Appendix E – Traffic Impact Analysis

King County

Department of
Natural Resources and Parks
Solid Waste Division

FACTORIA
RECYCLING
TRANSFER STATION

TRAFFIC IMPACT ANALYSIS

SEPTEMBER 2010

DELIVERABLE # D135.1



HDR

Traffic Impact Analysis
Factoria Recycling and Transfer Station

Prepared for

King County Solid Waste Division

September 2010

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Acronyms and Abbreviations

BKR	Bellevue-Kirkland-Redmond
CH	commercially-hauled
CHRLF	Cedar Hills Regional Landfill
CIP	Capital Investment Program
Factoria RTS	Factoria Recycling and Transfer Station
GFA	Gross Floor Area
HCM	Highway Capacity Manual
HHW	household hazardous waste
HOV	high-occupancy vehicle
ITE	Institute of Transportation Engineers
LOS	Level of Service
LUC	land use code
MMA	Mobility Management Areas
PSE	Puget Sound Energy
PSRC	Puget Sound Regional Council
SEPA	State Environmental Policy Act
SH	self-hauled
TIA	transportation impact analysis
V/C	volume to capacity

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Executive Summary

This report documents the transportation impact analysis (TIA) performed for the Factoria Recycling and Transfer Station (Factoria RTS) located in King County and the City of Bellevue, Washington. It describes potential impacts on the transportation infrastructure associated with expansion of the existing Factoria RTS, as required by city codes and state environmental law (State Environmental Policy Act [SEPA]), and recommends mitigation, if necessary, for those impacts. This study reviews the anticipated traffic characteristics of the proposed project and provides an assessment of operating conditions of the transportation infrastructure serving the project site, both with and without the proposed expansion.

The Factoria RTS is one of eight existing County transfer stations where waste is collected and transferred into large tractor-trailers. Commercial haulers as well as business and residential self-haul customers use the Factoria RTS. The Factoria RTS was constructed in the 1960s and is nearing the end of its useful life. It is anticipated that the regional landfill will continue to accept waste until approximately 2016.

Currently, the site is accessed from the SE 32nd Street/Richards Road intersection by all customers in addition to facility transfer haulers. In the future, facility transfer haulers will use the SE 30th Street/Richards Road intersection for ingress to and egress from the facility, while waste disposal haulers will continue to use the SE 32nd Street/Richards Road intersection for ingress to and egress from the facility. Thus, the updated Factoria RTS layout will separate the facility transfer hauler trips from the commercial and self-hauler trips. The site is being improved to accommodate the growing demands of local and regional population growth. At the same time, operational enhancements are being provided for enhanced compaction of solid waste to reduce the number of facility transfer haulers trips to and from the site. The number of facility transfer hauler trips will initially be reduced after the compaction improvements are completed; however, as the tonnage of waste processed increases in the future, the number of transfer hauler trips will increase.

A PM peak hour Level of Service (LOS) analysis was conducted at the four study intersections for the year 2010 existing conditions. Here are the primary results of the analysis:

- All the study intersections operate at LOS D or better in 2010.
- In 2014 without project conditions, all study intersections will operate at LOS C or better.
- In 2014, it is estimated that the tonnage of solid waste disposal will increase to approximately 600 tons per day.
- Under the 2014 with project conditions, all signalized intersections will operate at LOS C or better.
- In 2042 without project conditions, the Richards Road/SE 32nd Street intersection will operate at LOS E with a 1.15 V/C ratio, and the Richards Road/SE Eastgate Way intersection will operate at LOS D with a 1.34 V/C ratio.
- In 2042, it is estimated that the tonnage of solid waste disposal will increase to approximately 900 tons per day.

- For the 2042 with-project conditions, all signalized intersections were calculated to operate at the same LOS as the without project conditions.

In 2042, all of the study intersections will remain at the same LOS without and with the proposed Factoria RTS improvements. The V/C ratios remained constant for the 2014 analysis and increased by a maximum of 0.06 for the 2042 analysis. As a result of the minor changes, no mitigation is necessary for this development.

1.0 Introduction

This report documents the transportation impact analysis (TIA) performed for the Factoria Recycling and Transfer Station (Factoria RTS) located in King County and the City of Bellevue, Washington. It describes potential impacts on the transportation infrastructure associated with expansion of the existing Factoria RTS, as required by city codes and state environmental law (State Environmental Policy Act [SEPA]) and recommends mitigation, if necessary, for those impacts. This study reviews the anticipated traffic characteristics of the proposed project and provides an assessment of operating conditions on the transportation infrastructure serving the project site both with and without the proposed expansion.

1.1 Project Location and Description

The Factoria RTS is one of eight existing County transfer stations where waste is collected, transferred into large tractor-trailers, and subsequently hauled to the Cedar Hills Regional Landfill (CHRLF) in Maple Valley, Washington. Commercial haulers as well as business and residential self-haul customers use the Factoria RTS. The Factoria RTS was constructed in the 1960s and is nearing the end of its useful life.

The County intends to maintain operation of the existing transfer station during construction of its replacement on adjacent property. The updated Factoria RTS will include the following features:

- Enclosed solid waste transfer and processing area
- Employee/administration facility
- Scalehouse with weigh station plaza
- Fueling facility
- Maintenance shop
- Household hazardous waste (HHW) collection area
- Recycling facility
- Vactor truck decant area

Construction of the new facilities is planned to occur in two phases to limit disruption to site operations. The first construction phase is expected to include the new Factoria RTS, administration and employee areas, a maintenance shop, a fueling facility, a vactor truck decant area, and access roads. The second construction phase will include a new facility for household hazardous waste (HHW) and recycling functions, improved onsite and offsite access roads, new truck scales, and scalehouse facility.

The Factoria RTS is situated on an approximately 8.7-acre parcel that is constrained by steep topography, wetlands, streams, and a large utility corridor easement occupied by Olympic Pipeline high-pressure liquid petroleum lines and Puget Sound Energy (PSE) overhead power lines. The transfer station operation and HHW collection are contained within one large building on the site. SE 32nd Street terminates at the Factoria RTS entrance, where a small scalehouse is located to weigh vehicles upon

entering and exiting the site. To maintain existing operations, the County purchased adjacent property northwest of the site that contains two warehouse buildings, bringing the total size of the project site to approximately 10.7 acres. **Figure 1-1** shows the site vicinity.

Waste collected within King County is hauled to the transfer stations and drop boxes, transferred into large facility transfer haulers, and then hauled to the CHRLF, as mentioned above. It is anticipated that the regional landfill will continue to accept waste until approximately 2016. After that time, it is expected that waste will be exported to an out-of-county or out-of-state landfill.

The transfer station is open between 6:30 AM and 4:00 PM Monday through Friday, and between 8:30 AM and 5:30 PM on weekends. The site is open to commercial haulers, residential self-haulers, and business self-haul customers. Currently, the site is accessed from the SE 32nd Street/Richards Road intersection by all customers in addition to facility transfer haulers. In the future, facility transfer haulers will use the SE 30th Street/Richards Road intersection for ingress to and egress from the facility, while waste disposal haulers will continue to use the SE 32nd Street/Richards Road intersection for ingress to and egress from the facility. Thus, the updated Factoria RTS layout will separate the facility transfer hauler trips from the commercial and self-hauler trips.

The facility transfer haulers drive approximately 10 minutes to enter I-405 from Factoria Boulevard SE. Several different haul routes were studied and the results were summarized in a technical memorandum. The study indicated that the transfer haulers are currently using the most efficient haul route between the site and the interstate. A copy of the routing study technical memorandum may be found in **Appendix D**.

The site is being improved to accommodate the growing demands from local and regional population growth. At the same time, operational enhancements are being provided for enhanced compaction of solid waste to reduce the number of facility transfer hauler trips to and from the site. The number of facility transfer hauler trips will initially be reduced after the compaction improvements are completed; however, as the tonnage of waste processed increases in the future, the number of transfer hauler trips will increase.

1.2 Study Approach

Most agencies require analysis of the weekday PM peak hour because it is typically the time period when the local street system is experiencing the highest volumes and the worst operations. Although the peak traffic associated with King County transfer stations does not occur during the weekday PM peak hour, the total volume on the local street system will likely be higher during the weekday PM peak hour than during an hour when demand is highest for a transfer station (typically on a weekend). For this reason, traffic impact was analyzed for the weekday PM peak hour at each of the study intersections.

The study area for the project encompasses the major intersections providing access to the site. All signalized intersections along these roadways were analyzed using the traffic operation analysis tool Synchro. The four intersections included in this analysis are as follows:

- Richards Road/SE 30th Street

- Richards Road/SE 32nd Street
- Richards Road/SE Eastgate Way
- Richards Road/SE 36th Street

The following sections document the existing, future without-project (baseline), and future with project conditions within the study area. Project impacts are identified by comparing with-project conditions against without-project conditions.

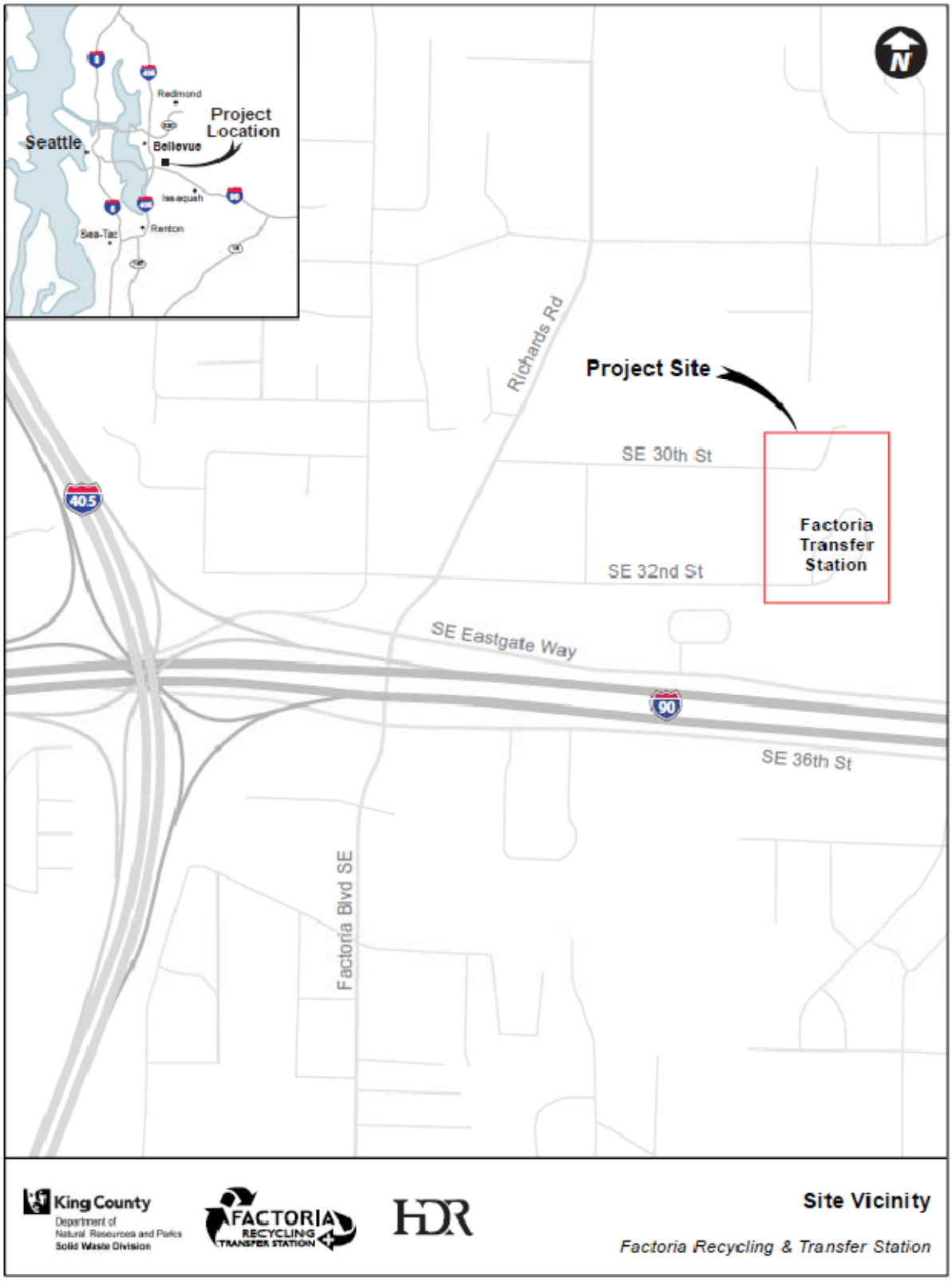

Figure 1-1. Site Vicinity

2.0 Existing Conditions

This section describes the condition of the existing traffic network throughout the study area. This will serve as the foundation from which future traffic conditions are forecasted and evaluated. The following paragraphs describe the roadway network vicinity, existing traffic volumes, and operations.

2.1 Roadway Network

The project is directly served by Richards Road and SE 32nd Street. New access will be provided at SE 30th Street. Other roadways that will be used by traffic to and from the proposed project include I-90, SE 36th Street, Factoria Boulevard SE, and SE Eastgate Way. It is anticipated that these roadways will accommodate a majority of the Factoria RTS users and, in doing so, could experience the greatest project impacts.

I-90 is an east–west interstate freeway facility providing regional access to the area. It has four lanes (three general-purpose lanes and one high-occupancy vehicle [HOV] lane in both directions). Richards Road is classified as a principal arterial, providing access to I-90. It bridges the northeast side of the I-90/I-405 interchange with the southeast side. It is a five-lane facility near the project site, providing left-turn lanes at each of the study intersections. Factoria Boulevard SE, SE 36th Street, and SE Eastgate Way are major collectors providing traffic circulation and distribution of vehicles from the arterial or freeway system to local roads. SE 32nd Street and SE 30th Street are local roads that serve short-distance vehicular trips from adjacent industrial areas. **Figure 2-1** illustrates the existing roadway network, including traffic control and channelization within the study area.

2.2 Traffic Volumes

Existing PM peak hour traffic counts were obtained from the City of Bellevue 2009 traffic databank. Most of the counts were conducted in 2008. Count data are presented in **Appendix A**. Although the study area is already built out and historical data show no growth in the PM peak hour, to be conservative, year 2008 traffic volumes were increased straight-line at an annual growth rate of 2% to estimate year 2010 traffic volumes. Based on the 4:00 to 6:00 PM count data, the PM peak hour was determined to occur between 4:30 and 5:30 PM. The volumes between intersections were balanced using a common traffic analysis balancing procedure called the bi-proportional method. **Figure 2-2** illustrates the existing 2010 PM peak-hour turning movement traffic volumes.

Transfer station traffic volume is primarily comprised of two types of trips: self-hauled (SH) and commercially-hauled (CH). Self-hauled trips are comprised of residents or small businesses delivering their recycling and waste. Commercially-collected trips are those from larger waste hauling companies. **Figure 2-3** summarizes the vehicle volumes accessing the transfer station throughout a typical day. The year 2008 was selected for several reasons. The years 2007 and 2008 had higher-than-average waste volumes collected; therefore, analysis of these years would provide a more conservative traffic analysis. The year 2008 also coincided with the base year of the traffic demand model that will be described in more detail in later sections of the report. As **Figure 2-3** illustrates, traffic associated with King County transfer stations is not the highest during the weekday PM peak hour, when traffic volumes are the highest. The transfer station experiences higher volumes between 2:00 and 3:00 PM due to increased self-haul residential trips. There were 18 commercial and self-haul truck trips to the transfer station during

the PM peak hour, which was about 40% of the total truck trips at the entire Richards Road/SE 32nd Street intersection during that time period. There are no fixed hourly runs for the long-haul facility trucks from the transfer station. However, for calculation purposes, it will be assumed that there are four long-haul facility truck runs per hour with two inbound runs and two outbound runs.

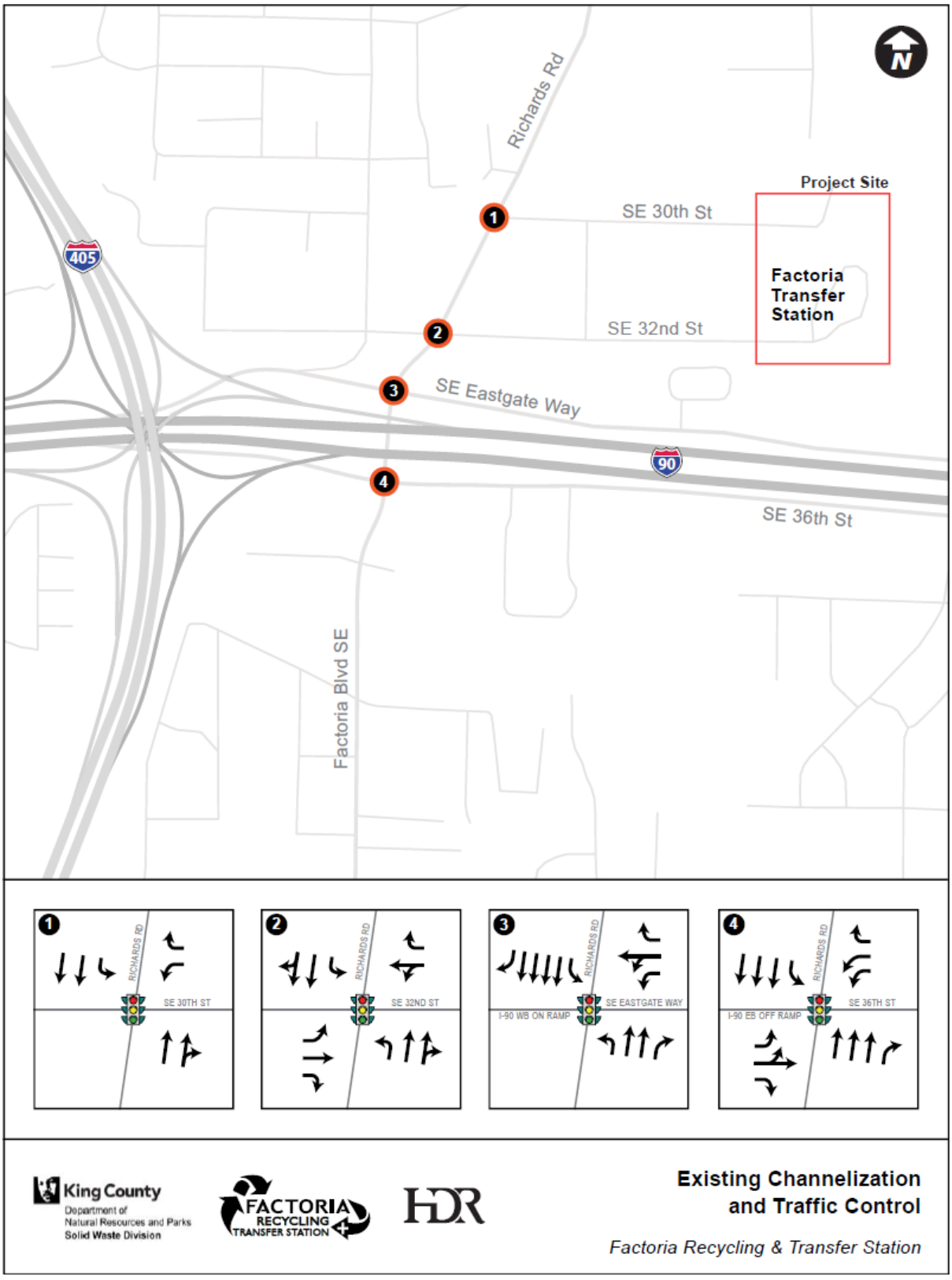

Figure 2-1. Existing Channelization and Traffic Control

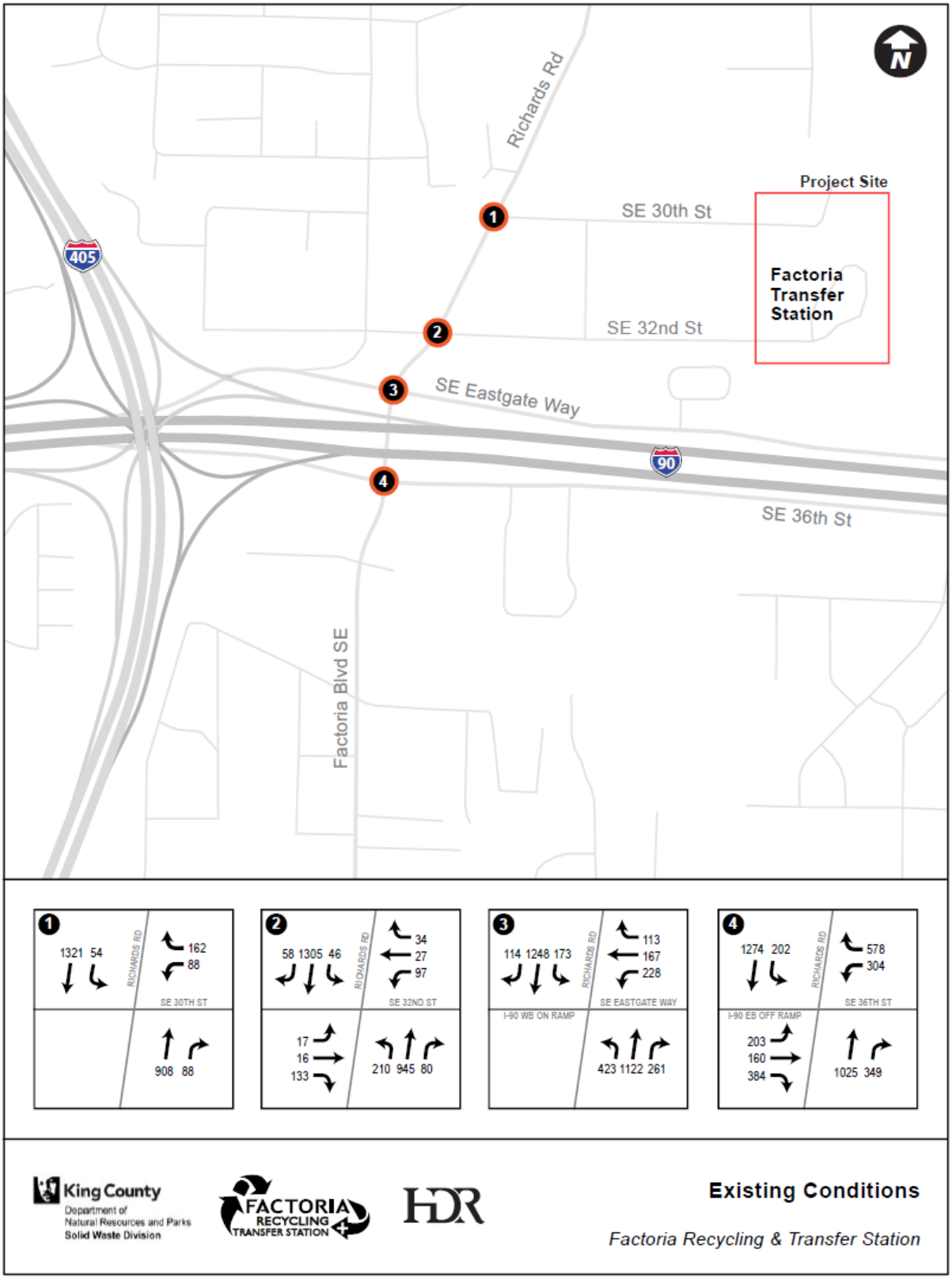

Figure 2-2. Existing PM Peak Hour Turning Movement Counts

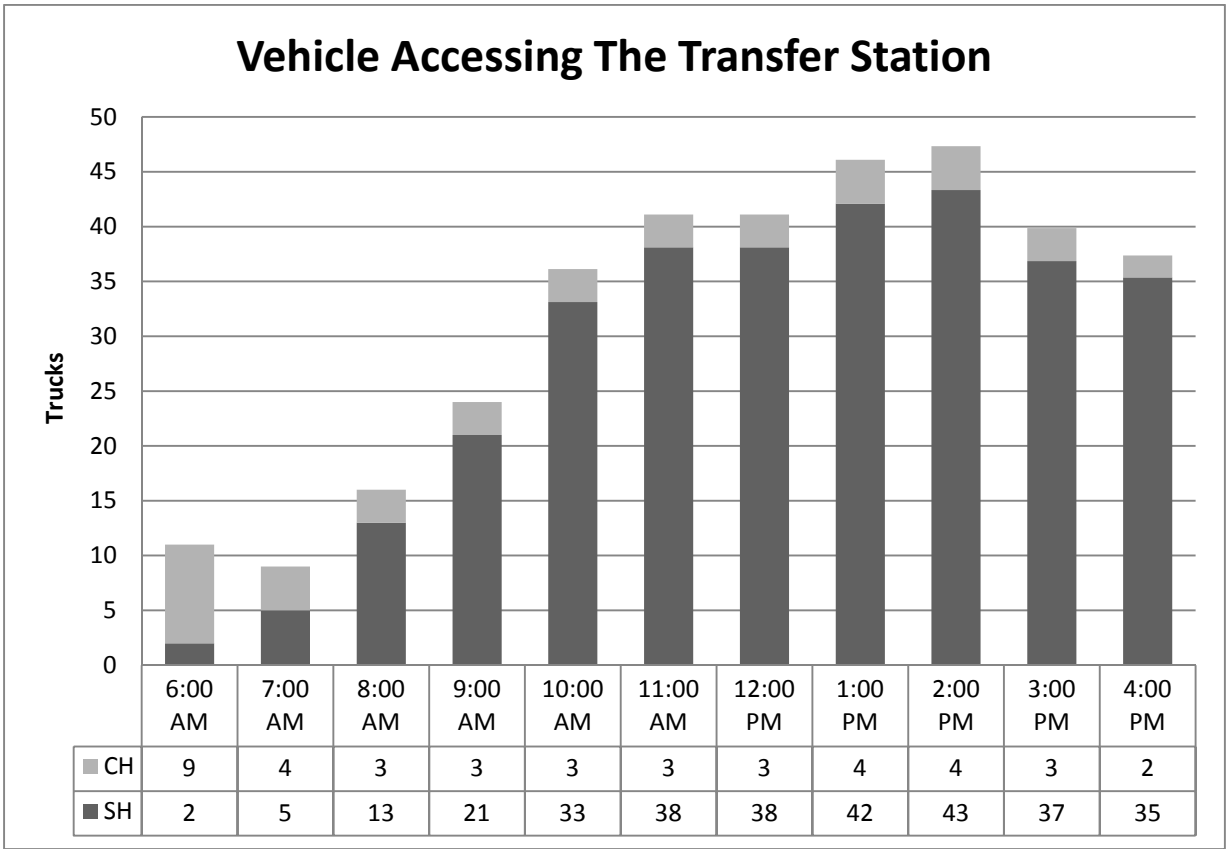

Figure 2-3. 2008 Vehicle Arrival Pattern

2.3 Traffic Operations

This section of the report summarizes existing traffic operations at the study intersections. Level of service (LOS) refers to the degree of congestion on a roadway or at an intersection, measured in average control delay. LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), LOS F represents forced-flow conditions (motorists experience very long delays and traffic levels exceed roadway capacity), and LOS B to E represent decreasingly desirable conditions. A more detailed discussion of the LOS concept is presented in **Appendix B.**

A PM peak hour LOS analysis was conducted at the four study intersections for the year 2010 existing conditions. The traffic analysis software program Synchro (Version 7, Build 763, Rev 73) was used to analyze the intersections. The LOS information was obtained from Synchro utilizing the Highway Capacity Manual (HCM) methodology. Synchro is a macroscopic traffic operations analysis program that uses the methodology outlined in the 2000 HCM. The HCM is a publication of the Transportation Research Board.

The existing signal timing plans were obtained from the City of Bellevue Synchro model. The model contains lane widths and saturation flow rate data input by the City. Truck percentage and peak hour factor data were updated from the most recent count data. The results of the LOS analysis for the study

intersections are shown in **Table 2-1**. The detailed LOS worksheets are included in **Appendix C** of this report.

King County LOS standard for an urban area is LOS E. The City of Bellevue LOS standard is LOS D for an urban area. As **Table 2-1** shows, all the study intersections operate at LOS D or better. The intersection at Richards Road/SE Eastgate Way has a volume to capacity (V/C) ratio greater than 1, which indicates that it is over capacity under existing conditions.

Table 2-1. Existing Conditions PM Peak Hour LOS Summary

Int. No.	Description	Control Type[1]	Delay/ Veh[2]	LOS[3]	V/C Ratio[4]
1	Richards Rd/SE 30th St	Signal	8.9	A	0.55
2	Richards Rd/SE 32nd St	Signal	21.2	C	0.80
3	Richards Rd/SE Eastgate Way	Signal	39.4	D	1.07
4	Richards Rd/SE 36th St	Signal	27.0	C	0.70

Notes:

1. OWSC = One-way stop controlled intersection. AWSC = All-way stop controlled intersection. Signal = Signalized intersection. Unsignalized and signalized intersections were analyzed using Synchro.

2. Control delay, measured in seconds per vehicle, is a measure of all the delay contributable to traffic control measures, such as traffic signals or stop signs. At signalized intersections and all-way stop controlled intersections, the delay reported is the average of all the control delay experienced for all the movements. At one-way or two-way stop controlled intersections, the reported delay is for only one movement: the movement experiencing the worst control delay, which is typically one of the stop controlled side street approaches. The control delay reported at two-way stop controlled intersections is not a valid indication of the operations at the entire intersection.

3. LOS is the level of service, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

4. V/C ratio is a measure that relates prevailing volume to the estimated capacity, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

2.4 Traffic Safety

For lager study areas, a historical review of the frequency of accidents may be completed. A more in-depth accident analysis was not completed for this analysis because the Factoria RTS improvements will not alter any of the existing intersection channelization at the four study intersections.

3.0 Future Conditions: 2014 Without-Project

The evaluations in this section establish a baseline for identifying project impacts. The future roadway network, traffic volumes, and traffic operations are defined in this section.

A 2014 baseline (representing a without-project scenario) analysis was developed to identify future traffic conditions. Independent of the proposed transfer station improvements, traffic volumes on the roadway network in the year 2014 without-project conditions represent traffic resulting from background traffic growth. Traffic volumes accessing the site were assumed to remain consistent with existing conditions in order to isolate growth in site-related traffic volumes for the with-project analysis.

3.1 Planned Transportation Improvements

No short-term (year 2014) transportation improvement projects that would enhance capacity were identified for the study intersections.

3.2 Forecasted Traffic Volumes

Year 2014 without-project traffic volumes were established based on a forecast from the Bellevue-Kirkland-Redmond (BKR) regional traffic forecasting model processed in EMME, a travel demand modeling software. The model was derived from the City of Bellevue 2008 and 2020 BKR model as well as the 2010 and 2020 Puget Sound Regional Council (PSRC) model. The 2008 BKR model has been updated to include the capacity improvement projects in 2009-2015 Capital Investment Program (CIP) Plan. Land uses for 2014 internal traffic analysis zones are interpolated between 2008 and 2020 BKR model land uses. Trips for the 2014 external traffic analysis zones are interpolated between 2010 and 2020 PSRC model trip productions and trip attractions. Traffic volumes are expected to decrease on some links along Richards Road due to traffic shifts created by capacity improvements along I-405.

Site access traffic volumes are addressed under the with-project conditions section. **Figure 3-1** shows the future 2014 without-project traffic volumes for the weekday PM peak hours. These volumes were used to estimate year 2014 without-project conditions operational analysis.

3.3 Traffic Operations

This section summarizes baseline traffic operations at the study intersections. Future traffic operations in the study area were evaluated based on the year 2014 forecast traffic volumes. Since no short-term planned improvements were identified, intersection channelization is consistent with existing conditions. The traffic operations analysis used the same methodologies discussed in the evaluation of existing levels of service. Synchro signal timing plans (green time and offsets) for the intersections were optimized for 2014. Signal cycle lengths remained unchanged from existing timing plans. A peak hour factor of 0.9 was used for the future analysis. **Table 3-1** summarizes the weekday PM without-project LOS results; existing conditions results are provided for comparison. The detailed LOS worksheets are provided in **Appendix C**.

As **Table 3-1** shows, under future without-project conditions, all signalized intersections will operate at LOS C or better. The intersection at Richards Road/SE Eastgate Way will improve from LOS D to LOS C because of improved signal timing as well as the inclusion of I-405 widening projects that will shift traffic away from Richards Road to I-405.

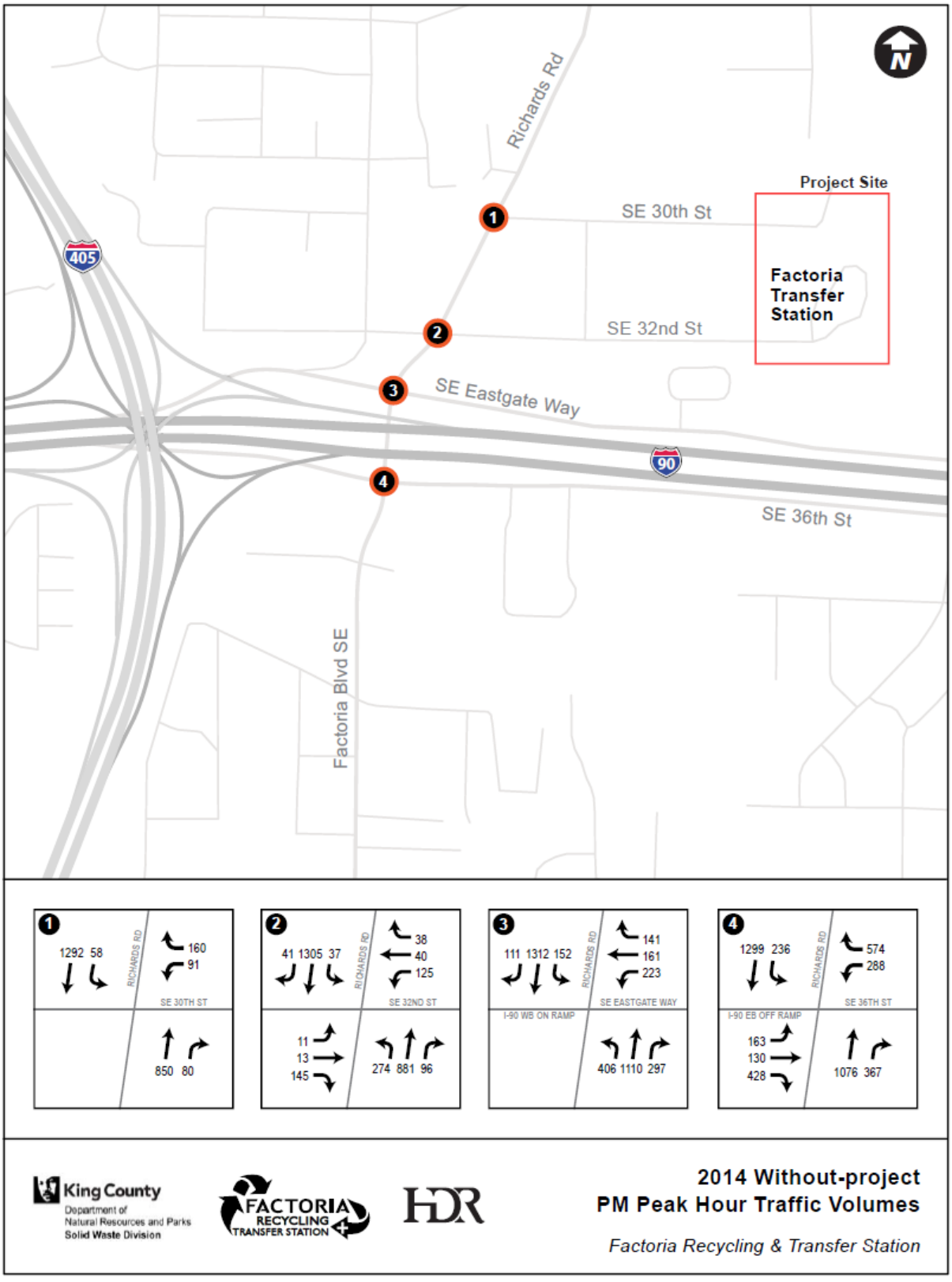

Figure 3-1. 2014 Without-Project PM Peak Hour Traffic Volumes

Table 3-1. Existing Conditions PM Peak Hour LOS Summary

Int. No.	Description	Control Type[1]	Delay/ Veh[2]	LOS[3]	V/C Ratio[4]
2014 Without-Project					
1	Richards Rd/SE 30th St	Signal	8.7	A	0.54
2	Richards Rd/SE 32nd St	Signal	24.6	C	0.85
3	Richards Rd/SE Eastgate Way	Signal	29.7	C	0.92
4	Richards Rd/SE 36th St	Signal	21.3	C	0.68
2010 Existing Condition					
1	Richards Rd/SE 30th St	Signal	8.9	A	0.55
2	Richards Rd/SE 32nd St	Signal	21.2	C	0.80
3	Richards Rd/SE Eastgate Way	Signal	39.4	D	1.07
4	Richards Rd/SE 36th St	Signal	27.0	C	0.70

Notes:

1. OWSC = One-way stop controlled intersection. AWSC = All-way stop controlled intersection. Signal = Signalized intersection. Unsignalized and signalized intersections were analyzed using Synchro.

2. Control delay, measured in seconds per vehicle, is a measure of all the delay contributable to traffic control measures, such as traffic signals or stop signs. At signalized intersections and all-way stop controlled intersections, the delay reported is the average of all the control delay experienced for all the movements. At one-way or two-way stop controlled intersections, the reported delay is for only one movement: the movement experiencing the worst control delay, which is typically one of the stop controlled side street approaches. The control delay reported at two-way stop controlled intersections is not a valid indication of the operations at the entire intersection.

3. LOS is the level of service, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

4. V/C ratio is a measure that relates prevailing volume to the estimated capacity, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

4.0 Future Conditions: 2014 With-Project

This section provides the forecasted traffic conditions with the proposed project. The results are compared to 2014 baseline (without-project) traffic conditions to identify project impacts. The following paragraphs describe the project trip generation, forecasted traffic volumes, and traffic operations.

4.1 Forecasted Traffic Volumes

The 2014 with-project condition traffic volumes for the study area roadways were determined by estimating project-generated traffic volumes and assigning these volumes on the study roadways. The project-generated traffic was added to the 2014 without-project traffic volumes to obtain the 2014 with-project volumes for the study intersections.

Trip Credit

An area of land approximately 42,000 square feet in size along SE 30th Street will be acquired by Factoria RTS in the future for improvements that include an office building, meeting rooms, locker rooms, equipment room, and storage space for the employees. Currently, the area is occupied by a light manufacturing industry. The weekday PM trip generation for the proposed land developments of the Factoria RTS was determined using the Institute of Transportation Engineers (ITE) *2008 Trip Generation Manual*, 8th Edition. Specifically, the following ITE land use codes (LUC) were used to estimate the trip generation:

- LUC 140 – Manufacturing for the existing land use
- LUC 710 – General Office Building

Trips generated from existing land use are subtracted from the future land use to estimate net new PM peak hour trips generated. Based on the ITE trip generation rate, the proposed development is expected to generate no new PM peak hour trips. **Table 4-1** summarizes the PM peak hour trip generation for the proposed development.

Table 4-1. Trip Generation Summary

Land Use	ITE LUC (1)	Size / Area	Units (2)	Trip Generation Rate			Peak Hour Trips		
				In	Out	Total	In	Out	Total
Manufacturing	140	42	GFA	0.39	0.36	0.75	17	15	32
Office Building	710	3	GFA	0.25	1.23	1.49	1	4	5
Net New PM Peak Hour Trips Generated =							***-16***	***-11***	***-27***

Notes:
(1) Institute of Transportation Engineers, Trip Generation Manual, 8th Edition, 2008 Land Use Code
(2) GFA = 1000 Sq. Feet Gross Floor Area

Trip Generation

The Solid Waste Division forecasts the total annual waste tonnage based on historical data and the expected development in economic activities and population growth. Based on econometric model forecasting done by the Solid Waste Division, it is estimated that the tonnage of solid waste disposal will increase to approximately 600 tons per day in 2014.

Based on the registry of the traffic volumes accessing the site in the peak month of 2008, each truck can carry 0.88 ton of solid waste on average. The total number of site access haulers in the future was estimated using the average 0.88 tons per truck. The total numbers of haulers were distributed over the typical day based on the existing distribution pattern. **Table 4-2** shows site access volume for year 2014.

Table 4-2. Site Access Volume for Year 2014

Time	2008	2014
6:00 AM	11	17
7:00 AM	9	14
8:00 AM	16	24
9:00 AM	24	36
10:00 AM	36	55
11:00 AM	41	62
12:00 PM	41	62
1:00 PM	46	70
2:00 PM	47	72
3:00 PM	40	60
4:00 PM	37	57
Trucks	349	528
Tons	397	600

No specific time-stamp data are available for outbound haulers; therefore, they are considered to be the same in number as the inbound haulers from the same hour. As site access volumes are registered in hourly fashion, 4:00 PM site access hourly volume data are considered to be the PM peak hour site access volume. **Table 4-3** shows the forecasted inbound and outbound trips by commercial and self-haulers for the future year 2014.

Table 4-3. PM Peak Hour Forecasted Trips by Commercial and Self-Haulers

Year	2008	2014 Additional Trips	2014
In	37	19	57
Out	37	19	57
Total	75	38	113

There will be 38 additional commercial and self-hauler trips per hour with 19 inbound and 19 outbound trips during the PM peak hour. The additional project trips for commercial and self-haulers in 2014 may require one additional trip inbound and outbound by a facility transfer hauler in 2014. This estimate is conservative because there could be zero additional facility transfer hauler trips due to the improved compactor technology that will be used to load waste containers. **Table 4-4** shows the forecasted inbound and outbound trips by facility transfer haulers.

Table 4-4. Forecasted Trips by Facility Transfer Haulers

Year	2008	2014 Additional Trips
In	2	1
Out	2	1
Total	4	2

Combining **Table 4-2**, **Table 4-3**, and **Table 4-4**, by the year 2014, there is expected to be a net of 40 new trips during the PM peak hour.

Trip Distribution

The generated trips to and from the proposed project were distributed over the network using a select zone assignment procedure within the 2014 BKR model. **Figure 4-1** illustrates the distribution of the project trips within the study area.

The 2014 with-project PM peak hour traffic volume network is graphically depicted in **Figure 4-2**. These are the volumes used to estimate the project impact in the operational analysis.

4.2 Traffic Operations

This section summarizes 2014 with-project traffic operations at the study intersections. An LOS analysis was conducted for with-project conditions to quantify traffic operations. The same HCM 2000 methodologies were applied and all intersection parameters such as channelization, intersection control, and signal timings were held consistent with those used in the evaluation of 2014 without-project conditions to measure the degree of impact of the proposed project. The with-project traffic operational analysis utilized the traffic volumes illustrated in **Figure 4-2**. **Table 4-5** summarizes the with-project LOS analysis; without-project conditions are provided for comparison purposes. The detailed LOS worksheets are provided in **Appendix C**.

As Table 4-5 shows, under the 2014 with-project conditions, all signalized intersections will operate at LOS C or better. The V/C ratio will remain unchanged and the control delay will remain virtually unchanged because of the addition of only 40 trips added with the Factoria RTS project improvements. All of the intersections' V/C ratios will remain below 1 as well.

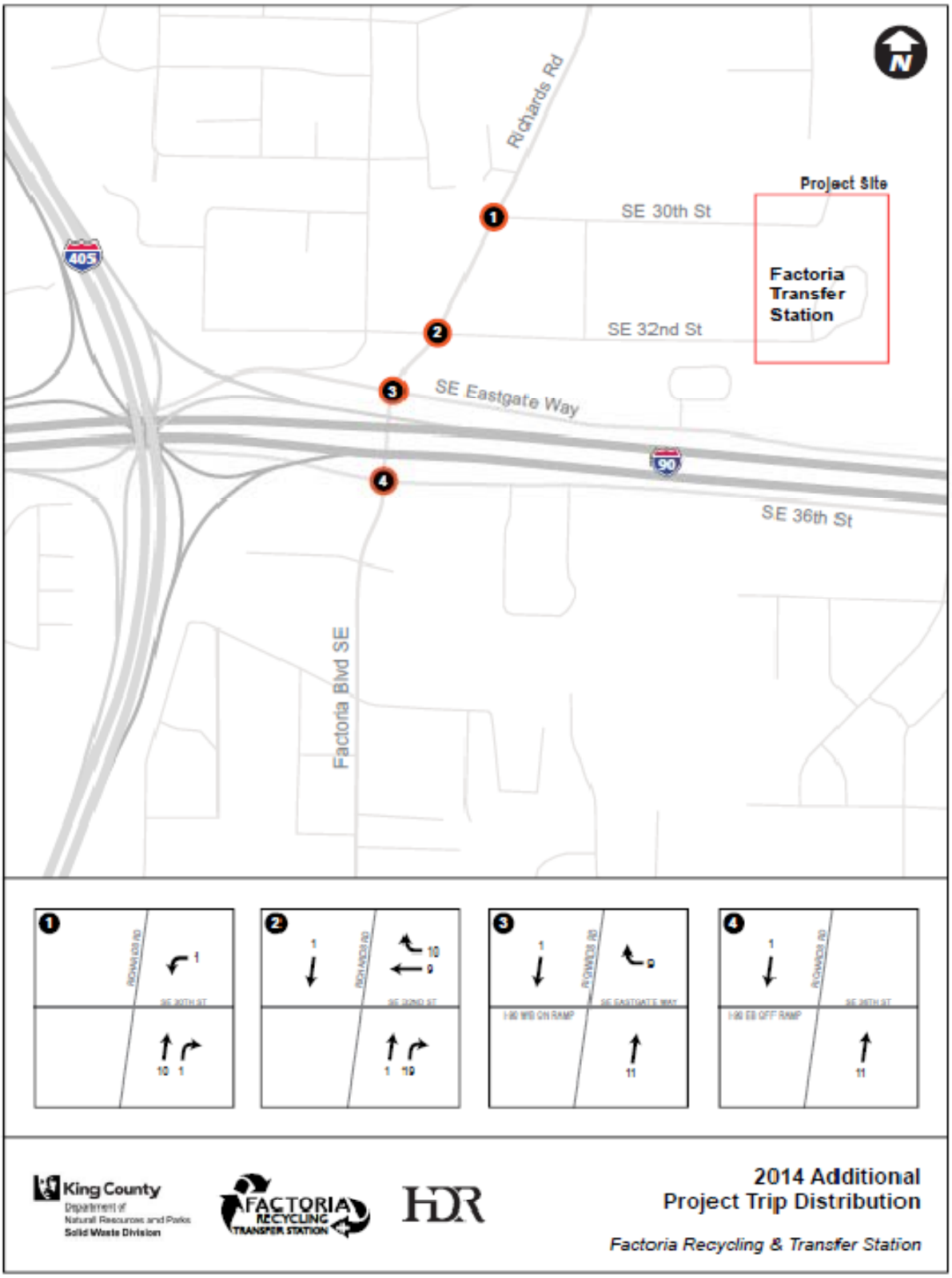

Figure 4-1. 2014 Project Trip Distribution

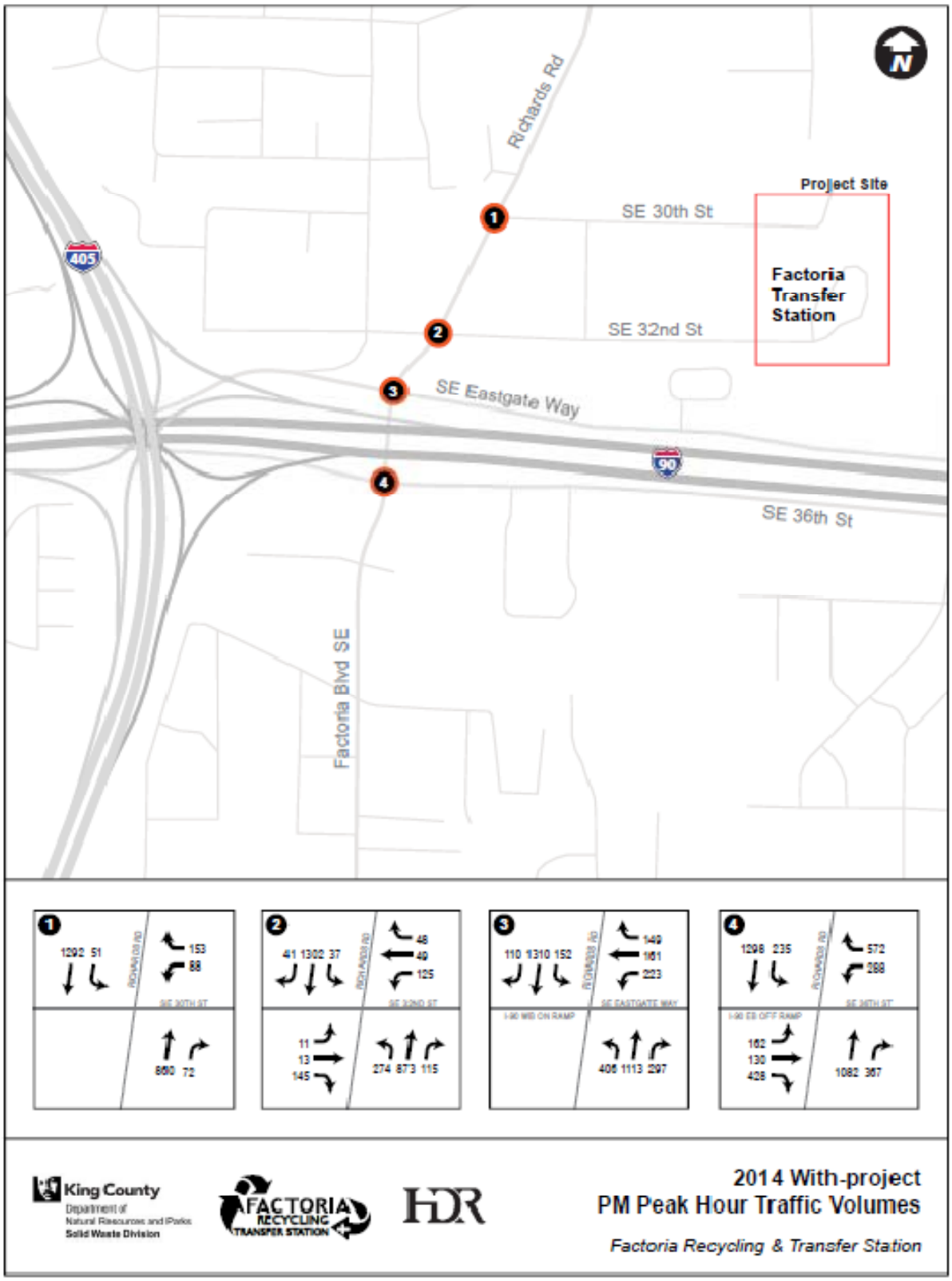

Figure 4-2. 2014 With-Project PM Peak Hour Traffic Volume

Table 4-5. 2014 With-Project Conditions PM Peak Hour LOS Summary

Int. No.	Description	Control Type[1]	Delay/ Veh[2]	LOS[3]	V/C Ratio[4]
2014 With Project					
1	Richards Rd/SE 30th St	Signal	8.5	A	0.50
2	Richards Rd/SE 32nd St	Signal	25.0	C	0.85
3	Richards Rd/SE Eastgate Way	Signal	29.6	C	0.93
4	Richards Rd/SE 36th St	Signal	21.3	C	0.68
2014 Without Project					
1	Richards Rd/SE 30th St	Signal	8.7	A	0.54
2	Richards Rd/SE 32nd St	Signal	24.6	C	0.85
3	Richards Rd/SE Eastgate Way	Signal	29.7	C	0.92
4	Richards Rd/SE 36th St	Signal	21.3	C	0.68

Notes:

1. OWSC = One-way stop controlled intersection. AWSC = All-way stop controlled intersection. Signal = Signalized intersection. Unsignalized and signalized intersections were analyzed using Synchro.

2. Control delay, measured in seconds per vehicle, is a measure of all the delay contributable to traffic control measures, such as traffic signals or stop signs. At signalized intersections and all-way stop controlled intersections, the delay reported is the average of all the control delay experienced for all the movements. At one-way or two-way stop controlled intersections, the reported delay is for only one movement: the movement experiencing the worst control delay, which is typically one of the stop controlled side street approaches. The control delay reported at two-way stop controlled intersections is not a valid indication of the operations at the entire intersection.

3. LOS is the level of service, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

4. V/C ratio is a measure that relates prevailing volume to the estimated capacity, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

5.0 Future Conditions: 2042 Analysis

To support longer-range planning, a traffic analysis is also provided for the 2042 horizon year. A future 2042 LOS analysis is provided analyzing without and with the project.

5.1 Planned Transportation Improvements

No long-term (year 2042) transportation improvement projects that would enhance capacity were identified for the study intersections.

5.2 Without-Project Traffic Volumes

Year 2042 without-project traffic volumes were established based on a forecast from the Bellevue-Kirkland-Redmond (BKR) regional traffic forecasting model. The model was derived from the City of Bellevue 2020 and 2030 BKR model as well as the 2020 and 2030 Puget Sound Regional Council (PSRC) model. The 2030 BKR model includes the capacity improvement projects in the 2030 Comprehensive Transportation Plan. No additional projects were included between the years 2030 and 2042. Land uses for 2042 internal traffic analysis zones are extrapolated from 2020 and 2030 BKR model land uses. Trips for the 2042 external traffic analysis zones are interpolated between 2030 and 2040 PSRC model trip productions and trip attractions.

Site access traffic volumes are addressed under the with-project conditions section. **Figure 5-1** shows the future 2042 without-project traffic volumes for the weekday PM peak hours. These volumes were used to estimate year 2042 without-project conditions operational analysis.

5.3 With-Project Traffic Volumes

The 2042 with-project condition traffic volumes for the study area roadways were determined by estimating project-generated traffic volumes and assigning these volumes on the study roadways. The project-generated traffic was added to the 2042 without-project traffic volumes to obtain the 2042 with-project volumes for the study intersections.

Trip Generation

Based on econometric model forecasting done by the Solid Waste Division, it is estimated that the tonnage of solid waste disposal will increase to approximately 900 tons per day in 2042. The total number of site access haulers in 2042 was estimated using the same factor for tons per truck as in the previous section. The total haulers were distributed over the typical day based on the existing distribution pattern. **Table 5-1** shows site access volume for year 2042. Site access volumes for year 2014 are shown for comparison purposes.

Table 5-1. Site Access Volume for Year 2042

Time/Year	2008	2014	2042
6:00 AM	11	17	25
7:00 AM	9	14	20
8:00 AM	16	24	36
9:00 AM	24	36	54
10:00 AM	36	55	82
11:00 AM	41	62	93
12:00 PM	41	62	93
1:00 PM	46	70	105
2:00 PM	47	72	107
3:00 PM	40	60	90
4:00 PM	37	57	85
Trucks	349	528	792
Tons	397	600	900

No data are available for the outbound haulers; therefore, they are considered to be the same in number as the inbound haulers of the same hour. As site access volumes are registered in hourly fashion, 4:00 PM site access hourly volume data are considered to be the PM peak hour site access volume. **Table 5-2** shows the forecasted inbound and outbound trips by commercial and self-haulers for the future year 2042. Project trips in 2014 are shown for comparison purposes.

Table 5-2. Forecasted Trips by Commercial and Self-Haulers

Year	2008	2014 Additional Trips	2014	2042 Additional Trips	2042
In	37	19	57	47	85
Out	37	19	57	47	85
Total	75	38	113	94	170

There will be 94 additional commercial and self-hauler trips per hour with 47 inbound and 47 outbound trips during the PM peak hour. The additional trips for commercial and self-haulers in 2042 may require two additional trips inbound and outbound by facility transfer haulers in 2042. **Table 5-3** shows the forecasted inbound and outbound trips by facility transfer haulers. Project trips in 2014 are shown for comparison purposes.

Table 5-3. Forecasted Trips by Facility Transfer Haulers

Year	2008	2014 Additional trips	2042 Additional trips
In	2	1	2
Out	2	1	2
Total	4	2	4

Combining **Table 5-2** and **Table 5-3**, by the year 2042, there is expected to be a net of 98 new trips during the PM peak hour.

Trip Distribution

The generated trips to and from the proposed project were distributed over the network using a select zone assignment procedure within the 2042 BKR model. **Figure 5-2** illustrates the distribution of the project trips within the study area.

The 2042 with-project PM peak hour traffic volume network is graphically depicted in **Figure 5-3**. These are the volumes used to estimate project impact in the operations analysis.

5.4 Traffic Operations

This section summarizes 2042 without-project traffic operations at the study intersections. An LOS analysis was conducted for without-project conditions to quantify traffic operations. Under without-project conditions, the analysis uses the same methodologies discussed in the existing analysis. A peak hour factor of 0.9 was used for the future models. Synchro signal timing plans (green time and offsets) for the intersections were optimized for 2042. Signal cycle lengths remained unchanged from 2014 for all intersections except for the SE 32nd Street and Richards Road intersection, which increased to 150 seconds. The with-project traffic operational analysis utilizes the traffic volumes illustrated in **Figure 5-3**. **Table 5-4** summarizes the 2042 without-project and 2042 with-project LOS analysis. The detailed LOS worksheets are provided in **Appendix C**.

As **Table 5-4** shows, for the 2042 without-project analysis, the Richards Road/SE 32nd Street intersection will operate at LOS E with a 1.15 V/C ratio and the Richards Road/SE Eastgate Way intersection will operate at LOS D with a 1.34 V/C ratio. The unacceptable LOS E and V/C ratios greater than 1 are due to background traffic growth in the northbound and southbound directions. For the 2042 with-project conditions, all signalized intersections were calculated to operate at the same LOS as the without-project conditions. The maximum increase of V/C ratios for the with-project scenario is 0.06.

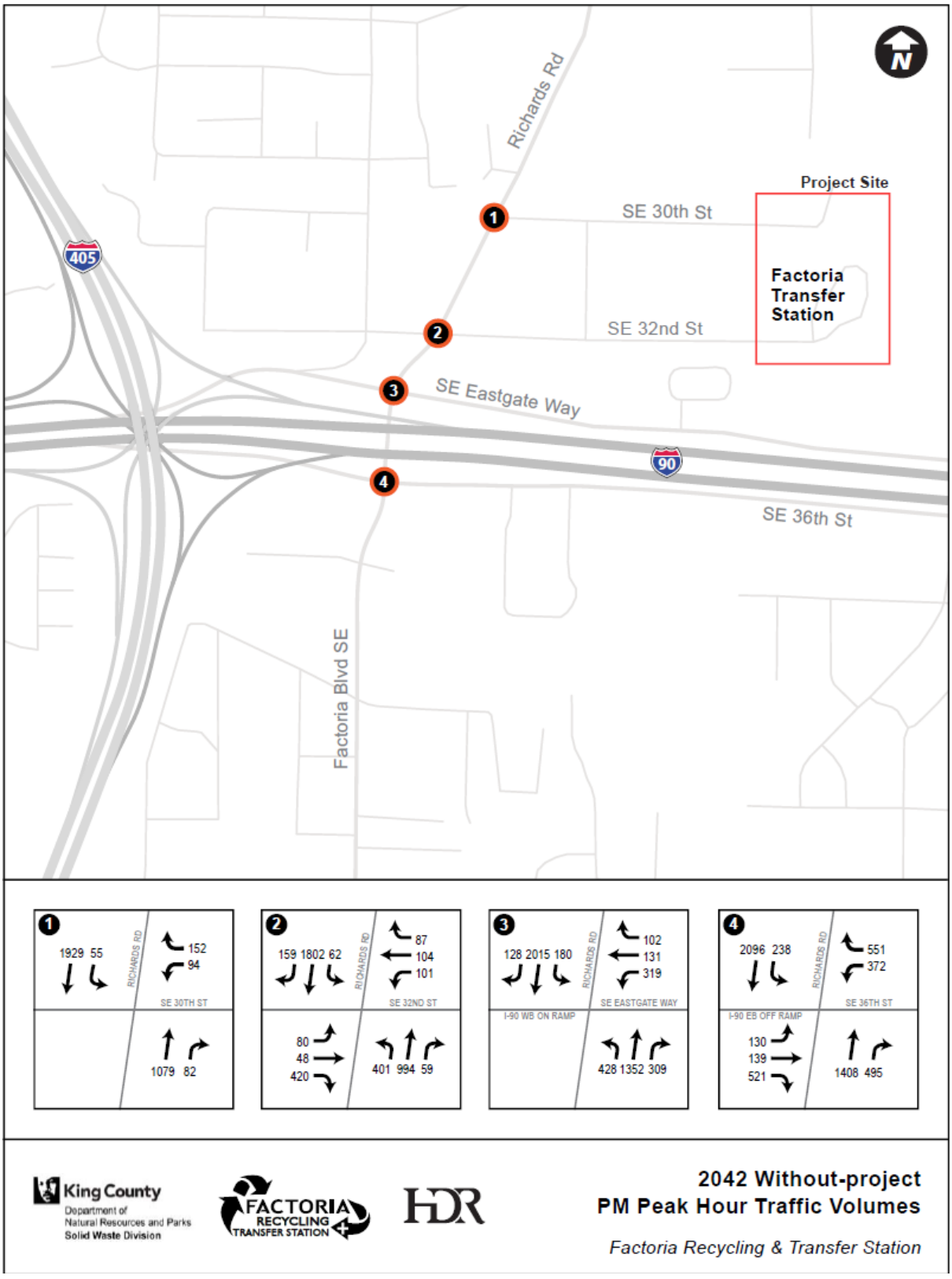

Figure 5-1. 2042 Without-Project PM Peak Hour Traffic Volume

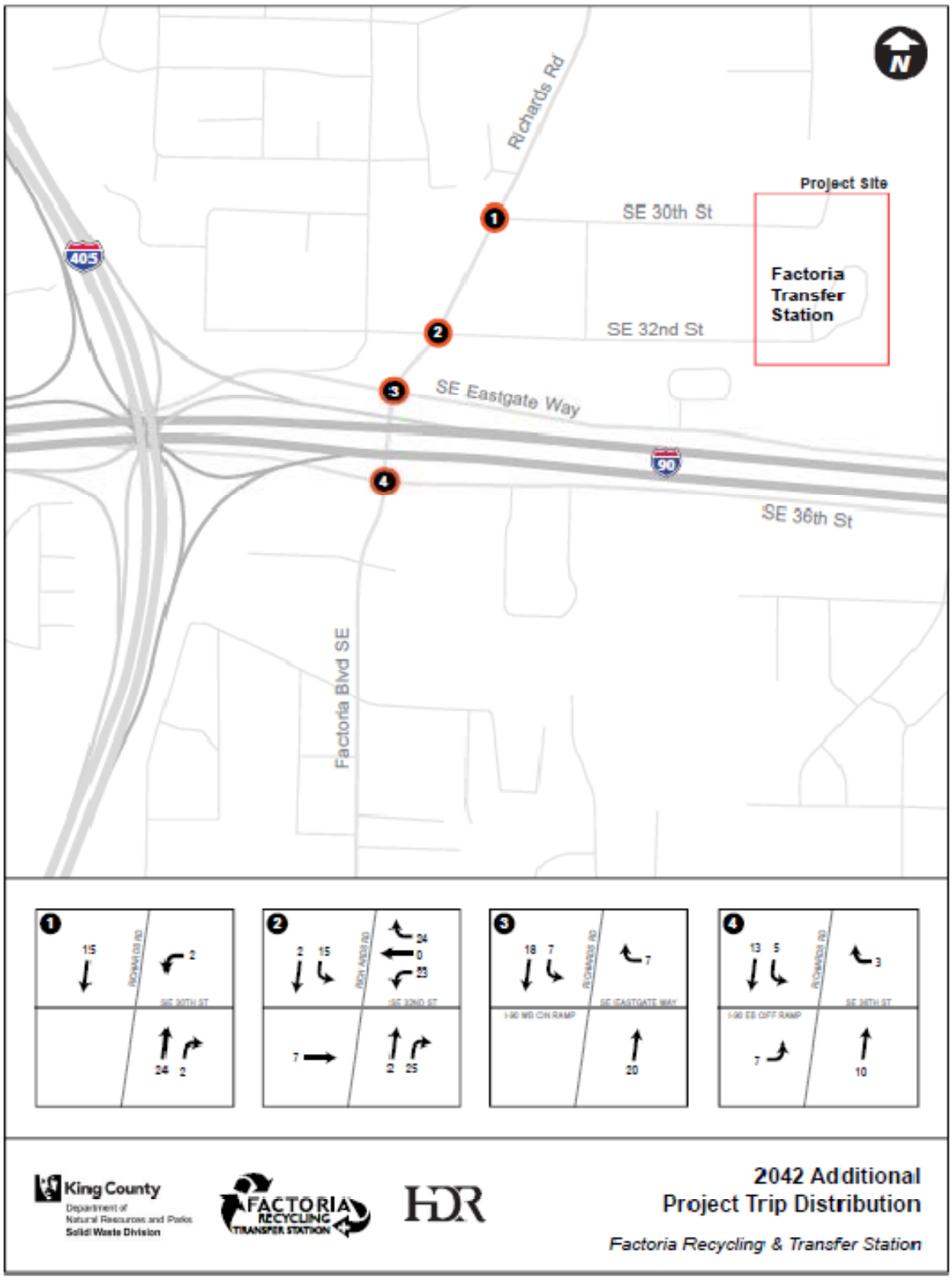

Figure 5-2. 2042 Project Trip Distribution

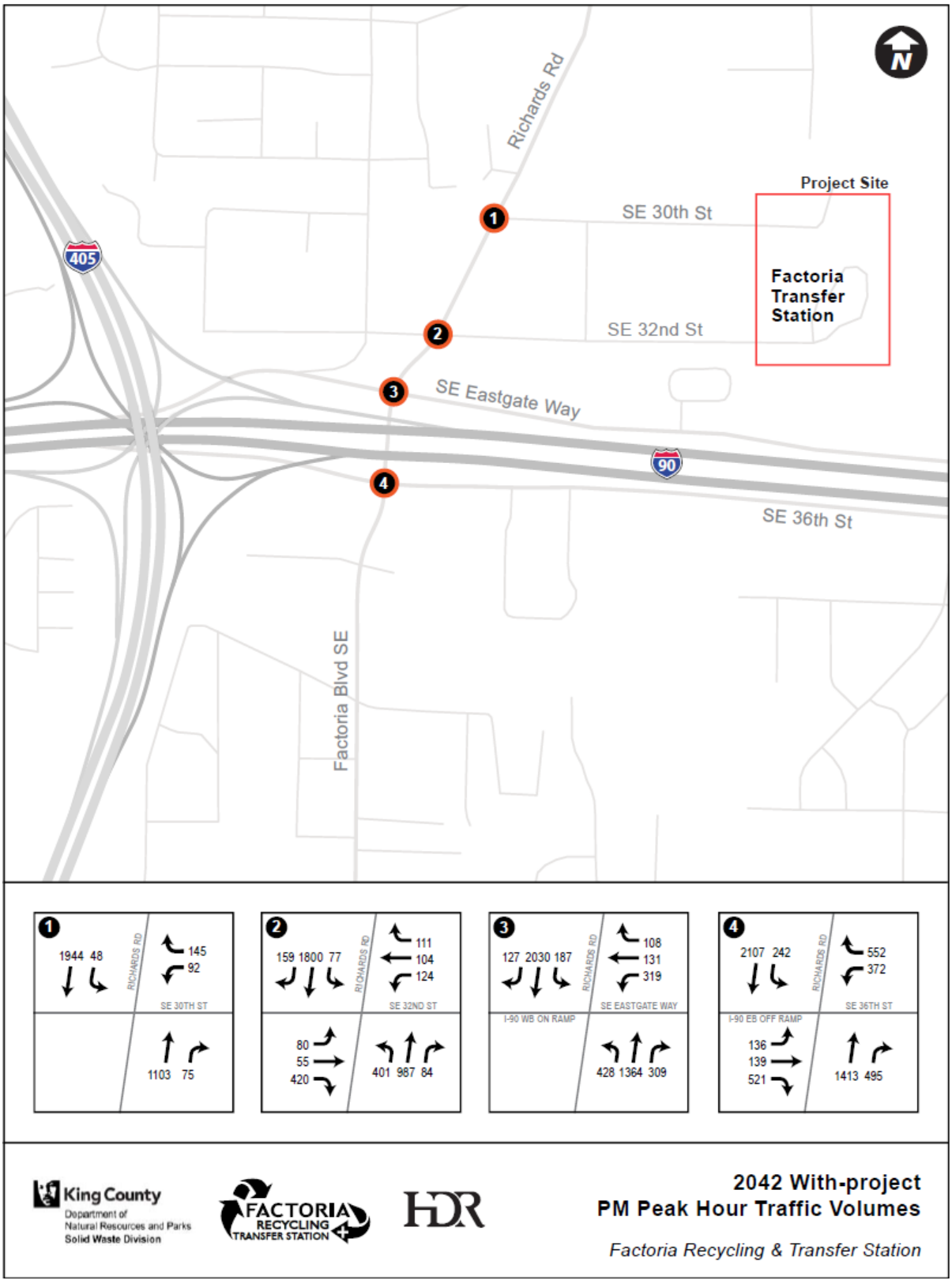

Figure 5-3. 2042 With-Project PM Peak Hour Traffic Volume

Table 5-4. 2042 PM Peak Hour LOS Summary

Int. No.	Description	Control Type[1]	Delay/ Veh[2]	LOS[3]	V/C Ratio[4]
2042 With Project					
1	Richards Rd/SE 30th St	Signal	8.9	A	0.73
2	Richards Rd/SE 32nd St	Signal	**79.5**	**E**	**1.20**
3	Richards Rd/SE Eastgate Way	Signal	47.9	D	**1.40**
4	Richards Rd/SE 36th St	Signal	24.6	C	0.81
2042 Without Project					
1	Richards Rd/SE 30th St	Signal	8.9	A	0.72
2	Richards Rd/SE 32nd St	Signal	**79.6**	**E**	**1.15**
3	Richards Rd/SE Eastgate Way	Signal	46.4	D	**1.34**
4	Richards Rd/SE 36th St	Signal	24.1	C	0.80

Notes:

1. OWSC = One-way stop controlled intersection. AWSC = All-way stop controlled intersection. Signal = Signalized intersection. Unsignalized and signalized intersections were analyzed using Synchro.
2. Control delay, measured in seconds per vehicle, is a measure of all the delay contributable to traffic control measures, such as traffic signals or stop signs. At signalized intersections and all-way stop controlled intersections, the delay reported is the average of all the control delay experienced for all the movements. At one-way or two-way stop controlled intersections, the reported delay is for only one movement: the movement experiencing the worst control delay, which is typically one of the stop controlled side street approaches. The control delay reported at two-way stop controlled intersections is not a valid indication of the operations at the entire intersection.
3. LOS is the level of service, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.
4. V/C ratio is a measure that relates prevailing volume to the estimated capacity, a concept based on the 2000 Highway Capacity Manual for unsignalized and signalized intersections.

6.0 Mitigation

All the study intersections will remain at the same LOS without and with the proposed Factoria RTS improvements. The V/C ratios remained constant for the 2014 analysis and increased by a maximum of 0.06 for the 2042 analysis. As a result of the minor changes, no mitigation is proposed for this development.

The City of Bellevue analyzes projects in terms of Mobility Management Areas (MMA). The study intersections impact two of these MMAs – the Eastgate MMA and the Factoria MMA. Each MMA has an overall V/C ratio threshold established by the City. The threshold for the zones impacted by the Factoria RTS is 0.95 for the Factoria MMA and 0.90 for the Eastgate MMA. Until the City of Bellevue runs its modeling software, it is unclear whether or not the minor changes from the Factoria RTS improvements will cause the MMAs to exceed the acceptable V/C ratios.

The City of Bellevue (COB) assesses transportation impact fees on building permits and some conditional use permits. Developers pay impact fees on new developments to help mitigate traffic impacts and to provide part of the funding for the city's transportation infrastructure. There is an impact fee schedule established by the city that has rates representing dollars per unit for each land use category. Because the Factoria RTS is proposed to be built over several parcels of land, a pre-application meeting with the Land Use Division will be necessary. They will help determine what industrial land use is most appropriate for the Factoria RTS site - most likely light industrial. Based upon approximately 64,100 square feet of building space, the light industrial cost would be $159,000. There will also be 2,800 square feet of office space billed at the commercial office rate, which would equal $9,600. The total approximate impact fee cost based upon the 2010 impact fee rate schedule would be $168,600. This fee is typically due at the building permit submittal.

The Factoria RTS will need to meet concurrency as well. Because the Factoria RTS generates 40 trips during the PM peak hour, which is greater than the COB threshold of 30, a concurrency run will need to be completed. The traffic analysis in this report shows that V/C ratios remain constant for 2014 and increased by a maximum of 0.06 for the year 2042. Therefore, it is unlikely that there will be major changes to the overall V/C ratio thresholds within the Mobility Management Areas.

7.0 References

City of Bellevue Traffic Data Book, 2009, City of Bellevue

Highway Capacity Manual, 2003, Transportation Research Board

ITE Trip Generation Manual, 2008, Institute of Transportation Engineers

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