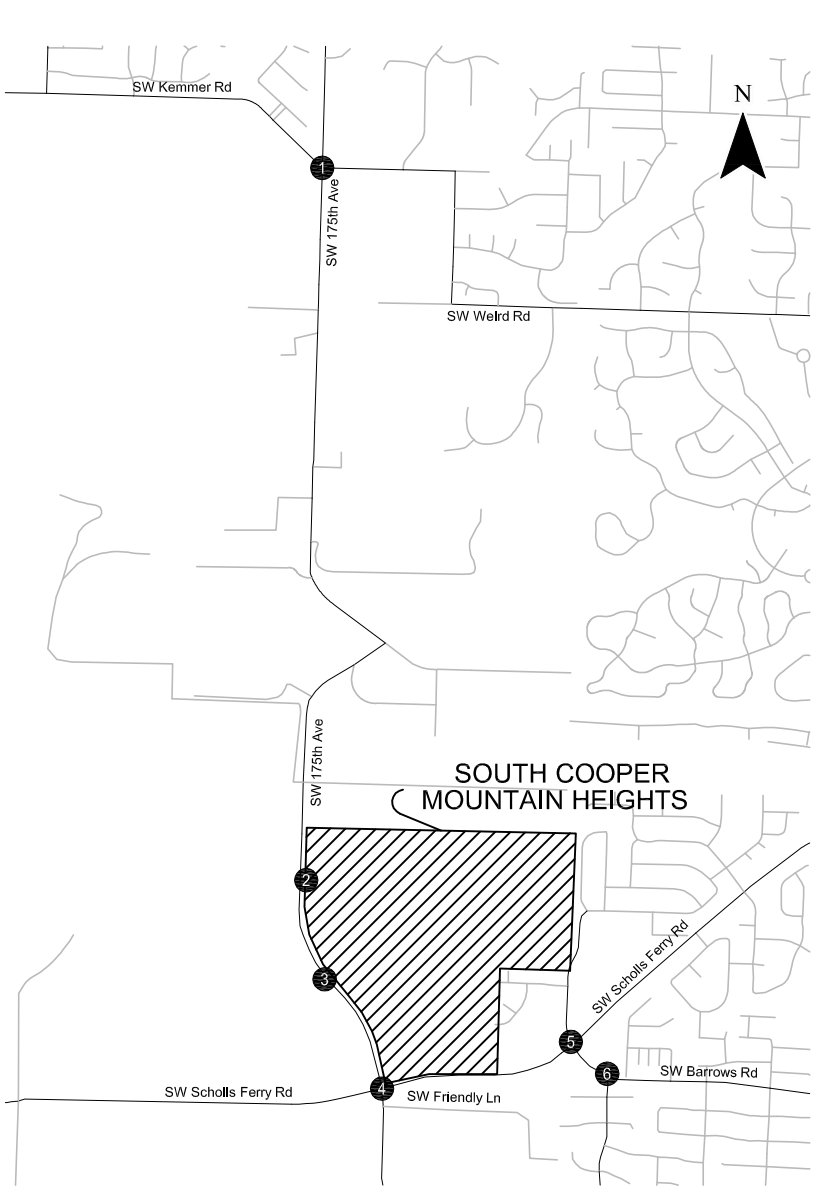


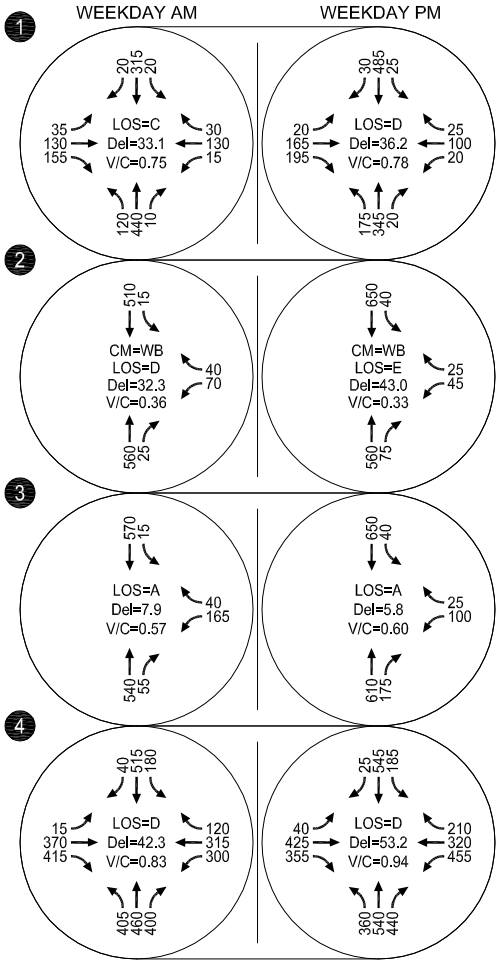



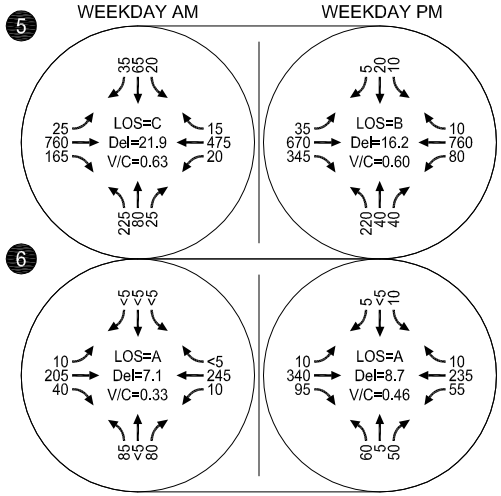

OVL - OVERLAP
- STOP SIGN
- TRAFFIC SIGNAL
- YIELD
- IMPROVEMENT

# Year 2016 Total Conditions
# Lane Configurations and Traffic Control Devices
# Beaverton, OR

Figure
9




CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/
CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED) /
CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

# 2016 Total Traffic Conditions
# Weekday AM and PM Peak Hours
# Beaverton, OR

Figure
10

## 2035 Total Traffic Conditions

Future year 2035 traffic operations at the study intersections were analyzed. Figures 11 and 12 illustrate the assumed lane configurations and traffic control devices and operations at the study intersection under year 2035 total traffic conditions during the weekday AM and PM peak periods, respectively. Year 2035 traffic volumes were estimated based on the existing traffic count data and future year travel forecasts obtained from Washington County, and consistent with the methodology in the *175th Avenue – Roy Rogers Road 15% Design Report*. *Appendix "J" includes the year 2035 total traffic operations worksheets and Washington County travel demand model runs.*

## Year 2035 Assumed Mitigations

Each study intersection and associated proposed mitigations for year 2035 conditions are discussed below. The proposed mitigations are consistent with the *175th Avenue – Roy Rogers Road 15% Design Report*. This report identifies the ultimate roadway cross-section along the corridor, including lane configurations and traffic control devices.

### *SW 175th Avenue/SW Kemmer Road*

Consistent with the planned MSTIP project, under year 2035 assumed mitigations, the SW 175th Avenue/SW Kemmer Road intersection will be signalized with exclusive northbound and southbound left-turn lanes. Due to the vertical profile of the intersection, protected left-turn phasing is recommended north/south and split phasing is recommended east/west.

### *SW 175th Avenue/Planned Collector 6b, 6c*

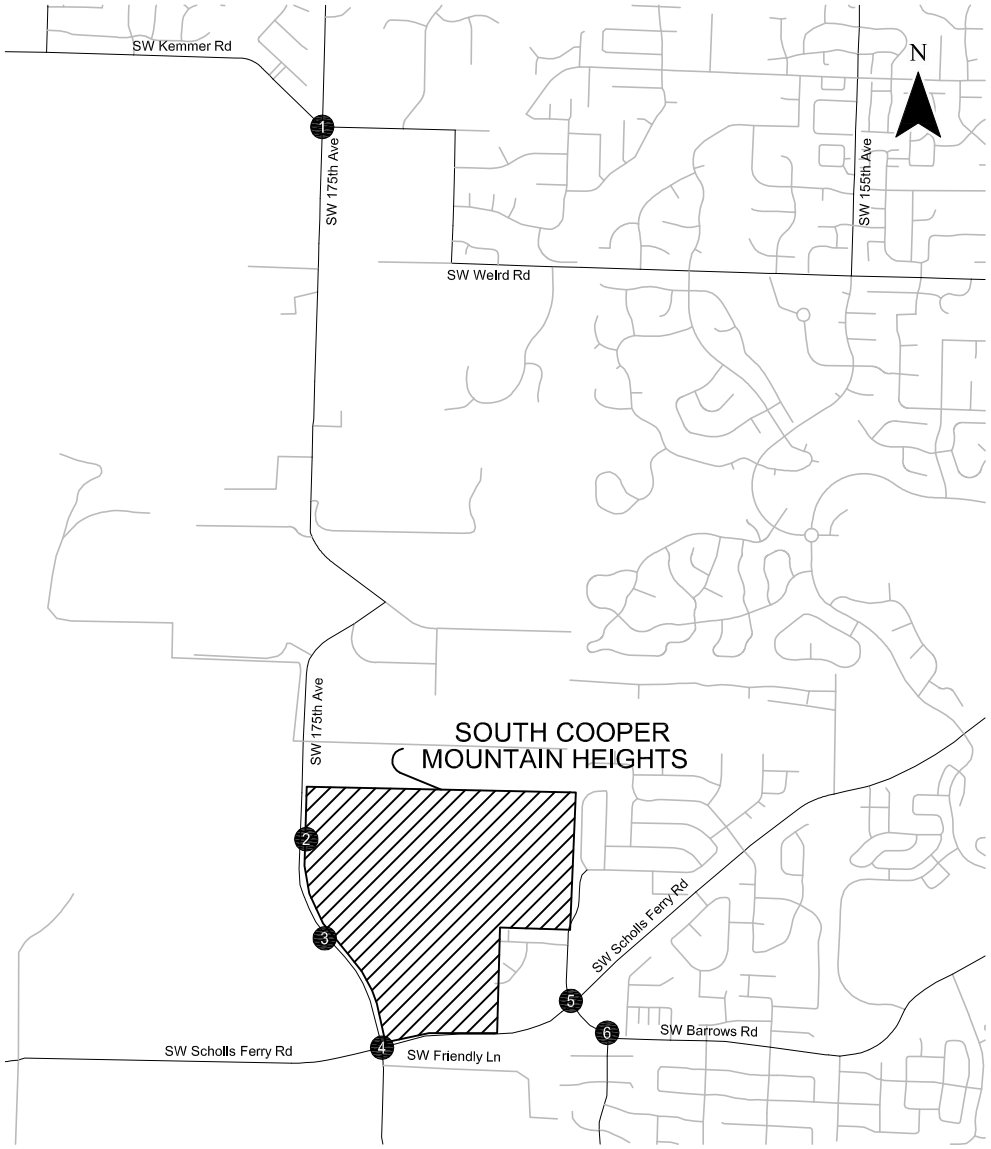
The SW 175th Avenue/Planned Collector 6b, 6c intersection is expected to meet signal warrants in the long term, assuming the build out of development to the west of SW 175th Avenue. Separate, protected left-turn lanes are proposed at all approaches, along with a second northbound and southbound through lane.

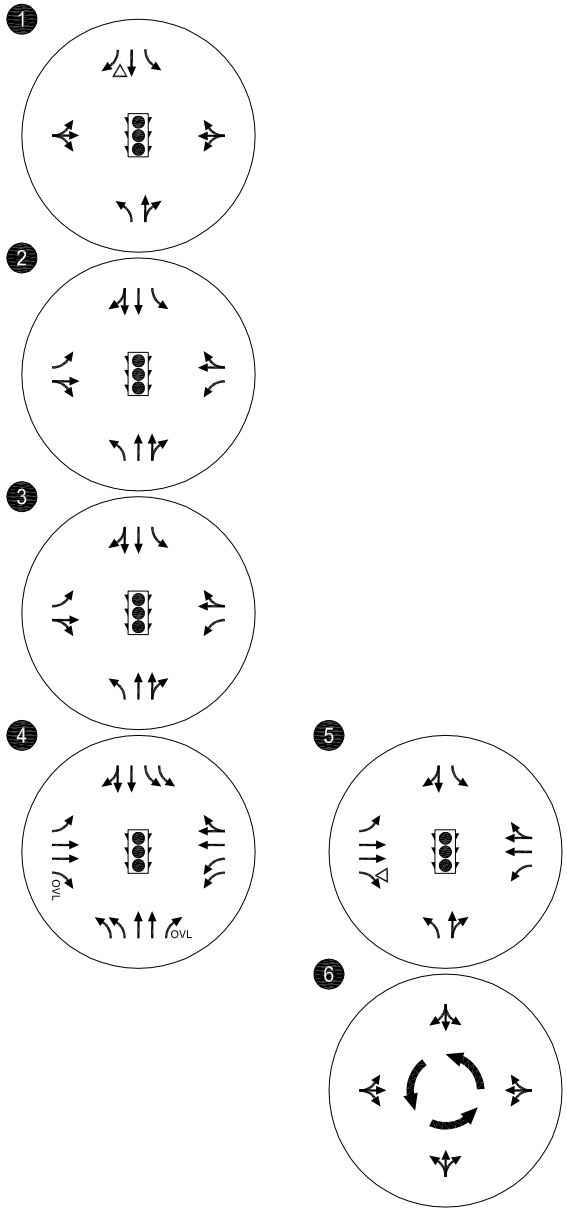
### *SW 175th Avenue/High School – South Site Access*

Consistent with near-term proposed mitigations, under year 2035 assumed mitigations, the *SW 175th Avenue/High School – South Site Access* intersection will be signalized. Separate, protected left-turn lanes are proposed at all approaches, along with a second northbound and southbound through lane.

### *SW Roy Rogers Road/SW Scholls Ferry Road*

The SW Roy Rogers Road/SW Scholls Ferry Road intersection is proposed to include additional northbound and southbound left-turn and through lanes.



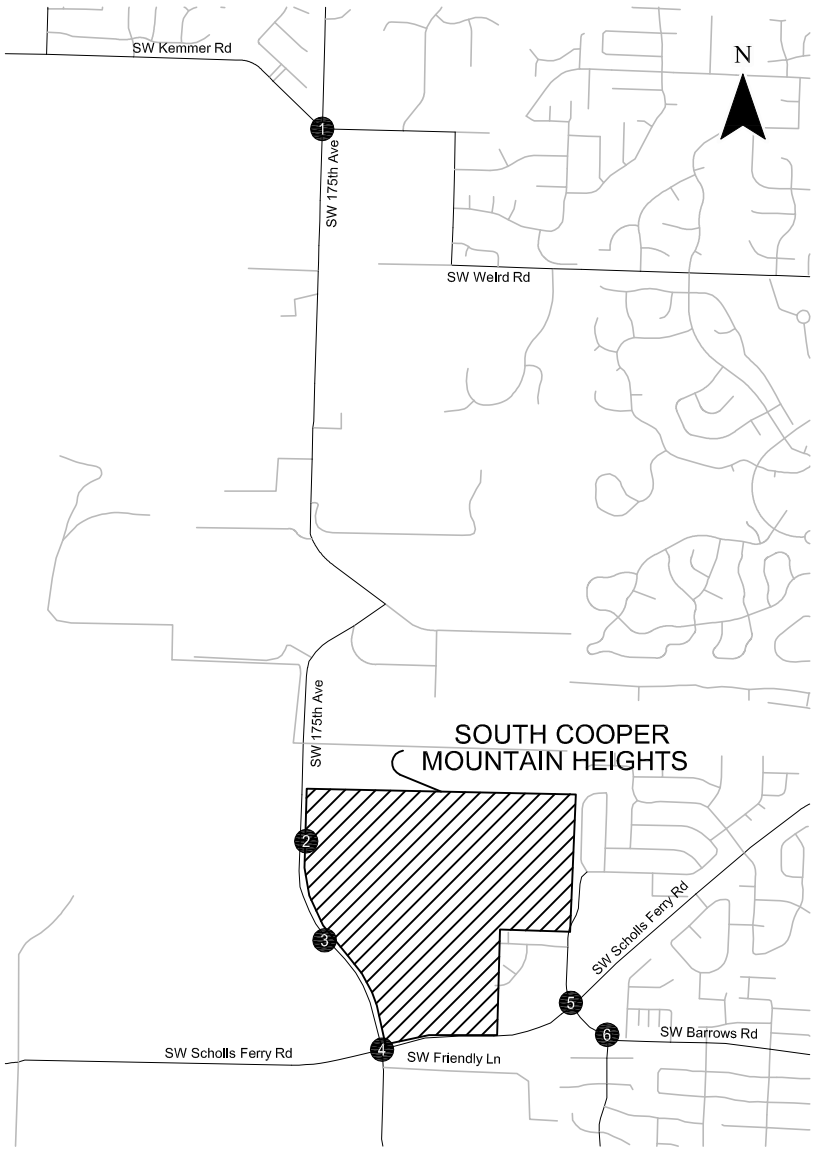

OVL - OVERLAP

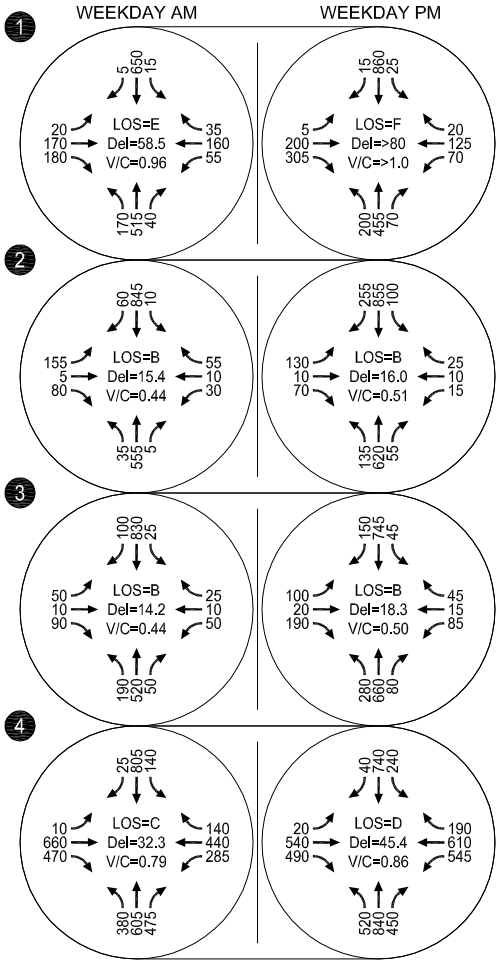
- TRAFFIC SIGNAL

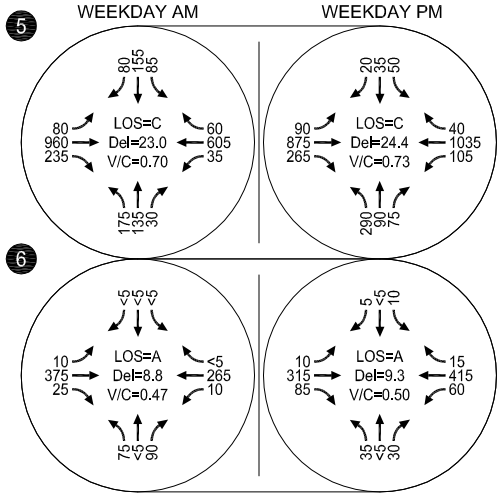
- YIELD

## Year 2035 Conditions
## Assumed Lane Configurations and Traffic Control Devices
## Beaverton, OR

Figure
11

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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

## 2035 Total Traffic Conditions
## Weekday AM and PM Peak Hours
## Beaverton, OR

Figure
12

# CONCLUSIONS AND RECOMMENDATIONS

The traffic impact analysis described in this memorandum has assessed the impacts of the proposed South Cooper Mountain Heights subdivision, and has found the following:

- The intersections of SW 175th Avenue/SW Kemmer Road and SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road do not meet operational standards under existing conditions. However, both intersections can meet standards with the planned MSTIP project at the SW 175th Avenue/SW Kemmer Road intersection and updated signal timing at the SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road in-place.
- At a full build out of 308 single-family homes, 104 townhomes, and 270 apartments, the proposed development is project to generate 5,330 daily vehicular trips, with 415 and 530 occurring during the weekday AM and PM peak hours, respectively.
- Two new site-access roadways are proposed for the development on SW 175th Avenue. In the future, a third access via SW Loon Lane will be provided to the proposed subdivision.
- All study intersections meet operational standards under 2016 and 2035 total traffic conditions based on the recommended improvements.
- The proposed development complies with the Transportation Element of the City of Beaverton Comprehensive Plan and the South Cooper Mountain Concept Plan

## Recommendations

- SW 175th Avenue/SW Kemmer Road – Provide a proportional share contribution per the 2017 Cumulative Impact Analysis to the Washington County led project which will result in the installation of a new traffic signal and exclusive northbound and southbound left-turn lanes with protected phasing.
- SW 175th Avenue/Planned Collector 6b, 6c – Provide a stop-controlled intersection with a new 100-foot southbound left-turn lane and exclusive westbound right- and left-turn lanes.
- SW 175th Avenue/High School–South Site Access – Install a traffic signal (or modify the conditioned High School Site-Access traffic signal) with a 100-foot southbound left-turn lane and exclusive westbound shared through-right and left0turn lanes.
- SW Roy Rogers Road-SW 175th Avenue/SW Scholls Ferry Road – Optimize signal timing to provide additional green time to the northbound and southbound movements.
- Any future landscaping, above-ground utilities, and site signage should be located and maintained such that they provide minimum required sight lines in either direction at all access locations.

Please contact us at (503) 228-5230 if you have any questions regarding this study or the findings and recommendations presented.

# REFERENCES

1. Kittelson & Associates, Inc. *175th Avenue – Roy Rogers Road 15% Design*. April 2015.
2. Transportation Research Board. *2000 Highway Capacity Manual.* 2000.
3. Washington County, Oregon*. Safety Priority Index System (SPIS)*. 2010-2012.
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7. Institute of Transportation Engineers. *Trip Generation, 9th Edition.* 2012.

# APPENDICES

A. Scoping Memorandum

B. Description of LOS Methods and Criteria

C. Traffic Counts

D. Year 2015 Existing Traffic Conditions Worksheets

E. ODOT Crash Data

F. Year 2016 Background Traffic Conditions Worksheets

G. Policy Compliance

H. Year 2016 Total Traffic Conditions Worksheets

I. Signal Warrant

J. Year 2035 Total Traffic Conditions Worksheets