

MEMORANDUM

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Subject: Ridership Forecasts for Uptown DBL Alternatives

Introduction / Summary:

The purpose of this memorandum is to present the revised ridership forecasts for the Dedicated Bus Lanes (DBL) alternatives. This technical memorandum contains two parts. The first part of the memo briefly documents the model setup and major service assumptions embedded in the baseline and build scenarios. The second part of the memo contains the BRT ridership forecasts.

Ridership projections for this study were developed using the Houston-Galveston Area Council's (H-GAC's) regional travel forecasting model. Our results indicate under the mixed flow option on west loop, the opening year ridership (2018) on the DBL line, running from Northwest Transit Center (NWTC) to Bellaire/Uptown Transit Center (BUTC) would be 14,100 daily boardings. In the long term (2035), the projected ridership is about 20,750 daily boardings. Under the Elevated busway option on west loop, the DBL ridership is projected to be 18,400 trips in 2018 and 25,800 in 2035.

The DBL ridership is projected to increase to significantly when it is extended from BUTC to Bellaire Transit Center (BTC). In the near term (2018), the total daily ridership with the BTC extension would be 19,800 and in the long term (2035), about 28,700 boardings.

PART 1: Model Setup and Major Service Assumptions

Model setup

The base year travel model represents the 2010/11 transportation service and the corresponding system demand. As a first step, the model inputs were checked thoroughly to ensure it accurately represented the current level of service both on the highway and transit system. Next, the 2010 transit ridership generated by the model in the study area was compared with the average observed daily ridership collected by Houston METRO in 2010 to ensure the differences between simulated and observed ridership levels were within accepted margins of error.

As a part of model validation on the highway side, observed travel speed data were collected on West Loop and Post Oak Boulevard and compared with peak congested speeds estimated by the travel model. The Gunda Corporation and Texas Transportation Institute (TTI) provided the

roadway speed data for various segments of the corridor during the morning and afternoon peak periods. In general, the estimated highway speeds in the model compared reasonably well with observed data. Based on these validation checks, it was concluded the model was ready for forecasting purposes.

Forecast years

Two forecast years were considered in this study.
Near term: (Opening year): **2018** and
Long term: **2035**

Alternatives Tested

The calibrated and validated travel model was applied to generate projections of travel demand for four alternatives:

- 2018 DBL from NWTC to BUTC. Service in a dedicated bus lane on Post Oak Blvd and in Mixed Flow on West Loop
- 2018 DBL from NWTC to BUTC. Service in a dedicated bus lane on Post Oak Blvd and in elevated busway on West Loop
- 2018 DBL from NWTC to BTC. Service in a dedicated bus lane on Post Oak Blvd and in Mixed Flow on: West Loop and from BUTC to BTC.
- 2035 DBL from NWTC to BUTC. Service in a dedicated bus lane on Post Oak Blvd and in Mixed Flow on West Loop
- 2035 DBL from NWTC to BUTC. Service in a dedicated bus lane on Post Oak Blvd and in elevated busway on West Loop
- 2035 DBL from NWTC to BTC. Service in a dedicated bus lane on Post Oak Blvd and in Mixed Flow on: West Loop and from BUTC to BTC

2018 DBL from NWTC to BUTC, Busway and Mixed Flow operations

This alternative assumes a - service connecting the planned BUTC and NWTC through the Uptown study area. From BUTC to the West Loop, the DBL alignment would run along an exclusive busway on Post Oak Boulevard. From Post Oak and I-610 to Memorial Drive the alignment would be in mixed traffic on the West Loop from Memorial Drive to NWTC, the alignment would follow North Post Oak. **Under this alternative, Route 33 would not serve the segment between NWTC and the BUTC.** Since Route 33 is assumed to terminate at BTC in this alternative, a shuttle service would be provided between BUTC and BTC, running at 15 minute headway.

2018 DBL from NWTC to BUTC, Busway on Post Oak and Elevated Busway on West Loop

This alternative assumes a - service connecting the planned BUTC and NWTC through the Uptown study area. From BUTC to the West Loop, the DBL alignment would run along an exclusive busway on Post Oak Boulevard. From Post Oak to NWTC, the alignment would be on an elevated busway running in the middle of I-610. **Under this alternative, Route 33 would not serve the segment between NWTC and the BUTC.** Since Route 33 is assumed to terminate at BTC in this alternative, a shuttle service would be provided between BUTC and BTC, running at 15 minute headway.

2018 DBL from NWTC to BTC, Busway and Mixed Flow operations

This alternative assumes a service connecting the existing BTC and NWTC through the Uptown study area. From BTC to BUTC, buses would operate in mixed traffic and from BUTC to the West Loop, the buses would run along an exclusive busway on Post Oak Boulevard. From Post Oak and I-610 to Memorial Drive the alignment would be in mixed traffic on the West Loop and from Memorial Drive to the Northwest Transit Center, the alignment would follow North Post Oak. **Under this alternative, Route 33 would not serve the segment between NWTC and the BTC.** Since the proposed service in this alternative serves the segment between BUTC and BTC, the shuttle service described in the above alternative is not necessary in this alternative.

2035 DBL from NWTC to BUTC, Busway and Mixed Flow operations

See the 2018 description above

2018 DBL from NWTC to BUTC, Busway on Post Oak and Elevated Busway on West Loop

See the 2018 description above

2035 DBL from NWTC to BTC, Busway and Mixed Flow operations

See the 2018 description above

DBL Service Assumptions Used in the Build Scenarios

The following assumptions for the DBL service were used in the model:

- Average speed on the DBL service is 13 MPH on the entire alignment. Speeds on Post Oak busway would be in the order of 14 MPH. This average speed includes station dwell times. This speed assumption is based on recommendation made by Houston METRO staff.
- Bus speeds in mixed flow on West loop are based on highway congested speeds
- DBL fare would be: \$1.25. Free transfers from/to Park and Ride buses.
- Transfer time at NWTC: 1 min
- Transfer time at BUTC: 2 min
- Transfer time at BTC: 1 min
- DBL Peak and off-peak headways would be: 5 min
- No capacity constraints on DBL

Table 1 and **2** provides a summary of travel speeds for various segments of the DBL alignment.

Table 1: DBL Speed Assumptions (Mixed flow on West Loop)

Alternative	DBL speeds on Post Oak Blvd		DBL speeds on West Loop	
	Peak period	off-peak period	Peak period	off-peak period
Busway on Post Oak, Mixed Flow on West Loop	14 MPH	14 MPH	12.5 MPH between Post Oak and Memorial Drive	14 MPH between Post Oak and Memorial Drive
			14 MPH on N. Post Oak	16 MPH on N. Post Oak
Average DBL speed in the entire alignment: 13 MPH in peak period				

Table 2: DBL Speed Assumptions (Elevated Busway on West Loop)

Alternative	DBL speeds on Post Oak Blvd		DBL speeds on West Loop	
	Peak period	off-peak period	Peak period	off-peak period
Busway on Post Oak, Elevated Busway on West Loop	14 MPH	14 MPH	45 MPH between Post Oak and NWTC	45 MPH between Post Oak and NWTC
Average DBL speed in the entire alignment: 19.5 MPH in peak period				

The DBL service is expected to save significant travel times for those traveling in the study area. For example, the current round trip travel time on Bus Route 33 between the vicinity of BUTC and NWTC is approximately 54 minutes. In the Mixed Flow Busway option, this travel time would be reduced to 42 minutes. In the Elevated Bus way option, the round trip travel time will further reduce to 28 minutes. This information is presented in **Table 3**.

Table 3: Travel Times on the Proposed DBL Service

Option	Round trip travel time
Current local Bus Route 33	54 min
DBL in Mixed Flow on West Loop	42 min
DBL in Elevated Bus way on West loop	28 min

Park and Ride Bus Service Improvements in the Build Scenario

In the Northwest and Katy corridors, all Park and Ride routes that operate peak headways between 4 and 15 minutes would stop at the NWTC. In the Westpark Corridor, all routes that operate peak headways between 15 and 30 minutes would stop at the BUTC. In the Southwest Corridor, all Park and Ride routes that operate peak headways between 4 and 12 minutes would stop at the BUTC. **Table 4** identifies the Park and Ride route characteristics.

Table 4: Park and Ride Service in the Build Scenarios

Corridor/Type	Route	Description	Direction	Headway		Comments
				Peak	Off-Peak	
Northwest	214	Northwest Station	Inbound	5	N/A	No Change
			Outbound	5	N/A	Stops at NWTC
	216	W. Little York/Pinemont	Inbound	12	N/A	Stops at NWTC
			Outbound	12	N/A	Stops at NWTC
	217	Cypress	Inbound	10	N/A	Stops at NWTC
			Outbound	10	N/A	Stops at NWTC
286	W. Little York	To Galleria	15	N/A	Stops at NWTC	
		From Galleria	15	N/A	Stops at NWTC	
Katy	221a	Kingsland	Inbound	5	N/A	Stops at NWTC
			Outbound	5	N/A	Stops at NWTC
	221b	Kingsland	Inbound	20	N/A	Stops at NWTC; Pk Hdwy
			Outbound	20	N/A	Improved Peak Headway
	222	Grand Parkway	Inbound	5	N/A	Stops at NWTC
			Outbound	5	N/A	Stops at NWTC
	228	Addicks	Inbound	6	N/A	Stops at NWTC
			Outbound	6	N/A	Stops at NWTC
	229	Kingsland/Addicks	Inbound	N/A	45	No Change
			Outbound	N/A	45	No Change
	298a	Addicks/NWTC	To TMC	20	N/A	Stops at NWTC
			From TMC	20	N/A	Stops at NWTC
298b	Addicks/NWTC	To TMC	20	N/A	No Change	
		From TMC	20	N/A	No Change	
274	Westchase/Gessner	Inbound	15	N/A	Stops at BUTC	
Southwest	262a	Westwood	Inbound	10	N/A	Stops at BUTC
			Outbound	10	N/A	Stops at BUTC
	262b	Westwood	Inbound	30	N/A	No Change
			Outbound	30	N/A	No Change
	265a	West Belfort	Inbound	5	N/A	Stops at BUTC
			Outbound	5	N/A	Stops at BUTC
	265b	West Belfort	Inbound	5	N/A	Stops at BUTC
			Outbound	5	N/A	Stops at BUTC
	269	Westwood/West Belfort	Inbound	N/A	5	No Change
			Outbound	N/A	5	No Change
292	West Belfort/Westwood/TMC	To TMC	15	N/A	No Change	
		From TMC	15	N/A	No Change	

PART 2: Ridership Forecasts

Ridership forecasts for each alternative described in **Part 1** were estimated by running H-GAC's regional travel demand model, implemented in CUBE software. These forecasts are for an average weekday condition. They include commuter work trips as well as non-work trips. The model produces ridership by peak period (AM and PM combined) and off-peak period.

Presented in **Table 4** are the projected ridership estimates for each alternative.

As seen in **Table 5**, under the mixed flow option on west loop, the DBL service running from NWTC to BUTC is projected to generate about 14,100 daily boardings in 2018 and 19,800 daily boardings in 2035. Under the elevated busway option on west loop, the DBL is projected to carry 18,400 trips in 2018 and 25,800 trips in 2035. The ridership impact of extending the DBL from BUTC to BTC is also shown in **Table 5** for the mixed flow option only. As seen, the model projects significantly high ridership, about 20,750 daily boardings in 2018 and 28,700 daily boardings in 2035. The model results indicate a major share of this increase would be as a result of a diversion from several local routes including Routes 33, 49, 2 and 65. The DBL extension also draws some additional trips from the park and ride services as well as from the auto mode. ***It should be noted that the transit component of METRO's regional travel model is more sensitive to transfers than what has been observed in surveys. Several sensitivity analyses conducted as part of the North Corridor New Starts¹ project indicated the model may be overestimating the impact of transfers by almost 90 percent. Therefore, the increase in ridership resulting from DBL extension to BTC is most likely to be half of what the model projects.***

Approximately 56 percent of these boardings would occur in AM and PM peak periods combined and the remaining 44 percent would be distributed during the mid day and late evening. The maximum peak passenger loads during the peak AM and PM hours are expected to occur just south of NWTC.

An examination of the station to station volumes indicate approximately 28 percent of the ridership in the NTWC to BUTC alternative would be internal trips, meaning they start and end between Uptown Park (Hollyhurst) station and Richmond station.

¹ BRT alternatives involving a forced transfer at University of Houston downtown station was tested as part of the New Starts analysis for the North Corridor in 2004 and 2005.

Table: 4 DBL Ridership Forecasts for 2018 and 2035

Stations	2018			2035		
	DBL from NWTC to BUTC (mixed flow on West loop)	DBL from NWTC to BUTC (Elevated bus way on West loop)	DBL from NWTC to BTC (mixed flow on West loop)	DBL from NWTC to BUTC (mixed flow on West loop)	DBL from NWTC to BUTC (Elevated bus way on West loop)	DBL from NWTC to BTC (mixed flow on West loop)
BTC	Not appl	Not appl	2,950	Not appl	Not appl	3,900
Fournace Rd	Not appl	Not appl	1,750	Not appl	Not appl	2,150
BUTC	2,600	3250	2,450	4,300	5400	4,050
Richmond	1,750	2300	1,900	2,900	3800	3,150
Fairdale	250	350	300	400	500	500
West Alabama	500	600	650	1,250	1550	1,650
Westheimer	1,950	2500	2,100	1,350	1750	1,450
Guilford Court	450	550	500	650	800	700
Ambassador Way	500	650	600	700	900	850
San Felipe	1,150	1500	1,250	1,600	2100	1,800
Four Oaks	350	450	250	450	600	300
Uptown Park (Hollyhurst)	800	1000	1,250	1,000	1250	1,600
Memorial	500	not applicable	600	600	not applicable	700
NWTC	3,300	5250	4,200	4,600	7150	5,900
Total	14,100	18,400	20,750	19,800	25,800	28,700

Source: HDR Engg