WRITTEN STATEMENT FOR FARMINGTON ROAD IMPROVEMENTS
(PTF2013-0002, SDM2013-0006)

Applicant:	Washington County Dept. of Land Use and Transportation ATTN: Abe Turki 1400 SW Walnut Street Hillsboro, OR 97123
Applicant's Representative:	Harper Houf Peterson Righellis Inc. ATTN: Stefanie Slyman, AICP 202 SE Spokane Street, Suite 200 Portland, OR 97202
Project Location:	The Project site is located in Township 1 South, Range 1 West, Sections 16 and 17, Willamette Meridian, in the City of Beaverton, Oregon. The project site runs along Farmington Road and includes all the intersections between the SW Murray Boulevard and SW Hocken Avenue.
Surrounding Zoning:	GC, NS, R1, R2, R10
Neighborhood Association:	Central Beaverton Neighborhood Association West Beaverton Neighborhood Association (west of Murray Blvd.)

A. PROJECT DESCRIPTION

Farmington Road between Murray Boulevard and Hocken Avenue is a heavily-used four-lane section of roadway that lacks continuous bicycle and pedestrian facilities. This project will make needed safety and traffic capacity improvements to this section of Farmington Road, for all modes of transportation. Improvements include:

- Roadway widening to five lanes (two travel lanes in each direction and center turn lane)
- Continuous bicycle facilities
- Continuous pedestrian facilities
- Street lighting
- Realign 141st and 142nd Avenues
- Additional turn lanes at Murray Boulevard

The project area is located south of the Tualatin Valley (TV) Highway in Beaverton, extending along Farmington Road from Hocken Avenue west to Murray Boulevard. The area is within Township 1 South, Range 1 West, Sections 16 and 17. The Farmington Road Improvement Project (Project) widens Farmington Road between SW Murray Blvd. and SW Hocken Avenue. The project aligns with existing Farmington Road approximately 500 feet east of SW Hocken Avenue and 575 feet west of SW Murray Boulevard.

Improvements to the Farmington Road/Murray Boulevard intersection will extend approximately 650 feet north and south on Murray Boulevard. Improvements to Hocken Avenue will extend from the intersection of Hocken Avenue and Farmington Road approximately 220 feet to just south of the railroad crossing. Improvements to other intersecting streets, including SW Second Street, Menlo Drive, Rose Lane, SW 139th Avenue, 141st Avenue, 142nd Avenue, and SW Normandy Place will extend 20 to 250 feet north and south in order to match existing street sections.

As the project received final funding in 2013 to move forward with final plans and construction of the project, Washington County, with HHPR and City of Beaverton assistance, has supplemented the original public involvement process by building upon the decisions made from the original PAC process. In order to inform the public of the newly funded project, Washington County and team has sent out informational mailers, written and distributed press releases on the project, developed an updated project webpage www.farmingtonroadproject.com, and held a public open house at Beaverton High School on April 10, 2013 to update the public on the five changes made to the project as outlined above. The design team also met with the Central Beaverton NAC on June 3, 2013 and West Beaverton NAC on June 13, 2013 to present the revised project and answer questions about the design.

The design team will continue to inform the public through the design process by attending Neighborhood Association Committee (NAC) meetings as requested, attending individual property owner meetings as necessary, and provide updates on the webpage and newsletters as necessary.

C. EXISTING AND PROPOSED IMPROVEMENTS

The major features of the existing and proposed improvements for the updated Farmington project are shown in the Plan Set submitted with the application. The existing and proposed conditions are summarized below**. Refer to Project Index Map 1A to locate specific subareas within the overall project area.**

Existing Conditions Sheets EC-01 - EC-14; Dimensioned Site Plan Sheets SP-01 – SP-14

Street Improvements

Existing. Farmington Road contains five lanes from Hocken Avenue to Menlo Drive, and four lanes west to Murray Boulevard. The proposed improvement will tie into Washington County's multiple mode improvements on Farmington from Murray west to 185th that have already widened Farmington Road to five lanes.

Proposed. Widen Farmington Road to a five lane section with bike lanes and sidewalks in addition to eastbound and westbound dual left turn-lanes and right turn-lanes at the intersection of Murray Boulevard. The improvements will match the existing five lane section west of Murray prior to the widening for the turn lanes at the intersection with Murray Boulevard. At the east end of the project, Farmington Road will be constructed to a five lane section through the Hocken Intersection and then taper down to the existing four lane section to match existing improvements. The total length of widening along Farmington Road is approximately 4,000 feet. The Farmington Road cross section is proposed as an 86-foot right of way, 11-foot inside lanes, 12-foot curbside lanes for truck/bus traffic, 12-foot turn lane, pedestrian crossings, minimum 5-foot bike lanes, and 8.5-foot curb tight sidewalks with tree wells.

Intersection improvements

Existing. Currently, the **Farmington/Murray intersection** includes typical five-lane sections, with dedicated left turn lanes at all approaches. Integrated right turn/through lanes are provided on each leg of the intersection.

The **Farmington/Hocken intersection** is a "T" configuration, with Farmington Road comprising a five-lane section on the western approach to Hocken Avenue, and a 4-lane

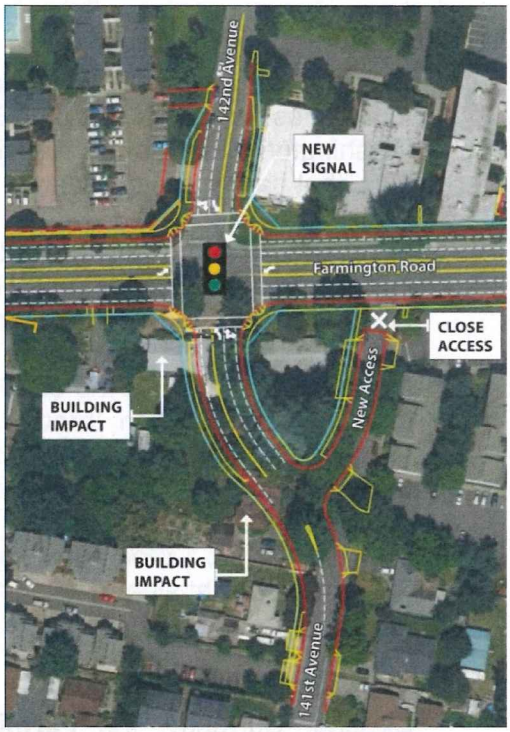
section on the east approach. Hocken Avenue is the northern leg of the intersection, consisting of one northbound lane and two southbound lanes. The southbound and westbound approaches include combined through and right turn lanes.

141st Avenue and 142nd Avenue are separate, two-lane collectors that intersect Farmington Road. The intersections are offset by approximately 180'.

Proposed. Improvements at the **Farmington/Murray intersection** will include widening for double left turn lanes and right turn lanes on all approaches except there will be no northbound right turn lane from Murray Boulevard onto Farmington Road. The addition of northbound and southbound dual left turn lanes along with a southbound right turn lane will require improvements along Murray Boulevard for approximately 1,200 feet.

At the **Farmington/Hocken intersection**, Hocken Avenue will be widened to a five lane section from the existing three lane section just south of the Portland and Western railroad ROW. The proposed five lane section will taper back to match the existing three lane section just south of the railroad ROW, although the project is acquiring right of way for future widening of the five lane section across the railroad ROW to Tualatin Valley Highway. Proposed improvements for this current segment include three southbound lanes (two left turn lanes and one right turn lane) and two northbound lanes (one left turn and one through/right turn). 5' bike lanes and 8.5' curb tight sidewalks with 4' tree wells are provided on both sides of Hocken. Associated improvements to signal location, phasing and timing are also included with the project.

The existing offset "T" intersections at **141st and 142nd Avenues** will be realigned into one intersection consistent with the City's Transportation System Plan (TSP). SW 141st Avenue south of Farmington Road will be re-aligned to align with SW 142nd Avenue at Farmington Road. The design team is proposing that 141st Avenue will be constructed to meet a 25 mph design speed, as the area south of the connection is residential with traffic calming in place, and the lower speed roadway will reduce impacts to adjacent properties. The figure to the right shows the proposed alignment of the new connection.



Bicycle Improvements

Existing. There are currently no bike lanes along this section of Farmington between Murray Boulevard and Hocken Avenue. There is a shared pedestrian and bike way along a portion of the south side of the roadway.

Proposed. Five-foot bike lanes are proposed on both sides of Farmington Road, Murray Boulevard and Hocken Avenue. In addition, Hocken includes a separate left turn southbound bike lane from the TV Highway to the "T" intersection approach at Farmington Road. All bike lanes will be striped, stenciled and signed appropriately. Bike lanes in the proposed project boundaries will complete the bicycle system from 185th Avenue into the Beaverton Regional Center.

Pedestrian Improvements

Existing. Intermittent, curb-tight sidewalks exist along a majority of project area street frontages. A portion on the south side of Farmington is a shared path.

Proposed. 8.5-foot curb tight sidewalks with 4' tree wells will be constructed on both sides of Farmington Road and Hocken Avenue. Curb-tight sidewalks are proposed on Murray Boulevard. Pedestrians will be buffered from bicycle and auto traffic by new street trees.

Transit Facilities

Existing. Farmington Road is a major transit route. Route 52 serves the area and provides access to the Beaverton Transit Center, a Westside MAX station and bus transfer point to 12 other bus routes.

Proposed. Tri-Met will consider additional amenities at existing or modified stop locations within the project boundaries if warranted. Coordination with TriMet for such amenities will occur in the field.

Parking

Existing. No parking currently exists in the project area, and the City does not allow parking on arterial streets. Adjacent side streets and off street parking lots provide for area parking.

Proposed. No parking is proposed for the project area.

Grading Plan Sheets G-01 – G-14

Existing: The existing grade of Farmington Road is generally flat, with curb and sidewalk along the majority of the north side and a combination of curb and sidewalk and an asphalt shoulder along the south side. The existing ponds recently constructed adjacent to Erickson Creek represent the greatest slopes adjacent to the roadway along the corridor. This is a 2:1 slope away from the roadway that was designed to accommodate future improvements to Farmington Road.

Proposed: The project is using 2:1 slopes at the back of the sidewalk to match into existing properties as quickly as possible. Where slopes extend beyond an acceptable limit into private property improvements, retaining walls of approximately two to three feet in height will be constructed to minimize disturbance. In two other locations, on the

north side of Farmington Road east of Murray Boulevard (G-02, G-03) and the west side of Murray Boulevard north of Farmington Road (Sheet G-10), taller neighborhood walls may be constructed based on property owner requests as determined during the right-of-way process.

Utility Plan Sheets U-01 – U-14

Public Utilities

Existing. The project area has existing water, sanitary sewer, storm drainage, and street light systems.

Proposed. The sanitary sewer main running along Farmington Road is proposed to be upsized from the existing 10" sewer main to a 15" sewer main. The existing water line along the north side of Farmington Road is proposed to be abandoned and a new 12" water line is proposed in Farmington Road along with other waterline improvements that were identified in the 2004 design.

A new storm sewer conveyance system and catch basins/inlets are proposed to be constructed within Farmington Road and Murray Boulevard along the length of the project. The majority of Farmington Road will be conveyed to the existing water quality swales constructed at Erickson Creek as part of the Erickson Creek at Menlo Drive Creekside Enhancement project completed in 2011. (CIP 8074).

Private Utilities

Existing. Power, telephone, cable and associated utilities exist both above and below grade.

Proposed. Power, telephone, cable and associated conduit and vaults will be relocated to accommodate proposed roadway improvements.

Landscape Plan Sheets L-01 – L-14

Existing. Landscaping within the existing public right of way is minimal. Most of the project area contains curb-tight sidewalks with no street trees. Currently, street trees exist only along Hocken Avenue.

Proposed. Shrubs and groundcover will be planted at the intersections and vines planted adjacent to the neighborhood walls. Landscaping along the corridor will consist of street trees in 4'x8' tree wells, leaving a 4' clear pedestrian path behind the planter. This concept is consistent with the plans approved in 2004.

A total of 171 trees located within the project area will be removed for the roadway widening, none of which are on the City's Tree Inventory Map as either a Significant Individual Tree or within a Significant Tree Resource area. 104 new street trees, approved by the City of Beaverton for street tree use, will be planted in the project area. The current design does not include the undergrounding of utilities; therefore, the palate of street trees for the corridor has been revised from the 2004 plan to account for street trees under utility lines. As per the 2004 PAC recommendations, tree grates are not proposed to be used along Farmington. The following are the tree species proposed for the corridor:

***Acer griseum* Paperbark Maple**
Broadleaf deciduous tree, 20-30 ft, upright, oval, very attractive copper-red bark, exfoliates, paper-like. City of Beaverton/PGE approved street tree for use under power wires.

Malus 'Spring snow' Flowering Crabapple
Dense, upright, white-flowered crabapple that typically matures over time to 20-25' tall by 15-20' wide. This is a fruitless crabapple. Single, fragrant, white flowers bloom in spring. Ovate bright green leaves (to 3" long) turn yellow in fall. City of Beaverton/PGE approved street tree for use under power wires.

***Prunus* × *yedoensis* 'Akebono' Akebono Yoshino Cherry**
Broadleaf deciduous tree, 25 ft high, spreading to an equal width. Flowers are a soft pink single flower. City of Beaverton approved street tree for use in a minimum 4-foot planting area where no overhead utility wire conditions exist.

Lighting Plan Sheets LP-01 – LP – 14

Existing. Existing street lights are cobra heads on PGE power poles.

Proposed. New LED cobra head street lighting will be installed as part of the improvements. See cut sheets submitted with Plan Set. The street lighting is designed to meet Washington County and the City of Beaverton's Engineering Design Manual.

Wall Plan Sheets WP-01 – WP – 08

Existing. There are no existing neighborhood walls associated with Farmington Road as a public transportation facility.

Proposed. Split face CMU block walls of up to a maximum of six (6) feet in height are proposed as neighborhood walls in three locations in the project area: Wall 1 at Marysville (Sheet WP-05); Wall 2 at Fountain Court Apartments – Murray frontage (Sheet WP-06), and Wall 3 at Fountain Court Apartments – Farmington Rd. frontage (Sheet WP-08). Retaining walls, which consist of segmental block walls of no more than four (4) feet in height, are shown on Grading Plan Sheets.

D. APPROVED ENGINEERING DESIGN MANUAL MODIFICATIONS

Three modifications to the City of Beaverton Engineering Design Manual modifications in conjunction with the Farmington Road Improvement Project have been approved by the City Engineer. Design Modification Request #1, for a sidewalk design modification, is subject to additional land use review in this application through the concurrent Sidewalk Design Modification. Design Modifications #2 and #3 are provided as documentation that the roadway design has met the City of Beaverton Engineering Design Manual or received approval for modifications from the City Engineer. **See Appendix B: Approved Engineering Design Modification Requests**

Summary of Design Modification Request #1
Eliminate the 7.5' width planter strip from the proposed typical section and provide a 8.5' curb tight sidewalk with tree wells. The justification for the modification is that as part of the extensive public involvement process for the project, the PAC reviewed three

alternative cross sections. They included the City standard typical section (including planter strips), curb tight sidewalks, and expanded curb tight sidewalks with tree wells. It was the recommendation of the committee and subsequent recommendation of City Council to proceed with the expanded curb tight sidewalks with tree wells. This cross section best balanced the private property impacts associated with the road widening with the benefit received to pedestrians along this developed urban corridor.

Table 1. Summary of Beaverton Arterial Street Standards

Roadway Element	Standard Width	Proposed Width
Travel lane	11-12 feet	11-12 feet
Turn lane/median	12 feet	12 feet
Bike lane	5 feet	5 feet
Planter Strip	7.5 feet	**n/a**
Sidewalk	6 feet	**8.5 feet including tree wells**
Right-of-Way	96 feet	**86 feet**

Bold items indicate a modification from the City standard.

This modification was approved under the City's Engineering Design Manual section 145.1.5 item 2: "Topography, right-of-way, or other geographical conditions or impediments impose an undue economic hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility. The sidewalk and planter strip modification is further subject to Sidewalk Design Modification approval via this PTF application and is addressed in the applicable section of this application.

Summary of Design Modification Request #2
Reduce the design speed on the realignment of 141st Avenue to 142nd Avenue at Farmington Road from 35 mph to 25 mph. The primary reason for this change is to avoid impacts to a residential structure on 141st Avenue. The justification for the change is that 141st Avenue is a collector that is predominantly residential and already has traffic calming installed. Speeds are generally low, particularly approaching the intersection with Farmington Road. Additionally, the 25 mph curves will help keep speeds low after the intersection with Farmington Road is signalized. This modification does not require additional land use approval.

Summary of Design Modification Request #3
Reduce the curb return radius required at the intersection of 141st/142nd and Farmington Road. Per the Engineering Design Manual, the curb returns must be designed to accommodate a WB-65 vehicle because it is an intersection of a collector and an arterial truck route. To accommodate this size vehicle requires widening the intersection throat and providing a two centered curb return radius. The proposed design uses a 40' radius. The primary reason for the proposed change is to reduce the right of way impacts and crossing distance of the side streets to Farmington Road. The justification for the change is that 141st Avenue is a collector that is predominantly residential homes and already has traffic calming installed. While truck traffic is not excluded from 141st Avenue, it is not he preferred or an anticipated route. 142nd Avenue is a short segment of roadway between Farmington Road and Tualatin Valley Highway. The intersection of 142nd and Tualatin Valley Highway is unsignalized, making it less desirable for truck

traffic. The more appropriate truck route going both north and south of Farmington Road is Murray Boulevard. The reduction in curb radius will benefit pedestrians crossing the 141st or 142nd legs of the intersection be reducing the crossing distance and bringing the ramp location closer to the travel lane for better visibility. This modification does not require additional land use approval.

E. RESPONSES TO APPROVAL CRITERIA

CHAPTER 20 LAND USES

20.05. RESIDENTIAL LAND USE DISTRICTS

20.05.05. Residential Areas.

The areas of the City that are designated as residential densities implement the policies of the City's Comprehensive Plan and are identified on the City's Zoning Map. Full urban services are to be provided.

> ***Response***: *The project is located in three residential districts: the R1 Residential Urban High Density District (1,000), R2 Residential Urban Medium Density District (2,000), and R10 Residential Urban Low Density (10,000) District. The zoning districts implement the policies of the City's Comprehensive Plan. The proposed improvements are consistent with the provision of "full urban services" to be provided in the City's Residential Areas. Per Chapter 90 Definitions, "Urban Services" include the following services and facilities: a public sanitary and storm sewer system, a public water supply, a street system, police and fire protection, public schools, public parks and library service. Improvements to Farmington Road, a Public Transportation Facility, is consistent with the provision of full urban services. This criterion is met.*

20.05.10. Purpose

R1 Residential Urban High Density District (1,000). The R1 District is intended to establish high density residential developments where a minimum land area of 1,000 square feet is available for each dwelling unit.

> ***Response***: *The Public Transportation Facility is consistent with the purposes of the R1 district. This criterion is met.*

R2 Residential Urban Medium Density District (2,000). The R2 District is intended to establish medium density residential developments where a minimum land area of 2,000 square feet is available for each dwelling unit.

> ***Response***: *The Public Transportation Facility is consistent with the purposes of the R2 district. This criterion is met.*

R10 Residential Urban Low Density District (10,000). The R10 District is intended to establish low density residential home sites where a minimum land area of 10,000 square feet is available for each dwelling unit.

> ***Response***: *The Public Transportation Facility is consistent with the purposes of the R2 district. This criterion is met.*

20.05.15 Site Development Standards. Site Development Standards support implementing development consistent with the corresponding zoning district.

***Response**: This application is for a Transportation Facility for which the site development standards in this table do not apply.*

20.05.20 Land Uses

***Response**: This application is for a Transportation Facility, defined by Chapter 90 as "Any physical facility that moves or assists in the movement of people or goods, which may include accessways, bicycle facilities, shared-use paths, pedestrian connections, or streets. This term does not include electricity, sewage, or water delivery systems." The Land Use table does not regulate Public Transportation Facilities; therefore the table does not apply to the transportation facility per se.*

Utility improvements ("Public Sewer and Water and Utility Transmission lines") associated with the transportation facility are listed as Permitted Uses in the R1 and R2 zones. This approval criterion is met.

20.10 COMMERCIAL LAND USE DISTRICTS

20.10.05. Corridor and Main Street Areas. These areas of the City implement the Corridor and Main Street policies of the City's Comprehensive Plan and are identified on the City's Zoning Map. Full urban services are to be provided.

***Response**: The project is located in two commercial districts, the Neighborhood Service (NS) District and General Commercial (GC) District which implement the policies of the City's Comprehensive Plan. The proposed improvements are consistent with the provision of "full urban services" to be provided in the City's Commercial Areas. Per Chapter 90 Definitions, "Urban Services" include the following services and facilities: a public sanitary and storm sewer system, a public water supply, a street system, police and fire protection, public schools, public parks and library service. Improvements to Farmington Road, a Public Transportation Facility that is a part of the City's street system, is consistent with the provision of full urban services. This criterion is met.*

20.10.10 Purpose

Neighborhood Service (NS). The NS District is intended to provide minimal areas of service and convenience uses to meet the frequent needs of nearby residents.

***Response**: The Public Transportation Facility is consistent with the purposes of the NS district. This criterion is met.*

General Commercial (GC). The GC District is intended to provide businesses requiring extensive land intensive outdoor storage and/or display of merchandise, equipment, or inventory.

***Response**: The Public Transportation Facility is consistent with the purposes of the GC district. This criterion is met.*

20.10.15 Site Development Standards

***Response**: This application is for a Transportation Facility within the public right-of-way for which the site development standards in this table do not apply.*

20.10.20 Land Uses

***Response**: This application is for a Transportation Facility, defined by Chapter 90 as "Any physical facility that moves or assists in the movement of people or goods, which may include accessways, bicycle facilities, shared-use paths, pedestrian connections, or streets. This term does not include electricity, sewage, or water delivery systems." The Land Use table does not regulate Public Transportation Facilities; therefore the use table does not apply to the transportation facility. Utility improvements ("Public Sewer and Water and Utility Transmission lines") associated with the transportation facility are listed as Permitted Uses in the NS and GC zones. This approval criterion is met.*

CHAPTER 30 NON-CONFORMING USES

30.05. Purpose.

1. Within the districts established by this ordinance or amendments that may later be adopted there may exist lots, structures, uses of land and structures, and characteristics of use which were lawful before the effective date of this ordinance, but which would be prohibited, regulated, or restricted under the terms of this ordinance or future amendments. It is the intent of this ordinance to permit these nonconformities to continue until they are removed, but not to encourage their perpetuation. It is further the intent of this ordinance that nonconformities shall not be enlarged, expanded or extended, nor be used as grounds for adding other structures or uses not permitted elsewhere in the same district except as specifically provided elsewhere in this ordinance.

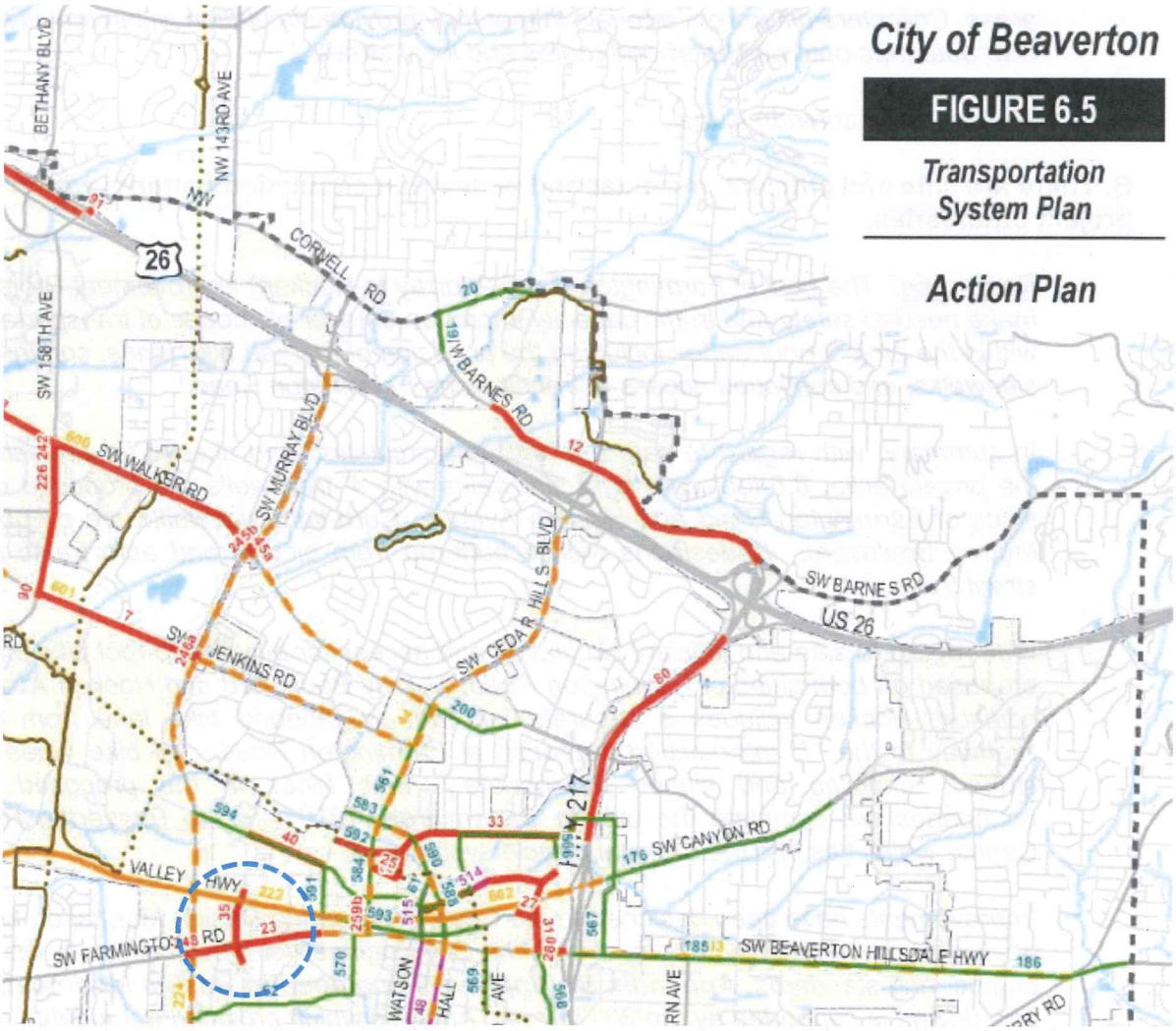
***Response**: The proposed Public Transportation Facility improvements will be made within existing or acquired right-of-way only and will not enlarge, expand, or extend non-conforming uses within the existing and acquired public right-of-way (project boundary). Therefore, the provisions of Chapter 30 do not apply to this PTF/Sidewalk Design Modification application.*

CHAPTER 40 APPLICATIONS

40.03.2 PUBLIC TRANSPORTATION FACILITY IMPROVEMENTS OR MODIFICATIONS, INCLUDING STREET VACATIONS.

A. The transportation facility, as proposed or modified, conforms to the Transportation System Plan.

***Response**: Per Table 6-1 the Transportation Element of the Comprehensive Plan (Chapter Six), Farmington Road: Murray Blvd. to Hocken Avenue is identified as project #23 in the City's 2035 Transportation System Plan (TSP) and its location shown in Figure 6.5 of the TSP.*



The proposed improvements are consistent with the location and purpose of the project which is to "Construct turn lane and intersection improvements; signalize where warranted; add bike lanes and sidewalks in gaps."

The proposed improvements further support Farmington Road's functional classification as an Arterial, the purpose of which is "to interconnect and support principal arterials and freeways. They link major commercial, residential, industrial, and employment areas. Arterials are typically spaced about one mile apart to assure access to through routes and to reduce the incidence of traffic using collectors or local streets in lieu of a well-placed arterial street."

The realignment of 141st and 142nd Avenues is identified in Table 6-1 of the Transportation Element of the Comprehensive Plan (Chapter Six) as project #35 and its location shown in Figure 6.5. The proposed improvements are consistent with the location and the purpose of the project which is to "Connect streets, add bikeways, sidewalks, turn lanes and signalized as warranted."

The proposed improvements further support the Collector street functional classification which is to "balance access and circulation within residential, commercial, and industrial

areas. Collectors differ from arterials in that they provide circulation within the city and distribute trips onto neighborhood routes and local streets."

This approval criterion is met.

B. There are safe and efficient vehicular and pedestrian circulation patterns within the project boundaries.

***Response**: The goal of Farmington Road (Murray to Hocken) Improvement Project is to make needed safety and traffic capacity improvements for all modes of transportation within the project boundaries including the provision of marked bike lanes, continuous sidewalks, and continued access to transit along Farmington Road.*

In summary, with regard to safe and efficient circulation and access for pedestrians in the project area, 8.5-foot curb tight sidewalks with 4' tree wells are proposed on both sides of Farmington Road and Hocken Avenue. Curb-tight sidewalks are proposed on Murray Boulevard. Pedestrians will be buffered from bicycle and auto traffic by new street trees.

With regard to safe and efficient circulation and access for bicycles, 5-foot bike lanes are proposed on both sides of Farmington Road, Murray Boulevard and Hocken Avenue. In addition, Hocken includes a separate left turn southbound bike lane from the TV Highway to the "T" intersection approach at Farmington Road. All bike lanes will be striped, stenciled and signed appropriately. Bike lanes in the proposed project boundaries will complete the bicycle system from 185th into the Beaverton Regional Center, which ties into the regional bicycle system.

Improvements have been designed to the City's Engineering Design Manual or, where applicable, have received approval from the City Engineer for modifications to the engineering standards. ***Appendix B: Approved Engineering Design Modifications.*** *The design is supported by the 2013 Traffic Analysis which provided an updated traffic analysis to determine safe and efficient vehicular and pedestrian circulation patterns within the project boundaries.* ***Appendix A: Traffic Analysis.***

This criterion is met.

C. The proposed development is consistent with all applicable provisions of Chapter 60 (Special Requirements) and all improvements, dedications, or both required by the applicable provisions of Chapter 60 (Special Requirements) are in place.

***Response**: The approval criteria provided below were identified at the Pre-Application conference as applicable to a combined Public Transportation Facility and Design Review application. Subsequently, the request has been modified to seek approval of those improvements within the existing or acquired right-of-way for the Public Transportation Facility only. Therefore, some of the criteria which address impacts to property outside of the public right-of-way are not applicable to this application. See responses to Chapter 60 Special Requirements.*

D. Adequate means are provided or proposed to be provided in a satisfactory manner, to ensure continued periodic maintenance and replacement of the following, as applicable: drainage facilities, roads and other improved rights-of-way, structures, recreation facilities, landscaping, fill and excavation areas, screening and fencing, ground cover, garbage and recycling storage areas and other facilities.

***Response**: Farmington Road east of Murray is a City street and will be maintained by the City up to Murray Blvd. Farmington Road west of Murray and Murray Blvd are County roads and will be maintained by the County. All improvements within the rights of way and public infrastructure in easements will be maintained by the agency with jurisdiction. This criterion is met.*

E. The proposed transportation facility connects to the surrounding circulation systems in a safe, efficient, and direct manner.

***Response**: Improvements to Farmington Road provide a safe, efficient and direct connection between Murray Boulevard to the west and Hocken Boulevard to the east. Multimodal improvements for vehicles, cyclists, and pedestrians are provided by the widening of the roadway to five lanes, completion of the sidewalk system, and striped bike lanes. Bike lanes in the proposed project boundaries will complete the bicycle system from 185th into the Beaverton Regional Center.*

The realignment of 141st/142nd Avenues at Farmington Road provides an efficient and direct north-south connection from Tualatin Valley Highway south to Allen Boulevard. This realignment improves safety by reconfiguring two off-set intersections into one signalized intersection. The design speed is proposed to be lowered from 35 mph to 25 mph to avoid impacts to a residential structure on 141st Avenue. The justification for the change is that 141st Avenue is a collector that is predominantly residential homes and already has traffic calming installed. Speeds are generally low, particularly approaching the intersection with Farmington Road. Additionally, the 25 mph curves will help keep speeds low after the intersection with Farmington Road is signalized.

This criterion is met.

F. The proposed transportation facility or modification thereof will provide adequate fire equipment facility access and turnaround area, as well as adequate street lighting for crime and accident prevention as well as protection from hazardous conditions due to inadequate, substandard or ill-designed development.

***Response**: The proposed improvements will provide adequate fire access along the corridor. The proposed improvements will widen Farmington Road to five lanes and add capacity at the signalized intersections. This will translate into better access for emergency vehicles along the corridor, particularly during peak travel hours. The project is creating one dead end street, the old intersection of 141st and Farmington Road. The street is being maintained to provide access to two adjacent properties. The access is 24' wide and is no more than 150' to the two properties. The properties in question also front 141st Avenue and Farmington Road. No other dead end access points are proposed.*

New LED cobra head street lighting will be installed as part of the improvements. The street lighting is designed to meet Washington County and the City of Beaverton's Engineering Design Manual light levels, which are based on the functional classification of the roadways and based on the zoning of the adjacent land uses. Intersection lighting is designed to meet current IESNA R-9-00 light levels.

The following table identifies the light level design values.

Light Level Design Values

Location	Light Levels Average Maintained Illuminance (fc)	Uniformity (Avg/Min)
SW Farmington Rd, West of SW 142nd Ave	1.0	3.0
SW Farmington Rd, East of SW 142nd Ave	1.4	3.0
SW Murray Blvd	1.0	3.0
SW 142nd Ave, North of SW Farmington Rd	0.9	3.0
SW 141st Ave, South of SW Farmington	0.6	3.0
SW Hocken Ave	1.2	3.0
SW Farmington Rd / SW Murray Blvd Intersection	2.6	3.0
SW Farmington Rd / SW 142nd Ave Intersection	2.2	3.0
SW Farmington Rd / SW Rose Ln Intersection	2.2	3.0
SW Farmington Rd / SW Hocken Ave Intersection	2.2	3.0
Sidewalks*	0.5	4.0

*Minimum vertical luminance = 0.2 fc measured at 4.9 feet

Through these lighting standards, lighting along the roadway and adjacent sidewalks will be adequate for safe access and crime prevention, while minimizing light trespass onto private properties.

This criterion is met.

G. Grading and contouring are the minimum necessary to accommodate the proposed transportation facility, while mitigating adverse effect(s) on neighboring properties, public right-of-way, surface drainage, water storage facilities, and the public storm drainage system.

***Response**: The improvements and associated widening of Farmington Road have been mitigated in several ways to minimize the adverse effects on neighboring properties,*

drainage facilities and other features along the corridor. The following is a brief list of mitigation measures that have been incorporated into the design.

Horizontal Alignment: The horizontal alignment of Farmington Road is shifted from the current centerline in strategic locations to minimize building impacts, minimize impacts to Erickson Creek, and keep the corridor as efficient as possible while still meeting the requirements of the City's Engineering Design Manual or approved modifications thereof.

Cross Section: The project has developed a typical section that includes 8.5' curb tight sidewalks with tree wells rather than the traditional planter strip and sidewalk. This section was selected by the project advisory committee because it helps to reduce the impacts to adjacent properties while still maintaining the functional goal of the project.

Grading and Retaining Walls: The project is using 2 horizontal :1 vertical slopes at the back of the sidewalk to match into existing properties as quickly as possible. Where slopes extend beyond an acceptable limit into private property improvements, retaining walls have been utilized to minimize the disturbance.

This criterion is met.

H. Access and facilities for physically handicapped people are maintained and/or incorporated into the subject transportation facility, with particular attention to providing continuous, uninterrupted access routes.

***Response**: Continuous, uninterrupted facilities accessible for physically handicapped people will be provided by curb tight 8.5-foot-wide, ADA-compliant sidewalks with 4' tree wells on both sides of Farmington Road and Hocken Avenue. Curb-tight, ADA-compliant sidewalks are proposed on Murray Boulevard. ADA compliant sidewalk ramps are provided at intersections. These facilities will be buffered from bicycle and auto traffic by new street trees. This criterion is met.*

I. The application includes all required submittal materials as specified in Section 50.25.1. of the Development Code.

***Response**: All submittal materials have been submitted. This criterion is met.*

40.57.15.1.C PUBLIC TRANSPORTATION FACILITY APPROVAL CRITERIA

1. The proposal satisfies the threshold requirements for a Public Transportation Facility application.

***Response**: The proposal is for modification of an Arterial street with acquisition of right-of-way, which meets the threshold requirements for a Public Transportation Facility. This criterion is met.*

2. All City application fees related to the application under consideration by the decision making authority have been submitted.

***Response**: All application fees related to the application have been submitted. This criterion is met.*

3. The proposal contains all applicable application submittal requirements as specified in Section 50.25.1. of the Development Code.

***Response**: The proposal includes all submittal requirements as specified in Section 50.25.1 as follows:*

A. Application Form and Checklist
B. Written Statement addressing criteria and development regulations
C. Additional information as requested by Director – none requested
D. Information required by Section 50.30.4 regarding Neighborhood Meeting requirements – not applicable
E. Copy of pre-application conference summary
F. Documentation from Clean Water Services stating that water quality will not be adversely affected by the proposal
G. Applicable fee in effect at the date of submittal

This criterion is met.

4. The proposal meets all applicable design standards for the classification of the subject road as specified by the Engineering Design Manual and Standard Drawings unless the applicable provisions have been modified by the City Engineer by separate process.

***Response**: The proposed improvements were reviewed by the City of Beaverton Engineering Division for compliance with the City's Engineering Design Manual and deemed to meet all applicable design standards per the manual or as modified and approved as shown in the following table:*

Design Feature	**Design Criteria**
Classification	Farmington Road – Arterial/Truck Route Murray Boulevard – Arterial/Truck Route Hocken Avenue – Collector SW 141st and SW 142nd – Collector 2nd Street, Menlo, SW 139th - Local Rose Lane and Normandy Place – Private Road
Design Speed (MPH)	Farmington Road – 45 (35 posted) Murray Boulevard – 45 (35 posted) SW 141st Re-alignment – 25 (25 posted) ** Hocken Avenue – 35 (25 posted) Local/Private - 25
Minimum Grade	0.5%
Maximum Grade	10% - All Other Roads 15% - Local Roads
Minimum K_{sag} (values assume street lighting provided)	Arterial – 44 Collector - 26 Local/Private – 13
Minimum K_{crest}	Arterial – 61 Collector - 29 Local/Private – 12

Maximum Superelevation	4%
Minimum Cross Slope	2.5%
Minimum Horizontal Curve Radius (for -2.5% cross slope)	Arterial – 980' Collector – 475' Local/Private – 185'
Typical Lane Widths	Typical
Travel Lane	11-12'
Turn Lanes	11' + 1' shy
Bike Lane	5'
Sidewalk	Farmington – 8.5' ** Murray – 5.5' (10.5' at bus stops) **
Right-of-way Widths (Typical)	86'
Side Slopes	2H : 1V Max.
Curbs	Curb and Gutter with 6" Exposure
Curb Returns	Arterial to Arterial = Accommodate WB-65 Arterial to Collector = WB-65 ** Arterial to Local = 25'

*Three of these design criteria, as noted by **, required Design Modification Requests related to sidewalk/planter strip width, design speed, and curb radii. These modifications were reviewed and approved by the City Engineer in a separate process.* ***See Appendix B****. This criterion is met.*

5. The alignment of the new or extended transportation facility is consistent with the general location shown in the Comprehensive Plan Transportation Element.

Response*: Improvements to Farmington Road from Murray to Hocken and the realignment of 141st/142nd Avenues are consistent with the general location shown in the Comprehensive Plan Transportation Element in Figure 6.5: Transportation System Action Plan. Farmington Road: Murray Blvd. to Hocken Avenue is identified as project #23 and the realignment of 141st and 142nd Avenues is identified in as project #35. Both projects are consistent with these alignments. This criterion is met.*

6. Any interim improvements have been designed to accommodate future improvement of the facility to ultimate standards.

Response*: No interim improvements are proposed. This criterion does not apply.*

7. Applications and documents related to the request, which will require further City approval, shall be submitted to the City in the proper sequence.

Response*: A Sidewalk Design Modification application has been submitted concurrently with this application for the Public Transportation Facility. No other land use approvals require further City approval for this request.*

CHAPTER 60 SPECIAL REQUIREMENTS

60.05 DESIGN REVIEW PRINCIPLES, STANDARDS, AND GUIDELINES

Response. *The Design Review Principles, Standards, and Guidelines are applicable to private property and do not apply to public facility transportation improvements in existing or acquired right-of-way. Therefore, this section does not apply to this application.*

60.10 FLOODPLAIN REGULATIONS

60.10.10. Floodplain Designation

1. Consistent with Clean Water Services Design and Construction Standards, the floodplain is the flood management area and shall include those areas identified by the Department of Homeland Security's Federal Emergency Management Agency in a scientific and engineering report entitled "The Flood Insurance Study for the City of Beaverton," dated February 18, 2005, . . .

2. When interpretation is requested by a property owner, or designee concerning the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), or if a development application is received for a site where a floodplain is unclear or lacks an established elevation, the City Engineer shall require the concerned person or applicant to provide a detailed hydraulic data report . . .

3. The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Large floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages . . .

4. Uncontained areas of hazardous materials, as defined by the Department of Environmental Quality, are prohibited in the floodplain. Any storage or placement of materials in the floodplain that would obstruct the flow of water or reduce the available flood holding capacity of a site is prohibited.

Response: *The proposal includes cut and fill activities within a designated 100-year flood plain and its associated floodway (see Plan Set, Dimensioned Site Plan). The area of improvement within the flood plain is located at the SE corner of Farmington Road and Menlo Drive. As demonstrated in the Farmington Road Improvement Project Final Stormwater Management Report dated October 2013, the project results in no net loss of flood storage and provides substantial new storage area within the basin.*

60.10.15. Development in Floodway.

1. Development in the floodway is prohibited, with the following exceptions, which are subject to the site development ordinance;

A. Stormwater outfall pipes and other drainage; improvements;
B. Bridges;
C. Culverts;
D. Public utility lines;
E. Trails or bikepaths;
F. Roads and other uses identified on the City's Transportation Plan; and
G. Grading associated with A through F above.

***Response**: The proposal includes development within the floodway, with all development activities falling into exception categories above. This criterion is met.*

60.30 OFF-STREET PARKING

60.30.05. Off-Street Parking Requirements. Parking spaces shall be provided and satisfactorily maintained by the owner of the property for each building or use which is erected, enlarged, altered, or maintained in accordance with the requirements of Sections 60.30.05. to 60.30.20.

***Response**: This proposal is for a Public Transportation Facility located wholly within public right-of-way for which there is no requirement for off-street parking. These requirements do not apply to this application.*

60.55 TRANSPORTATION FACILITIES

60.55.25. Street and Bicycle and Pedestrian Connection Requirements.

1. All streets shall provide for safe and efficient circulation and access for motor vehicles, bicycles, pedestrians, and transit. Bicycle and pedestrian connections shall provide for safe and efficient circulation and access for bicycles and pedestrians.

***Response**: The goal of Farmington Road (Murray to Hocken) Improvement Project is to make needed safety and traffic capacity improvements for all modes of transportation including the provision of marked bike lanes, continuous sidewalks, and continued access to transit along Farmington Road. The proposed improvements are consistent with the Transportation System Plan and the level of improvements associated with the functional classifications for Farmington Road (arterial) and 141st/142nd Ave, (collector). The improvements have been designed to the City's Engineering Design Manual or, where applicable, have received approval from the City Engineer for modifications to the engineering standards.*

With regard to safe and efficient circulation and access for bicycles, 5-foot bike lanes are proposed on both sides of Farmington Road, Murray Boulevard and Hocken Avenue. In addition, Hocken includes a separate left turn southbound bike lane from the TV Highway to the "T" intersection approach at Farmington Road. All bike lanes will be striped, stenciled and signed appropriately. Bike lanes in the proposed project boundaries will complete the bicycle system from 185th into the Beaverton Regional Center, which ties into the regional bicycle system.

With regard to safe and efficient circulation and access for pedestrians, 8.5-foot curb tight sidewalks with 4' tree wells are proposed on both sides of Farmington Road and Hocken Avenue. Curb-tight sidewalks are proposed on Murray Boulevard. Pedestrians will be buffered from bicycle and auto traffic by new street trees.

This approval criterion is met.

2. The Comprehensive Plan Transportation Element Figures 6.1 through 6.23 and Tables 6.1 through 6.6 shall be used to identify ultimate right-of-way width and future potential street, bicycle, and pedestrian connections in order to provide adequate multi-modal access to land uses, improve area circulation, and reduce out-of-direction travel.

Response: *Per Table 6-1 the Transportation Element of the Comprehensive Plan (Chapter Six), Farmington Road: Murray Blvd. to Hocken Avenue is identified as project #24 in the City's 2035 Transportation System Plan. The proposed improvement are consistent with the project description "Construct turn lane and intersection improvements; signalize where warranted; add bike lanes and sidewalks in gaps." The proposed improvements are also consistent with the design standards for arterials, as modified and approved by the City Engineer under a separate process. See Design Modification Request #1 in the project description and* ***Appendix B*** *and in the concurrent Sidewalk Design Modification request in this application.*

The realignment of 141st and 142nd Avenues is also identified in Table 6-1 of the Transportation Element of the Comprehensive Plan (Chapter Six), as project #35 in the City's 2035 Transportation System Plan. Improvements are consistent with the project description "Connect streets, add bikeways, sidewalks, turn lanes and signalized as warranted." The proposed improvements are also consistent with the design standards for collectors, as modified and approved by the City Engineer under a separate process. See Design Modification Requests #2 and #3 in the project description and ***Appendix B.***

The remaining provisions of Chapter 60.55.25 address requirements outside of the project right-of-way and do not apply to this application.

60.55.30. Minimum Street Widths.

1. Any project-specific modifications of the standards contained in the Engineering Design Manual regarding the widths of features relating to the movement of vehicles, including but not limited to rights of way, travel lanes, parking lanes, bike lanes, driveway aprons, curb radii, or other such features shall be processed in accordance with the provisions contained in the Section 145 Design Modifications of the *Engineering Design Manual*. [ORD 4418; February 2007]

Response: *Modifications to design speed and curb radii have been requested and approved in accordance with the provisions contained in Section 145 Design Modifications of the Engineering Design Manual. This criterion is met.*

2. Any project-specific modifications of the standards of the Engineering Design Manual relating to the location and dimensions of required street landscaping and pedestrian

features including, but not limited to, sidewalks, planter strips, street trees, street tree wells, street tree easements, or street furniture are subject to the procedures contained in Chapter 40 (Applications). The required application will depend on the scope of the proposed project and the type of application filed with the City. [ORD 4418; February 2007]

***Response**: Per the procedures in Chapter 40 (Applications) a concurrent Sidewalk Design Modification request has been submitted with this Public Transportation Facility application for approval of modifications to the sidewalk width and planter width. This criterion is met.*

60.65 UTILITY UNDERGROUNDING

1. At the option of the applicant and subject to rules promulgated by the Oregon Public Utility Commission (PUC), this requirement does not apply to surface mounted transformers, surface mounted connection boxes and meter cabinets, which may be placed above ground, temporary utility service facilities during construction, high capacity electric lines operating at 50,000 volts or above, and that portion of a project where undergrounding will require boring under a Collector or Arterial roadway, and City funded roadway projects which the City Council has specifically considered and declined to fund utility undergrounding as a component of the roadway project, Washington County funded roadway projects, such as MSTIP projects, and Oregon Department of Transportation funded roadway projects.

   ***Response**: The applicant is Washington County and the project is funded by Washington County through its MSTIP program. At its option, the County has declined to fund utility undergrounding as a component of this project and is therefore exempt from the provisions of 60.65.*

60.60 TREES AND VEGETATION)

60.60.05. Purpose.

Healthy trees and urban forests provide a variety of natural resource and community benefits for the City of Beaverton. Primary among those benefits is the aesthetic contribution to the increasingly urban landscape. Tree resource protection focuses on the aesthetic benefits of the resource. In conjunction with processes set forth in Section 40.90 of this Code, this section is intended to help manage changes to the City's urban forest by establishing regulations and standards for the protection, pruning, removal, replacement, and mitigation for removal of Protected Trees (Significant Individual Trees, Historic Trees, Mitigation Trees and trees within a Significant Natural Resource Area (SNRA) or Significant Grove), Landscape Trees, and Community Trees. [ORD 4584; June 2012]

***Response**: A total of 171 trees located within the project area are to be removed, none of which are on the City's Tree Inventory Map as either a Significant Individual Tree or within a Significant Tree Resource area. 104 new street trees, approved by the City for street tree use, will be planted in the project area.*

Per the Pre-Application conference notes, a "Tree Plan 2 application does not apply to trees removed for public street and sidewalk improvements (e.g. in the right-of-way –

existing or subject to widening through the PTF application.)" Such tree Plans are processed under Section 40.90 which implements the special requirements set forth in Chapter 60.60. Because a Tree Plan is not required for the proposed public transportation improvements, the special requirements of Chapter 60.60 do not apply.

60.67. SIGNIFICANT NATURAL RESOURCES.

60.67.05. Local Wetland Inventory. Prior to issuing a development permit, the Local Wetland Inventory map shall be reviewed to determine if the site proposed for development is identified as the location of a significant wetland.

1. Development activities and uses permitted on a proposed development site identified as the possible location of a significant natural resource, including significant wetlands shall be subject to relevant procedures and requirements specified in Chapter 50, of this ordinance.

2. Upon City's determination that a site contains wetland as identified on the Local Wetland Inventory map, notice of the proposed development shall be provided to the Division of State Lands (DSL) in a manner and form prescribed by DSL pursuant to ORS requirements.

***Response**: A field investigation for wetlands was conducted of the project area. The investigation identified three water quality facilities, two wetlands adjacent to Erickson Creek (Menlo Drive Natural Area Project) and the waters of Erickson Creek. The delineation has been submitted to the DSL. The only impact to wetlands or waters proposed by the project is impacts associated with the replacement of the culvert across Farmington Road. This work will be permitted through ACOE and DSL.*

60.67.10. Significant Riparian Corridors. Prior to issuing a development permit, the list of Significant Riparian Corridors shall be reviewed to determine if the site proposed for development is identified as being listed corridor.

1. Development activities and uses permitted on a proposed development site identified as the possible location of a significant natural resource, including riparian corridors, shall be subject to relevant procedures and requirements specified in Chapter 50 of this ordinance.

***Response**: Clean Water Services identified a 50' vegetated corridor along Erickson Creek that was enhanced as part of the Menlo Drive Natural Area Project. A Service Provider Letter was received from Clean Water Services for the project and has been submitted with this PTF application. The only impacts to the vegetated corridor are associated with riprap energy dissipation at a proposed culvert outfall into the water quality swale. This impact is less than 100 square feet and does not require mitigation.*

40.58 SIDEWALK DESIGN MODIFICATION

40.48.C.15.C APPROVAL CRITERIA

1. The proposal satisfies the threshold requirements for a Sidewalk Design Modification application.

Response: *Per 40.58.15.A. Threshold, an application for Sidewalk Design Modification shall be required when one of the following thresholds applies:*

1. *The sidewalk width, planter strip width, or both minimum standards specified in the Engineering Design Manual are proposed to be modified.*

2. *The dimensions or locations of street tree wells specified in the Engineering Design Manual are proposed to be modified.*

The sidewalk width and planter strip width are proposed to be modified which meets this threshold. This criterion is met.

2. All City application fees related to the application under consideration by the decision making authority have been submitted.

Response: *All fees have been submitted. This criterion is met.*

3. One or more of the following criteria are satisfied:

a. That there exist local topographic conditions, which would result in any of the following:

i. A sidewalk that is located above or below the top surface of a finished curb.
ii. A situation in which construction of the Engineering Design Manual standard street cross-section would require a steep slope or retaining wall that would prevent vehicular access to the adjoining property.

b. That there exist local physical conditions such as:

i. An existing structure prevents the construction of a standard sidewalk.
ii. An existing utility device prevents the construction of a standard sidewalk.
iii. Rock outcroppings prevent the construction of a standard sidewalk without blasting.

c. That there exist environmental conditions such as: a Significant Natural Resource Area, Jurisdictional Wetland, Clean Water Services Water Quality Sensitive Area, Clean Water Services required Vegetative Corridor, or Significant Tree Grove

d. That additional right of way is required to construct the Engineering Design Manual standard and the adjoining property is not controlled by the applicant.

Response. *This request is to eliminate the 7.5' width planter strip from the proposed typical section and provide an 8.5' curb tight sidewalk with tree wells. The justification*

for the modification is that as part of the extensive public involvement process for the project in 2002, the PAC reviewed three alternative cross sections. They included the City standard typical section (including planter strips), curb tight sidewalks, and expanded curb tight sidewalks with tree wells. It was the recommendation of the committee and subsequent recommendation of City Council to proceed with the expanded curb tight sidewalks with tree wells. This cross section best balanced the private property impacts, including site and building impacts, associated with the road widening with the benefit received to pedestrians along this developed urban corridor. This cross section continues to be the best alternative today for the same reasons as its original selection.

The project has requested and received approval of this modification under the City's Engineering Design Manual section 145.1.5 item 2 and has demonstrated that this alternative standard can accomplish the same design objective is available and does not compromise public safety or accessibility."

Table 1. Summary of Beaverton Arterial Street Standards

Roadway Element	Standard Width	Proposed Width
Travel lane	11-12 feet	11-12 feet
Turn lane/median	12 feet	12 feet
Bike lane	5 feet	5 feet
Planter Strip	7.5 feet	**0**
Sidewalk	6 feet	**8.5 feet including tree wells**
Right-of-Way	96 feet	**86 feet**

Bold items indicate a modification from the City standard.

Appendix C *attached to this application summarizes the evaluation worksheet used to evaluate the different cross section options for Farmington Road. This was completed and reviewed as part of the PAC process in early 2002. The evaluation criteria included the following items:*

- *Right of way impacts (by use) and cost*
- *Parking impacts,*
- *Access impacts*
- *Tree impacts*
- *Design exception requirements*
- *Pedestrian safety and accessibility*
- *Noise impacts*
- *Intersection impacts*
- *Natural resource impacts*
- *Aesthetic and visual impacts*
- *Overall estimated project cost*

Based on this evaluation, curb tight sidewalks with tree wells was the recommended typical section based on its reduction in impacts to adjacent properties and associated structures compared with the city standard section and met more of the criteria than a standard curb tight sidewalk by providing additional width and tree canopy.

The purpose of such an extensive effort was to identify a set of improvements that best met the transportation demands of the corridor while balancing impacts to the adjacent properties. The modified typical section to include an 8.5 foot wide curb tight sidewalk with tree wells results in a reduction in right of way width of 10 feet. This reduction has a substantial reduction in impacts to private property and their associated structures.

Therefore, due to multiple physical conditions and impacts to private property and structures throughout this existing developed corridor, this criterion is met.

4. The proposal complies with provisions of Section 60.55.25 (Street and Bicycle and Pedestrian Connection Requirements) and 60.55.30 (Minimum Street Widths).

***Response**: As demonstrated in the response to these provisions addressed previously in this application under findings for 60.55 Transportation Facilities, the proposal complies with the provisions of Section 60.55.25 and 60.55.30. This criterion is met.*

5. Applications and documents related to the request, which will require further City approval, have been submitted to the City in the proper sequence.

***Response**: No further City land use applications are required for the approval of the Sidewalk Design Modification application. Supporting documentation for the City Engineer's approval of the sidewalk design modification through a separate Approved Engineering Design Modification has been submitted with this application as provided in **Appendix B.** This criterion is met.*

6. The proposed Sidewalk Design Modification provides safe and efficient pedestrian circulation in the site vicinity.

***Response**: The proposed Sidewalk Design Modification provides for a safe pedestrian circulation with an 8.5 foot wide, curb tight sidewalk with street trees, to be planted in tree wells, which provide for visual and physical buffering from Farmington Road. The modification does not alter the alignment of the sidewalk; therefore it does not affect the efficiency of pedestrian circulation in the site vicinity. This criterion is met.*

APPENDIX A:
TRAFFIC ANALYSIS

- Existing Transportation Conditions Memorandum dated May 10, 2013

- Future Transportation Conditions Memorandum dated May 10, 2013

FINAL MEMORANDUM

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: May 10, 2013

TO: Dan Houf, P.E., HHPR

FROM: Peter Coffey, P.E., DKS Associates

SUBJECT: Farmington Road Improvement Project – Existing Transportation Conditions P#13013-000

The following memorandum summarizes the existing transportation conditions for the Farmington Road Improvement Project which extends from Murray Boulevard to Hocken Avenue in the City of Beaverton. Included is an inventory of the existing transportation facilities, analysis of the recent study area crash history, and an operational analysis of study intersections.

STUDY AREA

The study area (shown in Figure 1) extends along Farmington Road for approximately 0.6 miles, and is generally bounded by Murray Boulevard on the west, Hocken Avenue to the east, Tualatin Valley Highway to the north, and 6th Street to the south. The following nine intersections have been identified as study area intersections, with their intersection control listed:

1. Farmington Road/Murray Boulevard – Signalized
2. Farmington Road/Normandy Place – Unsignalized
3. Farmington Road/142nd Avenue – Unsignalized
4. Farmington Road/141st Avenue – Unsignalized
5. Farmington Road/139th Avenue – Unsignalized
6. Farmington Road/Menlo Drive – Unsignalized
7. Farmington Road/2nd Street – Unsignalized
8. Farmington Road/Hocken Avenue – Signalized
9. Tualatin Valley Highway/Hocken Avenue – Signalized

PREVIOUS STUDIES

The 1997 City of Beaverton Transportation System Plan[1] identified a project to widen Farmington Road between Murray Boulevard and Hocken Avenue to a five lane facility including sidewalks and bike lanes. A traffic analysis was conducted in 2002 including existing and future conditions for the Farmington Road improvement project.

[1] City of Beaverton Transportation System Plan, DKS Associates, September 1997. Chapter 11: Funding and Implementation.

The results of the traffic analysis led to 90% design plans. However, the project has not yet been constructed due to funding constraints. The Farmington Road improvement project has continued to be identified in the 2009 City of Beaverton Transportation System Plan as high priority[2].

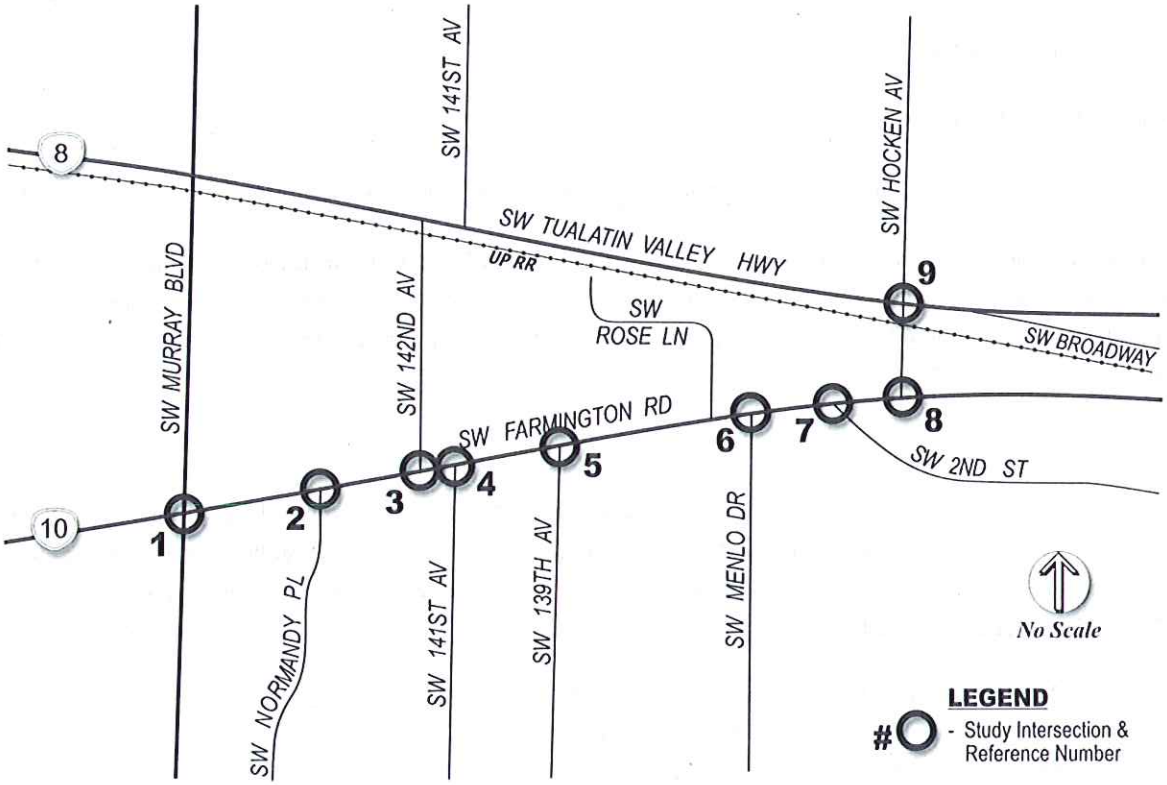


Figure 1. Study Area

PEDESTRIAN FACILITIES

An inventory of existing pedestrian facilities was conducted to determine the current locations of sidewalks within the study area. Along Farmington Road, there is continuous sidewalk on the north side of the roadway from Murray Boulevard to Hocken Avenue. However, the south side only has sidewalk from just west of Menlo Drive to Hocken Avenue. Along Farmington Road (see Figure 2), there is an at-grade shoulder walkway west of Menlo Drive to Murray Boulevard. There are no pedestrian crossings available at the location where the sidewalk ends at Menlo Drive on the south side of Farmington Road. This section of roadway from Murray Boulevard to Menlo Drive without sidewalk is a gap in the pedestrian network.

[2] City of Beaverton Transportation System Plan, DKS Associates, December 2009. Table 4-9.

In addition, several key roadways connecting to Farmington Road lack continuous sidewalks including, the west side of 141st Avenue, both sides of 139th Avenue, most of Menlo Drive, and part of 2nd Street.

There is also a lack of safe pedestrian crossings on Farmington Road. Pedestrians often avoid significant lengths of out-of-direction travel and are more likely to unsafely cross roadways when designated crossing areas are more than 500 feet out of their intended path. Through the study corridor (over a half mile segment), marked and controlled crosswalks are only available at 2 signalized intersections, and one mid-block pedestrian crossing. Generally, marked and controlled crossings are spaced between 0.20 (1,030 feet) and 0.37 miles (1,930 feet).

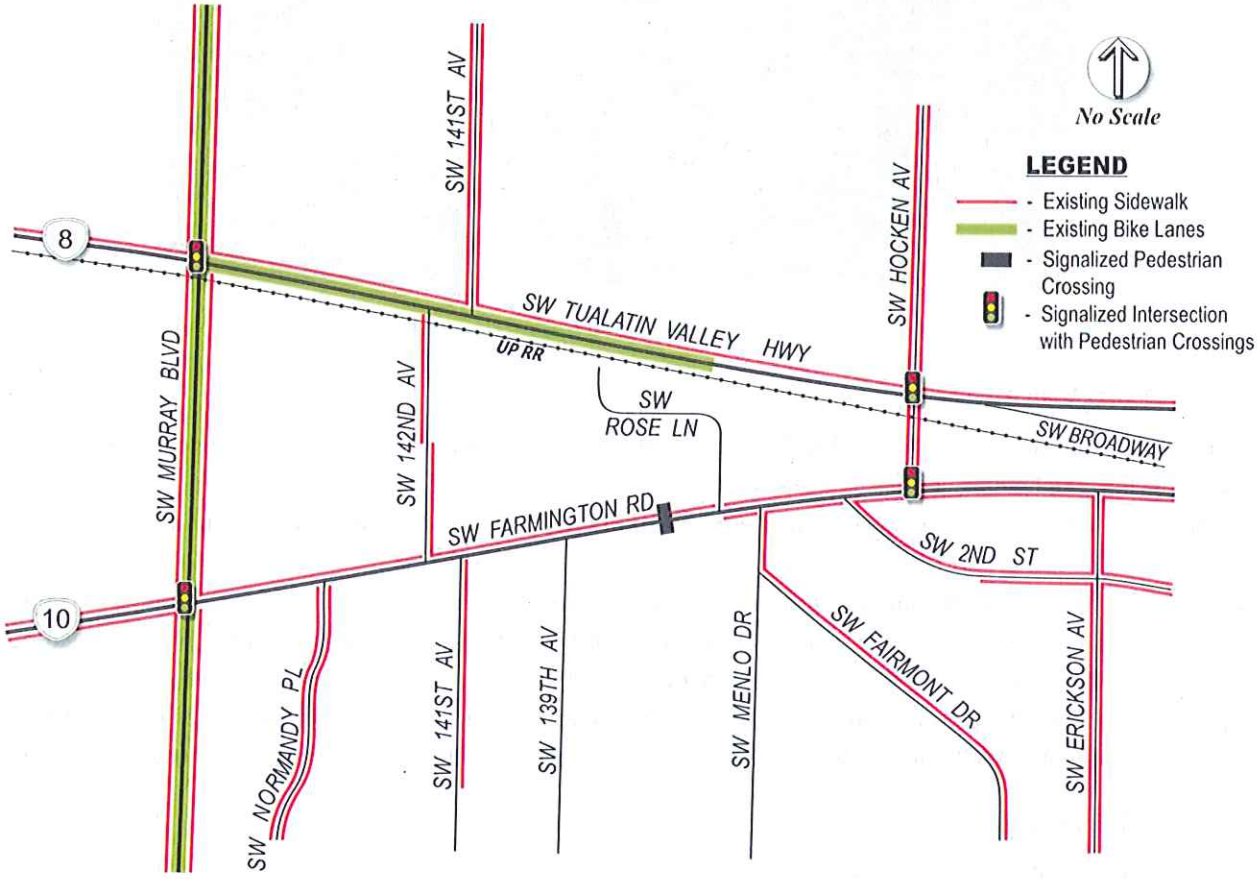


Figure 2. Existing Pedestrian & Bicyclist Facilities

A High-Intensity Activated Crosswalk (HAWK) on Farmington Road is located east of 139th Avenue at the Tualatin Valley Fire & Rescue (TVF&R) Station (see Figure 3). This signalized crossing allows opportunities for pedestrians to safely cross Farmington Road in a midblock location. The signal remains dark until a pedestrian presses the push button. At that point, the signal goes through the following cycle of movements before returning to a dark state:

- Flashing Yellow – warns drivers that the signal is going to change

- Solid Yellow – the signal is about to change to red
- Solid Red – drivers must stop and obey the signal to allow the pedestrian(s) to cross
- Flashing Red – tells drivers to stop and then proceed with caution if the crossing is clear

Figure 3. Farmington Road Pedestrian Crossing

Pedestrian Volumes

Pedestrian count data during the AM and PM peak hours was collected at study area intersections[3]. Count data indicates that the highest volume of pedestrian crossings occurred at signalized intersections during the PM peak. Figure 4 identifies the pedestrian movements for the AM and PM peak hours at study area intersections.

Pedestrian activity varies by time of day and location. Pedestrians traveling north/south are crossing Farmington Road most often on the west approach at Murray Boulevard and on the west approach at Hocken Avenue during the AM and PM peak period. Pedestrians traveling west/east along Farmington Road cross on the north approach west of 139th Avenue and switch to the south approach after using the signalized pedestrian crossing. There are bus stops on Farmington Road, which may explain some of the pedestrian crossing activity.

BICYCLE FACILITIES

There are bicycle lanes on Murray Boulevard and a portion of TV Highway between Murray Boulevard and Tualaway Avenue, which is located about halfway between 141st Avenue and Hocken Avenue (see Figure 2). The rest of the study area does not have bicycle lanes, including the connecting roadways. Bicyclists use many of the same crossing opportunities that pedestrians use.

[3] Based on counts conducted on January 24, 2013 and January 29, 2013 by Quality Counts.

Bicycle Volumes

Bicycle count data during the AM and PM peak hours was also collected at study area intersections[4]. Bicycle activity along the study corridor during the peak periods is minimal. Bicycle count data indicates on average less than four bicycle movements per study area intersection during the AM, and PM peak hours. The highest bicycle volumes generally occurred during the AM peak period at the intersection of Farmington Road and Murray Boulevard.

TRANSIT FACILITIES

Transit service is available through the study corridor via three fixed bus routes. Bus service is provided through the entire study corridor by TriMet Route 52 (Farmington/185th), which runs from the Beaverton Transit Center to the Portland Community College-Rock Creek campus via Farmington Road. In addition, TriMet Route 57 (TV Hwy/Forest Grove) which runs between the Beaverton Transit Center and Forest Grove provides transit service just north of the study corridor along Tualatin Valley Highway. TriMet Route 62 offers service to the Sunset Transit Center and Washington Square Transit Center, but only crosses the study corridor via Murray Boulevard.

TriMet Route 57 is a frequent service line that runs with 15 minute headways during the AM, Midday, and PM peak periods, and offers service between 5 AM to 2 AM every day. Routes 52 and 62 also provide service every day between 6 AM to midnight, generally with 20 to 30 minute headways. The designated routes for these services have been mapped in Figure 5, with bus stop locations and usage identified.

Transit Amenities

There are about ten bus stops for TriMet Route 52 along the study corridor. Of the ten bus stops, only one offers a bench and there are no shelters. Some bus stops lack sidewalk connections to the surrounding neighborhoods and businesses. However, at any particular point along the study corridor, a user is generally never more than 750 feet from a bus stop for Route 52.

TriMet Route 57 has six bus stops within 500 feet of the study corridor. Two of these stops have benches and shelters, ones has only a bench and most offer continuous sidewalk connections to Farmington Road. In addition TriMet Route 62 offers four bus stops within the study corridor, with three of the four having benches, and none with shelters. All four bus stops offer sidewalk connections to Farmington Road.[5]

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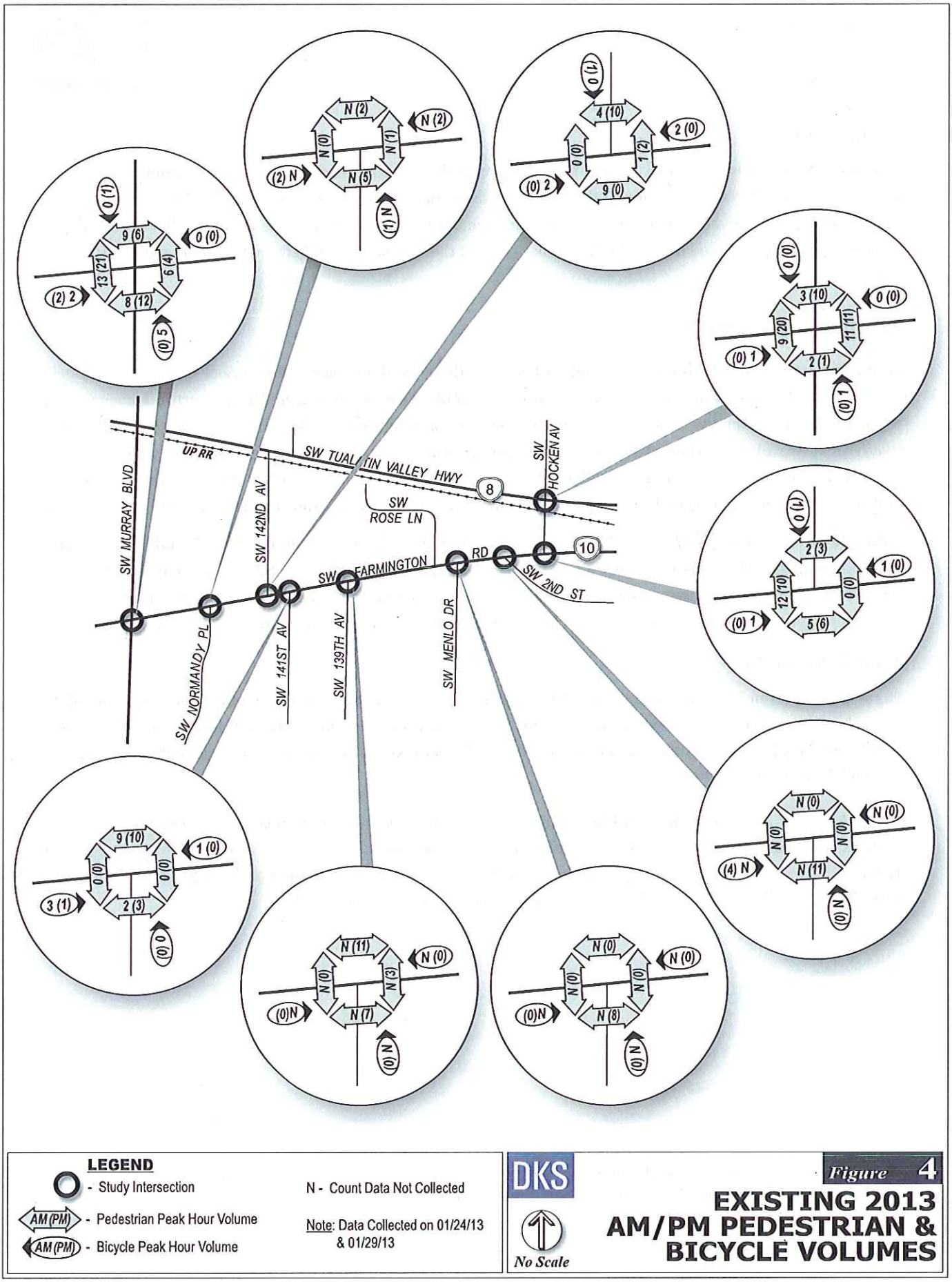
[4] Based on counts conducted on January 24, 2013 and January 29, 2013 by Quality Counts.
[5] TriMet Interactive System Map, accessed on February 20, 2013.



LEGEND

- Study Intersection
- AM (PM) - Pedestrian Peak Hour Volume
- AM (PM) - Bicycle Peak Hour Volume

N - Count Data Not Collected

Note: Data Collected on 01/24/13 & 01/29/13

DKS

No Scale

Figure 4

EXISTING 2013 AM/PM PEDESTRIAN & BICYCLE VOLUMES

Transit Passenger Activity

There are four bus stops that have high passenger activity, as shown in Figure 5, which is defined as over one hundred daily boarding and alightings. The ons and offs are not always evenly split, for example at Murray Boulevard and TV Highway, the westbound stop has the highest number of boardings, while the eastbound stop has the highest number of alightings. Additionally, the bus stop with the highest lift usage is at TV Highway and Hocken Avenue with 42 lifts per month.[6]

Figure 5. Public Transit Bus Routes

[6] TriMet Passenger Census, Spring 2010. All Day Ons and Offs by Route and Stop, Weekdays.

DKS

MOTOR VEHICLE FACILITIES

Farmington Road is an arterial under the jurisdiction of the City of Beaverton between Murray Boulevard and Hocken Avenue[7]. It runs east-west and connects the study area to nearby population and employment areas. Roadway characteristics of various segments of Farmington Road through the study area are shown in Table 1.

Farmington Road through the study area varies between a four-lane (two through lanes in each direction) and five-lane cross-section (i.e. two through lanes in each direction and a center turn lane). Between Murray Boulevard and Menlo Drive it generally maintains a four-lane cross section, before widening to five lanes along the segment between Menlo Drive and Hocken Avenue.

Table 1. Farmington Road Characteristics

Roadway	*Cross Section*	*Median*	*Posted Speed (mph)*
Murray Boulevard to Normandy Place	5 lanes	Center Turn Lane	35
Normandy Place to 142nd Avenue	4 lanes	No	35
142nd Avenue to 141st Avenue	4 lanes	No	35
141st Avenue to 139th Avenue	4 lanes	No	35
139th Avenue to Menlo Drive	4 lanes	No	35
Menlo Drive to 2nd Street	5 lanes	Center Turn Lane	30
2nd Street to Hocken Avenue	5 lanes	Center Turn Lane	30

Characteristics of the major roadways connecting to the study corridor were documented and presented in Table 2. Data collected included roadway jurisdiction, functional classification, roadway cross-section, posted speed, and on-street parking.

Besides Farmington Road, most of the remaining roadways in the study area are collectors, neighborhood routes, or local streets serving as neighborhood connections to Farmington Road and other arterials. These include Normandy Place, 142nd Avenue, 141st Avenue, 139th Avenue, Menlo Drive, 2nd Street, and Hocken Avenue. These roadways provide good connections to Farmington Road and other arterials for trips between the residential neighborhoods, but they traverse established residential neighborhoods, and they generally do not have enough capacity to serve large volumes of traffic.

The exception is Murray Boulevard, which is designated as an arterial by the Beaverton TSP. It has a five-lane cross-section, providing north-to-south connectivity between the study corridor and parallel arterials.

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[7] City of Beaverton Comprehensive Plan, Chapter 6: Transportation Element, Figure 6.4 Functional Classification, 2008.

Table 2. Connecting Roadway Characteristics

Roadway	*Jurisdiction*	*Washington County/ Beaverton*	*Cross Section*	*Posted Speed (mph)*	*On-Street Parking*
Murray Boulevard	Washington County	Arterial	5 Lanes	40	No
Normandy Place	City of Beaverton	Local Street	2 Lanes	20	Yes
142nd Avenue	City of Beaverton	Collector	2 Lanes	25	Yes
141st Avenue	City of Beaverton	Collector	2 Lanes	25	No
139th Avenue	City of Beaverton	Local Street	2 Lanes	25	No
Menlo Drive	City of Beaverton	Neighborhood Route	2 Lanes	25	No
2nd Street	City of Beaverton	Local Street	2 Lanes	25*	Yes
Hocken Avenue	City of Beaverton	Collector	3 Lanes	30	No

*School zone: 20 mph during school hours

Motor Vehicle Volumes

To determine intersection traffic operations, vehicle turn movement counts were conducted at study area intersections during the weekday morning peak period (7 to 9 AM), and evening peak period (4 to 6 PM)[8]. The raw traffic count data is included in the Appendix.

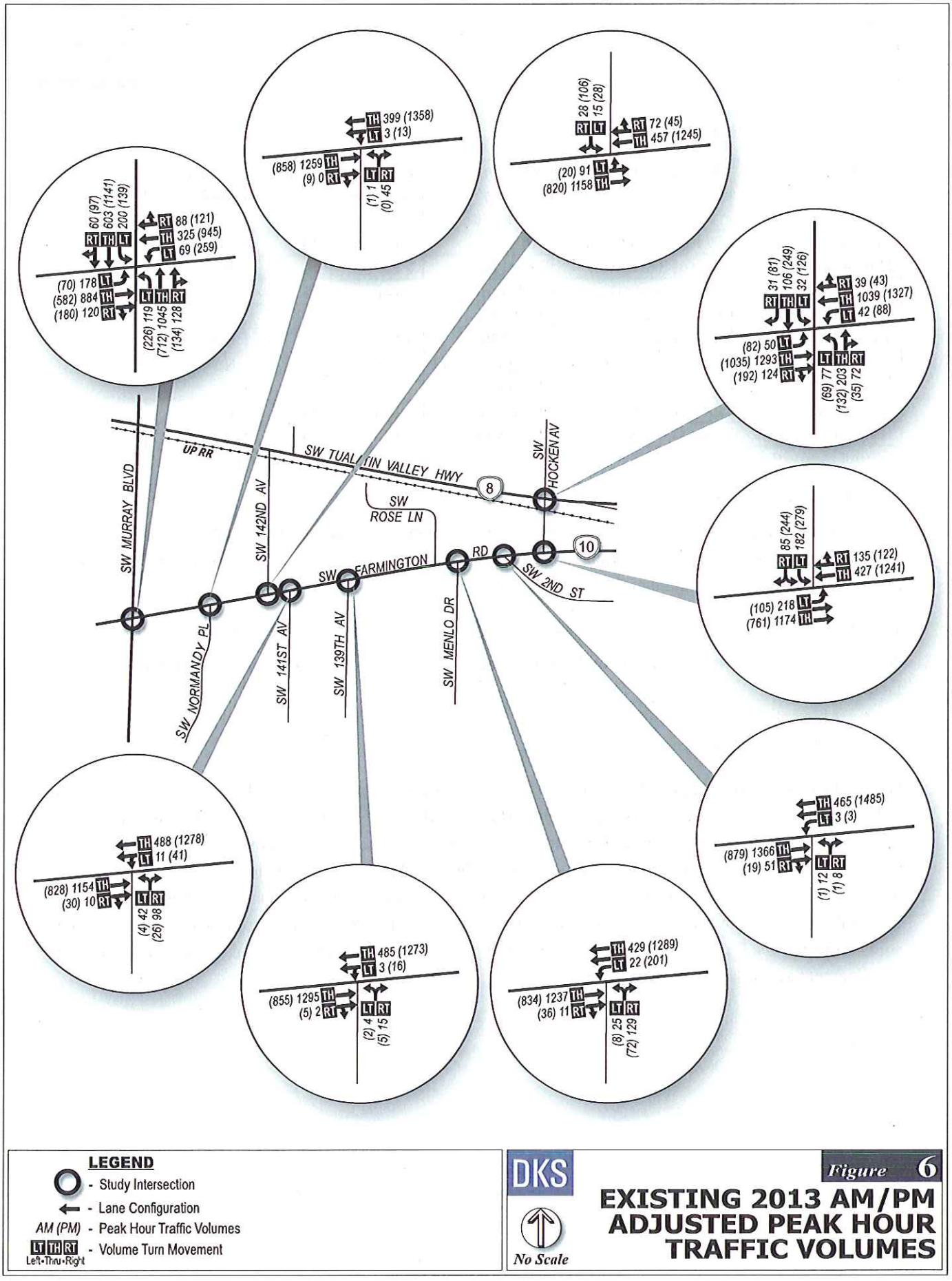
The adjusted peak period traffic volumes developed for the study intersections are displayed in Figure 6.

The volumes adjustments were based on historical trends in traffic volumes, and resulted in the following factors:

- AM Peak – no adjustments
- PM Peak – +5% increase

Seasonal factors are often applied to adjust traffic counts taken in off-peak times of the year (such as winter) up to the highest season of traffic (typically summer). However, there are no automatic traffic recorders (ATR's) located on site that provide annual traffic patterns and peaks. Historical traffic volumes were examined in the vicinity of the study area to determine the seasonal and historical trend in traffic volumes. The turning movement counts from January 2013 were compared to the turning movement counts from September 2001. During the AM peak, on average the 2013 volumes were 10 percent lower, ranging from 7 to 14 percent at the study intersections. During the PM peak, on average the 2013 volumes were 14 percent lower, ranging from 10 to 16 percent at various study intersections.

[8] Vehicle turning movement counts performed on January 24, 2013 and January 29, 2013 by Quality Counts.



LEGEND

- Study Intersection
- Lane Configuration
- AM (PM) - Peak Hour Traffic Volumes
- LT TH RT - Volume Turn Movement (Left-Thru-Right)

DKS

No Scale

Figure **6**

EXISTING 2013 AM/PM ADJUSTED PEAK HOUR TRAFFIC VOLUMES

Tube counts on Farmington Road from January 2013 were compared to the September, 2001 volumes[9] from the previous memorandum[10]. Consistent with the turning movement counts, the volumes were higher in 2001 than 2013.

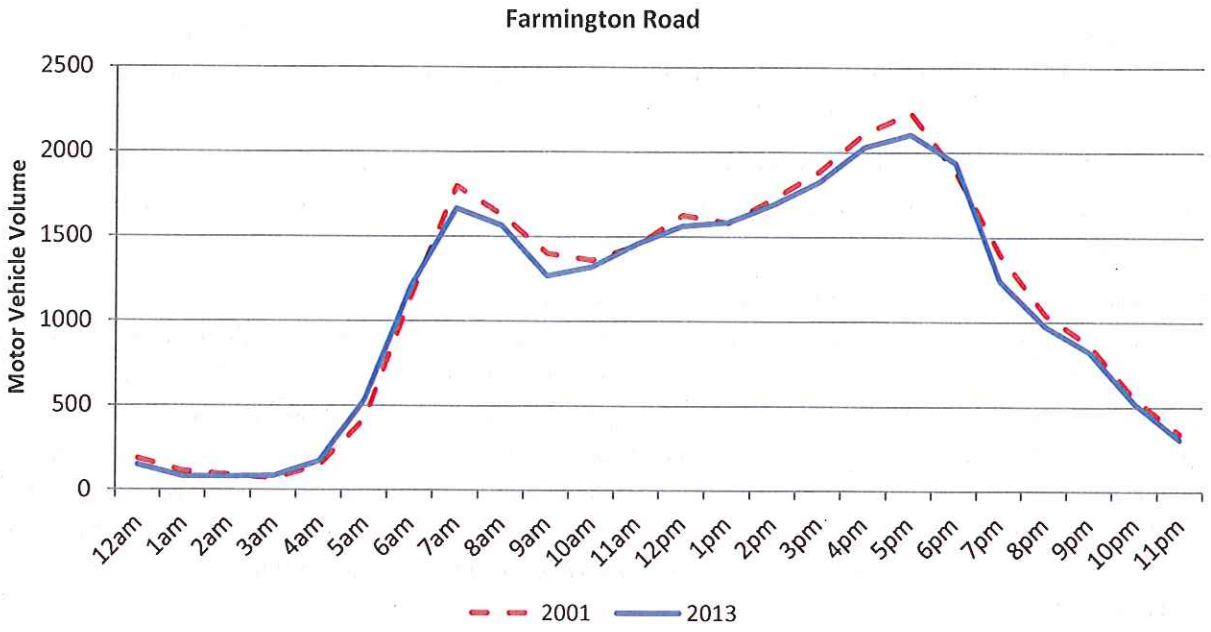


Figure 7. Farmington Road Tube Count Comparison

Traffic counts at various locations within Washington County confirmed a somewhat downward trend that has occurred since 2001. The trend between 2007 and now is fairly flat. The locations that were examined include the following:

- Murray Boulevard north of Farmington Road
- Murray Boulevard south of Farmington Road
- Murray Boulevard north of TV Highway
- Murray Boulevard south of Allen Boulevard
- Farmington Road west of 149th Avenue
- Farmington Road east of 160th Avenue

[10] Farmington Road Existing Transportation Conditions Analysis Memorandum, DKS Associates, January 17, 2003.

To isolate the seasonal fluctuations from the annual differences in traffic volumes, recent counts were examined from the summer of 2011. The January 2013 counts were compared to three weekday counts from the summer of 2011 at Farmington Road and Murray Boulevard. Across the three days, the variability from the lowest to the highest daily total traffic was less than three percent for both the AM and PM peak periods.

The AM peak counts from January 2013 were ten percent higher than those conducted in August of 2011. This difference is likely due to traffic related to school trips, since school is not in session in August. Therefore, the AM peak hour counts taken in January of 2013 include school traffic and do not need to be adjusted.

The PM peak counts from January 2013 were six percent lower than those conducted in September 2011. Therefore a five percent adjustment for the PM peak is appropriate to account for the effects of daily fluctuation or seasonal variation.

To supplement the intersection counts collected, 24-hour directional counts were obtained along Farmington Road, just east of Murray Boulevard and along Murray Boulevard, just north of the study corridor. As shown in Figure 8 and Figure 9, the traffic volumes at both locations have distinct peaks in the morning and evening periods, with the higher volume in the evening. This type of profile is representative of a typical "commuter" profile with a PM peak having the highest volume of the day, while the AM peak is the second highest period of the day. Eastbound traffic volumes on Farmington Road towards Downtown Portland peaks between 7:00 AM and 8:00 AM, while returning westbound traffic volumes peaks between 5:00 PM and 6:00 PM. Northbound traffic volumes on Murray Boulevard peak between 7:00 AM and 8:00 AM and southbound traffic peaks from 5:00 PM and 6:00 PM.

Total daily traffic volumes at both locations are similar, with 26,300 (13,500 eastbound, 12,800 westbound) along Farmington Road and 29,400 (14,500 northbound, 14,900 southbound) along Murray Boulevard[11].

[11] 24-hour tube counts conducted on January 24, 2013 by Quality Counts.

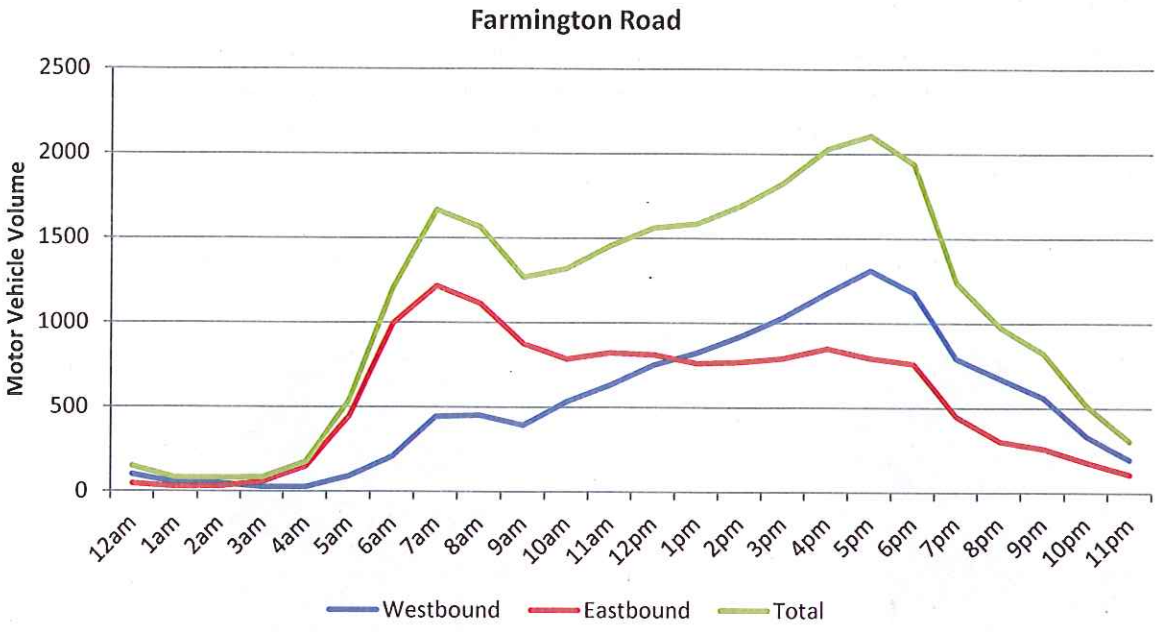


Figure 8. Hourly Motor Vehicle Volumes, Farmington Road east of Murray Boulevard – January 24, 2013

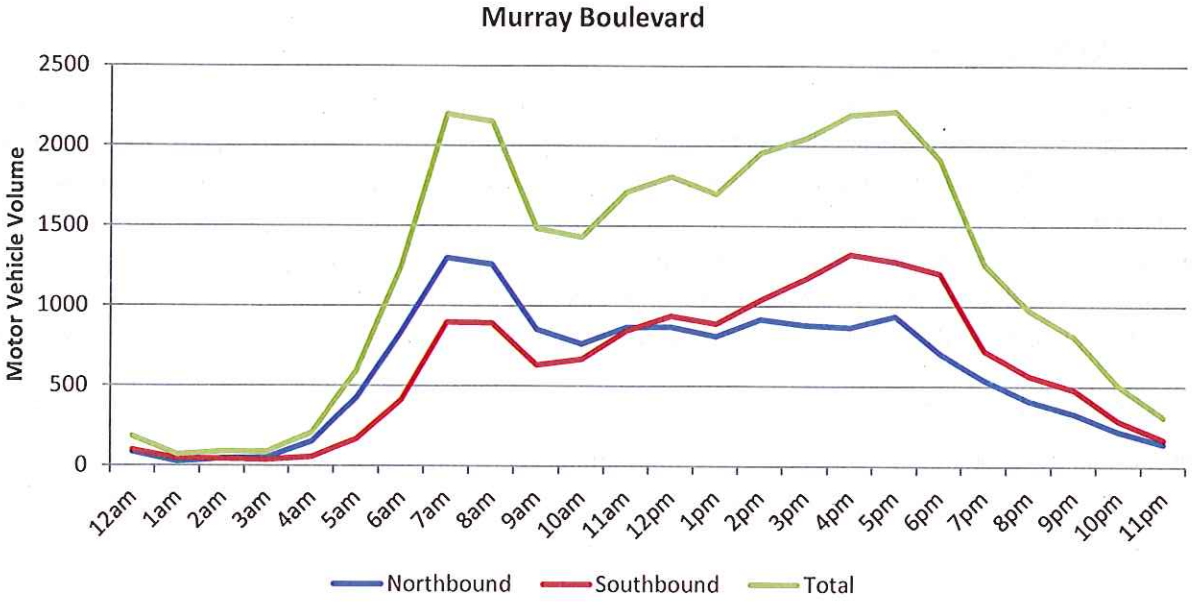


Figure 9. Hourly Motor Vehicle Volumes, Murray Boulevard north of Farmington Road – January 24, 2013

Vehicle Classifications

Vehicles types were also classified along Farmington Road, just east of Murray Boulevard and along Murray Boulevard, just north of the study corridor. As shown in Figure 10, passenger vehicles account for over 75 percent of the total daily vehicles at both locations. The vehicle classification on the two roadways is very similar and falls within four percent in each bin.

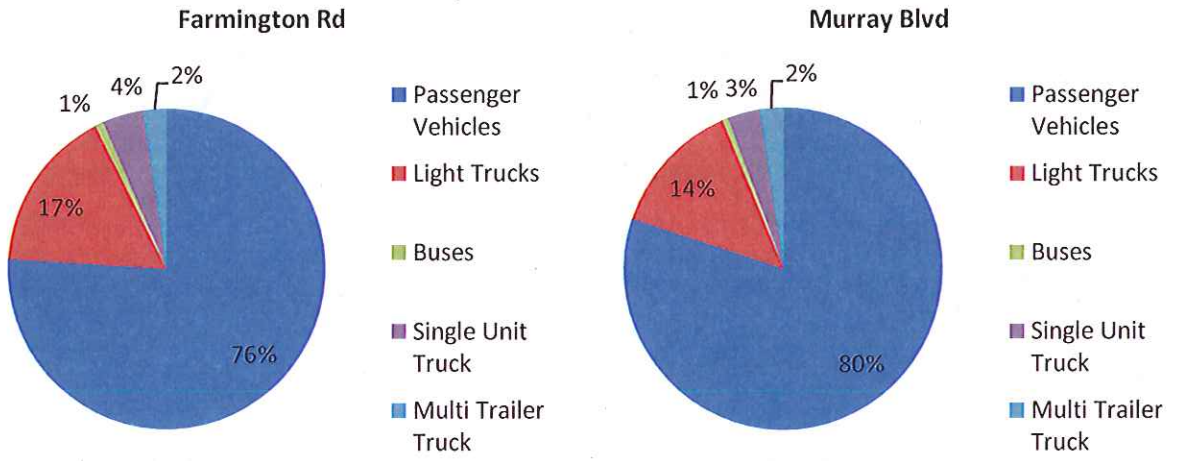


Figure 10. Daily Vehicle Classification[12]

Motor Vehicle Speeds

Two 24-hour directional motor vehicle speed classification counts were obtained, one on Farmington Road, just east of Murray Boulevard and another on Murray Boulevard, just north of the study corridor. The 85th percentile speed[13] is 39 miles per hour on Farmington Road and the average is 30 to 33 miles per hour. On Murray Boulevard the 85th percentile speed is 34 miles per hour and the average is 27 miles per hour. The speed on Farmington Road is generally around or slightly over the posted speed of 35 miles per hour and the speed on Murray Boulevard is less than the posted speed of 40 miles per hour. Along Farmington Road, 68 percent, while along Murray Boulevard about 9 percent of traffic travels within five miles per hour of the posted speed limit.

Motor Vehicle Operations

The existing traffic operating conditions at the study intersections were determined for the AM, and PM peak hours based on the 2000 Highway Capacity Manual methodology[14] for signalized intersections and 2010

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[12] Light trucks are defined as trucks with 2 axles and 6 tires
[13] The 85th percentile speed is defined as the speed at which 85 percent of the vehicles are traveling at or below. The 85th percentile speed is typically used when assessing speed limit observance.
[14] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

Highway Capacity Manual methodology[15] for unsignalized intersections. The conditions include the estimated average delay, level of service (LOS), and volume-to-capacity (V/C) ratio of the study intersections.

Intersection Performance Measures

Level of service (LOS) and volume-to-capacity (V/C) ratios are two commonly used performance measures that provide a gauge of intersection operations. In addition, they are often incorporated into agency mobility standards. Descriptions are given below:

- Level of service (LOS): A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.
- Volume-to-capacity (V/C) ratio: A decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays.

Jurisdictional Operating Standards

All study intersections have been compared against the operating standards, which vary by jurisdiction of the roadways. The study intersection under ODOT jurisdiction (Tualatin Valley Highway/Hocken Avenue) must comply with the v/c targets in the Oregon Highway Plan (OHP) of 0.99.

All non-state roadways within the study area are under the jurisdiction of the City of Beaverton or Washington County. The City and Washington County operating standards require a v/c ratio of 0.98 be maintained for all study area intersections.

Existing Motor Vehicle Operations

Existing motor vehicle operations can be seen in Table 2. During the AM and PM peak hours, all study area intersections operate within the corresponding jurisdictional standard.

The intersection of Farmington Road/Murray Boulevard is at or right under the jurisdictional standard of 0.98, with a 0.97 in the AM peak and a 0.98 in the PM peak. The intersection of TV Highway/Hocken Avenue has a lower level of service in the PM than the AM. The intersection of Farmington Road/Hocken Avenue performs similarly with a level of service B during both the AM and PM peak periods. All of the unsignalized intersections have less than an estimated 45 seconds of average delay per vehicle for the worst movement, with the highest being 28 seconds.

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[15] *2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.

Table 2. Intersection Operations

	Intersection	*Jurisdictional Standard*	*AM Peak Hour*			*PM Peak Hour*		
			LOS	Delay	v/c	LOS	Delay	v/c
Signalized Intersections								
1	**Farmington Rd/Murray Blvd**	0.98	E	61.7	0.97	E	66.8	0.98
8	**Farmington Rd/Hocken Ave**	0.98	B	10.4	0.50	B	18.8	0.64
9	**TV Highway/Hocken Ave**	0.99	C	27.0	0.77	D	45.0	0.97
Unsignalized Intersections*								
2	**Farmington Rd/Normandy Pl**	45 seconds	-	-	-	A/C	22.7	0.01
3	**Farmington Rd/142nd Ave**	45 seconds	A/C	16.2	0.13	B/D	28.0	0.48
4	**Farmington Rd/141st Ave**	45 seconds	B/D	27.6	0.49	B/B	13.7	0.07
5	**Farmington Rd/139th Ave**	45 seconds	-	-	-	B/C	15.1	0.02
6	**Farmington Rd/Menlo Dr**	45 seconds	-	-	-	B/C	16.6	0.22
7	**Farmington Rd/2nd St**	45 seconds	-	-	-	B/C	17.9	0.01

*LOS: major street left turn/minor street, delay and v/c for worst minor street movement

Queuing Analysis

An estimate of the 95th percentile vehicle queues for each of the signalized intersection approach movements under existing conditions was made using SimTraffic modeling software and supplemented with field observations. This value estimates the queue length that would not be exceeded in 95 percent of the queues formed during the peak hour. Queuing results are summarized in the Appendix.

There are several intersection movements throughout the study area that experience vehicle queues longer than can be accommodated given existing storage lengths, which should be expected given some of the high v/c ratios reflected in Table 2. When vehicle queues extend past available storage bays, turning queues can block through movements and through movements can block upstream intersections. The result is an increased potential for rear-end collisions and a significant loss in system capacity.

At the intersection of Farmington Road and Murray Boulevard, there is extensive queuing during the AM peak. The eastbound queues often extend from Murray Boulevard to the intersection of 149th Avenue, which is spaced at approximately 900 feet. The northbound queues extend back approximately 1,000 feet, as shown in Figure 11.

Figure 11. Northbound Queuing at Farmington Road/Murray Boulevard

Hocken Avenue experiences long vehicle queues during both the AM and PM peak bounded by Farmington Road to the south and TV Highway to the north. Hocken Avenue has limited storage of approximately 215 feet, causing spillback and blocking of turning movements onto Hocken Avenue.

Figure 12. Hocken Avenue Queuing between Farmington Road & TV Highway

Additionally, the operations along Hocken Avenue are limited by the use of the southbound left and right turn lanes at Farmington Road. There is an exclusive left turn lane as well as a shared left and right turn lane. Because there is no exclusive right turn lane, drivers sometimes squeeze by the queued left turn lanes. However, there is not enough space for three lanes, and often the vehicle attempting to go around does not fit.

TRAFFIC SIGNAL WARRANTS

The need for a traffic signal at the intersections of Farmington Road and 141st Avenue and Farmington Road and 142nd Avenue was tested by the use of the nine warrants provided by the Manual on Uniform Traffic Control Devices (MUTCD)[16]. The nine warrants are summarized below:

1. Eight-Hour Vehicular Volume: large volume of intersecting traffic (condition A) or large major street traffic volumes causing excessive delay on the intersecting minor street (condition B)
2. Four-Hour Vehicular Volume: large volume on intersecting street
3. Peak Hour: a facility attracts or discharges large numbers of vehicles over a short time
4. Pedestrian Volume: large major street traffic volumes causing pedestrians to experience excessive delay when crossing the major street
5. School Crossing: excessive delay at school crossings from large major street volumes
6. Coordinated Signal System: when needed to maintain vehicle platoons
7. Crash Experience: history of severe and frequent collisions (greater than five per year)
8. Roadway Network: part of a major route or roadway system
9. Intersection Near a Grade Crossing: close proximity to an at grade railroad crossing

[16] Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, 2009 Edition, Federal Highway Administration.

The results from the traffic signal warrant analysis are summarized in Table 3, with each intersection examined separately and as one four-legged re-aligned intersection. Warrant 3, for peak hour, is met in all cases. Additionally, when 142nd Avenue and 141st Avenue are re-aligned and the intersection is examined with four-legs, Warrant 2 for four-hour vehicular volume is met. In this case, a traffic signal is warranted due to high minor street volumes, which last for at least four hours of the average day.

Table 3. Traffic Signal Warrants

		Meets Signal Warrant?		
Warrant	Warrant Name	Farmington Rd/ 142nd Ave.	Farmington Rd/ 141st Ave.	Farmington Rd/Re-aligned 142nd Ave/141st Ave
1	Eight-hour vehicular volume	No	No	No
2	Four-hour vehicular volume	No	No	**Yes**
3	Peak hour	**Yes**	No	**Yes**
4	Pedestrian volume	No	No	No
5	School crossing	No	No	No
6	Coordinated signal system	No	No	No
7	Crash experience	No	No	No
8	Roadway network	No	No	No
9	Intersection near a grade crossing	No	No	No

SAFETY ANALYSIS

The most recent three years (May 31, 2009 – May 31, 2012) of available crash data for the study area was obtained from the Oregon Department of Transportation (ODOT)[17] and used to evaluate the crash history. To identify potential deficiencies, crash types were analyzed to identify patterns or trends, and Washington County and ODOT Safety Priority Index Systems were reviewed to identify potentially hazardous locations.

Farmington Road Safety Analysis

The individual crash types along the study corridor were examined to see if any patterns would emerge. Figure 13 breaks down the crash types and severities experienced, with percentages of each shown. There were a total of 113 collisions along Farmington Road between Murray Boulevard and Hocken Avenue (May 31, 2009 to May 31, 2012). The majority of collisions that occurred were rear ends, with more than half of the total. The second most common type was turning, followed by overtaking sideswipes where both vehicles were traveling in the same direction. Fifty-eight percent of the collisions have been property damage only, while the remaining forty-two percent resulted in injuries. There have not been any fatalities in the past three years.

[17] Oregon Department of Transportation Crash Data System, accessed February 11, 2013.

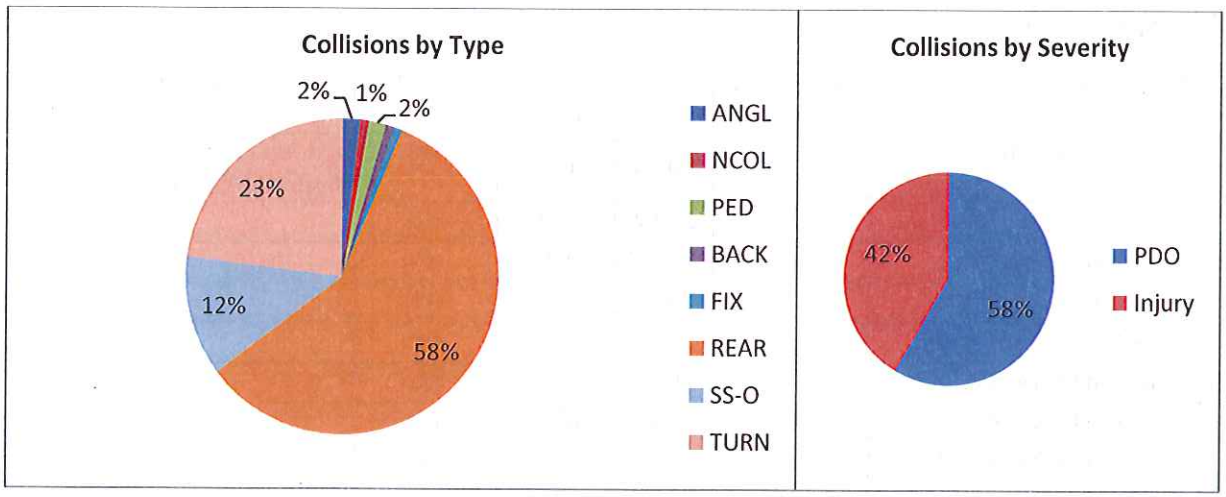


Figure 13. Farmington Road Collisions by Type & Severity

The high number of rear-end collisions may indicate that vehicles are slowing in unexpected places due to queue spillback from traffic signals, or for driveways or unsignalized intersections. Since the corridor lacks a center turn lane in most locations, left turning vehicles must wait in the through lane for adequate gaps in on-coming traffic to make a turn. The turning collisions may indicate that turning movements to and from driveways or unsignalized intersections are occurring at multiple locations through the study corridor.

There were two pedestrian related crashes during the three-year time span. The pedestrian collisions that occurred at the unsignalized intersection of Farmington Road and SW Rose Lane, which is approximately 200 feet east of the pedestrian crossing at the Fire Station, was at night and the pedestrian was in the roadway. The other pedestrian collision occurred at Farmington Road and Murray Boulevard during the day.

Intersection Safety Analysis

Crash rates at study intersections were calculated to identify problem areas in need of mitigation using the crash frequency and the million entering vehicles (MEV). Using this technique, a crash rate of 1.0 MEV or greater is commonly used to identify when further investigation is warranted. As shown in Table 4 and Figure 15, crash rates calculated at one intersection is well above this threshold, indicating the frequency of crashes is high for the volume of traffic served. The intersection of Farmington Road and Murray Boulevard has a crash rate above the 1.0 MEV threshold, with a crash rate of 1.31.

DKS

Table 4. Intersection Collisions

Intersection	*Number of Crashes*	*MEV*	*Crash Rate*	*>1.0*	*SPIS Location**
Farmington Rd/Murray Blvd	66	50.44	1.31	Yes	#11 on Washington County SPIS list
Farmington Rd/Normandy Pl	4	24.52	0.16	No	
Farmington Rd/142nd Ave	6	24.79	0.24	No	
Farmington Rd/141st Ave	4	24.17	0.17	No	
Farmington Rd/139th Ave	8	23.61	0.34	No	
Farmington Rd/Menlo Dr	7	26.72	0.26	No	
Farmington Rd/2nd Ave	0	26.16	0.00	No	
Farmington Rd/Hocken Ave	6	30.13	0.20	No	
TV Highway/Hocken Ave	31	37.88	0.82	No	On ODOT SPIS list

*TV Highway is on the ODOT SPIS list, while Farmington Road is on the Washington County SPIS ranking

Figure 14 shows the number of collisions by type at each intersection west to east along Farmington Road. The highest number of collisions, 66, occurred at Farmington Road and Murray Boulevard, with the majority (64 percent) being rear-end collisions, most likely a result of queue spillback from traffic signals, and a relatively high number of turning collisions (18 percent). Very few occurred at unsignalized intersections.

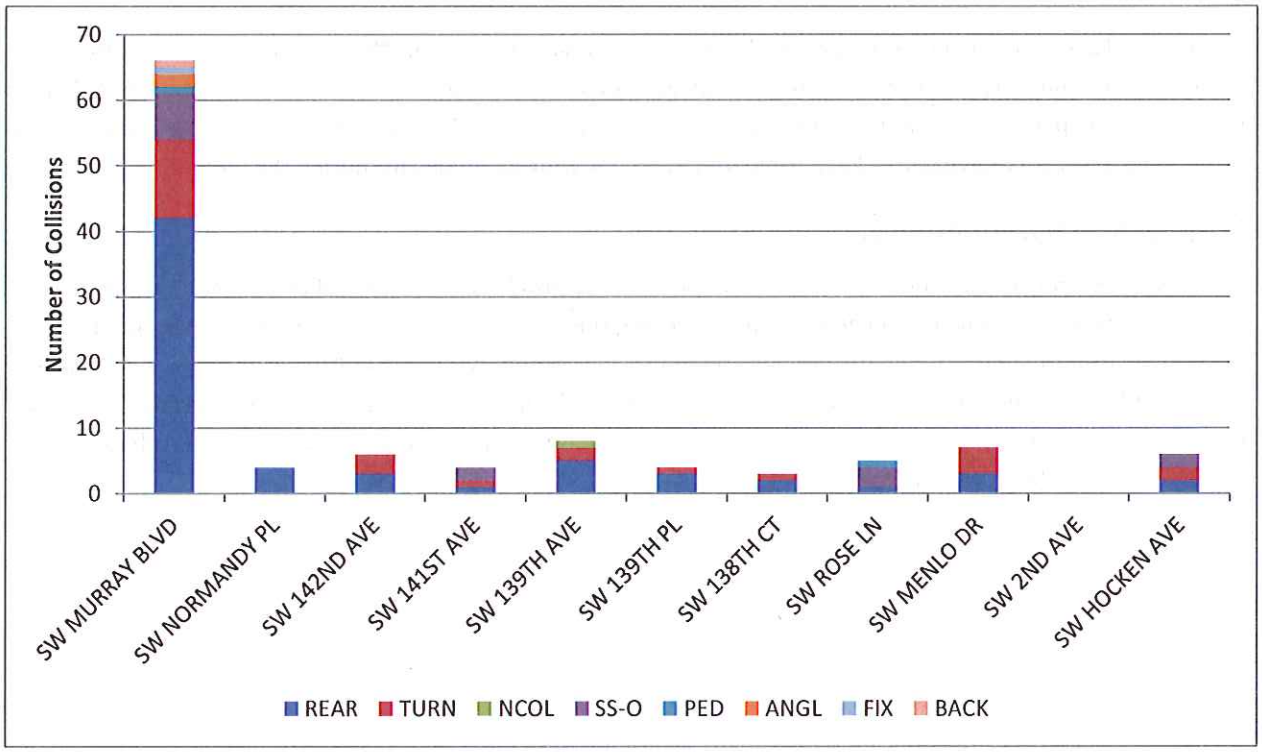


Figure 14. Collisions by Type for Study Intersections along Farmington Road

SPIS Ratings

This analysis was supplemented by a review of ODOT Safety Priority Index System listings for locations in the study corridor ranked among the state's top five percent of hazardous locations. The Safety Priority Index System (SPIS) is a method developed by ODOT for identifying hazardous locations on state highways, with the score based on three years of crash data as well as crash frequency, rate, and severity. ODOT bases its SPIS on 0.10-mile segments to account for variances in how crash locations are reported. This rating provides a general comparison of the overall safety of the highway based on crash information for all highway segments throughout the state.

ODOT's SPIS applies only to ODOT facilities, which does not include Farmington Road within the study area. However, the Tualatin Valley Highway is an ODOT facility and is included in the ODOT SPIS list. The study intersection of Tualatin Valley Highway and Hocken Avenue is a top 5% location and has a score of 71.78 out of a total of 100 being the worst case. Although the intersection of TV Highway and Murray Boulevard is not a study intersection, it is a top 5% location with a SPIS score of 54.16.

Washington County intersections are screened using a SPIS list, which includes a ranking system within the county. The intersection of Farmington Road and Murray Boulevard was ranked as #11 on Washington County's SPIS list for 2007-2009, as indicated in Figure 15. Farmington Road and Murray Boulevard has been in the top 10 for the past two years. Murray Boulevard and Tualatin Valley Highway was ranked as #4 on the SPIS list.

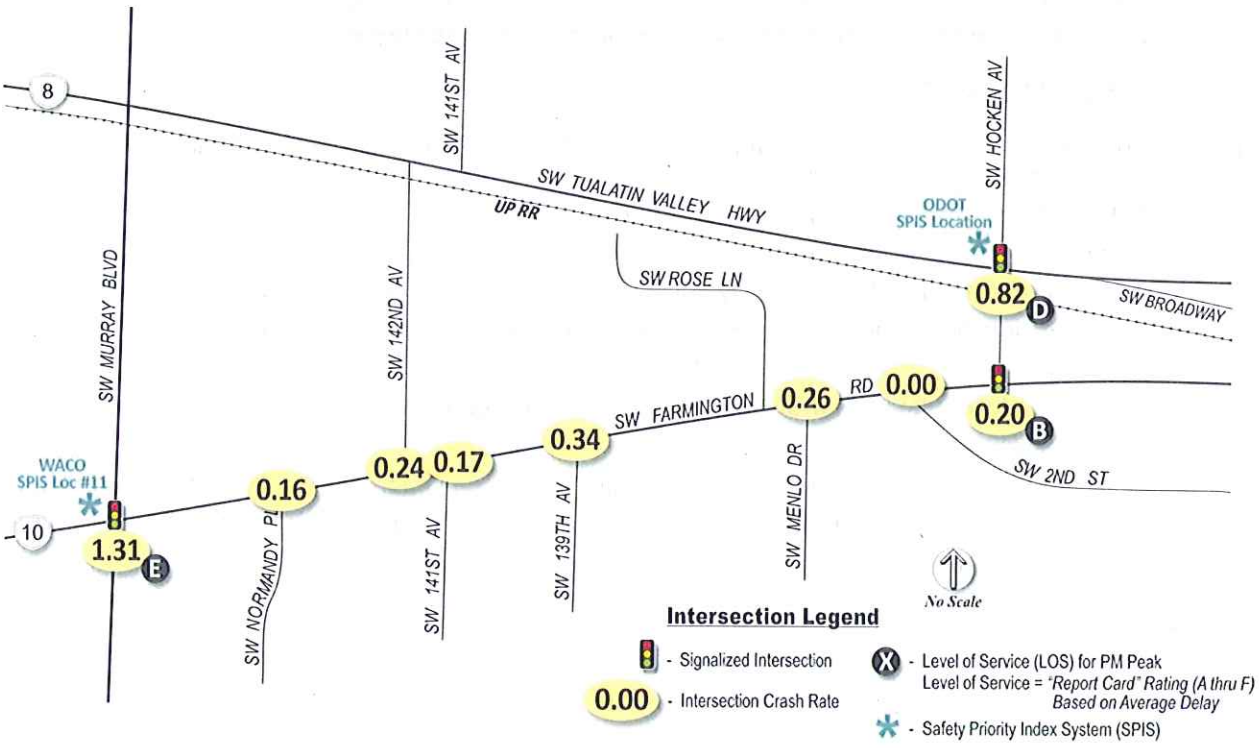


Figure 15. Existing Conditions Safety & Operations

FINAL MEMORANDUM

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: May 10, 2013

TO: Dan Houf, P.E., HHPR

FROM: Peter Coffey, P.E., DKS Associates

SUBJECT: Farmington Road Improvement Project – Future Transportation Conditions P#13013-000

This final memorandum presents the future year 2035 transportation conditions analysis for the Farmington Road Improvement Project. Three alternatives were considered as part of the future traffic operations. Included in this memorandum is an overview of the project alternatives, options of bicycle and pedestrian facilities, future year assumptions, and traffic analysis results.

The Farmington Road Improvement Project was previously included in the 1997 City of Beaverton Transportation System Plan (TSP)[1] and continues to be included in the current TSP (2009 update)[2] as high priority. A traffic analysis was conducted in 2002 that included existing (year 2001) and future conditions for the Farmington Road improvement project. The future year traffic analysis forecasted to years 2020 and 2026, which resulted in recommendations that were incorporated into 90 percent design plans. This memorandum includes revised future traffic analysis and recommendations based on the findings.

PROJECT ALTERNATIVES

Three alternatives were considered for the future year 2035 traffic operations analysis, including:

- No Build: Maintains the existing roadway geometry.
- Current 90% Design: Includes the following improvements:
  - **Farmington Road from Murray Boulevard to Hocken Avenue:** widen roadway to a five-lane section that includes two travel lanes in each direction, a center turn lane, bike lanes, curbs, and sidewalks.
  - **Farmington Road/Murray Boulevard:** add double left turn lanes and single right turn lanes on all approaches.
  - **Hocken Avenue between TV Highway and Farmington Road:** widen roadway to a five-lane section (three southbound lanes and two northbound lanes) with bike lanes, curbs, and sidewalks.

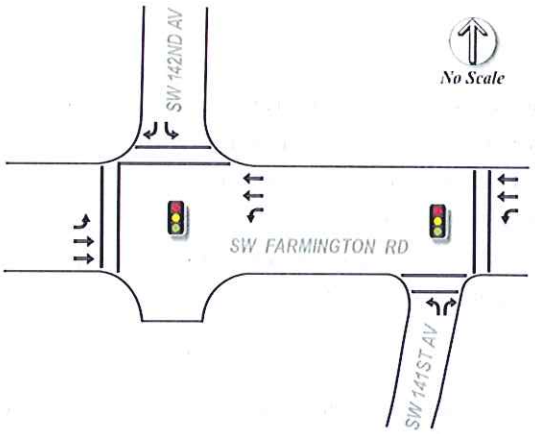
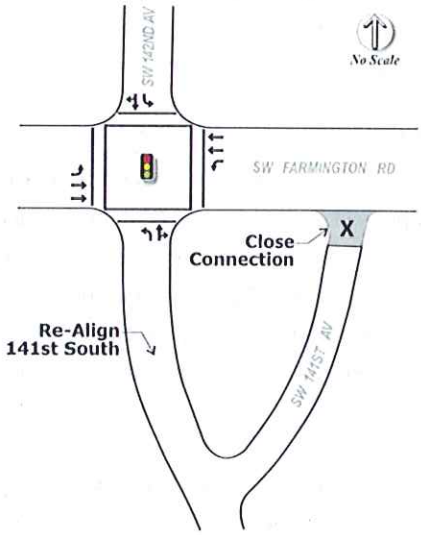
[1] City of Beaverton Transportation System Plan, DKS Associates, September 1997. Chapter 11: Funding and Implementation.
[2] City of Beaverton Transportation System Plan, DKS Associates, December 2009. Table 4-9.

- **Farmington Road/141st Avenue/142nd Avenue:** Signalize Farmington Road/141st Avenue and Farmington Road/142nd Avenue by maintaining the current side street alignments and add two pedestrian crossings located on the east side of 141st and on the west side of 142nd
  Previously called Option F in 2003 Future Transportation Conditions Analysis Memorandum[3]

- Realigned Current 90% Design: Variation of the current 90% design
  - **Farmington Road/141st Avenue/142nd Avenue:** Signalize 141st Avenue and 142nd Avenue by retaining the current 142nd alignment and realigning 141st further west on the south side of Farmington Road to match 142nd
    Previously called Option A in 2003 Future Transportation Conditions Analysis Memorandum[4]

Schematics and a general comparison of the two build alternatives are shown in Table 1.

Table 1. Farmington Road/141st Avenue & 142nd Avenue Build Options

Current 90% Design	Realigned Current 90% Design
• Signalize two intersections • Maintain current side street alignments • Add two pedestrian crossings on east side of 141st and west side of 142nd 	• Signalize one intersection • Realign 141st further west on the south side of Farmington Road to match 142nd Avenue 

[3] Farmington Road Future Transportation Conditions Analysis Final Report Memorandum, DKS Associates, January 17, 2003.
[4] ibid

TRAFFIC FORECASTING

This section summarizes the assumptions and methodology that were used to develop future year 2035 peak hour volumes at the study intersections.

Travel Demand Model

The year 2035 traffic volumes were projected using a refined travel demand model based on the West Side Metro travel demand model developed by Washington County[5]. The model is generally based on Metro's 2035 Regional Transportation Plan (RTP)[6] financially constrained transportation system street network and Metro's "Beta" land use7 and contains additional refinements and calibration.

For transportation forecasting, the land use data is stratified into geographical areas called transportation analysis zones (TAZs), which represent the sources of vehicle trip generation. There are 12 Metro TAZs within or adjacent to the study area that were further refined as part of this study. These 12 TAZs were subdivided into 61 TAZs to more specifically represent the allocation of land use and location of vehicle loading in the vicinity of the study area.

To further refine forecasts, a "mesoscopic" sub-area model was developed for the study area that includes all public streets and utilizes Highway Capacity Manual (HCM) node delays for trip assignment and routing in order to evaluate changes in circulation and traffic control. The boundaries for the sub-area model generally include Millikan Way to the north, Cedar Hills Boulevard and Erickson Avenue to the east, Allen Boulevard to the south, and Murray Boulevard to the west.

Roadway Network Assumptions

As noted, the West Side Metro travel demand model street network is generally consistent with the financially constrained project list in Metro's RTP. In the vicinity of the study area, projects from the RTP list generally include motor vehicle capacity and connectivity enhancements north of Tualatin Valley (TV) Highway. These projects were coded into the sub-area model to be consistent with the projects in the West Side model. The RTP project list also included capacity and intersection improvements on Farmington Road where necessary. The "no-build" scenario however, was analyzed without any improvements on Farmington Road.

Forecasting Methodology

Calibration was performed on the 2010 base year PM peak hour model using the existing PM peak hour counts at key intersections in the study area. The future year 2035 PM peak hour volumes were then estimated by a

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[5] Phone conversation with Steve L. Kelley, Washington County, January 22, 2013
[6] 2035 Regional Transportation Plan. Metro. June 2010.
[7] Administrative Interpretation of 2035 Regional Transportation Plan, No 2012-2, Letter from John Williams, Metro, May 2, 2012.

post-processing[8] methodology that includes adding the growth increment between the 2010 base year and 2035 future year models to base year counts.

FUTURE YEAR 2035 VOLUMES

Future year 2035 traffic volumes were developed for the three alternatives (No Build, Current 90% Design, and Realigned Current 90% Design). Overall, the traffic volume forecasts indicate that the average daily traffic on Farmington Road would increase by approximately 6,000 vehicles by the year 2035. This growth corresponds to an average growth rate of approximately one percent per year for through traffic on Farmington Road. The projected growth rate is lower than what was forecasted in the previous study[9]. The overall difference in the forecasted volumes between this study and the 2003 study can be attributed to a number of potential factors, including lower existing year traffic counts, evolution of the regional travel demand model (several generations of updates, a more refined zone structure, refined delay functions, etc.), regional economic and land use projection changes, transportation network changes, etc.

Traffic volume forecasts indicate that future year 2035 PM peak hour traffic volumes at all study intersections would increase from the existing counts for all future alternatives. Across the three alternatives, potential circulation changes and traffic volume shifts due to the different improvements were identified using outputs from the sub-area travel demand model.

In addition to growth during the peak hour, future traffic demand is likely to spread to adjacent time periods and create a longer "peak" demand. Existing peak hour factors (PHF) in the study area are generally 0.93 or greater and are assumed to increase as overall traffic volumes grow and the peak demand spreads in the future. The future year traffic volumes are shown in Figures 1 through 3. For the future analysis, the AM peak hour factor was 0.98 and the PM peak hour factor was 1.0[10].

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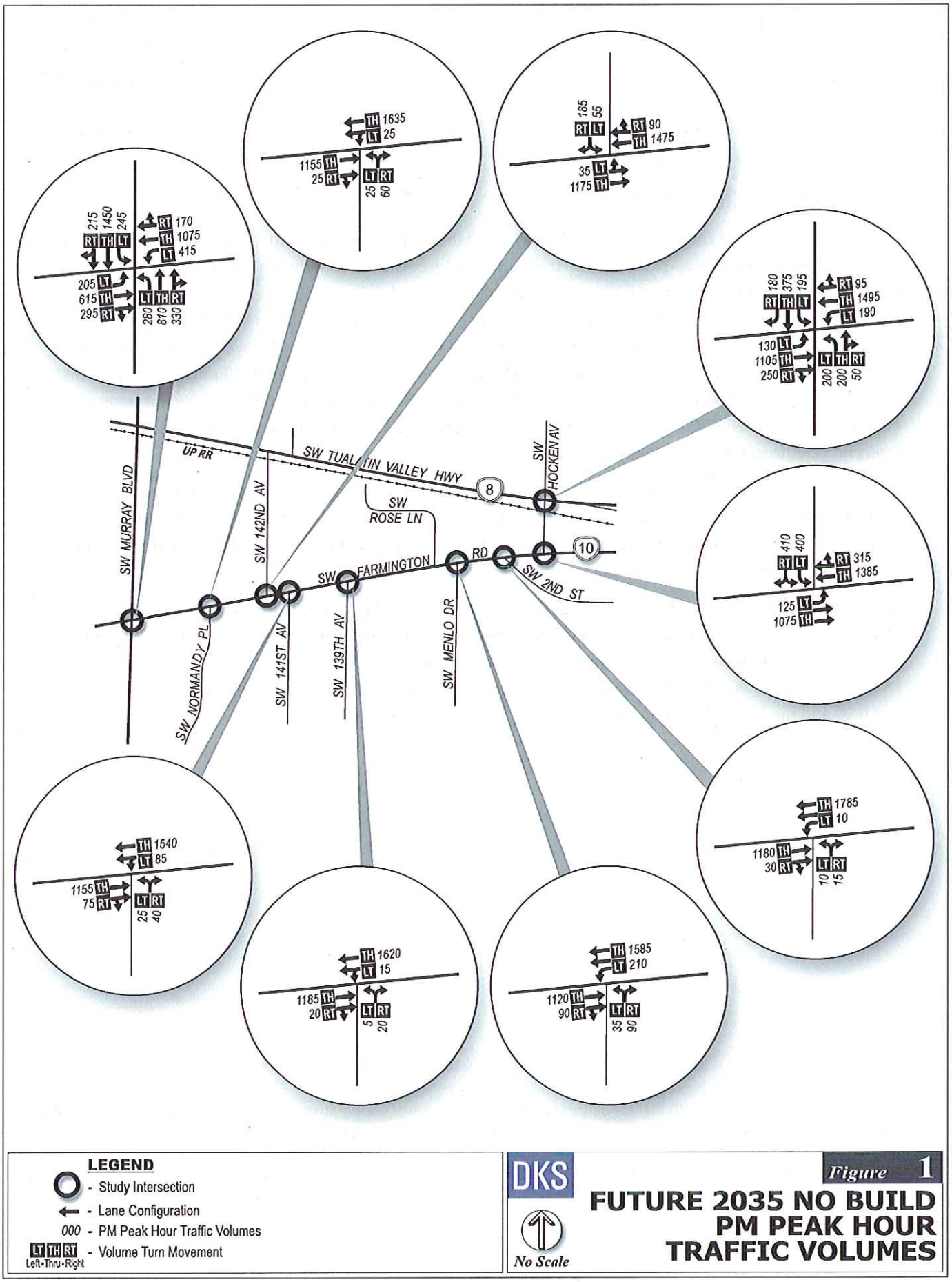
[8] This approach is consistent with methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 255, Highway Traffic Data for Urbanized Area Project Planning and Design

[9] Farmington Road Future Transportation Conditions Final Report, DKS Associates, January 17, 2003. This study projected average growth rates of approximately 1.5 percent per year for through traffic on Farmington Road.

[10] Per discussion on March 6, 2013 with Jabra Khasho from the City of Beaverton and Jinde Zhu from Washington County



LEGEND

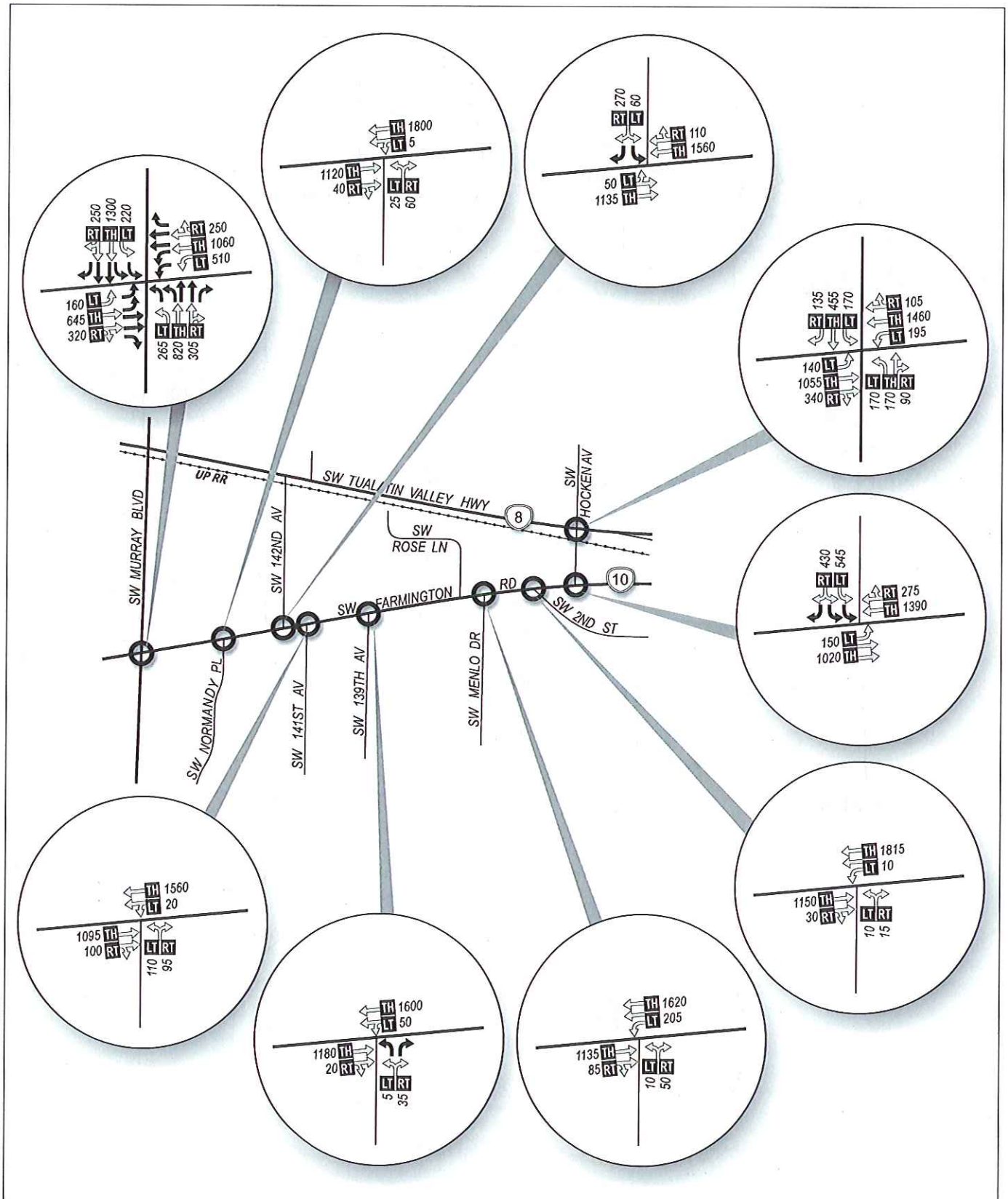
- Study Intersection
- Lane Configuration
- *000* - PM Peak Hour Traffic Volumes
- LT TH RT - Volume Turn Movement (Left•Thru•Right)

DKS

No Scale

Figure **1**

FUTURE 2035 NO BUILD PM PEAK HOUR TRAFFIC VOLUMES



LEGEND

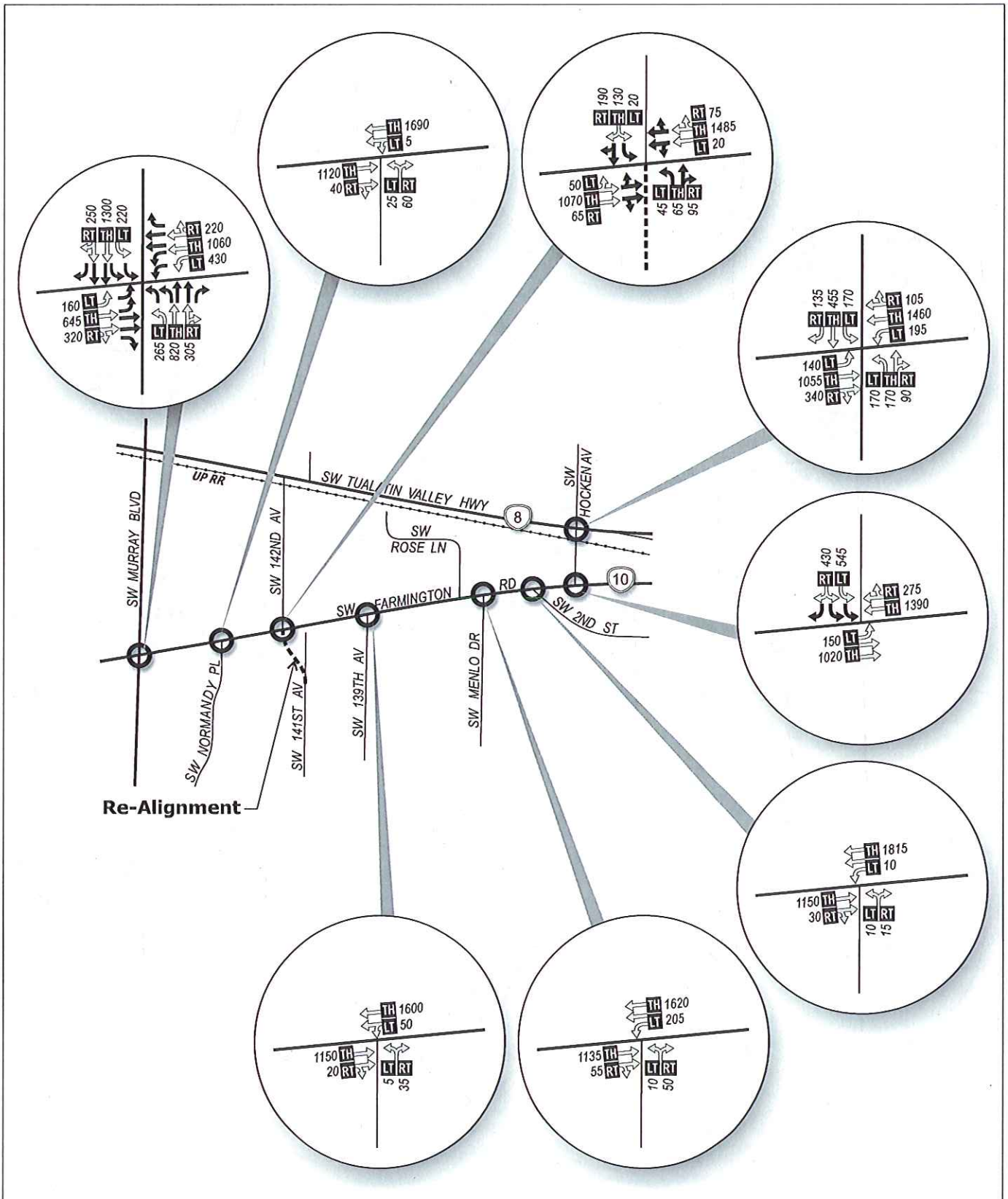
- Study Intersection
- ⇦ - Existing Lane Configuration
- ⬅ - Proposed Lane Configuration
- *000* - PM Peak Hour Traffic Volumes
- LT TH RT - Volume Turn Movement (Left•Thru•Right)

DKS

No Scale

Figure **2**

FUTURE 2035 90% DESIGN PM PEAK HOUR TRAFFIC VOLUMES



LEGEND

- Study Intersection
- Existing Lane Configuration
- Proposed Lane Configuration

000 - Peak Hour Traffic Volumes

LT TH RT (Left • Thru • Right) - Volume Turn Movement

DKS

No Scale

Figure 3

FUTURE 2035 ALIGNED PM PEAK HOUR TRAFFIC VOLUMES

FUTURE YEAR 2035 TRAFFIC OPERATIONS

The future traffic operating conditions at the study intersections were determined for the PM peak hour based on the 2000 Highway Capacity Manual methodology[11] for signalized intersections and 2010 Highway Capacity Manual methodology[12] for unsignalized intersections. The conditions include the estimated average delay, level of service (LOS), and volume-to-capacity (V/C) ratio of the study intersections.

Intersection Performance Measures

Level of service (LOS) and volume-to-capacity (V/C) ratios are two commonly used performance measures that provide a gauge of intersection operations. In addition, they are often incorporated into agency mobility standards. Descriptions are given below:

- Level of service (LOS): A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.
- Volume-to-capacity (V/C) ratio: A decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is "oversaturated", with a demand volume that exceeds the capacity of traffic that can be served. This occurrence usually results in excessive queues and long delays.

Jurisdictional Operating Standards

All study intersections have been compared against the operating standards, which vary by jurisdiction of the roadways. The study intersection under ODOT jurisdiction (Tualatin Valley Highway/Hocken Avenue) must comply with the v/c targets in the Oregon Highway Plan (OHP) of 0.99.

All non-state roadways within the study area are under the jurisdiction of the City of Beaverton or Washington County. Under the City of Beaverton Development Code[13], for signalized intersections the peak hour delay should not exceed 65 seconds and the v/c ratio should not exceed 0.98 for each intersection or lane group. For unsignalized intersections, the delay should not exceed 45 seconds. The County requires a v/c ratio of 0.99[14] for the peak hour in urban areas.

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[11] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.
[12] *2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.
[13] City of Beaverton Development Code, Transportation Facilities, June 2012.
[14] Washington County Transportation System Plan, Table 5, March 31, 2003.

Operational Results

The following section summarizes the operational results for the three scenarios: (1) No Build, (2) Current 90% Design, and (3) Realigned Current 90% Design, relative to their corresponding jurisdictional standard. For both of the build alternatives, it was initially assumed that all of the turn lanes identified in the current 90% design plans would be added.

Table 2. PM Peak Intersection Operations

Intersection	*V/C Standard*	*No Build*			*Current 90% Design Full Build Out*			*Realigned Current 90% Design Full Build Out*		
		LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c
Signalized Intersections										
Farmington Rd/ Murray Blvd	0.98	F	137.5	**1.27**	D	49.9	0.90	D	48.1	0.91
Farmington Rd/ Hocken Ave	0.98	C	23.6	0.86	C	21.7	0.83	C	21.7	0.83
TV Highway/ Hocken Ave	0.99	F	114.1	**1.20**	F	144.1	**1.28**	F	144.1	**1.28**
Farmington Rd/ 142nd Ave/141st Ave	0.98	N/A			N/A			B	14.0	0.74
Farmington Rd/ 142nd Ave	0.98				B	10.8	0.70	N/A		
Farmington Rd/ 141st Ave	0.98				B	15.4	0.60			
Unsignalized Intersections*										
Farmington Rd/ Normandy Pl	45 seconds	B/D	28.4	0.36	B/F	**77.6**	0.67	B/C	22.9	0.30
Farmington Rd/ 142nd Ave	45 seconds	B/F	**>300**	2.47	N/A			N/A		
Farmington Rd/ 141st Ave	45 seconds	B/F	**99.1**	0.68						
Farmington Rd/ 139th Ave	45 seconds	B/E	37.9	0.19	B/C	16.9	0.12	B/C	22.5	0.16
Farmington Rd/ Menlo Dr	45 seconds	C/F	**>300**	2.27	C/C	22.4	0.23	B/C	21.9	0.22
Farmington Rd/ 2nd St	45 seconds	B/C	21.6	0.10	B/C	21.3	0.10	B/C	21.3	0.10

LOS = Level of Service
Delay = Average Stopped Delay per Vehicle (seconds)
V/C = Volume-to-Capacity Ratio
*For unsignalized intersections: LOS is major street left turn/minor street, delay and v/c are for worst minor street movement
Note: Level of service by lane group at Farmington Road/Murray Boulevard is included in the Appendix.

The Farmington Road/Murray Boulevard intersection would improve from a v/c ratio of 1.25 in the no build scenario to 0.90 or 0.91 in both of the build scenarios (which include the addition of double left turn lanes and right turn lanes on all four approaches). The intersection Farmington Road/Hocken Avenue intersection would meet the capacity standard in all scenarios using HCM analysis; however, due to the configuration of approach lanes and limited storage distance for turn pockets, traffic flow may be blocked. The TV Highway/Hocken Avenue intersection does not meet the capacity standards as no improvements are identified for this intersection as part of this project.

In the no build scenario the unsignalized intersections of Farmington Road with 142nd Avenue and with 141st Avenue fail to meet the standards without signalization in either of the build options. The unsignalized intersection of Farmington Road and Normandy Place performs to standard when 141st Avenue is realigned to 142nd Avenue, and does not meet the standards with the existing roadway geometry.

Farmington Road/Murray Boulevard Build Options

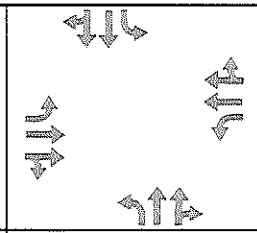
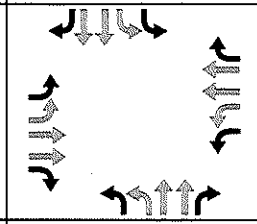
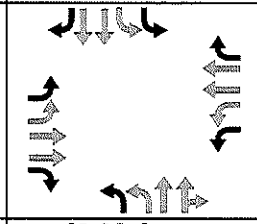
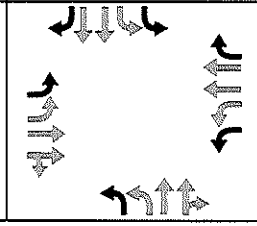
In order to minimize right-of-way impacts and better balance the needs of all roadway users, including motor vehicles, pedestrians, bicyclists, and transit riders, various lane configuration options were considered at the Farmington Road/Murray Boulevard intersection. The options range from a no build, which keeps the existing lane configuration, to a full build out, which assumes the proposed lane configuration from the current 90% design. The mobility standards were examined for various combinations of left and right turn lane configurations on all four approaches (see Appendix). The options were tested for the existing lane configuration at Farmington Road and 141st Avenue/142nd Avenue and assuming realignment at that intersection.

Three build scenarios and the no build are summarized in Table 3, including the following lane configurations:

(1) Existing 90% Design: double left turns and single right turns on all four approaches
(2) No Northbound Right Turn: double left turns on all four approaches and single right turns on the westbound, eastbound, and southbound approaches
(3) No Northbound Right Turn and no Eastbound Right Turn: double left turns on all four approaches and single right turns on the westbound and southbound approaches

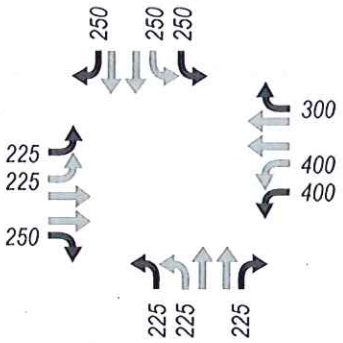
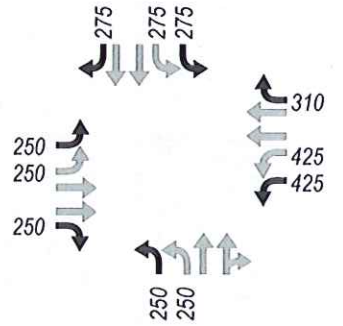
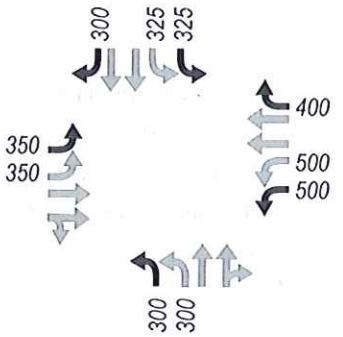
The existing lane configuration does not meet operational standard, however the three build options will meet the mobility standards in the year 2035.

Table 3. Farmington Road/Murray Boulevard Lane Configuration Options

Lane Configuration Options		*PM Offset*			*PM Realigned*			*AM Offset*			*AM Realigned*		
		LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c
Existing Lane Configuration		F	137.5	**1.27**	F	137.5	**1.27**	F	90.4	**1.10**	F	90.4	**1.10**
Existing 90% Design		D	49.9	0.90	D	48.1	0.91	D	45.3	0.88	D	44.8	0.86
No NBR		D	52.9	0.93	D	50.4	0.91	D	49.2	0.91	D	49.1	0.92
No NBR & EBR		E	58.8	0.97	E	55.4	0.92	D	54.8	0.95	D	54.6	0.96
⟸ - Existing Lane Configuration ↑ ↰ - Proposed Turn Lanes		LOS = Level of Service Delay = Average Stopped Delay per Vehicle (seconds) V/C = Volume-to-Capacity Ratio						PM Peak Hour Factor = 1.00 AM Peak Hour Factor = 0.98					

Recommended storage lengths for left and right turn pockets at the Farmington Road/Murray Boulevard intersection were determined under two lane configuration options as shown in Table 4. The recommended storage lengths in general do not always accommodate 95th percentile vehicle queuing for both peak hours. However, they do attempt to strike a balance between accommodating traffic flow and minimizing right-of-way impact.

Table 4. Farmington Road/Murray Boulevard Recommended Storage Lengths

Option	Desired Storage Length (ft)	Comparison	Storage Limitations
Current 90% Design		• Most turn lanes: includes both the northbound and eastbound right turn lanes • Shortest storage length for turn lanes	More westbound storage desired than is available due to proximity of Normandy Lane
No NBR		• Less turn lanes than current 90% design: no northbound right turn lane • Longer storage length for turn lanes than current 90% design	
No NBR and EBR		• Least number of turn lanes: no eastbound and northbound right turn lanes • Longest storage length for turn lanes	

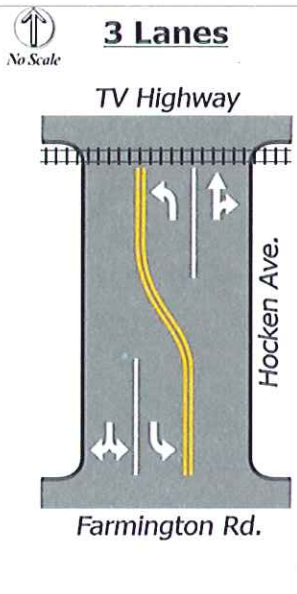
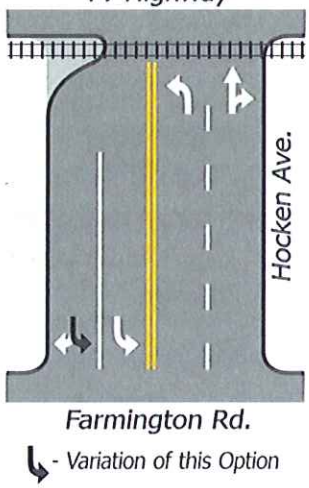
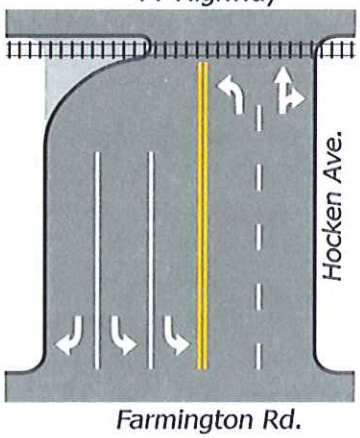
Note: The westbound and eastbound right turn lanes for the second lane configuration (without a northbound right turn lane) have been shortened to minimize right-of-way impacts.

Farmington Road/Hocken Avenue Build Options

Three options were considered at the Farmington Road/Hocken Avenue intersection, including the existing configuration, two southbound lanes, or three southbound lanes consistent with the current 90% design (as shown in Table 5). The existing configuration has a southbound left turn lane and a shared left and right turn lane on Hocken Avenue.

Vehicle storage on Hocken Avenue is limited by the railroad crossing (located approximately 250 feet to the north) and the intersection with TV Highway to the north. Because of the limited storage and the risk of stopping vehicles on the rail crossing, options were considered to modify the existing lane configuration to improve safety. The four lane option would add another lane to extend storage in both the northbound and southbound direction for left turning vehicles. The four lane cross section can be striped as either an exclusive right turn lane or a shared right and left turn lane. The five lane cross section would provide additional storage with a southbound double left turn lane. All three options will not affect the railroad crossing to the north which will need to be improved as part of a future project.

Table 5. Hocken Avenue Build Options between Farmington Road and TV Highway

3 Lanes	4 Lanes	5 Lanes
		
• Existing configuration • Northbound left turn has limited storage • Southbound left turn has limited storage	• One additional lane • Northbound left turn has additional storage • Southbound left turn has additional storage	• Two additional lanes • Same northbound left turn storage as 4 lane option • The most southbound left turn storage

The PM peak operations for the three cross section options on Hocken Avenue were examined at the Farmington Road/Hocken Avenue intersection. The four lane section with a shared left/right turn lane has the

same v/c ratio as the existing configuration. The same four lane section with an exclusive right turn lane was a higher v/c ratio of 0.98. The five lane section has the lowest v/c ratio of 0.83.

Table 6. Farmington Road/Hocken Avenue 2035 PM Peak Operations

Option	*Southbound Hocken Avenue Configuration*	*V/C Standard*	*LOS*	*Delay*	*v/c*
Existing Configuration (3 Lanes)	1 Left Turn Lane 1 Shared Left/Right Turn Lane	0.98	C	29.1	0.90
4 Lane Shared (2 Southbound & 2 Northbound)	1 Left Turn Lane 1 Shared Left/Right Turn Lane	0.98	C	29.1	0.90
4 Lanes Exclusive (2 Southbound & 2 Northbound)	1 Left Turn Lane 1 Right Turn Lane	0.98	D	37.0	0.98
5 Lanes (3 Southbound & 2 Northbound)	2 Left Turn Lanes 1 Right Turn Lane	0.98	C	21.7	0.83

LOS = Level of Service
Delay = Average Stopped Delay per Vehicle (seconds)
V/C = Volume-to-Capacity Ratio

The intersection operations summarized in Table 6 are not capable of assessing the effects of additional storage on spillback and queuing performance. The 95th percentile and average queues were examined (included in the Appendix) for the eastbound left turn and southbound movements at the Farmington Road/Hocken Avenue intersection in addition to the northbound movement at TV Highway/Hocken Avenue. The 95th percentile queue lengths exceed the available storage in all cases, whereas the average queue lengths are less than the available storage for several movements with the four of five lane section.

TRAFFIC SIGNAL WARRANTS

The need for a traffic signal at the intersections of Farmington Road and 141st Avenue and Farmington Road and 142nd Avenue for the opening year of 2015 was tested by the use of the nine traffic signal warrants provided by the Manual on Uniform Traffic Control Devices (MUTCD). Warrants 1 through 3 are traffic volume based, examining if the following conditions occur:

1. Eight-Hour Vehicular Volume: large volume of intersecting traffic (condition A) or large major street traffic volumes causing excessive delay on the intersecting minor street (condition B)
2. Four-Hour Vehicular Volume: large volume on intersecting street
3. Peak Hour: a facility attracts or discharges large numbers of vehicles over a short time

The results from the traffic signal warrant analysis are summarized in Table 7, with each intersection examined separately and as one four-legged re-aligned intersection. The peak hour warrant is met at 142nd Avenue and when the two intersections are realigned.

Table 7. Opening Year 2015 Traffic Signal Warrants

Warrant	*Warrant Name*	*Critical Minor Street Warrant Volume (vehicles/hour)*	*Meets Signal Warrant?*		
			Farmington Rd/ 142nd Ave.	Farmington Rd/ 141st Ave.	Farmington Rd/ Re-aligned 142nd Ave/141st Ave
1B	Eight-hour vehicular volume	100	No (51)	No (36)	No (71)
2	Four-hour vehicular volume	115	No (79)	No (41)	No (108)
3	Peak hour	150	**Yes (152)**	No (141)	**Yes (152)**

*Threshold based on two major street lanes and two minor street lanes and the side street volume includes right turn volume (i.e. no right turn reduction applied)

The peak hour traffic signal warrant will be met in the opening year (2015) at the Farmington Road/141st Avenue/142nd Avenue intersection. The four hour traffic signal warrant is nearly met in 2015, but will not be met until approximately 2017 (using projected volumes). Based on the volume based warrants, a traffic signal is recommended at the realigned intersection of Farmington Road/142nd Avenue/141st Avenue.

Additionally, the installation of a traffic signal will provide safer pedestrian crossing opportunities, which is beneficial due to the current lack of a nearby enhanced pedestrian crossing of Farmington Road. Vehicle queuing and delay was examined as part of the traffic signal warrant analysis. The maximum queues on 142nd Avenue during the PM Peak were observed to be six vehicles or approximately 150 feet. The maximum delay measured was two minutes and the average delay was approximately thirty seconds.[15]

FARMINGTON ROAD CROSS SECTION

As documented in the Farmington Road Existing Transportation Conditions Analysis Draft Memorandum[16], there are gaps in the existing bicycle and pedestrian networks along Farmington Road. The widening of Farmington Road to a five-lane section between Murray Boulevard and Hocken Avenue will include bike lanes, curbs, and sidewalks to connect the pedestrian and bicycle system.

SW Farmington Road is classified as an arterial roadway and both State and City policy require that all arterial and collector roads have bikeways. As part of the original 90% design, bike lanes were located along the project alignment from SW Murray Boulevard to SW Hocken Avenue. The proposed cross-section for the ninety percent design is shown at the top of Figure 4 (Cross Section 1). This cross-section provides for five-foot bike lanes between a twelve- foot travel lane and the sidewalk curbface. The City of Beaverton *Engineering Design Manual*

[15] Field visit at Farmington Road/142nd Avenue conducted on March 5, 2013 from 4:30 – 5:45 PM by DKS Associates.
[16] Farmington Road Existing Transportation Conditions Analysis Draft Memorandum, DKS Associates, February 21, 2013.

states that bike lanes may have a minimum width of five feet and a maximum width of six feet.[17] Therefore, the existing design meets the City's requirements for allocated bike lane space, but may be considered narrow for those among the bike community.

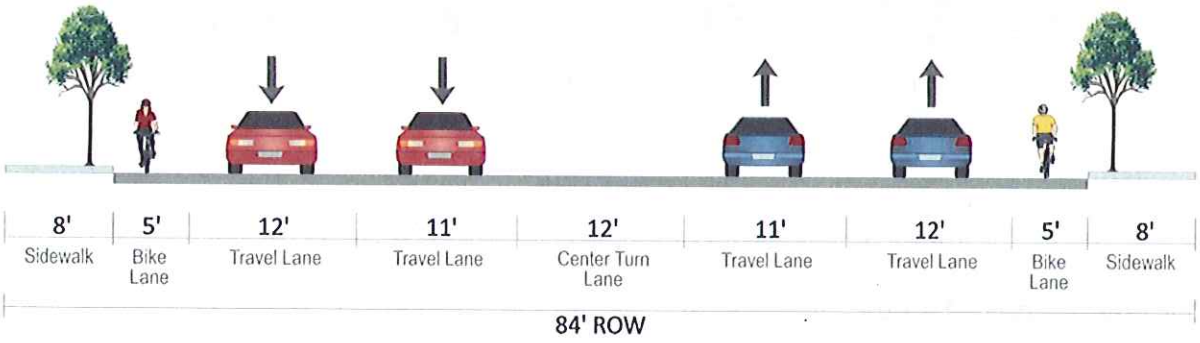


Figure 4. Farmington Road Existing 90% Plan Cross Section

Ten years have passed since the 90% design documents were developed. During that time guidance for bicycle facilities has evolved as more bicyclists are taking advantage of existing infrastructure. New guidance on bicycle facilities has been released from different national organizations including the National Association of City Transportation Officials (NACTO), which states that the desirable bike lane width adjacent to a curbface is six feet.[18] Although, the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*[19] still states five feet as a minimum width for a bike lane. However, on busy streets with high volumes, a six foot bike lane is a more comfortable space for most users.

A modified cross section (as shown in Figure 5) was provided as another option that is consistent with current policies and standards, for consideration beyond the cross-section from the 90% design. Within the available right-of-way on Farmington Road, space can be allocation between motor vehicles, bicyclists, and pedestrians in various manners. The modified Cross Section design shows an alternative where one foot is taken from the outside travel lanes and reallocated to the bike lane. In this alternative, all travel lanes are eleven feet with a six foot bike lane. This alternative gives additional space for bicyclists, but reduces the lane width motor vehicles, which may require a design modification of the City of Beaverton's Minimum Arterial Street Widths standard drawing.[20]

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[17] City of Beaverton. Engineering Design Manual. Chapter 7, 730.1 Bicycle Lanes. http://www.beavertonoregon.gov/DocumentCenter/Home/View/318 Accessed February 26, 2013.
[18] NACTO. Conventional Bike Lanes. http://nacto.org/cities-for-cycling/design-guide/bike-lanes/conventional-bike-lanes/ Accessed February 26, 2013.
[19] AASHTO. Guide for the Development of Bicycle Facilities, 2012 Fourth Edition. Washington, D.C. 2012.
[20] City of Beaverton. Public Works Department. Minimum Arterial Street Widths. http://www.beavertonoregon.gov/DocumentCenter/Home/View/324. Accessed February 26, 2013.

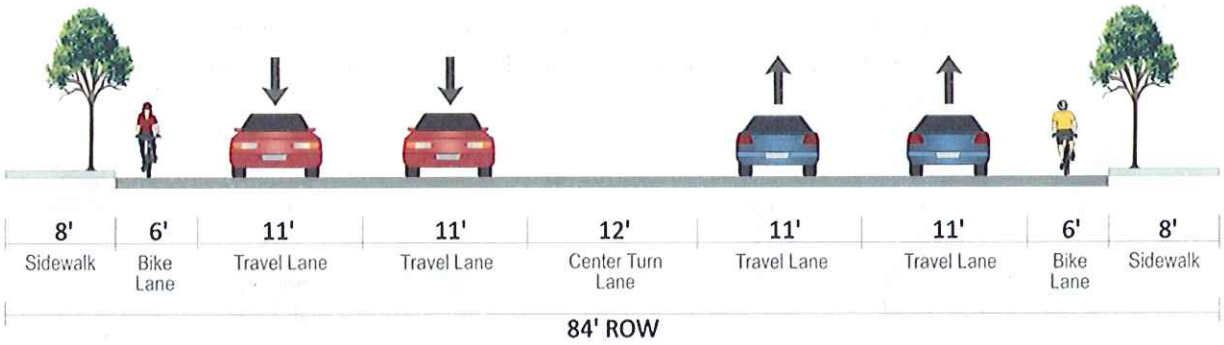

Figure 5. Farmington Road Modified Cross Section

RECOMMENDATIONS

The proposed design includes the following features (as shown in Figure 6):

- 141st Avenue will be realignment to 142nd Avenue at Farmington Road.
- A traffic signal at Farmington Road/141st Avenue/142nd Avenue will be installed.
- Double left turn lanes on all four approaches as well as single right turn lanes on the westbound, eastbound, and southbound approaches at the Farmington Road/Murray Boulevard intersection.
- Five-lane section on Hocken Avenue between Farmington Road and just south of the rail crossing, allowing for southbound double left turn lanes and a right turn lane on Hocken Avenue at Farmington Road.
- Exclusive left turn lanes along Farmington Road at all study intersections except for Normandy Place, which will have limited right-in right-out access.

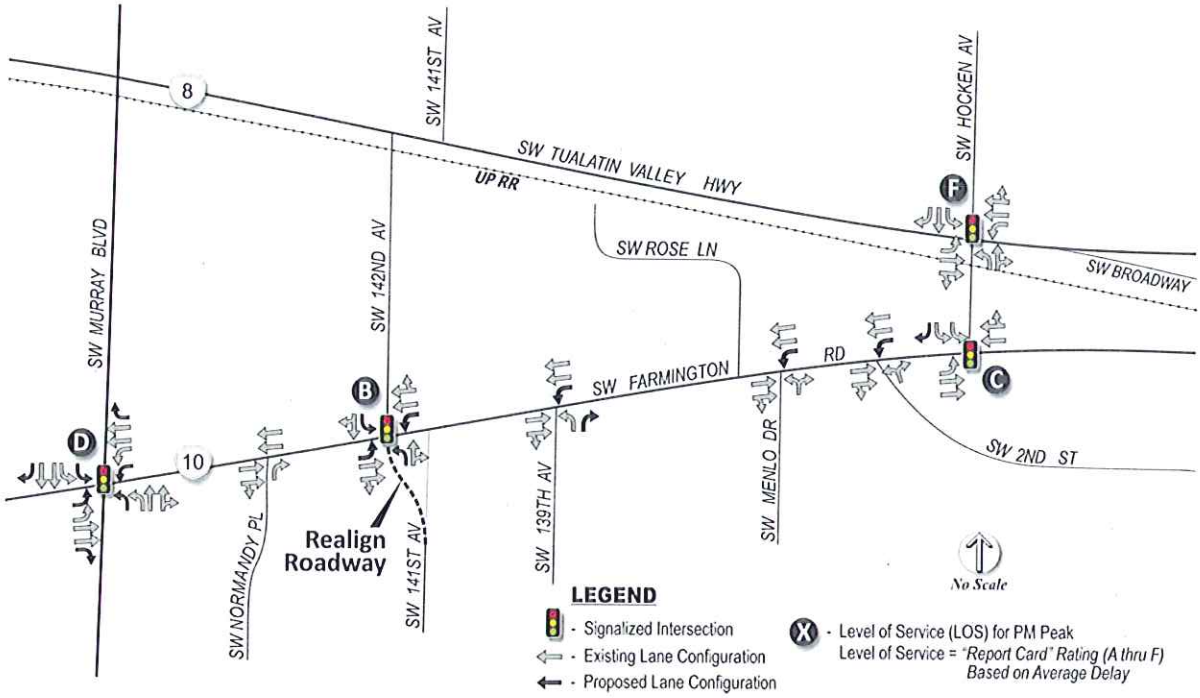

Figure 6. Proposed Lane Configuration and Future Traffic Operations

APPENDIX B:
APPROVED ENGINEERING DESIGN MANUAL MODIFICATIONS

- Request for Modification of Standards of the City of Beaverton Engineering Design Manual in conjunction with the Farmington Road Improvement Project dated May 15, 2013
- Amendment to Request for Modification of Standards of the City of Beaverton Engineering Design Manual in conjunction with the Farmington Road Improvement Project dated July 17, 2013
- City Engineer Approval of Engineering Design Manual modifications for Requests #1 and #2 dated July 31, 2013
- City Engineer Approval of Engineering Design Manual modifications for Request #3 dated July 26, 2013

May 15, 2013

Harper
Houf Peterson
Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
PHONE: 503.221.1131 www.hhpr.com FAX: 503.221.1171

Peter Arellano
City Engineer
City of Beaverton
PO Box 4755
Beaverton OR 97076

RE: Request for Modification of Standards in the City of Beaverton Engineering Design Manual in conjunction with the Farmington Road Improvement Project

Washington County, on behalf of the City of Beaverton, is requesting the following design modifications as part of the Farmington Road Project in accordance with Section 145 "Design Modifications" of the City of Beaverton Engineering Design Manual.

Project Background
The project started in 2001 as a City of Beaverton project using federal funding through the MTIP program. The design was developed through a public process that included a Project Advisory Committee (PAC) that met 11 times over a 15-month period, as well as two open houses. The PAC made a recommendation for a "preferred alternative" which was approved by the City in 2003/2004.

The PAC worked closely with the design team in the development of the project design that was ultimately recommended to City Council. The PAC was made up of a variety of stakeholders including commercial and residential property owners along the corridor, the neighborhood association, THPRD, TVFR, School District, the traffic commission, Friends of Beaverton Creek, and the Bike Task Force. This broad set of interested created a balanced look at the opportunities and constraints of the corridor to arrive at a recommended set of improvements.

Final design and construction of the project had been on hold since that time pending construction funding, which has now been secured through the Washington County MSTIP. With the current funding the project is being updated to get ready for construction. This includes the preparation of a Public Transportation Facility land use application and this Design Modification Request.

Proposed Improvements
This project will make needed safety and traffic capacity improvements to Farmington Road, between Murray Boulevard and Hocken Avenue, for all modes of transportation including:

- Widening of Farmington Road to five lanes (two lanes each direction with a center turn lane)
- Improvements to the intersection of Farmington Rd. and Murray Blvd.
- Realignment of 141st and 142nd Avenues
- Continuous sidewalks and bike lanes
- New street lighting and street trees
- Waterline improvements
- Sanitary sewer improvements

Design Modification Request #1
We request to eliminate the 7.5' width planter strip from the proposed typical section and provide a 8.5' curb tight sidewalk with tree wells. The justification for the modification is that as part of the extensive public involvement process for the project, the PAC reviewed three alternative cross sections. They included the City standard typical section (including planter strips), curb tight sidewalks, and expanded curb tight sidewalks with tree wells. It was the recommendation of the committee and subsequent recommendation of City Council to proceed with the expanded curb tight sidewalks with tree wells. This cross section best balanced the private property impacts associated with the road widening with the benefit received to pedestrians along this developed urban corridor.

Table 1. Summary of Beaverton Arterial Street Standards

Roadway Element	Standard Width	Proposed Width
Travel lane	11-12 feet	11-12 feet
Turn lane/median	12 feet	12 feet
Bike lane	5 feet	5 feet
Planter Strip	7.5 feet	**n/a**
Sidewalk	6 feet	**8.5 feet including tree wells**
Right-of-Way	96 feet	**86 feet**

Bold items indicate a modification from the City standard.

The project is requesting this modification under the City's Engineering Design Manual section 145.1.5 item 2: **"Topography, right-of-way, or other geographical conditions or impediments impose an undue economic hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility."**

Attached to this application is a summary of the evaluation worksheet used to evaluate the different cross section options for Farmington Road. This was completed and reviewed as part of the PAC process in early 2002. The evaluation criteria included the following items:

- Right of way impacts (by use) and cost
- Parking impacts,
- Access impacts
- Tree impacts
- Design exception requirements
- Pedestrian safety and accessibility
- Noise impacts
- Intersection impacts
- Natural resource impacts
- Aesthetic and visual impacts
- Overall estimated project cost

Based on this evaluation, curb tight sidewalks with tree wells was the recommended typical section based on its reduction in impacts compared with the city standard section and met more of the criteria than a standard curb tight sidewalk by providing additional width and tree canopy.

The purpose of such an extensive effort was to identify a set of improvements that best met the transportation demands of the corridor while balancing impacts to the adjacent properties. The modified typical section to include an 8.5 foot wide sidewalk with tree wells results in a reduction in right of way width of 10 feet. This reduction has a substantial reduction in impacts and

associated right of way acquisition associated with the project. The wider sidewalk with street trees helps to mitigate the narrower pedestrian corridor.

Design Modification Request #2
We request to reduce the design speed on the realignment of 141st Avenue to 142nd Avenue at Farmington Road from 35 mph to 25 mph. The primary reason for this change is to avoid impacts to a residential structure on 141st Avenue. The justification for the change is that 141st Avenue is a collector that is predominantly residential homes and already has traffic calming installed. Speeds are generally low, particularly approaching the intersection with Farmington Road. Additionally, the 25 mph curves will help keep speeds low after the intersection with Farmington Road is signalized.

Design Modification Request #3
We request to reduce the curb return radius required at the intersection of 141st/142nd and Farmington Road. Per the Engineering Design Manual, the curb returns must be designed to accommodate a WB-65 vehicle because it is an intersection of a collector and an arterial truck route. To accommodate this size vehicle requires widening the intersection throat and providing a two centered curb return radius. The proposed design uses a 40' radius. The primary reason for the proposed change is to reduce the right of way impacts and crossing distance of the side streets to Farmington Road. The justification for the change is that 141st Avenue is a collector that is predominantly residential homes and already has traffic calming installed. While truck traffic is not excluded from 141st Avenue, it is not he preferred or an anticipated route. 142nd Avenue is a short segment of roadway between Farmington Road and Tualatin Valley Highway. The intersection of 142nd and Tualatin Valley Highway is unsignalized, making it less desirable for truck traffic. The more appropriate truck route going both north and south of Farmington Road is Murray Boulevard. The reduction in curb radius will benefit pedestrians crossing the 141st or 142nd legs of the intersection be reducing the crossing distance and bringing the ramp location closer to the travel lane for better visibility. Turning templates are included in the attachments showing the required and proposed design of the intersection.

Attachments
Project Overview Strip Map (Project Location Map)
Request for Design Modification Application
PAC Evaluation Matrix
City standard typical section
Proposed typical section
Comparison of Design Speeds on 141st Avenue
141st/142nd Truck Turning Templates

We respectfully request your consideration and approval of these design modifications.

Ben Austin, PE
Project Engineer

July 17, 2013

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
PHONE: 503.221.1131 www.hhpr.com FAX: 503.221.1171

Peter Arellano
City Engineer
City of Beaverton
PO Box 4755
Beaverton OR 97076

RE: Amendment to Request for Modification of Standards in the City of Beaverton Engineering Design Manual in conjunction with the Farmington Road Improvement Project

A design modification request was submitted on May 15, 2013 for the Farmington Road Improvement Project. Based on comments from the City, the design modification request #3 has been revised. The revision is indicated in bold below.

Design Modification Request #3
We request to reduce the curb return radius required at the intersection of 141st/142nd and Farmington Road. Per the Engineering Design Manual, the curb returns must be designed to accommodate a WB-65 vehicle because it is an intersection of a collector and an arterial truck route. To accommodate this size vehicle requires widening the intersection throat and providing a two centered curb return radius. ***The proposed design uses a 40' radius on the 141st leg of the intersection and can accommodate a WB-50 turning onto 141st while splitting the two through lanes on Farmington. The proposed design uses a 40' radius on the west and a two centered curve on the east returns of the 142nd leg of the intersection and can accommodate a WB-62 turning onto 142nd while splitting the two through lanes on Farmington.*** The primary reason for the proposed change is to reduce the right of way impacts and crossing distance of the side streets to Farmington Road. The justification for the change is that 141st Avenue is a collector that is predominantly residential homes and already has traffic calming installed. While truck traffic is not excluded from 141st Avenue, it is not he preferred or an anticipated route. 142nd Avenue is a short segment of roadway between Farmington Road and Tualatin Valley Highway***. This segment is wider to accommodate more truck traffic, but has been reduced to a WB-62 to reduce the size of the intersection.*** The more appropriate truck route going both north and south of Farmington Road is Murray Boulevard. The reduction in curb radius will benefit pedestrians crossing the 141st or 142nd legs of the intersection be reducing the crossing distance and bringing the ramp location closer to the travel lane for better visibility. Turning templates are included in the attachments showing the required and proposed design of the intersection.

Attachments
141st/142nd Revised Truck Turning Templates

We respectfully request your consideration and approval of these design modifications.

Ben Austin, PE
Project Engineer

City Engineer Approval of Engineering Design Modification Request #1 and #2

From: Peter Arellano <parellano@beavertonoregon.gov>
Date: July 31, 2013, 5:48:46 PM PDT
To: Ben Austin <BenA@hhpr.com>, Jim Brink <jbrink@beavertonoregon.gov>
Cc: Abe Turki <Abraham_Turki@co.washington.or.us>, Dan Houf <Dan@hhpr.com>, Jabra Khasho <jkhasho@beavertonoregon.gov>, Jim Duggan <jduggan@beavertonoregon.gov>, Wendy Prather <wprather@beavertonoregon.gov>
Subject: RE: Farmington Road Design Modification Request

Ben,

Design Modification Request #1

I do not have any problem with using 8.5 foot wide curb tight sidewalk with tree wells in lieu of the standard 6 foot sidewalk and 7.5 foot wide planter strip however ultimate approval for sidewalk widths and locations comes from the land use process at the City of Beaverton.

Design Modification Request #2

The requested modification to reduce the design speed on 141st Ave. through the reversing curves immediately south of Farmington is approved as requested.

peter

From: Ben Austin [mailto:BenA@hhpr.com]
Sent: Wednesday, July 31, 2013 4:31 PM
To: Peter Arellano; Jim Brink
Cc: Abe Turki; Dan Houf; Jabra Khasho; Jim Duggan; Wendy Prather
Subject: RE: Farmington Road Design Modification Request

Peter:

In looking back at our other email about the Design Modification requests, I can't seem to find a written record of approval of requests #1 and #2. I seem to recall we spoke on the phone. Can you please confirm that all three requests are approved?

Thanks,

Ben

Benjamin R. Austin, P.E.
Associate

HARPER HOUF PETERSON RIGHELLIS INC.
205 SE Spokane Street | Suite 200 | Portland, OR | 97202
p: 503.221.1131 | f: 503.221.1171 | bena@hhpr.com | hhpr.com

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City Engineer Approval of Engineering Design Modification Request #3

From: Peter Arellano [parellano@beavertonoregon.gov]
Sent: Friday, July 26, 2013 7:02 PM
To: Ben Austin; Jim Brink
Cc: Abe Turki; Dan Houf; Jabra Khasho; Jim Duggan; Wendy Prather
Subject: RE: Farmington Road Design Modification Request
Attachments: WAS24-Request for Design Modification-Revision-07162013.pdf; RE: Farmington Road - 141st Truck Turning

Ben,
The revised request for Design Modification is approved as submitted. This approval supersedes the approval in the
attached email.
peter

From: Ben Austin [mailto:BenA@hhpr.com]
Sent: Tuesday, July 16, 2013 10:21 AM
To: Jim Brink; Peter Arellano
Cc: Abe Turki; Dan Houf
Subject: Farmington Road Design Modification Request

Jim and Peter:
Based on our conversations about the curb returns at 141st/142nd, we have revised the north side to accommodate a WB-62. Attached is a memo to supplement the original design modification request. The memo summarizes the modifications made to accommodate trucks at 141st/142nd and should be considered a supplement to the original modification request. Please let me know if you have questions.
Thanks,
Ben

Benjamin R. Austin, P.E.
Associate

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FARMINGTON ROAD IMPROVEMENTS (PTF2013-0002, SDM2013-0006)

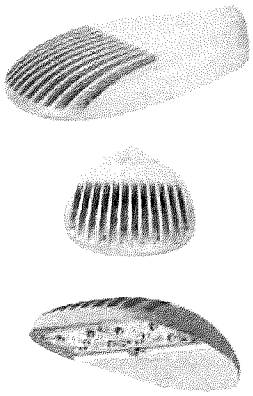
LIGHTING CUT SHEETS

XSP2™

XSP Series LED Street Light – Horizontal Tenon – Type III

Product Description

Designed from the ground up as a totally optimized LED street light system, the XSP Series delivers incredible efficiency and is designed to provide L70 lifetime over 100,000 hours without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic® Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree XSP Series LED Street Light is the best alternative for traditional street lighting with better payback and better performance



Performance Summary

Utilizes BetaLED® Technology

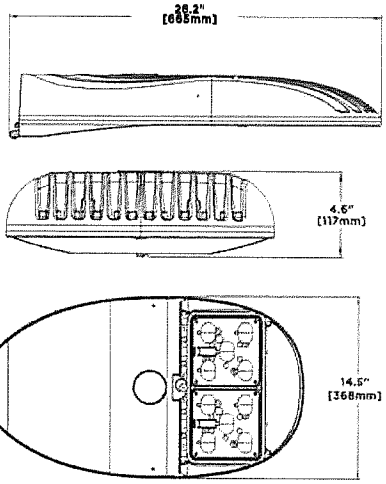
NanoOptic Precision Delivery Grid optic

CRI: Minimum 70 CRI

CCT: 4000K (+/- 300K), 5700K (+/- 500K)

Warranty: 10 years on luminaire/limited 10 years on Colorfast DeltaGuard® finish

Made in the U.S.A. of U.S. and imported parts



Accessories

Field Installed Accessories
XA-SP2BLS Backlight Control Shield - Provides 1/2 Mounting Height Cutoff
XA-SP2BRDSPK Bird Spikes

Ordering Information

Example: BXSPA032A-USF

BXSP	A	0	3	2	A	-	U	S	
Product	Version	Mounting	Optic	Packages	Input Power	-	Voltage	Color Options	Options
BXSP	A	0 Horizontal Tenon	3 Type III H Type III w/ BLS	2 Standard 4000K B Standard 5700K H High Efficacy 4000K* P High Efficacy 5700K*	A 101W	-	U Universal 120-277V V Universal 347-480V**	S Silver (Standard) T Black Z Bronze B Platinum Bronze W White	A ROAM® Controls - Installation of ROAM dimming control module only. Services provided by others - Includes R option F Fuse - When code dictates fusing, use time delay fuse - Not available with V voltage K Occupancy Control - Refer to Occupancy Control spec sheet for details N Utility Label and NEMA Photocell Receptacle - Includes Q option - Refer to Field Adjustble Output spec sheet for details Q Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details R NEMA Photocell Receptacle - Photocell by others U Utility Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q option - Refer to Field Adjustable Output spec sheet for details

* Available Q3 2012. Preliminary data shown

** 347-480V utilizes magnetic step-down transformer. For input power for 347-480V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table below

BetaLED TECHNOLOGY

RoHS

c UL us

Rev Date: 9/14/2012

CREE®

Product Specifications

CONSTRUCTION & MATERIALS

- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" IP (1.66" [42mm] O.D.) or 2" IP (2.375" [60mm] O.D.) horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultradurable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Standard is silver. Black, bronze, platinum bronze and white are also available

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz
- Class 2 output
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS

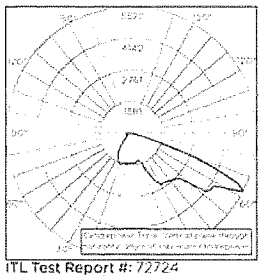
- cULus Listed
- Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL"). Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details.
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets CALTrans 611 Vibration testing and GR-63-CORE Section 4.4.1/5.4.2 C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- RoHS Compliant
- Meets Buy American requirements within ARRA

PATENTS

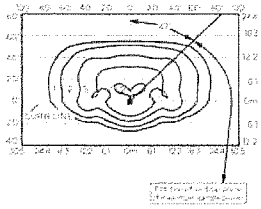
- Visit website for patents that cover these products: Patents http://www.cree.com/patents

Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by Independent Testing Laboratories, a NVLAP certified laboratory



ITL Test Report #: 72724
BXSPA*32A-U
Initial Delivered Lumens: 7,406



BXSPA*32A-U
Mounting Height: 25' (7.6m)
Initial Delivered Lumens: 7,000
Initial FC at grade.

Lumen Output, Electrical, and Lumen Maintenance Data

Type 3 Distribution

Module	Input Power Designator	4000K		5700K		System Watts 120-277V	TOTAL CURRENT				System Watts 347-480V	TOTAL CURRENT		50K Hours Calculated Lumen Maintenance Factor @ 15°C (59°F)***
		Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11		120V	208V	240V	277V		347V	480V	
Standard	A	7,000	B2 U0 G1	7,700	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	9,612	B2 U0 G2	10,680	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

Type 3 Distribution w/ BLS

Module	Input Power Designator	4000K		5700K		System Watts 120-277V	TOTAL CURRENT				System Watts 347-480V	TOTAL CURRENT		50K Hours Calculated Lumen Maintenance Factor @ 15°C (59°F)***
		Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11		120V	208V	240V	277V		347V	480V	
Standard	A	6,130	TBD	6,742	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	8,417	TBD	9,352	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

* Available Q3 2012. Preliminary data shown.

** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratac/TM-15-11BugRatingsAddendum.pdf

*** Projected L_{70} (6K) Hours >36,000. For recommended lumen maintenance factor data see TD-13.

EPA and Weight

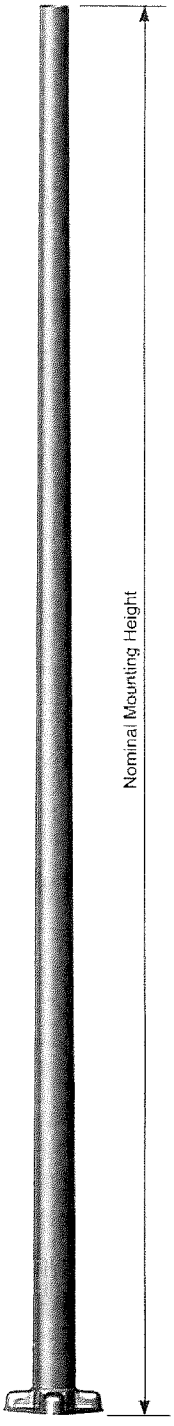
Input Power Designator	Weight 120-277V	Weight 347-480V	EPA				
			1@90	2@90	2@180	3@90	4@90
A	26 lbs (12kg)	29 lbs (13.2kg)	0.692	1.140	1.384	1.832	2.280

www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

valmont STRUCTURES

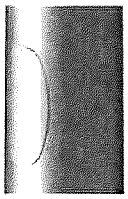
28' to 33' ROUND TAPERED ALUMINUM 4-Bolt Anchor Base

Job Name:	Client Name:
Job Location - City: State:	Created By: Date:
Product: Quote:	Customer Approval: Date:

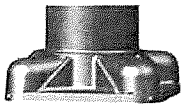


Tenon Top

Handhole



Nut Covers



SPECIFICATIONS

Pole - The pole shaft is spun from seamless alloy aluminum.

Pole Top - A pole top tenon is provided for top mount luminaire and/or bracket. A removable pole cap is available for poles receiving drilling patterns for side-mount luminaire arm assemblies.

Handhole - A covered handhole with hardware and grounding provision are provided.

Base Cover - Optional decorative base covers available as special order.

Anchor Base - The anchor base is cast from 356 alloy aluminum. The completed assembly is heat-treated to a T6 temper. Aluminum nut covers are included with anchor base unless otherwise specified.

Anchor Bolts - Anchor bolts conform to ASTM F1554 Grade 55 and are provided with two hex nuts and two flat washers. Bolts have an "L" bend on one end and are galvanized a minimum of 12" on the threaded end.

Finish - The standard finish for the pole assembly and components is satin brushed, natural anodize, duranodic or polyester powder applied coating in accordance with Valmont's Specifications. Additional finish options available upon request.

Design Criteria - Please reference Design Criteria Specification for appropriate design conditions.

28' to 33' ROUND TAPERED ALUMINUM 4-Bolt Anchor Base

valmont STRUCTURES

Job Name: _____ Client Name: _____

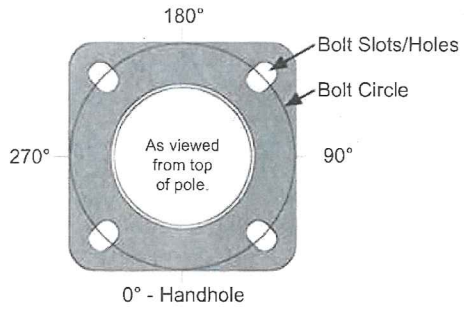
Job Location - City: _____ State: _____ Created By: _____ Date: _____

Product: _____ Quote: _____ Customer Approval: _____ Date: _____

ANCHORAGE DATA

POLE		BASE PLATE				ANCHOR BOLTS		
BASE OD (IN)	WALL THK (GA)	BOLT CIRCLE DIA (IN)	BOLT CIRCLE ± (IN)	SQUARE (IN)	THK (IN)	DIA x LENGTH x HOOK (IN)	PROJECTION (IN)	± (IN)
7.00	0.156	10.56	0.43	11.26	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.156	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.188	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.250	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
9.00	0.156	13.25	0.75	12.48	1.250	1.00 x 36.00 x 4.00	4.13	N/A
9.00	0.188	13.25	0.75	12.48	1.250	1.00 x 36.00 x 4.00	4.13	N/A
10.00	0.188	14.31	0.69	13.19	1.250	1.00 x 36.00 x 4.00	4.75	N/A
10.00	0.250	14.50	0.50	14.00	1.250	1.25 x 42.00 x 6.00	5.25	N/A

Anchor Base Detail



LOAD AND DIMENSIONAL DATA

DESIGN INFORMATION											POLE DIMENSIONS					
	70 MPH w/1.3 GUST		80 MPH w/1.3 GUST		90 MPH w/1.3 GUST		100 MPH w/1.3 GUST		110 MPH w/1.3 GUST							
NOMINAL MOUNTING HEIGHT	MAX EPA[1] (SQ FT)	MAX WEIGHT (LBS)	MAX EPA[1] (SQ FT)	MAX WEIGHT (LBS)	MAX EPA[1] (SQ FT)	MAX WEIGHT (LBS)	MAX EPA[1] (SQ FT)	MAX WEIGHT (LBS)	MAX EPA[1] (SQ FT)	MAX WEIGHT (LBS)	POLE HEIGHT	BASE OD (IN)	TOP OD (IN)	WALL THK (IN)	STRUCTURE WEIGHT[2] (LBS)	MODEL NUMBER
28'-0"	10.5	150	7.1	150	5.0	150	3.7	150	2.8	150	27'-8"	7.00	4.00	0.156	92	+27084070ST4
	15.5	150	11.1	150	8.3	150	6.5	150	5.1	150	27'-8"	8.00	4.50	0.156	105	27084580ST4
	19.6	150	14.3	150	10.8	150	8.5	150	6.8	150	27'-8"	8.00	4.50	0.188	124	27084580ST4
	27.4	150	20.2	150	15.5	150	12.3	150	9.9	150	27'-8"	8.00	4.50	0.250	161	270845808T4
	21.4	150	15.7	150	12.0	150	9.4	150	7.5	150	27'-8"	9.00	4.50	0.156	116	27084590ST4
	26.8	150	19.8	150	15.2	150	12.0	150	9.7	150	27'-8"	9.00	4.50	0.188	137	270845906T4
	34.5	200	26.0	200	20.2	200	16.0	200	12.9	200	27'-8"	10.00	6.00	0.188	161	270860106T4
	46.6	300	35.3	300	27.5	300	22.0	300	17.8	300	27'-8"	10.00	6.00	0.250	217	270860108T4
30'-0"	8.8	150	5.7	150	3.8	150	2.7	150	2.0	150	29'-8"	7.00	4.00	0.156	99	+29084070ST4
	13.3	150	9.3	150	6.9	150	5.3	150	4.1	150	29'-8"	8.00	4.50	0.156	113	+29084580ST4
	17.1	150	12.2	150	9.2	150	7.1	150	5.6	150	29'-8"	8.00	4.50	0.188	134	290845806T4
	18.8	150	13.6	150	10.3	150	8.0	150	6.3	150	29'-8"	9.00	4.50	0.156	127	29084590ST4
	23.7	150	17.4	150	13.3	150	10.4	150	8.3	150	29'-8"	9.00	4.50	0.188	149	290845906T4
	24.2	150	17.7	150	13.6	150	10.7	150	8.6	150	29'-8"	8.00	4.50	0.250	174	290845808T4
	30.9	200	23.2	200	17.9	200	14.1	200	11.3	200	29'-8"	10.00	6.00	0.188	175	290860106T4
	41.9	300	31.7	300	24.6	300	19.6	300	15.8	300	29'-8"	10.00	6.00	0.250	235	290860108T4
33'-0"	10.4	150	7.1	150	5.1	150	3.8	150	2.9	150	32'-8"	8.00	4.50	0.156	124	+32084580ST4
	13.8	150	9.7	150	7.1	150	5.5	150	4.2	150	32'-8"	8.00	4.50	0.188	147	32084580ST4
	15.3	150	10.9	150	8.1	150	6.2	150	4.8	150	32'-8"	9.00	4.50	0.156	138	+32084590ST4
	19.7	150	14.2	150	10.7	150	8.4	150	6.6	150	32'-8"	9.00	4.50	0.188	163	320845906T4
	20.1	150	14.5	150	11.0	150	8.6	150	6.8	150	32'-8"	8.00	4.50	0.250	190	32084580ST4
	26.0	200	19.4	200	14.9	200	11.7	200	9.2	200	32'-8"	10.00	6.00	0.188	191	320860106T4
	35.8	300	26.9	300	20.8	300	16.4	300	13.1	300	32'-8"	10.00	6.00	0.250	257	320860108T4

1. EPA represents the Effective Projected Area of each luminaire. Designs are limited to top mount or side-mount luminaires. Variations from sizes above are available upon inquiry at the factory. Satisfactory performance of poles is dependent upon the pole being properly attached to a supporting foundation of adequate design.
2. Structure weight is a nominal value which includes the pole shaft and base plate.
   + Pole includes factory installed vibration damper.

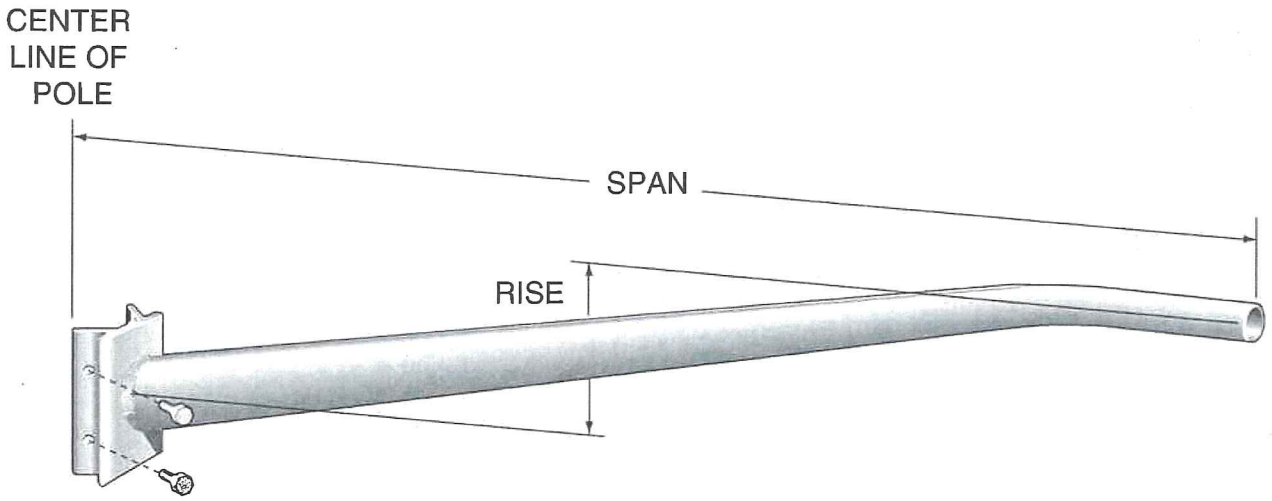
PRODUCT ORDERING CODES

CROSS SECTION	MODEL NUMBER	FIXTURE MOUNTING	COLOR		OPTIONS
R	320845806T4	PQ	DNA	204	
R = Round	+27084070ST4 270845805T4L 270845806T4 270845808T4 270845905T4 270845906T4 270860106T4 270860108T4 +290840705T4 +290845805T4 290845806T4 290845905T4 290845906T4 290845808T4 290860106T4 290860108T4 +320845805T4 320845806T4 +320845905T4 320845906T4 320845808T4 3208601O6T4 320860108T4	**Drill Mounting** D1 = 1 Luminaire D2 = 2 @ 180° D3 = 3 @ 120° D4 = 4 @ 90° D5 = 2 @ 90° D6 = 3 @ 90° **Tenon Mounting** P2 = 2.38" OD x 4.00" P3 = 3.50" OD x 6.00" P4 = 4.00" OD x 6.00" P5 = 2.88" OD x 4.00" P7 = 2.38" OD x 5.00" PQ = 2.38" OD x 12.00" PD = 3.00" OD x 3.00" -- = Plain Top P9 = Other Tenon (Contact Factory)	**Polyester Powder** DWH = White DSS = Sandstone BR = Burgundy HG = Hunter Green DNA = Natural Aluminum DCG = Charcoal Gray DMB = Medium Bronze SBN = Sanded Brown DNB = New Dark Bronze DDB = Dark Bronze SBK = Sanded Black DBL = Black DSB = Steel Blue DTG = Dark Green DBR = Red SC = Special Color (Contact Factory)	**Anodized** 204 = Clear Natural 311 = Light Bronze* 312 = Medium Bronze* 313 = Dark Bronze* 335 = Black* *Duranodic Anodize **Brushed** SBF = Satin Brushed	See Accessories at valmontstructures.com (Please Specify with Code)

SPC7540 05/11 valmontstructures.com carries the most current spec information and supersedes these guidelines.

valmont STRUCTURES ALUMINUM

4′, 6′ AND 8′ TAPERED BOLT MOUNT ELLIPTICAL MAST ARMS



BOLT MOUNT SPECIFICATIONS

- The mast arm is conically tapered from 3-1/2" O.D. x .125" wall 6063 alloy extruded aluminum tube to 2-3/8" O.D. (2" pipe size) at the luminaire end. The tapered tube is elliptical with the long axis oriented vertically. The arm is joined to the attachment system by a continuous circumferential weld. Each arm is heat treated after welding to produce a T6 temper. All arms are etched to create a satin finish. A 1-5/8" O.D. (1-1/4" pipe size) cast aluminum tenon may be installed in the luminaire end of the arm. Architectural finishes available are: paint, duranodic or natural anodized. All arms have a 32" rise. For additional information, contact your Valmont representative.
- Bolt mounted pole arms are held in place with (4) series 300 stainless steel 1/2"-13 UNC bolts, nuts, washers, and lock washers. The lighting standard is pre-drilled for the bolts and a 1" I.D. rubber grommet is installed in the wireway. Bolt mount arms fit 4", 4-1/2", and 6" O.D. pole tops. Unless otherwise directed, the first mast arm will be 90° to the right of the handhole, the second mast arm will be located 180° from the first.
- The following charts show the maximum allowable fixture EPA for the five wind zones acknowledged by AASHTO. The allowable EPA is based on a fixture weighing 75 pounds unless noted on the chart.
- Alternative arm lengths, rises, and mounting systems are available.

CATALOG LOGIC

Number of Arms	Type of Arms	Length of Arms	Rise of Arms	Mounting Style	Finishes	Options
1	MA	08	32	B	DNA	

Number of Arms	Type of Arms	Length of Arms	Rise of Arms	Mounting Style	Finishes	Options
1 – Single 2 – Double (2@180°)	MA – Tapered Elliptical Mast Arm	IN FEET 04 – 4 Feet 06 – 6 Feet 08 – 8 Feet	IN INCHES 32 – 32 Inches	B – Bolt Mount 45=fits 4.5" OD pole top	POLYESTER POWDER DBL – Black DBR – Bright Red DCG – Charcoal Gray DDB – Dark Bronze DMB – Med Bronze DNA – Natural Alum DSB – Steel Blue DSS – Sandstone DTG – Dark Green DWH – White SC – Special Color (Please Specify) ANODIZED 204 – Clear Natural 311 – Light Bronze* 312 – Med Bronze* 313 – Dark Bronze* 335 – Black* * Duranodic Anodize BRUSHED SBF – Satin Brushed Finish	See Accessory Section (Please Specify with Code #)

Customer Approval:

signature date

Job Name: _____ Quote: _____

Client Name: _____

Created By: _____ Date: _____

4′, 6′ AND 8′ TAPERED BOLT MOUNT ELLIPTICAL MAST ARMS

valmont STRUCTURES ALUMINUM

BOLT MOUNT 4′ SINGLE TAPERED MAST ARM
SPAN 45″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	6.0	6.0	5.3	4.0	2.9	170840605T4
20′	6.0	6.0	5.3	4.2	3.5	170840606T4
25′	6.0	4.2	2.5	1.5	0.7	220840605T4
25′	6.0	6.0	3.9	2.6	1.7	220840606T4
25′	6.0	6.0	5.3	3.9	2.8	220840705T4
30′	6.0	4.4	2.7	1.5	0.8	+270840705T4
30′	6.0	6.0	5.3	4.0	2.7	270845805T4
30′	6.0	6.0	5.3	4.2	3.5	270845806T4
35′	6.0	4.7	2.9	1.7	0.9	+320845805T4
35′	6.0	6.0	4.8	3.3	2.1	320845806T4
35′	6.0	6.0	5.3	4.2	3.5	320845808T4
39′	6.0	4.6	2.8	1.6	0.7	+360845806T4
39′	6.0	6.0	5.3	4.1	2.7	360845808T4

BOLT MOUNT 4′ DOUBLE TAPERED MAST ARM
SPAN 45″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	5.9	3.8	2.5	1.5	0.8	170840605T4
20′	7.1	5.3	3.5	2.4	1.5	170840606T4
25′	3.1	1.4	—	—	—	220840605T4
25′	4.5	2.6	1.3	0.6	—	220840606T4
25′	6.0	3.8	2.4	1.3	0.7	220840705T4
25′	7.1	6.4	4.5	3.1	2.1	220845805T4
30′	3.3	1.5	—	—	—	+270840705T4
30′	6.0	3.8	2.4	1.3	0.6	270845805T4
30′	7.1	5.4	3.6	2.5	1.5	270845806T4
30′	7.1	7.1	6.2	4.9	4.1	270860106T4
35′	3.4	1.6	0.7	—	—	+320845805T4
35′	5.3	3.1	1.8	0.8	—	320845806T4
35′	7.1	5.8	3.9	2.6	1.6	320845808T4
35′	7.1	7.1	6.1	4.2	2.9	320860106T4
39′	3.4	1.6	0.6	—	—	+360845806T4
39′	6.5	4.0	2.5	1.4	0.6	360845808T4

BOLT MOUNT 6′ SINGLE TAPERED MAST ARM
SPAN 68″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	6.0	4.7	3.6	2.8	2.3	170840605T4
25′	6.0	3.6	2.0	1.0	—	220840605T4
25′	6.0	4.7	3.4	2.1	1.3	220840606T4
25′	6.0	4.7	3.6	2.8	2.3	220840705T4
30′	6.0	3.9	2.2	1.1	—	+270840705T4
30′	6.0	4.7	3.6	2.8	2.3	270845805T4
35′	6.0	4.2	2.4	1.3	—	+320845805T4
35′	6.0	4.7	3.6	2.8	1.6	320845806T4
35′	6.0	4.7	3.6	2.8	2.3	320845808T4
39′	6.0	4.1	2.4	1.1	—	+360845806T4
39′	6.0	4.7	3.6	2.8	2.3	360845808T4

BOLT MOUNT 6′ DOUBLE TAPERED MAST ARM
SPAN 68″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	5.3	3.3	1.9	0.9	—	170840605T4
20′	7.1	4.7	3.1	1.9	1.2	170840606T4
20′	7.1	5.5	4.1	2.8	1.9	170840705T4
25′	5.4	3.2	1.8	0.8	—	220840705T4
25′	7.1	5.5	3.9	2.6	1.5	220845805T4
25′	7.1	5.5	4.2	3.3	2.7	220845806T4
30′	2.7	1.2	—	—	—	+270840705T4
30′	5.4	3.2	1.8	0.8	—	270845805T4
30′	7.1	4.9	3.2	1.9	1.1	270845806T4
30′	7.1	5.5	4.2	3.3	2.6	270845808T4
35′	4.7	2.6	1.3	—	—	320845806T4
35′	7.1	5.3	3.4	2.1	1.1	320845808T4
35′	7.1	5.5	4.2	3.3	2.4	320860106T4
39′	2.8	1.2	—	—	—	+360845806T4
39′	5.9	3.4	1.9	0.8	—	360845808T4
39′	7.1	5.5	3.9	2.4	1.2	360860106T4
39′	7.1	5.5	4.2	3.3	2.7	360860108T4

BOLT MOUNT 8′ SINGLE TAPERED MAST ARM
SPAN 90″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	4.5	3.2	2.4	1.7	1.3	170840605T4
25′	4.5	2.9	1.3	—	—	220840605T4*
25′	4.5	3.2	2.4	1.2	—	220840606T4
25′	4.5	3.2	2.4	1.7	1.3	220840705T4
30′	4.5	3.2	1.5	—	—	+270840705T4*
30′	4.5	3.2	2.4	1.7	1.3	270845805T4
35′	4.5	3.2	1.5	—	—	+320845805T4
35′	4.5	3.2	2.4	1.7	0.8	320845806T4
35′	4.5	3.2	2.4	1.7	1.3	320845808T4
39′	4.5	3.2	1.5	—	—	+360845806T4
39′	4.5	3.2	2.4	1.7	1.3	360845808T4

BOLT MOUNT 8′ DOUBLE TAPERED MAST ARM
SPAN 90″, RISE 32″, FIXTURE SLIPFITTER 2-3/8″ O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.²					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20′	4.2	2.2	0.8	—	—	170840605T4
20′	5.3	3.8	2.0	0.8	—	170840606T4
25′	2.9	1.1	—	—	—	220840606T4
25′	4.4	2.1	0.7	—	—	220840705T4
25′	5.3	3.8	2.8	1.5	0.6	220845805T4
30′	4.4	2.1	0.8	—	—	270845805T4
30′	5.3	3.8	2.1	0.9	—	270845806T4
30′	5.3	3.8	2.8	2.0	1.5	270845808T4
35′	3.6	1.5	—	—	—	320845806T4
35′	5.3	3.8	2.4	1.1	—	320845808T4
35′	5.3	3.8	2.8	2.0	1.3	320860106T4
39′	4.8	2.4	0.9	—	—	360845808T4
39′	5.3	3.8	2.8	1.3	—	360860106T4
39′	5.3	3.8	2.8	2.0	1.5	360860108T4

*60 lbs. maximum allowable fixture weight.
+ These pole/arm combinations include factory installed vibration dampeners inside pole.
Designs for greater E.P.A. loading and/or dimensional requirements available. Contact your Valmont Representative or Valmont Industries, Inc. for assistance.

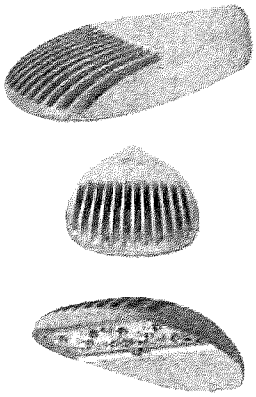
SPC7099 08/07 www.valmontstructures.com carries the most current spec information and supercedes these guidelines

XSP2™

XSP Series LED Street Light – Horizontal Tenon – Type III

Product Description

Designed from the ground up as a totally optimized LED street light system, the XSP Series delivers incredible efficiency and is designed to provide L70 lifetime over 100,000 hours without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic® Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree XSP Series LED Street Light is the best alternative for traditional street lighting with better payback and better performance.



Performance Summary

Utilizes BetaLED® Technology

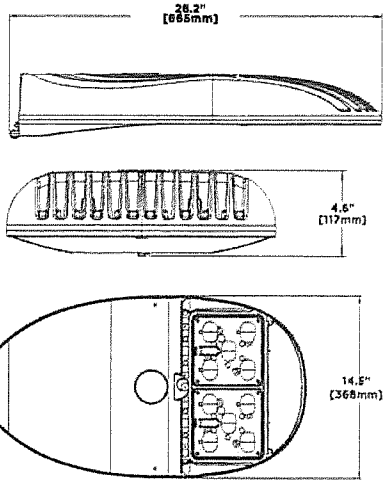
NanoOptic Precision Delivery Grid optic

CRI: Minimum 70 CRI

CCT: 4000K (+/- 300K), 5700K (+/- 500K)

Warranty: 10 years on luminaire/limited 10 years on Colorfast DeltaGuard® finish

Made in the U.S.A. of U.S. and imported parts



Accessories

Field Installed Accessories
XA-SP2BLS Backlight Control Shield - Provides 1/2 Mounting Height Cutoff
XA-SP2BRDSPK Bird Spikes

Ordering Information

Example: BXSPA032A-USF

BXSP	A	0	3	2	A	-	U	S	
Product	Version	Shielding	Optic	Modules	Input Power	-	Voltage	Color Options	Options
BXSP	A	0 Horizontal Tenon	3 Type III H Type III w/ BLS	2 Standard 4000K B Standard 5700K H High Efficacy 4000K* P High Efficacy 5700K*	A 101W	-	U Universal 120-277V V Universal 347-480V**	S Silver (Standard) T Black Z Bronze B Platinum Bronze W White	A ROAM® Controls - Installation of ROAM dimming control module only. Services provided by others - Includes R option F Fuse - When code dictates fusing, use time delay fuse - Not available with V voltage K Occupancy Control - Refer to Occupancy Control spec sheet for details N Utility Label and NEMA Photocell Receptacle - Includes Q option - Refer to Field Adjustble Output spec sheet for details Q Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details R NEMA Photocell Receptacle - Photocell by others U Utility - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q option - Refer to Field Adjustable Output spec sheet for details

* Available Q3 2012. Preliminary data shown.

** 347-480V utilizes magnetic step-down transformer. For input power for 347-480V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table below.

BetaLED TECHNOLOGY

RoHS

c UL us

Rev. Date: 9/14/2012

CREE

Product Specifications

CONSTRUCTION & MATERIALS

- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" IP (1.66" [42mm] O.D.) or 2" IP (2.375" [60mm] O.D.) horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultradurable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Standard is silver. Black, bronze, platinum bronze and white are also available

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz
- Class 2 output
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS

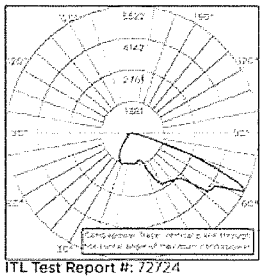
- cULus Listed
- Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL"). Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details.
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets CALTrans 611 Vibration testing and GR-63-CORE Section 4.4.1/5.4.2 C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- RoHS Compliant
- Meets Buy American requirements within ARRA

PATENTS

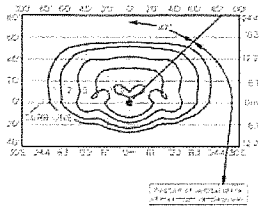
- Visit website for patents that cover these products: Patents http://www.cree.com/patents

Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by Independent Testing Laboratories, a NVLAP certified laboratory



ITL Test Report #: 72724
BXSPA*32A-U
Initial Delivered Lumens: 7,406



BXSPA*32A-U
Mounting Height: 25' (7.6m)
Initial Delivered Lumens: 7,000
Initial I-C at grade.

Lumen Output, Electrical, and Lumen Maintenance Data

Type 3 Distribution														
Module	Input Power Designator	4000K		5700K		System Watts 120-277V	TOTAL CURRENT				System Watts 347-480V	TOTAL CURRENT		50K Hours Calculated Lumen Maintenance Factor @ 15°C (59°F)***
		Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11		120V	208V	240V	277V		347V	480V	
Standard	A	7,000	B2 U0 G1	7,700	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	9,612	B2 U0 G2	10,680	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

Type 3 Distribution w/ BLS														
Module	Input Power Designator	4000K		5700K		System Watts 120-277V	TOTAL CURRENT				System Watts 347-480V	TOTAL CURRENT		50K Hours Calculated Lumen Maintenance Factor @ 15°C (59°F)***
		Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11		120V	208V	240V	277V		347V	480V	
Standard	A	6,130	TBD	6,742	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	8,417	TBD	9,352	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

* Available Q3 2012. Test industry data shown.
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.ies.org/PDF/Errata/TM-15-11BugRatingsAddendum.pdf
*** Projected L_{70} (6K) Hours >36,000. For recommended lumen maintenance factor data see TD-13.

EPA and Weight

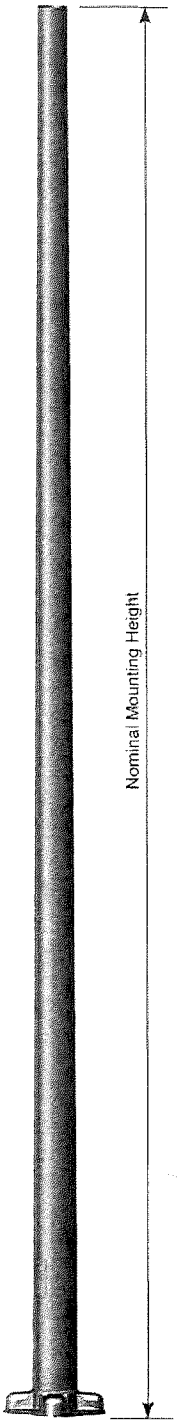
Input Power Designator	Weight 120-277V	Weight 347-480V	EPA				
			1@90	2@90	2@180	3@90	4@90
A	26 lbs (12kg)	29 lbs (13.2kg)	0.692	1.140	1.384	1.832	2.280

www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

valmont STRUCTURES

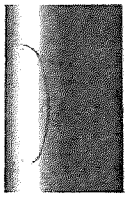
28' to 33' ROUND TAPERED ALUMINUM
4-Bolt Anchor Base

Job Name: _____	Client Name: _____
Job Location - City: _____ State: _____	Created By: _____ Date: _____
Product: _____ Quote: _____	Customer Approval: _____ Date: _____

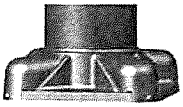


Tenon Top

Handhole



Nut Covers



SPECIFICATIONS

Pole - The pole shaft is spun from seamless alloy aluminum.

Pole Top - A pole top tenon is provided for top mount luminaire and/or bracket. A removable pole cap is available for poles receiving drilling patterns for side-mount luminaire arm assemblies.

Handhole - A covered handhole with hardware and grounding provision are provided.

Base Cover - Optional decorative base covers available as special order.

Anchor Base - The anchor base is cast from 356 alloy aluminum. The completed assembly is heat-treated to a T6 temper. Aluminum nut covers are included with anchor base unless otherwise specified.

Anchor Bolts - Anchor bolts conform to ASTM F1554 Grade 55 and are provided with two hex nuts and two flat washers. Bolts have an "L" bend on one end and are galvanized a minimum of 12" on the threaded end.

Finish - The standard finish for the pole assembly and components is satin brushed, natural anodize, duranodic or polyester powder applied coating in accordance with Valmont's Specifications. Additional finish options available upon request.

Design Criteria - Please reference Design Criteria Specification for appropriate design conditions.

28' to 33' ROUND TAPERED ALUMINUM 4-Bolt Anchor Base

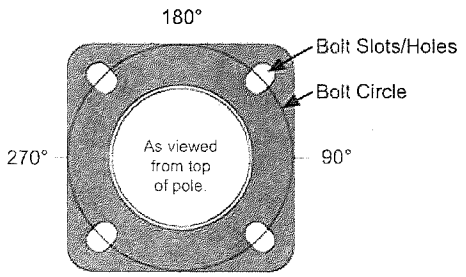
valmont STRUCTURES

Job Name:	Client Name:
Job Location - City: State:	Created By: Date:
Product: Quote:	Customer Approval: Date:

ANCHORAGE DATA

POLE		BASE PLATE				ANCHOR BOLTS		
		BOLT CIRCLE						
BASE OD (IN)	WALL THK (GA)	DIA (IN)	± (IN)	SQUARE (IN)	THK (IN)	DIA x LENGTH x HOOK (IN)	PROJECTION (IN)	± (IN)
7.00	0.156	10.56	0.43	11.26	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.156	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.188	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
8.00	0.250	11.63	0.37	12.05	0.750	1.00 x 36.00 x 4.00	4.13	N/A
9.00	0.156	13.25	0.75	12.48	1.250	1.00 x 36.00 x 4.00	4.13	N/A
9.00	0.188	13.25	0.75	12.48	1.250	1.00 x 36.00 x 4.00	4.13	N/A
10.00	0.188	14.31	0.69	13.19	1.250	1.00 x 36.00 x 4.00	4.75	N/A
10.00	0.250	14.50	0.50	14.00	1.250	1.25 x 42.00 x 6.00	5.25	N/A

Anchor Base Detail



LOAD AND DIMENSIONAL DATA

DESIGN INFORMATION										POLE DIMENSIONS					
	70 MPH w/1.3 GUST		80 MPH w/1.3 GUST		90 MPH w/1.3 GUST		100 MPH w/1.3 GUST		110 MPH w/1.3 GUST						
NOMINAL MOUNTING HEIGHT	MAX EPA (SQ FT)	MAX WEIGHT (LBS)	MAX EPA (SQ FT)	MAX WEIGHT (LBS)	MAX EPA (SQ FT)	MAX WEIGHT (LBS)	MAX EPA (SQ FT)	MAX WEIGHT (LBS)	MAX EPA (SQ FT)	MAX WEIGHT (LBS)	POLE HEIGHT	BASE OD (IN)	TOP OD (IN)	WALL THK (IN)	STRUCTURE WEIGHT (LBS)	MODEL NUMBER
28'-0"	10.5	150	7.1	150	5.0	150	3.7	150	2.8	150	27'-8"	7.00	4.00	0.156	92	+270840705T4
	15.5	150	11.1	150	8.3	150	6.5	150	5.1	150	27'-8"	8.00	4.50	0.156	105	270845805T4
	19.6	150	14.3	150	10.8	150	8.5	150	6.8	150	27'-8"	8.00	4.50	0.188	124	270845806T4
	27.4	150	20.2	150	15.5	150	12.3	150	9.9	150	27'-8"	8.00	4.50	0.250	161	270845808T4
	21.4	150	15.7	150	12.0	150	9.4	150	7.5	150	27'-8"	9.00	4.50	0.156	116	270845905T4
	26.8	150	19.8	150	15.2	150	12.0	150	9.7	150	27'-8"	9.00	4.50	0.188	137	270845906T4
	34.5	200	26.0	200	20.2	200	16.0	200	12.9	200	27'-8"	10.00	6.00	0.188	161	270860106T4
	46.6	300	35.3	300	27.5	300	22.0	300	17.8	300	27'-8"	10.00	6.00	0.250	217	270860108T4
30'-0"	8.8	150	5.7	150	3.8	150	2.7	150	2.0	150	29'-8"	7.00	4.00	0.156	99	+290840705T4
	13.3	150	9.3	150	6.9	150	5.3	150	4.1	150	29'-8"	8.00	4.50	0.156	113	+290845805T4
	17.1	150	12.2	150	9.2	150	7.1	150	5.6	150	29'-8"	8.00	4.50	0.188	134	290845806T4
	18.8	150	13.6	150	10.3	150	8.0	150	6.3	150	29'-8"	9.00	4.50	0.156	127	290845905T4
	23.7	150	17.4	150	13.3	150	10.4	150	8.3	150	29'-8"	9.00	4.50	0.188	149	290845906T4
	24.2	150	17.7	150	13.6	150	10.7	150	8.6	150	29'-8"	8.00	4.50	0.250	174	290845808T4
	30.9	200	23.2	200	17.9	200	14.1	200	11.3	200	29'-8"	10.00	6.00	0.188	175	290860106T4
	41.9	300	31.7	300	24.6	300	19.6	300	15.8	300	29'-8"	10.00	6.00	0.250	235	290860108T4
33'-0"	10.4	150	7.1	150	5.1	150	3.8	150	2.9	150	32'-8"	8.00	4.50	0.156	124	+320845805T4
	13.8	150	9.7	150	7.1	150	5.5	150	4.2	150	32'-8"	8.00	4.50	0.188	147	320845806T4
	15.3	150	10.9	150	8.1	150	6.2	150	4.8	150	32'-8"	9.00	4.50	0.156	138	+320845905T4
	19.7	150	14.2	150	10.7	150	8.4	150	6.6	150	32'-8"	9.00	4.50	0.188	163	320845906T4
	20.1	150	14.5	150	11.0	150	8.6	150	6.8	150	32'-8"	8.00	4.50	0.250	190	320845808T4
	26.0	200	19.4	200	14.9	200	11.7	200	9.2	200	32'-8"	10.00	6.00	0.188	191	320860106T4
	35.8	300	26.9	300	20.8	300	16.4	300	13.1	300	32'-8"	10.00	6.00	0.250	257	320860108T4

1. EPA represents the Effective Projected Area of each luminaire. Designs are limited to top mount or side-mount luminaires. Variations from sizes above are available upon inquiry at the factory. Satisfactory performance of poles is dependent upon the pole being properly attached to a supporting foundation of adequate design.
2. Structure weight is a nominal value which includes the pole shaft and base plate.
+ Pole includes factory installed vibration damper.

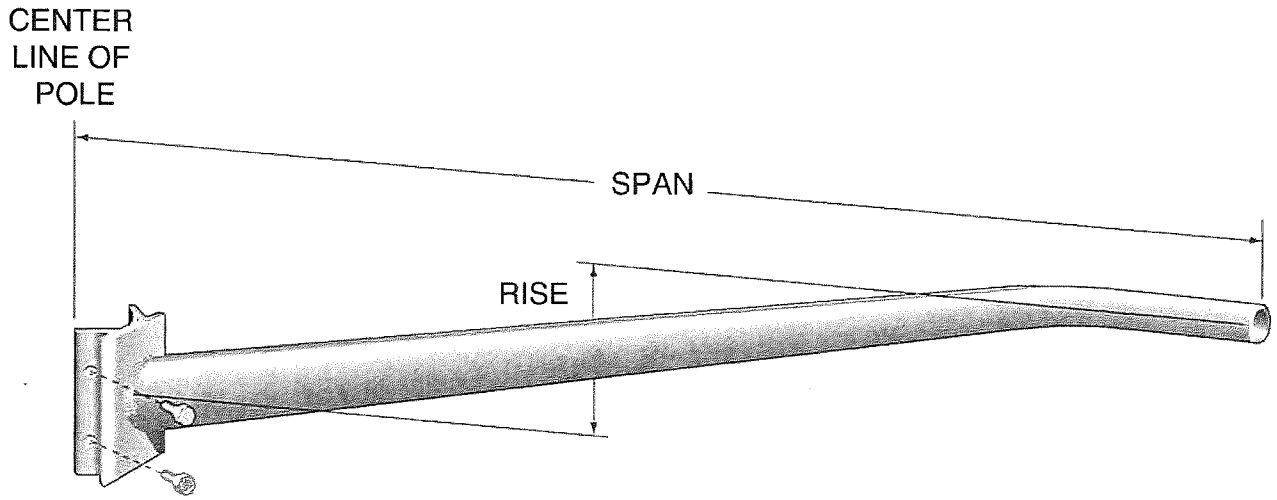
PRODUCT ORDERING CODES

CROSS SECTION	MODEL NUMBER	FIXTURE MOUNTING	COLOR		OPTIONS
R	320845806T4	PQ	DNA	204	
R = Round	+270840705T4 270845805T4L 270845806T4 270845808T4 270845905T4 270845906T4 270860106T4 270860108T4 +290840705T4 +290845805T4 290845806T4 290845905T4 290845906T4 290845808T4 290860106T4 290860108T4 +320845805T4 320845806T4 +320845905T4 320845906T4 320845808T4 320860106T4 320860108T4	**Drill Mounting** D1 = 1 Luminaire D2 = 2 @ 180° D3 = 3 @ 120° D4 = 4 @ 90° D5 = 2 @ 90° D6 = 3 @ 90° **Tenon Mounting** P2 = 2.38" OD x 4.00" P3 = 3.50" OD x 6.00" P4 = 4.00" OD x 6.00" P5 = 2.88" OD x 4.00" P7 = 2.38" OD x 5.00" PQ = 2.38" OD x 12.00" PD = 3.00" OD x 3.00" -- = Plain Top P9 = Other Tenon (Contact Factory)	**Polyester Powder** DWH = White DSS = Sandstone BR = Burgundy HG = Hunter Green DNA = Natural Aluminum DCG = Charcoal Gray DMB = Medium Bronze SBN = Sanded Brown DNB = New Dark Bronze DDB = Dark Bronze SBK = Sanded Black DBL = Black DSB = Steel Blue DTG = Dark Green DBR = Red SC = Special Color (Contact Factory)	**Anodized** 204 = Clear Natural 311 = Light Bronze* 312 = Medium Bronze* 313 = Dark Bronze* 335 = Black* *Duranodic Anodize **Brushed** SBF = Satin Brushed	See Accessories at valmontstructures.com (Please Specify with Code)

SPC7540 05/11 valmontstructures.com carries the most current spec information and supersedes these guidelines.

valmont STRUCTURES ALUMINUM

4', 6' AND 8' TAPERED BOLT MOUNT ELLIPTICAL MAST ARMS



BOLT MOUNT SPECIFICATIONS

- The mast arm is conically tapered from 3-1/2" O.D. x .125" wall 6063 alloy extruded aluminum tube to 2-3/8" O.D. (2" pipe size) at the luminaire end. The tapered tube is elliptical with the long axis oriented vertically. The arm is joined to the attachment system by a continuous circumferential weld. Each arm is heat treated after welding to produce a T6 temper. All arms are etched to create a satin finish. A 1-5/8" O.D. (1-1/4" pipe size) cast aluminum tenon may be installed in the luminaire end of the arm. Architectural finishes available are: paint, duranodic or natural anodized. All arms have a 32" rise. For additional information, contact your Valmont representative.
- Bolt mounted pole arms are held in place with (4) series 300 stainless steel 1/2"-13 UNC bolts, nuts, washers, and lock washers. The lighting standard is pre-drilled for the bolts and a 1" I.D. rubber grommet is installed in the wireway. Bolt mount arms fit 4", 4-1/2", and 6" O.D. pole tops. Unless otherwise directed, the first mast arm will be 90° to the right of the handhole, the second mast arm will be located 180° from the first.
- The following charts show the maximum allowable fixture EPA for the five wind zones acknowledged by AASHTO. The allowable EPA is based on a fixture weighing 75 pounds unless noted on the chart.
- Alternative arm lengths, rises, and mounting systems are available.

CATALOG LOGIC

Number of Arms	Type of Arms	Length of Arms	Rise of Arms	Mounting Style	Finishes	Options
1	MA	08	32	B	DNA	

Number of Arms	Type of Arms	Length of Arms	Rise of Arms	Mounting Style	Finishes	Options
1 – Single 2 – Double (2@180°)	MA – Tapered Elliptical Mast Arm	IN FEET 04 – 4 Feet 06 – 6 Feet 08 – 8 Feet	IN INCHES 32 – 32 Inches	B – Bolt Mount 45=fits 4.5" OD pole top	POLYESTER POWDER DBL – Black; DBR – Bright Red DCG – Charcoal Gray; DDB – Dark Bronze DMB – Med Bronze; DNA – Natural Alum DSB – Steel Blue; DSS – Sandstone DTG – Dark Green; DWH – White SC – Special Color (Please Specify) ANODIZED 204 – Clear Natural; 311 – Light Bronze* 312 – Med Bronze*; 313 – Dark Bronze* 335 – Black*; * Duranodic Anodize BRUSHED SBF – Satin Brushed Finish	See Accessory Section (Please Specify with Code #)

Customer Approval:

signature date

Job Name: _____ Quote: _____

Client Name: _____

Created By: _____ Date: _____

4', 6' AND 8' TAPERED BOLT MOUNT ELLIPTICAL MAST ARMS

valmont STRUCTURES ALUMINUM

BOLT MOUNT 4' SINGLE TAPERED MAST ARM
SPAN 45", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	6.0	6.0	5.3	4.0	2.9	170840605T4
20'	6.0	6.0	5.3	4.2	3.5	170840606T4
25'	6.0	4.2	2.5	1.5	0.7	220840605T4
25'	6.0	6.0	3.9	2.6	1.7	220840606T4
25'	6.0	6.0	5.3	3.9	2.8	220840705T4
30'	6.0	4.4	2.7	1.5	0.8	+270840705T4
30'	6.0	6.0	5.3	4.0	2.7	270845805T4
30'	6.0	6.0	5.3	4.2	3.5	270845806T4
35'	6.0	4.7	2.9	1.7	0.9	+320845805T4
35'	6.0	6.0	4.8	3.3	2.1	320845806T4
35'	6.0	6.0	5.3	4.2	3.5	320845808T4
39'	6.0	4.6	2.8	1.6	0.7	+360845806T4
39'	6.0	6.0	5.3	4.1	2.7	360845808T4

BOLT MOUNT 4' DOUBLE TAPERED MAST ARM
SPAN 45", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	5.9	3.8	2.5	1.5	0.8	170840605T4
20'	7.1	5.3	3.5	2.4	1.5	170840606T4
25'	3.1	1.4	—	—	—	220840605T4
25'	4.5	2.6	1.3	0.6	—	220840606T4
25'	6.0	3.8	2.4	1.3	0.7	220840705T4
25'	7.1	6.4	4.5	3.1	2.1	220845805T4
30'	3.3	1.5	—	—	—	+270840705T4
30'	6.0	3.8	2.4	1.3	0.6	270845805T4
30'	7.1	5.4	3.6	2.5	1.5	270845806T4
30'	7.1	7.1	6.2	4.9	4.1	270860106T4
35'	3.4	1.6	0.7	—	—	+320845805T4
35'	5.3	3.1	1.8	0.8	—	320845806T4
35'	7.1	5.8	3.9	2.6	1.6	320845808T4
35'	7.1	7.1	6.1	4.2	2.9	320860106T4
39'	3.4	1.6	0.6	—	—	+360845806T4
39'	6.5	4.0	2.5	1.4	0.6	360845808T4

BOLT MOUNT 6' SINGLE TAPERED MAST ARM
SPAN 68", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	6.0	4.7	3.6	2.8	2.3	170840605T4
25'	6.0	3.6	2.0	1.0	—	220840605T4
25'	6.0	4.7	3.4	2.1	1.3	220840606T4
25'	6.0	4.7	3.6	2.8	2.3	220840705T4
30'	6.0	3.9	2.2	1.1	—	+270840705T4
30'	6.0	4.7	3.6	2.8	2.3	270845805T4
35'	6.0	4.2	2.4	1.3	—	+320845805T4
35'	6.0	4.7	3.6	2.8	1.6	320845806T4
35'	6.0	4.7	3.6	2.8	2.3	320845808T4
39'	6.0	4.1	2.4	1.1	—	+360845806T4
39'	6.0	4.7	3.6	2.8	2.3	360845808T4

BOLT MOUNT 6' DOUBLE TAPERED MAST ARM
SPAN 68", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	5.3	3.3	1.9	0.9	—	170840605T4
20'	7.1	4.7	3.1	1.9	1.2	170840606T4
20'	7.1	5.5	4.1	2.8	1.9	170840705T4
25'	5.4	3.2	1.8	0.8	—	220840705T4
25'	7.1	5.5	3.9	2.6	1.5	220845805T4
25'	7.1	5.5	4.2	3.3	2.7	220845806T4
30'	2.7	1.2	—	—	—	+270840705T4
30'	5.4	3.2	1.8	0.8	—	270845805T4
30'	7.1	4.9	3.2	1.9	1.1	270845806T4
30'	7.1	5.5	4.2	3.3	2.6	270845808T4
35'	4.7	2.6	1.3	—	—	320845806T4
35'	7.1	5.3	3.4	2.1	1.1	320845808T4
35'	7.1	5.5	4.2	3.3	2.4	320860106T4
39'	2.8	1.2	—	—	—	+360845806T4
39'	5.9	3.4	1.9	0.8	—	360845808T4
39'	7.1	5.5	3.9	2.4	1.2	360860106T4
39'	7.1	5.5	4.2	3.3	2.7	360860108T4

BOLT MOUNT 8' SINGLE TAPERED MAST ARM
SPAN 90", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	4.5	3.2	2.4	1.7	1.3	170840605T4
25'	4.5	2.9	1.3	—	—	220840605T4*
25'	4.5	3.2	2.4	1.2	—	220840606T4
25'	4.5	3.2	2.4	1.7	1.3	220840705T4
30'	4.5	3.2	1.5	—	—	+270840705T4*
30'	4.5	3.2	2.4	1.7	1.3	270845805T4
35'	4.5	3.2	1.5	—	—	+320845805T4
35'	4.5	3.2	2.4	1.7	0.8	320845806T4
35'	4.5	3.2	2.4	1.7	1.3	320845808T4
39'	4.5	3.2	1.5	—	—	+360845806T4
39'	4.5	3.2	2.4	1.7	1.3	360845808T4

BOLT MOUNT 8' DOUBLE TAPERED MAST ARM
SPAN 90", RISE 32", FIXTURE SLIPFITTER 2-3/8" O.D.

LUMINAIRE MOUNTING HEIGHT	MAXIMUM ALLOWABLE EFFECTIVE PROJECTED AREA PER ARM IN FT.2					USED WITH LIGHTING POLE MODEL NUMBER
	70 MPH	80 MPH	90 MPH	100 MPH	110 MPH	
20'	4.2	2.2	0.8	—	—	170840605T4
20'	5.3	3.8	2.0	0.8	—	170840606T4
25'	2.9	1.1	—	—	—	220840606T4
25'	4.4	2.1	0.7	—	—	220840705T4
25'	5.3	3.8	2.8	1.5	0.6	220845805T4
30'	4.4	2.1	0.8	—	—	270845805T4
30'	5.3	3.8	2.1	0.9	—	270845806T4
30'	5.3	3.8	2.8	2.0	1.5	270845808T4
35'	3.6	1.5	—	—	—	320845806T4
35'	5.3	3.8	2.4	1.1	—	320845808T4
35'	5.3	3.8	2.8	2.0	1.3	320860106T4
39'	4.8	2.4	0.9	—	—	360845808T4
39'	5.3	3.8	2.8	1.3	—	360860106T4
39'	5.3	3.8	2.8	2.0	1.5	360860108T4

* 60 lbs. maximum allowable fixture weight.
+ These pole/arm combinations include factory installed vibration dampeners inside pole.
Designs for greater E.P.A. loading and/or dimensional requirements available. Contact your Valmont Representative or Valmont Industries, Inc. for assistance.

SPC7099 08/07 www.valmontstructures.com carries the most current spec information and supercedes these guidelines.