

CTA Blue Line Forest Park Branch Feasibility/Vision Study: Transit Ridership Forecasting Analysis Technical Memorandum

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1.0 Introduction

The transit ridership forecasting analysis for the Chicago Transit Authority (CTA) Blue Line Forest Park Branch/I-290 Eisenhower Expressway Corridor is documented in this technical memorandum. As part of the Illinois Department of Transportation (IDOT) I-290 Eisenhower Expressway Phase 1 Study and Environmental Impact Statement (EIS), a regional travel demand forecasting model was used to develop traffic and transit ridership forecasts for the I-290 Phase 1 Study. As part of the CTA Blue Line Forest Park Branch Feasibility/Vision Study, IDOT funded the preparation of transit ridership forecasts in the corridor.

1.1 Organization of this Report

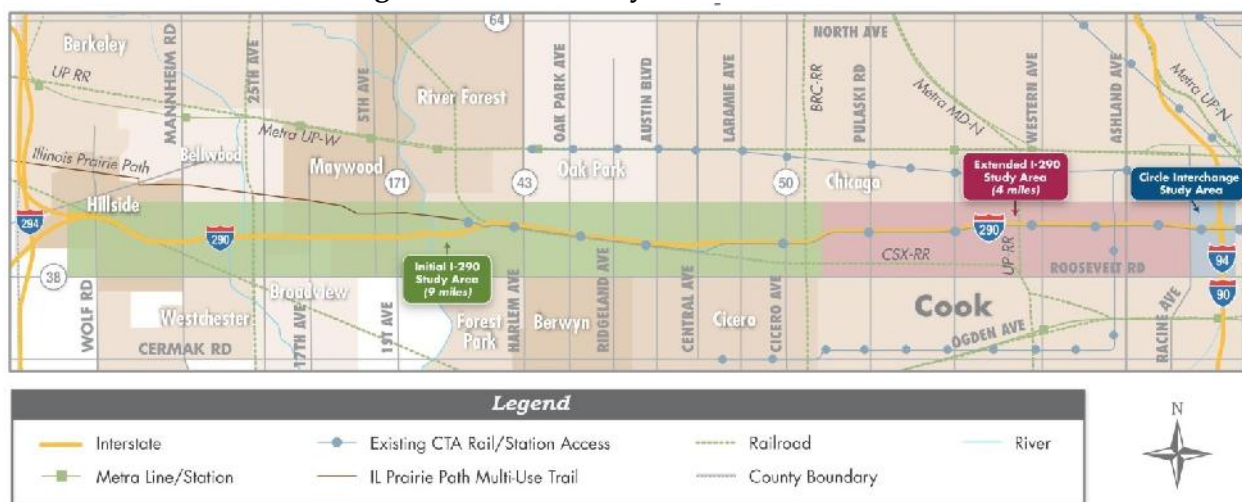
The structure of this document includes three main sections:

1. Ridership Forecasting Approach
2. Alternatives Definition
3. Ridership Forecasting Results

1.2 Study Area

The I-290 study area is located in Cook County and extends from I-88/I-294 to Racine Avenue. The northern boundary of the I-290 study area is North Avenue, and the southern boundary is Cermak Road, an area of approximately 55 square miles. The I-290 corridor is centered on I-290, and extends approximately ½-mile north and south of I-290. Figure 1.1 depicts adjacent transit and freight railroads, interchanges, cross streets and other parallel and crossing features that are within or in close proximity to I-290.

Figure 1.1 I-290 Study Area and Corridor



The study area for the CTA Blue Line Forest Park Branch Feasibility/Vision Study includes the twelve active CTA stations between Clinton Street and the Forest Park terminal station. In addition, the CTA Blue Line Forest Park Branch Feasibility/Vision Study is coordinating planning with IDOT for the entire I-290 corridor.

The travel demand forecasting model developed for use in the I-290 Phase 1 Study, based on the Chicago Metropolitan Agency for Planning (CMAP) regional travel demand forecasting model, includes Cook, DuPage, Kane, Lake, McHenry, Will, and Kendall Counties, as well as other Illinois, Indiana, and Wisconsin counties buffering the northeast Illinois region. Thus, the I-290 Phase 1 Study travel demand forecasting model encompasses the study areas for both the I-290 Phase 1 Study and the CTA Blue Line Forest Park Branch Feasibility/Vision Study, which are both in Cook County, as well as the entire northeast Illinois region.

2.0 Ridership Forecasting Approach

This section describes the transit ridership forecasting approach used for the I-290 Phase 1 Study/EIS (I-290 Study) and the CTA Blue Line Forest Park Branch Feasibility/Vision Study (Blue Line Vision Study).

2.1 Travel Demand Forecasting Model Description

The travel demand forecasting approach for the I-290 Study has included continuous coordination and cooperation with the Chicago Metropolitan Agency for Planning (CMAP). When the I-290 Study was initiated in 2009, the CMAP regional travel demand forecasting model and the 2030 Regional Transportation Plan network assumptions were used as the starting point.¹ With the adoption of CMAP's GO TO 2040 Comprehensive Regional Plan in October 2010, the travel modeling for the I-290 Phase I Study transitioned to using CMAP's GO TO 2040 network assumptions.

Over the course of the I-290 Study and Blue Line Vision Study, IDOT's consultant, WSP | Parsons Brinckerhoff, has implemented a number of enhancements to the CMAP regional travel model, many of which have been adopted by CMAP into their forecasting process. There were three major reasons for developing and implementing these enhancements to the CMAP regional travel forecasting model:

- To update the CMAP regional travel model using data from the 2007 CMAP Travel Tracker Survey, the American Community Survey (ACS) and the 2010 Census;
- To develop and implement more detailed travel forecasting procedures and inputs for use in the development of design-level traffic forecasts for major project development; and
- To develop enhanced travel forecasting procedures to provide improved sensitivity to the alternatives being tested.

Table 2.1 summarizes the regional travel model enhancements implemented for the I-290 Study. As seen in this table, there have been a series of travel model enhancements made for the I-290 Phase 1 Study, consistent with the technical information required for the study.

¹ I-290 Travel Model Assumptions Methodology & Validation Technical Memorandum, July 2010. Available at: http://www.eisenhowerexpressway.com/info_center/reports.asp

Table 2.1 Travel Demand Forecasting Model Enhancements

Attributes or Assumptions	I-290/Blue Line Travel Model	Comments
Specific Regional Travel Model Improvements		
1. Trip Generation Model (2009-2010)	Updated CMAP regional trip generation rates based on much more recent 2007-2008 CMAP Travel Tracker Survey and U.S. Census Bureau American Community Survey data. This included an update of trip generation rates for persons residing in households, stratification by income level for home-based work trips, and updates of the household vehicle ownership, trip attraction allocation, external trips, and non-motorized sub-models	I-290 improvements implemented by CMAP.
2. Trip Distribution Model (2009-2010)	Re-calibrated CMAP regional trip distribution models to more recent CMAP Travel Tracker Survey and Census journey to work trip length data. Updated the input files for estimating the costs of transit and highway travel, and stratified home based work trips by income level.	I-290 improvements implemented by CMAP.
3. Mode Choice Model (2009-2010)	Updated CMAP regional mode choice model, including re-calibration of the model based upon more recent CMAP Travel Tracker Survey mode shares, update of travel costs to reflect current conditions, adjustment of model coefficients for current dollars in the primary auto-transit choice model and the auto occupancy sub-model, and model code revisions to account for the stratification of home-based trips by income level (for example, this stratification improves transit mode choice modeling for commuter rail and other longer distance commuting trips).	I-290 improvements implemented by CMAP.
4. Highway Assignment (2009-2010)	Updated CMAP regional highway trip assignment model, including updates to more current time-of-day factors based on the more recent CMAP Travel Tracker Survey, and revisions to the traffic assignment macros to include the assignment of the additional managed lane	I-290 improvements implemented by CMAP.

	trip types.	
5. Sub-Area Highway Network (2009-2010)	Added highway network detail in CMAP regional highway network for the I-290 study area to allow the development of more detailed project level traffic forecasts required for design purposes.	I-290 project specific model improvement.
6. Sub-Area Zone System (2009-2010)	Added detail to transportation analysis zones in CMAP regional model for the I-290 study area to allow the development of more detailed project level traffic forecasts for design purposes.	I-290 project specific model improvement.
7. Evaluation Measure Summaries (2009-2012)	Developed processes to summarize regional model data into transportation system performance evaluation measures. The summaries allowed IDOT to prepare the evaluation results of alternatives in a tabular format for use in comparing the transportation performance of different alternatives.	I-290 project specific model improvement.
8. Highway Assignment (2011)	Incorporated advanced path-based traffic assignment resulting in improved model convergence, faster computer run times, and the ability to analyze path-based results that are required for the development of travel performance summaries.	Implemented by CMAP.
9. Trip Distribution/Mode Choice Models (2011)	Revised CMAP procedure for estimating transit cost and time inputs for trip distribution and mode choice, including updating the fare calculations to current levels. These revisions were made to better reflect current transit conditions to provide faster computer run times.	Implemented by CMAP.
10. Transit Assignment (2011)	Implemented transit assignment procedure that does not require coding of auto access links and allows riders to consider multiple rail stations and bus stops. This results in improved sensitivity of the transit modeling through better transit access representation.	
11. Highway Assignment (2012)	Updated tolling procedures in regional highway assignment through network coding, updated link volume-delay functions and revised assignment macros. This update improved the sensitivity of the model to tolling characteristics contained in the managed lane alternatives.	CMAP Implementation planned.

12. Mode Choice Model (2012)	Developed a post-processing procedure that estimates the effect upon mode choice of alternate tolling and pricing scenarios. This results in the mode choice model being sensitive to tolling, so its impacts can now be reflected in the transit mode share.	CMAP Implementation planned.
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2.2 Travel Demand Forecasting Model Assumptions

A major input to the I-290 Study and Blue Line Vision Study travel demand forecasting model is the socio-economic forecasts. The socio-economic forecasts include population, households, employment, and other demographic characteristics that are used by the travel demand forecasting model to generate trip making and travel characteristics. The future planning horizon for the socio-economic forecasts and resulting travel forecast is the year 2040, which is consistent with the planning horizon used by CMAP.

The methodology used to develop the I-290 socio-economic forecasts was approved by CMAP and is consistent with the original CMAP GO TO 2040 modeling area control totals. These socio-economic forecasts were developed to reflect market constraints and are based on 2010 Census results, historic trends, land availability, local land use policies, and independent Woods & Poole forecasts.² This market-based forecast approach reflects typical practice for design and financial analysis purposes for major project development, and is consistent with Federal Highway Administration (FHWA) suggested practice for socio-economic forecasting for use in National Environmental Policy Act (NEPA) document preparation.

The I-290 Study/Blue Line Vision Study travel demand forecasting model is also comprised of highway and transit networks that are computerized representations of the regional highway and transit systems. The highway and transit network coding was detailed and verified in the study area. Travel costs are also included in the travel demand forecasting model. These costs, such as transit fares, auto operating costs, and tolls, were also updated.

² The al Chalabi Group, The I-290 Corridor Study, Historic and Forecasted Growth of Population, Households and Employment in the Extended Region of Chicago, No-Build Market-Driven versus Policy-Based Socio-Economic Forecasts (2010-2040) and I-290 Build Forecasts, June 2014, revised September 2015.

3.0 Alternatives Definition

This section describes the 2040 No Build and Build alternatives that are being evaluated in Round 3 of the I-290 Study.³

3.1 2040 No Build Alternative

The I-290 Study utilized the CMAP GO TO 2040 Plan fiscally constrained highway and transit networks as a starting point to develop the 2040 No Build scenario transportation networks. Major capital projects that were part of the fiscally constrained GO TO 2040 Plan were included in these networks, with the exception of the I-290 improvement project. In addition, IDOT's Byrne Interchange (formerly the Circle Interchange) Improvement Project was also added to the 2040 No Build highway network for Round 3, since it was amended into the GO TO 2040 Plan as a fiscally constrained project on March 14, 2013.

Systematic transit service improvements were also part of the fiscally constrained GO TO 2040 Plan, such as transit system operations improvements, and systematic capital improvements to transit facilities (designated bus only lanes, transit signal priority, and queue jump lanes) were included in the CMAP transit network. These systematic transit improvements included services such as arterial bus rapid transit service (bus rapid transit operating on arterial roads), bus transfer facilities, and other bus operations improvements.

With regards to the CTA Blue Line Forest Park Branch service, 7 minute peak period headways (frequency of service) and a 22.8 minute in-vehicle travel time from the Forest Park station to the UIC/Halsted station was assumed. In comparison, the Metra UP-West Line was assumed to have a 15 minute in-vehicle travel time from the Oak Park station to the Ogilvie Transportation Center. It should also be noted that the proposed Cermak Road Arterial Bus Rapid Transit Project was assumed as a systematic transit service improvement. This service runs on Cermak Road from the 54th/Cermak CTA Pink Line station to just west of the Yorktown Shopping Center.

3.2 2040 Build Alternatives

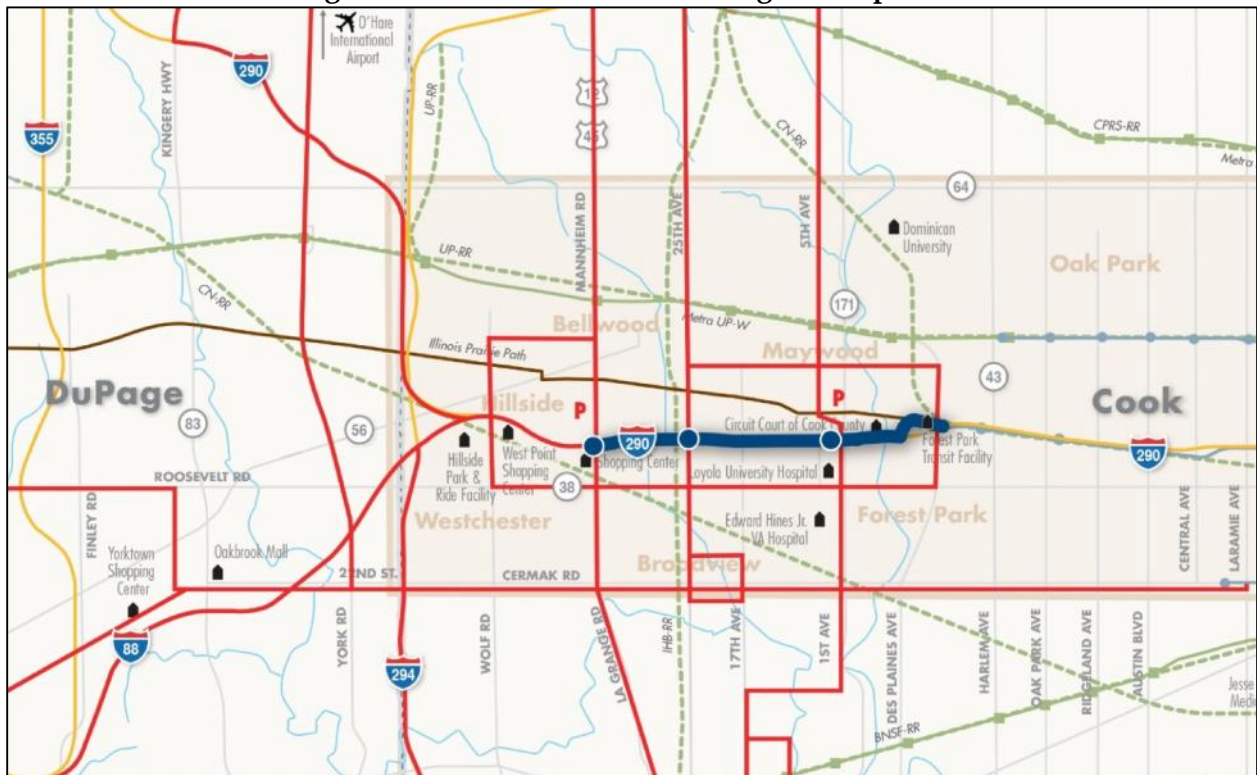
For the development and testing of transit alternatives in Round 1 – Single Mode Alternatives of the I-290 Study, the CTA Blue Line extension, bus rapid transit, and express bus alternatives were coded on top of the 2040 background transit network. The I-290 transit alternatives included the addition of new terminal and intermediate stations for the Blue Line extension and bus rapid transit alternatives, the availability of park-and-ride at outlying stations (Mannheim

³ Alternatives Identification and Evaluation Draft Interim Report, Initial Alternatives Identification and Round 1 & 2 Evaluation, Version 2.1, Round 2 Update, April 2013. Available at: http://www.eisenhowerexpressway.com/info_center/reports.asp

Road and stations to the west), feeder bus connections for existing bus routes, and additional new (or restored) feeder bus service.

During Round 2 – Combination Mode Alternatives of the I-290 Study, a CTA Blue Line (high capacity transit) extension to Mannheim Road was assumed in each of the Round 2 alternatives. The Blue Line extension to Mannheim Road showed a majority of the benefits versus extending the Blue Line to Oak Brook. This included 89% of the increase in regional transit trips at less than half the length (3.5 mile extension to Mannheim Road versus an 8 mile extension to Oak Brook). Figure 3.1 depicts the transit network improvements including feeder bus services for the testing of the Blue Line extension to Mannheim Road via I-290 as part of the Round 2 - Combination Mode Alternatives testing.

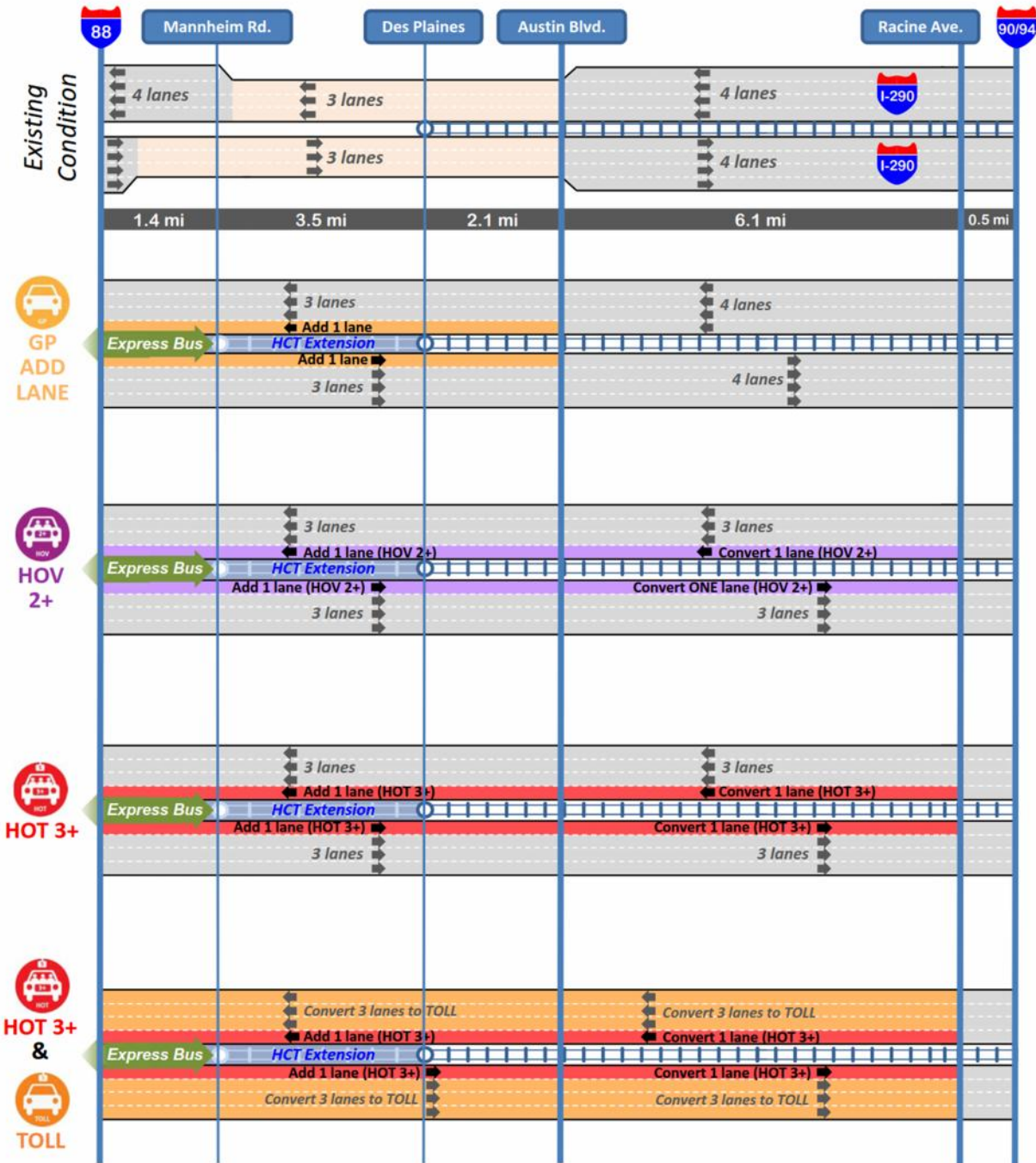
Figure 3.1 Transit Network Coding Assumptions



Based on the results of Round 2, four 2040 Build Alternatives were carried forward and refined in Round 3. The four 2040 Build Alternatives that are being analyzed in the Draft Environmental Impact Statement (DEIS), in addition to the 2040 No Build Alternative are shown in Figure 3.2 and include:

- General Purpose Lane (GP): The addition of a general purpose lane on I-290 in each direction from Mannheim to Austin
- High Occupancy Vehicle Lane with 2 or More Occupants (HOV 2+): The addition of a HOV 2+ managed lane on I-290 in each direction from Mannheim Road to Austin

Figure 3.2 Round 3 DEIS Alternatives



- Boulevard, and the conversion of an existing general purpose lane in each direction of I-290 to a HOV 2+ managed lane between Austin Boulevard and Ashland Avenue.
- High Occupancy Toll Lane with No Toll for High Occupancy Vehicles with 3 or More Occupants (HOT 3+): The addition of a HOT 3+ managed lane on I-290 in each direction from Mannheim Road to Austin Boulevard, and the conversion of an existing general

purpose lane in each direction of I-290 to a HOT 3+ managed lane between Austin Boulevard and Ashland Avenue.

- HOT 3+ Lane and Toll All Other Lanes (HOT 3+ & TOLL): The addition of a HOT 3+ managed lane on I-290 in each direction between Mannheim Road and Austin Boulevard, the conversion of a general purpose lane in each direction of I-290 to a HOT 3+ managed lane between Austin Boulevard and Ashland Avenue, and the tolling of the remaining 3 lanes in each direction on I-290 between Mannheim Road and Ashland Avenue.

All four of the Round 3 Build alternatives include the following new transit system assumptions:

- High Capacity Transit Extension (Blue Line Extension) from Forest Park to Mannheim Road with feeder bus services, shown in Figure 3.1. The proposed routing for the Blue Line extension is via existing CTA trackage from the Forest Park terminal via storage tracks running on the north side of I-290 to the west of the shop building. From there, the line would transition to I-290 and would continue west along I-290 to Mannheim Road with intermediate stations assumed at 1st Avenue and 25th Avenue. The Mannheim Road station would also include a park-and-ride facility.
- Two new fixed-route bus routes that replicate the proposed J-Line, shown in Figure 3.3.
- A new express bus route from DuPage County that uses the proposed new I-290 managed lane (HOV or HOT lane)/shoulder (GP alternative) serving the Illinois Medical District (IMD) and the University of Illinois at Chicago (UIC), shown in Figure 3.4.

The proposed transit service attributes of these new transit improvements is shown in Table 3.1.

Table 3.1 Transit Attributes for New Services

Route	Headway (minutes)	In-Vehicle Travel Time (minutes)	Length (miles)
CTA Blue Line Extension (Mannheim Rd to Forest Park)	7	8.0	4.4
J-Line Bus Route (Naperville to Mannheim Rd)	10	46.4	20.3
J-Line Bus Route (Schaumburg to Mannheim Rd)	40	62.1	22.8
DuPage – IMD/UIC Express Bus (Yorktown Center to UIC)	10	15.0	21.3

Figure 3.3 J-Line Bus Routes

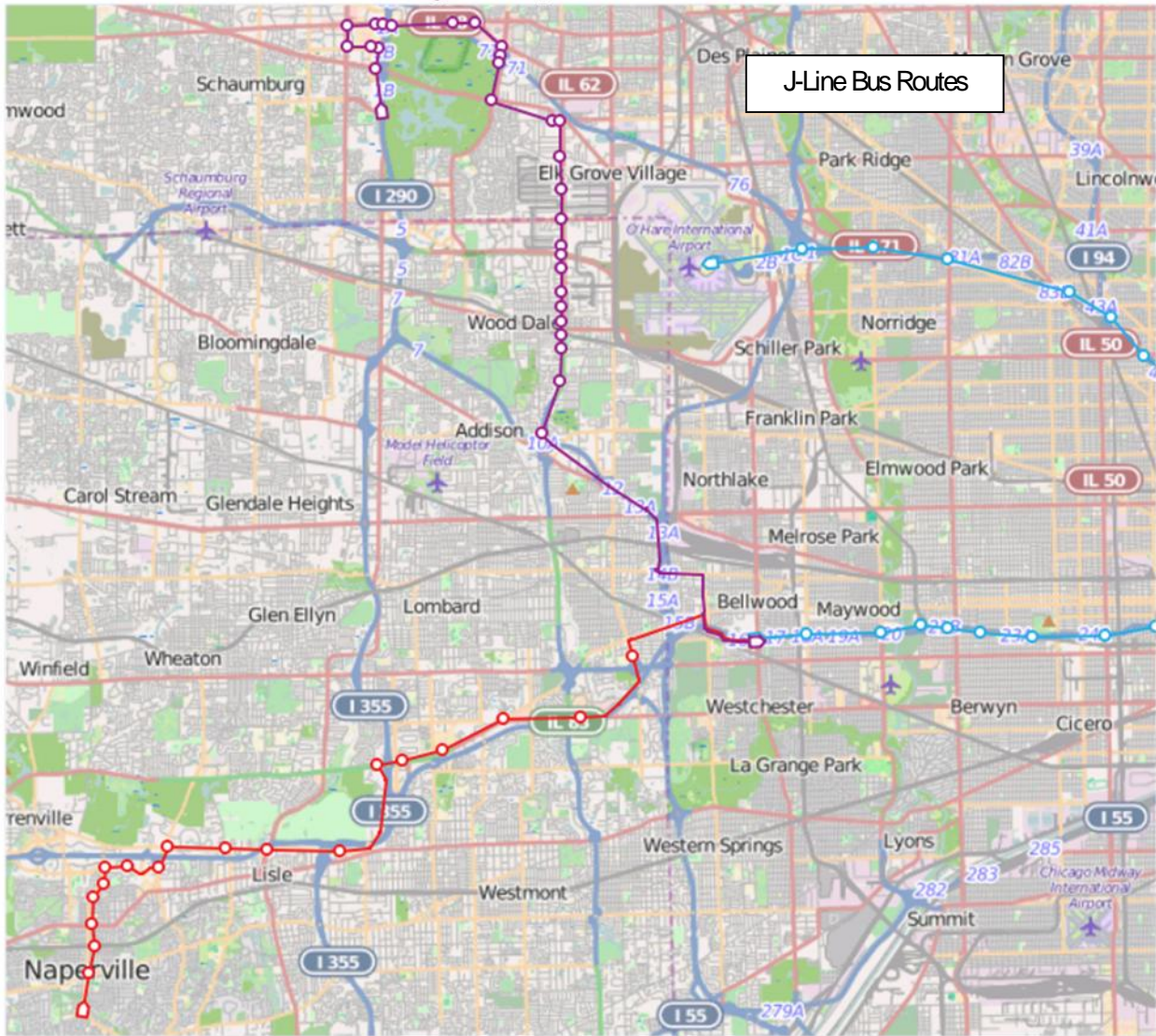
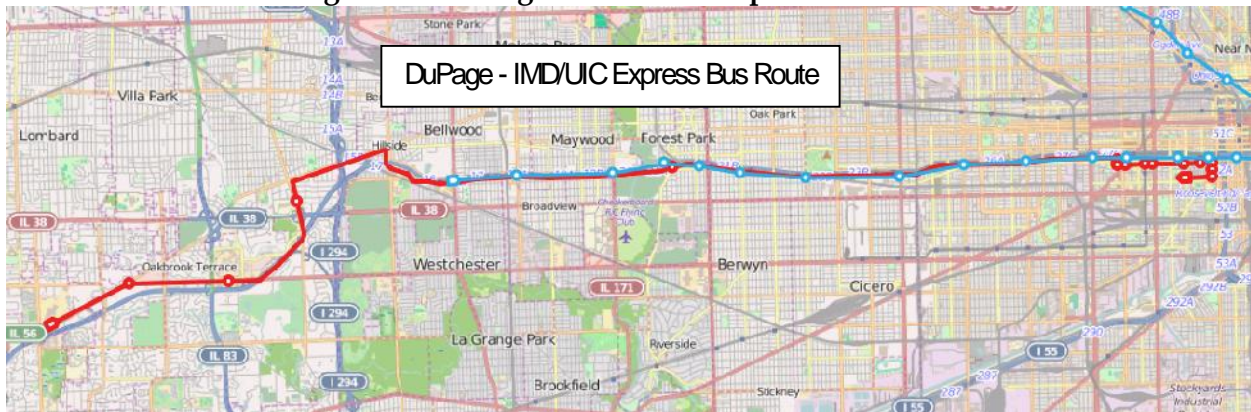


Figure 3.4 DuPage - IMD/UIC Express Bus Route



4.0 Transit Ridership Results

The No Build alternative and four Round 3 DEIS Build alternatives were tested using the I-290 Study and Blue Line Study travel forecasting model. The transit ridership results of the testing of the alternatives are presented in Table 4.1.

Table 4.1 Forecasted 2040 Weekday Transit Ridership

Transit Service	No Build	GP	HOV 2+	HOT 3+	HOT 3+ & TOLL
Blue Line – Forest Park Branch	26,400	30,800	30,700	30,800	31,300
J-Line Bus Routes	-	17,500	17,300	17,510	17,500
DuPage - IMD/UIC Express Bus	-	10,300	9,800	10,400	12,900

As seen in Table 4.1, transit ridership on the Blue Line Forest Park Branch increases by up to 4,900 boardings with the four Build alternatives, primarily due to the Blue Line extension from Forest Park to Mannheim Road. The ridership on the Blue Line is approximately the same for the GP, HOV 2+ and HOT 3+ alternatives, with slightly higher ridership for the HOT 3+ & TOLL alternative. This slightly higher ridership on the HOT 3+ & TOLL alternative can be attributed to the diversion of highway trips because of the tolling of all lanes on I-290.

The J-Line Bus Routes had consistent forecast ridership for the four Build alternatives at approximately 17,500 weekday riders in 2040.

The DuPage – IMD/UIC Express Bus route is forecasted to have between 9,800 and 10,400 riders for the GP, HOV 2+ and HOT 3+ alternatives. Again, slightly higher ridership for the HOT 3+ & TOLL alternative is expected for the DuPage – IMD/UIC Express Bus route due to the diversion of highway trips from tolling all lanes on I-290.

A screen line analysis was also performed for the I-290 study area. North-south screen lines at four locations in the I-290 study area were identified, as shown in Figure 4.1. All east-west transit services north of Cermak Road and south of North Avenue are included in the screen line analysis. East-west transit segments crossing the red screen lines are highlighted in orange in Figure 4.1.

The transit ridership of all east-west transit services crossing those screen lines was then tabulated for the alternatives and is presented in Table 4.2. Overall, the four Round 3 DEIS alternatives result in an increase in transit ridership across the screen lines primarily due to the

Blue Line Extension. The HOT 3+ & TOLL alternative results in the highest number of transit screen line crossings, because of the diversion of highway trips due to the tolling all lanes on I-290. The GP and HOT 3+ alternatives have the next highest transit screen line ridership, followed by the HOV 2+ Alternative. The HOV 2+ alternative is the most competitive with transit, as addition of the HOV 2+ lane provides incentive to carpool, which may divert some potential transit riders.

Figure 4.1 I-290 Study Area North-South Screen Lines

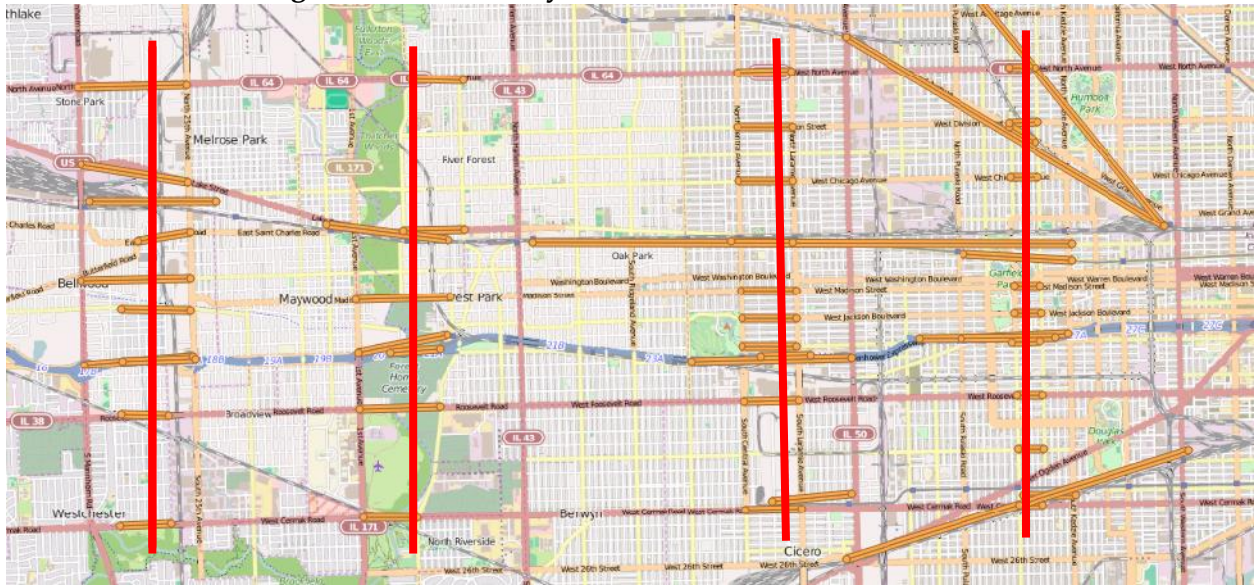


Table 4.2 Forecasted 2040 Transit Screen Line Analysis Results

Screen Line Location	No Build	GP	HOV 2+	HOT 3+	HOT 3+ & TOLL
Between Mannheim & 25 th Avenue	44,200	49,200	47,600	49,300	52,400
Between Des Plaines & 1 st Avenue	52,700	57,600	55,900	57,700	61,400
Between Central & Laramie	77,800	80,500	78,400	80,500	84,600
Between Central Park & Homan	133,100	138,000	134,500	138,000	143,100

Appendix

An additional alternative, the HOV 2+ without the proposed DuPage - IMD/UIC express bus route was tested for the CTA. Table A.1 presents 2010 and forecasted 2040 weekday boardings for Blue Line Forest Park Branch stations. As seen in this table, total station boardings are expected to increase by 2,900 from 2010 to the 2040 No Build, or an increase of 12.3 percent. This increase is consistent with the forecasted 13.6 percent increase in households in the I-290 study area. The Forest Park, Oak Park, and IMD stations exhibit the highest growth in ridership from 2010 to the 2040 No Build.

As seen in this table, the Build alternatives include the extension of the Blue Line from Forest Park to Mannheim Road. The GP, HOV 2+, and HOT 3+ alternatives have approximately 4,400 more boardings than the No Build alternative due to the extension of the Blue Line. The HOT 3+ & TOLL alternative has an additional 500 boardings more than the other three build alternatives, due to the diversion of highway trips from tolling all lanes on I-290. The HOV 2+ w/o DuPage – IMD/UIC route is expected to increase Blue Line ridership by up to 2,900 boardings over the four Build Alternatives. It is apparent that the proposed DuPage – IMD/UIC express bus route was diverting some transit trips from the Blue Line, due to its direct one-seat service from DuPage County to the IMD/UIC, and its more reliable travel time in the I-290 managed lane.

Forecasted 2040 weekday boardings on the three new Blue Line extension stations is 3,700 for the GP, HOV 2+, and HOT 3+ alternatives, and 4,100 weekday boardings for the HOT 3+ & TOLL alternative. The HOV 2+ w/o DuPage – IMD/UIC alternative is forecasted to have 4,900 weekday boarding on the extension. Forecasted weekday boardings at the Forest Park station for the Build alternatives are expected to decrease between 1,500 and 1,900 from the No Build alternative since the Forest Park station is no longer the terminal station for the Blue Line in the Build alternatives. The Racine, Kedzie, Pulaski, and IMD stations in the Build alternatives are expected to have the highest increase in boardings of existing stations on the Blue Line.

Table A.1 Forecasted 2040 Weekday Forest Park Branch Station Boardings

Station	2010	2040					
		No Build	GP	HOV2+	HOT3+	HOT3+ & TOLL	HOV2+ w/o DuPage-IMD/UIC
UIC-Halsted	3,200	3,400	3,700	3,700	3,700	3,700	4,200
Racine	2,400	2,600	3,300	3,300	3,300	3,200	3,500
IMD	2,900	3,200	3,600	3,500	3,600	3,500	4,000
Western	1,500	1,600	1,600	1,600	1,600	1,600	1,700
Kedzie	1,900	2,100	2,600	2,600	2,600	2,600	2,600
Pulaski	1,700	1,800	2,300	2,300	2,300	2,300	2,300
Cicero	1,300	1,400	1,600	1,600	1,600	1,600	1,600
Austin	2,000	2,100	2,200	2,200	2,200	2,300	2,100
Oak Park	1,700	2,300	2,200	2,200	2,200	2,300	2,300
Harlem	1,000	1,100	1,100	1,100	1,100	1,100	1,100
Forest Park	3,900	4,800	2,900	2,900	2,900	3,000	3,300
1st Ave	-	-	1,000	1,000	1,000	1,100	1,400
25th Ave	-	-	600	600	600	600	600
Mannheim	-	-	2,100	2,100	2,100	2,400	2,900
Totals	23,500	26,400	30,800	30,700	30,800	31,300	33,600