Texas Department of Transportation

IH 635 Managed Lanes Project
Technical Provisions

Attachment 11-1A

Interstate Access Justification Report

INTERSTATE HIGHWAY (I) 635 (LBJ)

FROM: LUNA ROAD
TO: MERIT DRIVE
DALLAS COUNTY, TEXAS

ACCESS JUSTIFICATION

I 635 CORRIDOR WEST SECTION UPDATE

CSJ: 2374-07-046 & 2374-01-068

January, 2007

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INTERSTATE HIGHWAY I 635 (LBJ)
From LUNA ROAD to MERIT DRIVE
(DALLAS COUNTY, TEXAS)

ACCESS JUSTIFICATION
I 635 CORRIDOR WEST SECTION UPDATE

Introduction

The Interstate 635 (LBJ) Corridor is located in north Dallas County extending from SH121 to Interstate 20. The West Section Corridor extends from Luna Road, west of I 35E to Merit Drive, west of US 75. Municipalities located along this corridor include the cities of Dallas and Farmers Branch. The west section of I 635 was completed in the 1970's and the growth in population and employment resulted in a traffic demand that greatly exceeded predictions. The roadway is also in need of substantial rehabilitation.

The intent of this report is to address and update the eight requirements of the Federal Highway Administration (FHWA) for revised access points to the existing Interstate System. The original Interstate Access Justification (IAJ) Report for the west section is dated August 22, 2003 is attached as Appendix A. This report will address the changes in access to I 635 and analyze the impact to the highway based on the revisions to the previous schematic.

It should be noted that this is a highly congested corridor. The funding of the project depends on the traffic in the congested General Purpose Lanes diverting into the Managed Lanes and paying a Toll for this swifter more dependable trip. The revisions to the approved schematic (Exhibit 3 of Attachment A) are required to allow for a more cost effective construction solution for the corridor by allowing for a no tunnel option. This study will update the 2003 IAJ Report using the same assumptions for the modifications.

Existing Roadway Network

The Texas Department of Transportation (TxDOT), Dallas District, has produced a schematic design to improve traffic flow and safety for the west section of I 635. The existing General Purpose Lanes (4 in each direction) will be reconstructed. The temporary High Occupancy Vehicle (HOV) Lane (1 in each direction) at grade will be replaced with Managed HOV Lanes (3 in each direction) in a below grade section. The general purpose lanes operation will improve; but it will continue to operate at a low Level-of-Service (LOS). This schematic design is currently being updated to adjust several elements. The NEPA process for this project has been completed. The west corridor received the Finding of No Significant Impact (FONSI) on April 29, 2004. The West Section is being Re-Evaluated to accommodate revised limits of open cut, cut and cover, and mined construction methods. A public meeting to receive comments on these revisions was held on November 16, 2006.

The attached diagram (Exhibit 1) shows the revisions to the Ramps for the Managed HOV Lanes (ML), General Purpose (GP) Lanes, and Frontage Roads (FR).

Reasonable Alternatives

Currently, the I 635 west corridor contains a single temporary High Occupancy Vehicle (HOV) lane in each direction. The proposed managed lane improvements will replace the interim HOV lanes with three Managed HOV Lanes in each direction. Dynamic pricing will be used to influence the traffic demand in the Managed Lanes. Pricing will be adjusted to maintain free flow (50 mph) in the Managed Lanes. HOV vehicles will be given a price reduction in the peak periods. Public transportation providers traveling in the Managed HOV Lanes will not be required to pay a toll at any time. The General Purpose Lanes and Frontage Roads will allow for the traffic mix that exists in the current conditions.

Other mobility improvements are also being implemented in the I 635 corridor.

- Dallas County, Area Cities, and TxDOT are constructing intersection improvements, widening roadways, and implementing signal progression enhancements.
- Dallas Area Rapid Transit (DART) is implementing Employer Trip Reduction programs and other Transportation System Management programs.
- DART has also identified the need for a Transit Rail extension under the corridor between US 75 and the Dallas North Tollway.
- DART will also use the Managed HOV Lanes for an Express Bus Service.

The No-build alternative would not be acceptable to the community.

Safety and Operation

The proposed West Section schematic has the following configuration, which is consistent with the previous schematic that was approved:

- Continuous Frontage Roads;
- 8 General Purpose Lanes;
- 4 Managed HOV Lanes (2 in each direction) from Luna Road to I 35;
- 6 Managed HOV Lanes (3 in each direction) from I 35 E to east of Preston;
- 4 Managed HOV Lanes (2 in each direction) from east of Preston through the I 635/US 75 interchange.

The previously approved IAJ Report based on the original schematic for the West Section of the LBJ corridor can be found in Appendix A. The diagrammatic representation of the revised ramp configuration of the West Section is shown in Exhibit 1. The projected Average Daily Traffic (ADT) in the year 2020 and number of lanes in the West Section of the corridor is also shown in Exhibit 1. A similar diagrammatic representation of the existing conditions is shown in Appendix A (Exhibit 2).

The proposed access locations from Luna Road to Merit Drive. are summarized in the following table (Table 1) in reference to Exhibit 1. The table also illustrates the difference in the ramp configurations between the revised schematic, the original approved schematic and the existing conditions. As the table suggests, in the revised schematic configuration, the majority of the revisions to the previous schematic involve movement of ramps upstream or downstream by a few feet to a few hundred feet.

The revised schematic also calls for minor revisions to ramps along the I 35 E corridor just north of the I 635 / I 35E interchange.

Table 1: Existing, Original and Revised General Purpose Lane Access Locations [1,2]

Existing		Approved Schematic		Revised Schematic		Comment [(3)]
East Bound I 635 Traffic						
Ramp	Type	Ramp	Type	Ramp	Type	
		Fr EB GP to FR (Ramp W-E)	Off	Fr EB GP to FR (Ramp W-E)	Off	No Change
		Fr EB GP to ML (Ramp W-ML)	Off	Fr EB GP to ML (Ramp W-ML)	Off	No Change
Fr Luna to EB GP	On	Fr Luna to EB GP (Ramp L-E (1))	On	Fr Luna to EB GP (Ramp L-E (1))	On	No Change
		Fr Luna/FR to EB GP (Ramp L-E (2))	On	Fr Luna/FR to EB GP (Ramp L-E (2))	On	No Change
I 635 / I 35E Interchange						
Access Point on I 635		Access Point on I 635		Access Point on I 635		
Fr EB GP to NB I 35E	Off	Fr EB GP to DC (Conn W-N/S)	Off	Fr EB GP to DC (Conn W-N/S)	Off	No Change
Fr EB GP to SB I 35E	Off					
Fr SB I 35E to EB GP	On	Fr DC to EB GP (Conn N/S-E)	On	Fr DC to EB GP (Conn N/S-E)	On	Ramp moved +-90' to the West Insignificant Change
Fr NB I 35E to EB GP	On					
Fr WB GP to NB I 35E	Off	Fr WB GP to DC (Conn E-N/S)	Off	Fr WB GP to DC (Conn E-N/S)	Off	No Change
Fr WB GP to SB I 35E	Off					
Fr NB I 35E to WB GP	On	Fr DC to WB GP (Conn N/S –W)	On	Fr DC to WB GP (Conn N/S –W)	On	No Change
Fr SB I 35E to WB GP	On					
Access Point on I 35E						
Fr WB GP to SB I 35E	On	Fr EB/WB I 635 to SB I 35E (Conn E/W-S)	On	Fr EB/WB I 635 to SB I 35E (Conn E/W-S)	On	No Change
Fr EB GP to SB I 35E	On					
Fr NB I 35E to EB GP	Off	Fr NB I 35E to EB/WB I 635 (Conn S-E/W)	Off	Fr NB I 35E to EB/WB I 635 (Conn S-E/W)	Off	No Change
Fr NB I 35E to WB GP	Off					
Fr WB GP to NB I 35E	On	Fr EB/WB I 635 to NB I 35E (Conn E/W-N)	On	Fr EB/WB I 635 to NB I 35E (Conn E/W-N)	On	GP-Gore moved 300' to the South No impact on operation
Fr EB GP to NB I 35E	On					
Fr SB I 35E to EB GP	Off	Fr SB I 35E to EB/WB I 635 (Conn N-E/W)	Off	Fr SB I 35E to EB/WB I 635 (Conn N-E/W)	Off	No Change
Fr SB I 35E to WB GP	Off					

Existing		Approved Schematic		Revised Schematic		Comment (3)
East Bound I 635 Traffic (continued)						
Fr Anaheim to EB GP	On					
Fr EB GP to Josey	Off	Fr EB GP to Josey/Webb Chapel (Ramp W-J/WC)	Off	Fr EB GP to Josey/Webb Chapel (Ramp W-J/WC)	Off	GP Gore - Moved 1180' to East, FR Gore - Moved 820' East No impact on operation
Fr EB GP to Webb Chapel	Off					
Fr Josey/Webb Chapel to EB GP	On	Fr EB GP to Marsh (Ramp W-M)	Off	Fr EB GP to Marsh (Ramp W-M)	Off	GP Gore - Moved 460' to West, FR Gore- Moved 330' to West No impact on operation
		Fr EB ML to GP (Ramp ML-E(1))	On	Fr EB ML to GP (Ramp ML-E(1))	On	Ramp moved 8200' East Significant change, Reanalyzed for impact on operation [a]
Fr EB GP to Marsh	Off	Fr Josey/Webb Chapel to EB GP (Ramp J/WC-E)	On	Fr Josey/Webb Chapel to EB GP (Ramp J/WC-E)	On	GP Gore – Moved 20' to the West FR Gore – Moved 340' to the West No impact on operation
From Marsh to EB GP	On	Fr EB GP to Midway (Ramp W-MW)	Off	Fr EB GP to Midway (Ramp W-MW)	Off	GP Gore – Moved 1270' to the East FR Gore – Moved 1500' to the East Significant change, Analyzed as a weaving section with ramp M-E [b]
Fr EB GP to Midway	Off	Fr Marsh to EB GP (Ramp M-E)	On	Fr Marsh to EB GP (Ramp M-E)	On	GP Gore – Moved 3090' to the West FR Gore – Moved 3450' to the West Significant change, Analyzed as a weaving section with ramp W-MW [b]
From Midway to EB GP	On	Fr Midway to EB GP (Ramp MW-E)	On	Fr Midway to EB GP (Ramp MW-E)	On	GP Gore - No change FR Gore - Moved 160' to West No impact on operation
		Fr EB GP to FR (Ramp W-PKWY)	Off	Fr EB GP to FR (Ramp W-PKWY)	Off	GP Gore - Moved 30' to the East FR Gore - Moved 100' to the East No impact on operation
I 635/DNT Interchange						
Fr EB GP to SB DNT	Off	Fr EB GP to DC (Conn W-N/S DNT)	Off	Fr EB GP to DC (Conn W-N/S DNT)	Off	No Change
Fr EB GP to NB DNT	Off					
Fr SB DNT to EB GP	On	Fr SB DNT to EB GP (Ramp NDNT-E)	On	Fr SB DNT to EB GP (Ramp NDNT-E)	On	No Change
Fr NB DNT to EB GP	On	Fr NB DNT to EB GP (Conn SDNT-E)	On	Fr NB DNT to EB GP (Conn SDNT-E)	On	No Change
Fr WB GP to NB DNT	Off	Fr WB GP to NB DNT (Conn E-NDNT)	Off	Fr WB GP to NB DNT (Conn E-NDNT)	Off	No Change
Fr WB GP to SB DNT	Off	Fr WB GP to SB DNT (Conn E-SDNT)	Off	Fr WB GP to SB DNT (Conn E-SDNT)	Off	No Change
Fr NB DNT to WB GP	On	Fr NB DNT to WB GP (Conn SDNT-W)	On	Fr NB DNT to WB GP (Conn SDNT-W)	On	No Change

Existing		Approved Schematic		Revised Schematic		Comment (3)
Fr SB DNT to WB GP	On	Fr SB DNT to WB GP (Conn NDNT-W)	On	Fr SB DNT to WB GP (Conn NDNT-W)	On	No Change
East Bound I 635 Traffic (continued)						
Fr EB FR to EB GP	On					
Fr EB GP to Preston	Off	Fr EB GP to Preston (Ramp W-PR)	Off	Fr EB GP to Preston (Ramp W-PR)	Off	GP Gore - No Change FR Gore - Moved 230' to the East No impact on operation
Fr Montfort to EB GP	On					
Fr EB GP to Hillcrest	Off	Fr EB GP to Hillcrest (Ramp W-HC)	Off	Fr EB GP to Hillcrest (Ramp W-HC)	Off	GP Gore - No Change FR Gore – Moved +-10' to the East No impact on operation
		Fr EB ML to GP (Ramp ML-E(2))	On	Fr EB ML to GP (Ramp ML-E(2))	On	GP Gore - No Change ML Gore – Moved 270' to the East No impact on operation
Fr Preston to EB GP	On	Fr Preston to EB GP (Ramp PR-E)	On	Fr Preston to EB GP (Ramp PR-E)	On	GP Gore - No Change FR Gore – Moved 180' to the West No impact on operation
Fr Hillcrest to EB GP	On	Fr Hillcrest to EB GP (Ramp HC-E)	On	Fr Hillcrest to EB GP (Ramp HC-E)	On	
Fr EB GP to Coit	Off	Fr EB GP to Coit (Ramp W-CT)	Off	Fr EB GP to Coit (Ramp W-CT)	Off	No Change
West Bound I 635 Traffic						
Fr Coit to WB GP	On	Fr Coit to WB GP (Ramp CT-W)	On	Fr Coit to WB GP (Ramp CT-W)	On	No Change
Fr WB GP to Hillcrest	Off					
Fr WB GP to Preston	Off	Fr WB GP to Preston (Ramp E-PR)	Off	Fr WB GP to Preston (Ramp E-PR)	Off	GP Gore - Moved 70' to the West FR Gore - No Change No impact on operation
		Fr WB GP to ML (Ramp E-ML)	Off	Fr WB GP to ML (Ramp E-ML(1))	Off	GP Gore – No Change FR Gore - Moved 300' to the West No impact on operation
From Hillcrest to WB GP	On	Fr Hillcrest to WB GP (Ramp HC-W)	On	Fr Hillcrest to WB GP (Ramp HC-W)	On	No Change
WB Fr WB GP to Montfort	Off					
Fr Preston to WB GP	On	Fr Preston to WB GP (Ramp PR-W)	On	Fr Preston to WB GP (Ramp PR-W)	On	GP Gore – No Change FR Gore - Moved 70' to the East No impact on operation
Fr WB GP to FR	Off	Fr WB GP to FR (Conn E-PKWY)	Off	Fr WB GP to FR (Conn E-PKWY)	Off	GP Gore - Moved 40' to the West FR Gore - No Change No impact on operation
Fr WB GP to Midway	Off	Fr WB GP to Midway (Ramp E-MW)	Off	Fr WB GP to Midway (Ramp E-MW)	Off	GP Gore – No Change FR Gore - Moved 90' to the East No impact on operation

Existing		Approved Schematic		Revised Schematic		Comment [(3)]
Fr Midway to WB GP	On	Fr WB GP to Marsh (Ramp E-M)	Off	Fr WB GP to Marsh (Ramp E-M)	Off	GP Gore – No Change FR Gore - Moved 210' to the East No impact on operation
		Fr WB ML to GP (Ramp ML-W (1))	On			Ramp modified to WB ML to FR, No impact on GP [c]
				Fr WB GP to ML (Ramp E-ML(2))	Off	Ramp analysis performed based on the new location [d]
Fr WB GP to Marsh	Off	Fr Midway to WB GP (Ramp MW-W)	On	Fr Midway to WB GP (Ramp MW-W)	On	GP Gore – Moved 460' to the East FR Gore – Moved 820' to the East No impact on operation
Fr WB GP to Josey/ Webb Chapel	Off	Fr WB GP to Josey/Webb Chapel (Ramp E-J/WC)	Off	Fr WB GP to Josey/Webb Chapel (Ramp E-J/WC)	Off	GP Gore – No Change FR Gore - Moved 120' to the West No impact on operation
Fr Marsh to WB GP	On	Fr Marsh to WB GP (Ramp M-W)	On	Fr Marsh to WB GP (Ramp M-W)	On	Ramp moved +-40' No impact on operation
Fr Webb Chapel to WB GP	On	Fr Josey/Webb Chapel to WB GP(Ramp J/WC-W)	On	Fr Josey/Webb Chapel to WB GP(Ramp J/WC-W)	On	
Fr Josey to WB GP	On					
Fr WB GP to Luna	Off					
		Fr WB GP to FR/Luna (Ramp E-L(2))	Off	Fr WB GP to FR/Luna (Ramp E-L(2))	Off	No Change
Fr WB GP to Luna	Off	Fr WB GP to Luna (Ramp E-L(1))	Off	Fr WB GP to Luna (Ramp E-L(1))	Off	No Change
		Fr ML to WB GP (Ramp ML-W(2))	On	Fr ML to WB GP (Ramp ML-W(2))	On	No Change
		Fr WB FR to WB GP (Ramp E-W)	On	Fr WB FR to WB GP (Ramp E-W)	On	No Change
Access Point on I 35E						
				Fr Frontage Road to NB I 35E (Ramp FR-N)	On	This ramp provides access from the frontage road to NB I 35E for traffic south of Valley View Lane in addition to the existing on ramp from Valley View Lane. This replaces ramp FR to existing WB/NB DC for Harry Hines [e]. Analyzed as a weaving section with Ramp S-VW.
Fr NB I 35E GP to Valwood Pkwy (Ramp S-VW)	Off	Fr NB I 35E GP to Valwood Pkwy (Ramp S-VW)	Off	Fr NB I 35E GP to Valwood Pkwy (Ramp S-VW)	Off	FR Gore – Moves 570 ' to the North GP Gore - Moves 990 ' to the South Analyzed as a weaving section with Ramp FR-N
Fr Valley View Lane to NB I 35E GP (Ramp VV-N)	On	Fr Valley View Lane to NB I 35E GP (Ramp VV-N)	On	Fr Valley View Lane to NB I 35E GP (Ramp VV-N)	On	FR Gore – Moves 780 ' to the North GP Gore - Moves 50 ' to the South No impact on operation

Notes for Table 1:

(1) Abbreviations:
The following abbreviations apply to the whole document.
Fr: From
EB: Eastbound
WB: Westbound
NB: Northbound
SB: Southbound
PKWY: Parkway
DNT: Dallas North Tollway
GP: General Purpose Lanes
ML: Managed HOV Lanes
FR: Frontage Roads

(2) Ramp name convention:
For off-ramp, the first letter shows “from” what direction (West, East, South or North) and the second letter denotes “to” which cross street. For example, ramp W-MW indicates the (“from” west) EB off-ramp “to” Midway Road. For on-ramp, the first letter shows “from” which cross street and the second letter denotes “to” what direction. For example, ramp MW-E indicates “from” Midway
Road “to” east (EB general purpose lanes). See Exhibit 1 and 2 for Ramp names.

(3) The ‘Comments’ column summarizes changes in the ramp access location in the Revised Schematic in relation to the Original Schematic

The major changes in the schematic, identified in the table above with letter notes are summarized below:

[a] The EB on ramp from the Managed HOV Lanes to the General Purpose Lane (W-ML(1)) east of the I 35E interchange has been moved downstream by 8200 ft in the revised schematic. The merge was analyzed based on the new schematic configuration.

[b] The eastbound off ramp to Midway (W-MW) and the eastbound on ramp from Marsh (M-E) have been reversed from the approved schematic. This configuration is consistent with the existing conditions. However, in the existing condition the distance between the on-ramp and the off-ramp is approximately 3000 ft (higher than the threshold of 2500 ft prescribed by HCM for a weaving section to be analyzed), the distance is only approximately 1350 ft in the revised schematic. Therefore, this section was analyzed for weaving condition.

[c] The westbound on ramp from the Managed HOV Lanes to the General Purpose Lanes (ML-W(1)), west of the off ramp to Midway (E-MW) in the approved schematic, has been eliminated. The traffic from the Managed HOV Lane, in the revised schematic will now exit to the frontage road directly. Therefore, this ramp does not have to be analyzed for the new schematic.

[d] Based on the old schematic, access was provided to the Managed HOV Lanes from the frontage road in the westbound direction from Midway. This ramp has been eliminated. In the revised schematic, access is provided to the Managed HOV Lane from the General Purpose Lanes. This ramp was analyzed for operational characteristics.

[e] In the revised schematic a new on ramp from the frontage road to northbound I 35E (FR-N) is added just south of Valley View Lane. This ramp provides additional access to northbound I 35E on top of the existing on ramp from Valley View Lane.

The traffic volumes were modified based on the revised schematic. But, the basic distribution of traffic across various ramps was kept consistent with the 2003 IAJ report. Based on this methodology, revised volumes were estimated on the General Purpose Lanes and reconfigured ramps.

Eastbound traffic: Due to the reconfiguration of the on ramp from the Managed HOV Lanes to the General Purpose Lanes (ML-E(1)), the volume on the General Purpose Lanes was estimated to increase by a small amount between the beginning of the Managed HOV Lanes west of I 35E interchange and to the relocated on ramp from the Managed HOV Lanes. Analysis was performed at all the ramp merge and diverge locations based on the revised volumes.

Westbound traffic: Using the methodology described above, the westbound traffic was determined for the revised schematic. It was found that the General Purpose Lane volumes will not change except at the locations where ramp gores have significantly moved or the functionality of a ramp has changed.

The projected year 2020 average daily traffic volumes on I 635 General Purpose Lanes, Managed Lanes and ramps are from TxDOT's Transportation Planning and Programming (TP&P) Division are shown in Exhibit 1. The projected average daily traffic volumes have been converted to the peak hour traffic volume by applying a "K" factor to it. A K-Factor of 0.08 was used for this study. The 2003 IAJ report on the I 635 corridor have indicated a K-factor of 0.078 (refer to Appendix A).
The I 635 corridor is located in a highly urbanized area and is the major east-west thoroughfare serving the North Dallas Metropolitan Area. In highly urbanized areas, the peak hour is spread out to most of the day. Therefore, heavy traffic is not restricted to one "peak hour", but rather for a longer "peak period". Past studies have indicated a K-factor of around 0.06 for the peak period (refer to 'Operational Analysis' section of Appendix A) which represents around a 15-hour period in a day.

In the previous study, the operational analysis was first performed using a K-Factor of 0.08, which represents the absolute worst case hour of the day. At locations where there is a breakdown (LOS=F) during the "peak hour", further analysis was performed for the "peak period" using a K-Factor of 0.06 as an alternative analysis. And if the traffic will continue to show failure, then the 2020 traffic numbers developed by the 'LBJ Traffic & Revenue Study' were applied to the level of service check calculation and capacity check. This same methodology was used in the 2003 report.

For weaving analysis, the assumptions made in the 2003 IAJ report have been adopted for this study too. It is assumed that a small volume of traffic would take the on ramp followed by off ramp (ramp to ramp weaving traffic). This percentage is assumed to be half the percentage of exiting traffic in the weaving area. Since HCM procedures are specified for only a maximum of five lane weaving sections, for six-lane weaving (5 upstream lanes plus 1 auxiliary lane) scenarios a factor of 4/5 was applied to the General Purpose Lanes upstream of the weaving segment to reduce the volume to the equivalent of a five-lane section in the weaving area.

In the original study, the ingress and egress locations were classified into 3 categories (See Appendix A, Pg.8).

- Category 1: Ramps that provide access to the General Purpose Lane (including General Purpose Lane/Managed Lane access) that do not exist today. Table 2 lists all the ramps that belong to this category based on the original schematic and the revised schematic.
- Category 2: Access at reconfigured interchanges. The I 635/I 35E and I 635/DNT interchanges fall into this category. The ramps that belong to Category 2 can be found in Appendix A (Table 3, Pg. 8). The configuration of these ramps does not change in the revised schematic.
- Category 3: Eliminated or reversed ramp access. In the revised analysis, this category will include ramps whose gores have moved significantly to warrant further analysis. Table 3 lists the ramps in this category.

Table 2: Category 1 – Added Ramps

Ramps		**Notes**
Revised Schematic	Original Schematic	
1. EB W-E	1. EB W-E	GP/FR Access
2. EB L-E (2)	2. EB L-E (2)	GP/FR Access
3. EB W-PKWY	3. EB W-PKWY	GP/FR Access
4. WB E-L(2)	4. EB E-L(2)	GP/FR Access
5. WB E-W	5. EB E-W	GP/FR Access
6. EB W-ML	6. EB W-ML	GP/ML Access
7. EB ML-E(1)	7. EB ML-E(1)	GP/ML Access
8. EB ML-E(2)	8. EB ML-E(2)	GP/ML Access
9. WB E-ML(1)	9. WB E-ML	GP/ML Access
10. WB E-ML(2)	10. WB ML-W(1)	GP/ML Access
11. WB ML-W(1)	11. WB ML-W(2)	GP/ML Access

Table 3: Category 3 – Eliminated/Revised Ramps

Ramps		Notes[1]
Revised Schematic	Original Schematic	
1. EB from Anaheim to GP	1. EB from Anaheim to GP	No change
2. EB from GP to Webb Chapel	2. EB from GP to Webb Chapel	No change
3. EB from Montfort to GP	3. EB from Montfort to GP	No change
4. WB from GP to Hillcrest	4. WB from GP to Hillcrest	No change
5. WB from GP to Montfort	5. WB from GP to Montfort	No change
6. WB from Webb Chapel to GP	6. WB from Webb Chapel to GP	No change
7. WB from GP to FR	7. WB from GP to FR	No change
8a. EB W-M	8a. EB W-M	No change
8b. EB J/WC-E	8b. EB J/WC-E	
9a. EB M-E	9a. EB W-MW	Pair reversed order (on-ramp followed by off-ramp) Consistent with existing configuration.
9b. EB W-MW	9b. EB M-E	
10. WB E-M	10. WB E-M	No change
11. WB MW-W	11. WB MW-W	

[1] Summarizes the change in the revised schematic in relation to the original schematic. Details of the change in comparison to the existing configuration can be found in Appendix A (Table 4, Pg.9).

Operational Analysis

Category 1: The operation analyses of General Purpose Lanes that are affected because of the revised schematic configuration have been performed in accordance with the procedures outlined in the 2000 Highway Capacity Manual (HCM), using Highway Capacity Software (HCS). The level of service of Category 1 ramps are shown in Table 4. The freeway analysis evaluates the LOS of freeway segments due to the addition of traffic volume by proposed access ramps. The operational LOS of ramp-freeway junctions was studied in the ramp analysis. The weaving analysis considers the weaving operation between proposed on ramps followed by off ramps.

Table 4: Category 1 – Added Ramps LOS

Ramp	Level of Service			Notes
	Freeway	Weaving	Ramp	
W-E	Appendix A			-
L-E (2)	C	No Weaving	B	The operation of this ramp is not affected adversely because of the revised schematic design.
W-PKWY	Appendix A			-
E-L(2)	Appendix A			-
E-W	Appendix A			-
W-ML	D	No Weaving	F E[I]	The operation of this ramp is not affected adversely due to the revised schematic.
ML-E(1)	F E[II]	No Weaving	F C[II]	
ML -E(2)	Appendix A			-
E- ML	Appendix A			-
ML -W(1)	Ramp access to Frontage from ML	Ramp access to Frontage from ML	Ramp access to Frontage from ML	Ramp access to Frontage from ML
ML -W(2)	Appendix A			-
E- ML(2) [III]	F D[III]	No Weaving	F D[III]	This is a modified ramp that provides access to the ML from the General Purpose Lane. This ramp previously provided access from the Frontage Road to the ML.

[I] By using the 2020 Traffic & Revenue Study traffic volume and applying the "peak period" K-Factor of 0.06, the LOS of the ramp diverge condition will improve.

[II] The peak hour LOS=F is because of insufficient capacity on 4 General Purpose Lanes to handle the 2020 peak hour flow of 12,496vph that is converted from the 156,200vpd by a factor of K=0.08. But, by using the 2020 Traffic & Revenue Study traffic number and applying the "peak period" K-Factor of 0.06, the LOS will improve.

Notes for table 4 continued:
[III] This is a reconfigured ramp. In the original schematic, the ramp provided connection from the Frontage Road to the Managed HOV Lanes. In the revised schematic the ramp connects the General Purpose Lane to the Managed HOV Lane. The peak hour LOS=F is because of insufficient capacity of 4 General Purpose Lanes for the 2020 peak hour flow of 9,248vph that was converted from the 115,600vpd by a factor of K=0.08. But, by using the 2020 Traffic & Revenue Study traffic number and applying the "peak period" K-Factor of 0.06, the LOS will improve to "D".

Category 2: The level of service of Category 2 ramps are shown in Table 5. The revised schematic is consistent with the configuration of the I 635/I 35E interchange and the I 635/DNT interchange in the original schematic. There is insignificant movement of some of the ramp locations (Table 1). The projected volume on I 635 General Purpose Lanes at certain locations have changed due to the reconfiguration of ramp access at other locations. New analyses at affected General Purpose Lanes, taking the revised volumes into account, are summarized in Table 5. Table 5 shows that the proposed changes to the schematic have minimal to no impact on Category 2 ramps.

Table 5: Category 2 – Reconfigured Ramps LOS

Revised Schematic	Original Schematic	Notes
I 635/I 35 Interchange		
1. Conn W-N/S a) Weaving with ramp L-E(1) Major Diverge Area 88900vpd x 0.08 = 7112vph 7112vph/ (PHF0.9xFhv0.96) =8231 pc/h Average Density D = 0.0109 x 8231/6 = 14.9 Eq. 25-12 LOS = B Exhibit (25-4) Depart leg-4 LN Freeway 53400vpd x 0.08 = 4272vph 4272vph/ (PHF0.90xFhv0.96) =4944 pc/h < 9000 pc/h from Exhibit 25-14 b) Consolidated one exit point	Refer to Appendix A (Page 14)	The LOS does not change from the previous Study
2. Conn N/S-E a) Major Merge Area Approach leg-3 LN Freeway 46400vpd x 0.08 = 3712vph 3712vph/ (PHF0.90xFhv0.96) =4296 pc/h < 6750 pc/h from Exhibit 25-7 Approach Leg-3 LN Conn b) Same as Original Schematic Consolidated one exit point	Refer to Appendix A (Page 15)	Operation of the ramp is not affected by the changes.

3. Conn E-N/S Same as Original Schematic	Refer to Appendix A (Page 15)	--
4. Conn N/S-W Same as Original Schematic	Refer to Appendix A (Page 16)	--
5. Conn S-E/W Same as Original Schematic	Refer to Appendix A (Page 16)	--
6. Conn E/W-N Same as Original Schematic	Refer to Appendix A (Page 17)	--
7. Conn N-E/W Same as Original Schematic	Refer to Appendix A (Page 17)	--
8. Conn E/W-N Same as Original Schematic	Refer to Appendix A (Page 18)	--
Revised Schematic	**Original Schematic**	**Notes**
I 635/DNT Interchange		
1. Conn W-N/S DNT Same as Original Schematic	Refer to Appendix A (Page 19)	--
2. Conn NDNT-E Same as Original Schematic	Refer to Appendix A (Page 19)	--
3. Conn SDNT-E Same as Original Schematic	Refer to Appendix A (Page 19)	--
4. Conn E-NDNT Same as Original Schematic	Refer to Appendix A (Page 19)	--
5. Conn E-SDNT Same as Original Schematic	Refer to Appendix A (Page 19)	--
6. Conn SDNT-W Same as Original Schematic	Refer to Appendix A (Page 20)	--
7. Conn NDNT-W Same as Original Schematic	Refer to Appendix A (Page 20)	--

Category 3: The revised schematic maintains the functionality of most of the ramps in the original schematic. In addition the changes that have been addressed in the previous sections, two other major changes include the following: a).The eastbound off ramp to Midway (W-MW) and the eastbound on ramp from Marsh (M-E) are reversed. This will result in the new configuration being consistent with the existing configuration. The distance between the ramps is 1350 ft and falls within the 2500 ft threshold distance for weaving analysis as prescribed by HCM. In the 2003 IAJ report, weaving analysis was conducted for the section between the on ramp from Josey Lane/Webb Chapel (J/WC-E)

and the off ramp to Midway Road (W-MW). The Ramp reversal eliminated the weaving section that occurred in the original schematic as can be seen from Exhibit 1. b) The distance of the weaving section between the WB on ramp from Midway (MW-W) and WB off ramp to Josey/Webb Chapel increases from 2200 ft to 2600 ft (approx.).
The results of the analysis for the above conditions are shown below in Table 6. The original analysis still applies for the other ramps and details of those analyses can be found in Appendix A (Pg. 22-23).

Table 6: Category 3 – Eliminated/Reversed/Modified Ramps LOS

Revised Schematic	Original Schematic	Notes
8a and 8b. EB off-ramp to Marsh (Ramp W-M) followed by EB on-ramp from Webb Chapel (Ramp J/WC-E). No weaving between J/WC-E and W-MW.	8a and 8b. EB off-ramp to Marsh (Ramp W-M) followed by EB on-ramp from Webb Chapel (Ramp J/WC-E). Weaving between J/WC-E and W-MW.	No analysis required for the new configuration since there is no weaving section.
9a and 9b. EB on-ramp from Marsh (Ramp M-E) followed by EB off-ramp to Midway (W-MW). Weaving Analysis LOS = F ([I])	9a and 9b. Reversed ramps EB off-ramp to Midway (Ramp W-MW) followed by EB on-ramp from Marsh (Ramp M-E)	Weaving between M-E and W-MW with a weaving distance of 1350 ft.
10a and 10b. Reversed ramps WB off-ramp to Marsh (Ramp E-M) followed by WB on-ramp from Midway (Ramp MW-W). Weaving between WB on-ramp from Midway (MW-W) and WB off-ramp to Josey/Webb Chapel (E-J/WC).	10a and 10b. Reversed ramps WB off-ramp to Marsh (Ramp E-M) followed by WB on-ramp from Midway (Ramp MW-W). Weaving between WB on-ramp from Midway (MW-W) and WB off-ramp to Josey/Webb Chapel (E-J/WC).	The weaving distance between the ingress/egress ramps is 2650 ft in the revised schematic compared to 2200 ft in the original schematic. 2500 ft is the maximum distance for which weaving analysis needs to be conducted according to the HCM. Therefore, no analysis was considered necessary for the operation between the ramps in the revised schematic.

[I] By using the 2020 Traffic & Revenue Study traffic volume, applying the “peak period” K-Factor of 0.06 and Peak Hour Factor of 0.95 the LOS of the weaving operation will improve to acceptable condition.

I 35 E

A new on ramp from the Frontage Road to northbound I 35E General Purpose Lanes is added in the revised schematic. This ramp forms a weaving segment with the off ramp to Valwood Parkway (Ramp S-VW). Therefore, it was analyzed for weaving operation and freeway capacity. The results are shown in Table 7.

Table 7: Ramp analysis for I 35E - LOS

Ramp	Level of Service			Notes
	Freeway	Weaving	Ramp	
FR-N	D	E	-	This ramp was analyzed for weaving operation with Ramp S-VW. This is a five lane weaving segment of 2010 ft length.

Proposed Access

The proposed design provides for traffic movement onto corridor and connects only with public roadways and the frontage road system. The proposed access additions are required to support the Managed HOV Lane system, tolling of the managed lanes and the rebuilding of the Interstate System as part of this project. A continuous frontage road system will increase capacity and improve mobility.

Consistency with Local and Regional Land Use

A Major Investment Study (MIS) was completed for the entire corridor in 1996. The Metropolitan Planning Organization (MPO) for this region is the North Central Texas Council of Governments (NCTCOG). This proposal considered and is consistent with local and regional land use and transportation plans. The revised corridor is also consistent with the policies and goals set forth by the North Central Texas Council of Governments in the Mobility 2025 Plan. The proposal is also consistent with NCTCOG 2030 plan adopted January 2007. The NCTCOG approved a Managed Lane policy on Sept. 14, 2006 specifically for this corridor (see Appendix B).

The City of Dallas Bond Plan and DART programs include funding and support of this project.

Comprehensive Interstate Network

This project will reconstruct the Interstate and Frontage Road network in the process of constructing the Managed HOV Lanes to create a seamless roadway network.

Coordination

This request is not generated by new or expanded development. This request is being generated by the Texas Department of Transportation's intent to reconstruct and improve the efficiency and safety of the corridor. The additional Managed HOV Lanes are also critical to maintain the capacity required in the corridor.

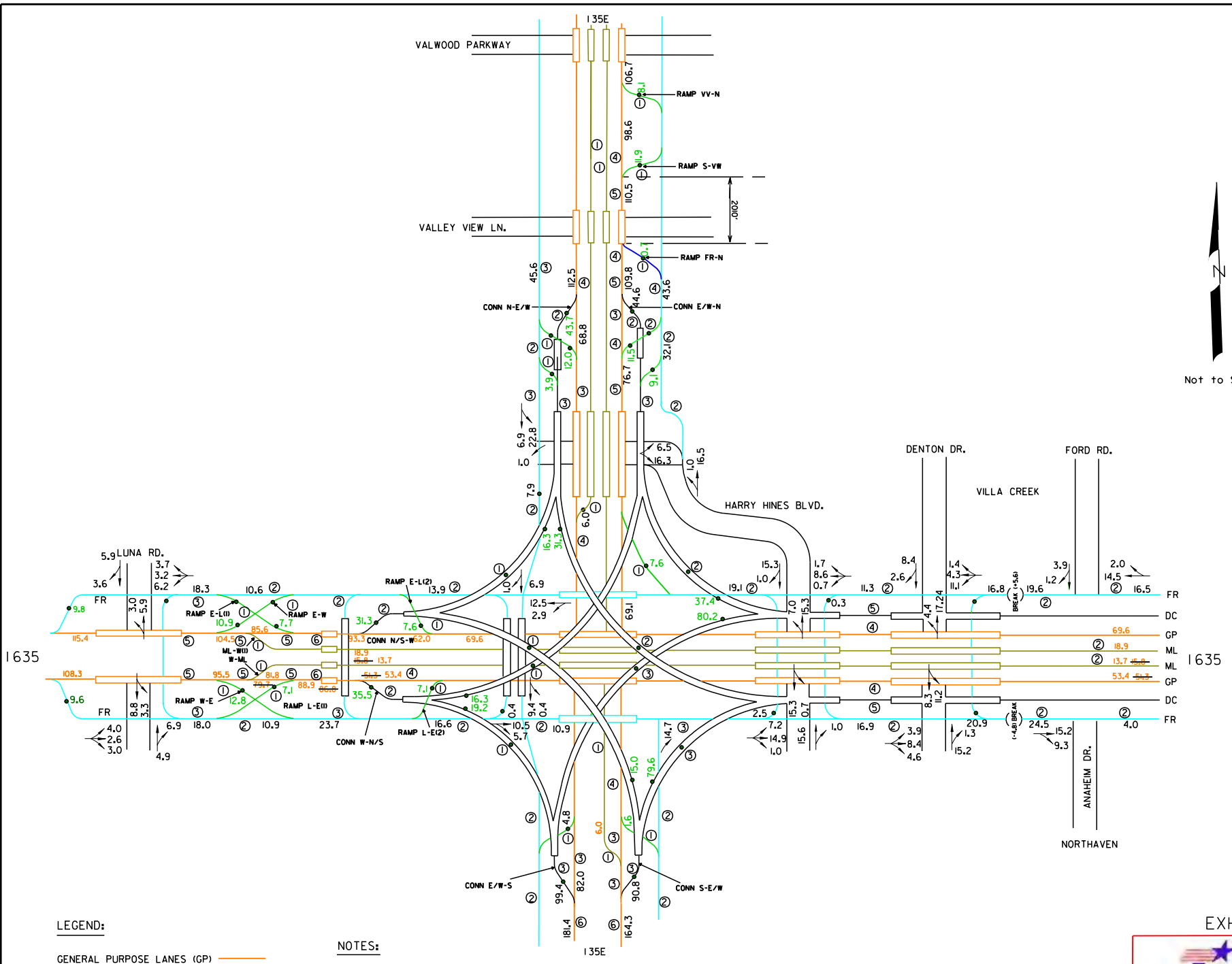
Planning and Environmental Requirements

The FONSI Re-Evaluation process for this project is being conducted and the revised design schematic is currently under review by the Austin office of TxDOT.

Conclusions

The North Dallas Metropolitan Area will benefit from the additional capacity the Managed HOV Lanes provide for the I 635 area. The additional access is required to rebuild the Interstate System and add the Managed HOV Lanes. This improvement will provide for congestion relief on the existing main lanes. The Managed HOV Lanes will provide for a dependable time saving trip for those willing to use them. Those remaining in the

General Purpose Lanes they will benefit from reduced congestion compared to the current conditions, however some congestion must remain for the Managed HOV Lanes to be economically viable. The revisions to the project will provide for a more cost effective solution to the rebuilding of the corridor.



LEGEND:

- GENERAL PURPOSE LANES (GP)
- MANAGED HOV LANES (ML)
- FRONTAGE ROADS (FR)
- BYPASS FRONTAGE ROADS
- RAMPS
- DIRECT CONNECT RAMPS (DC)
- ELIMINATED/RELOCATED RAMPS
- REVISED RAMP LOCATION

NOTES:

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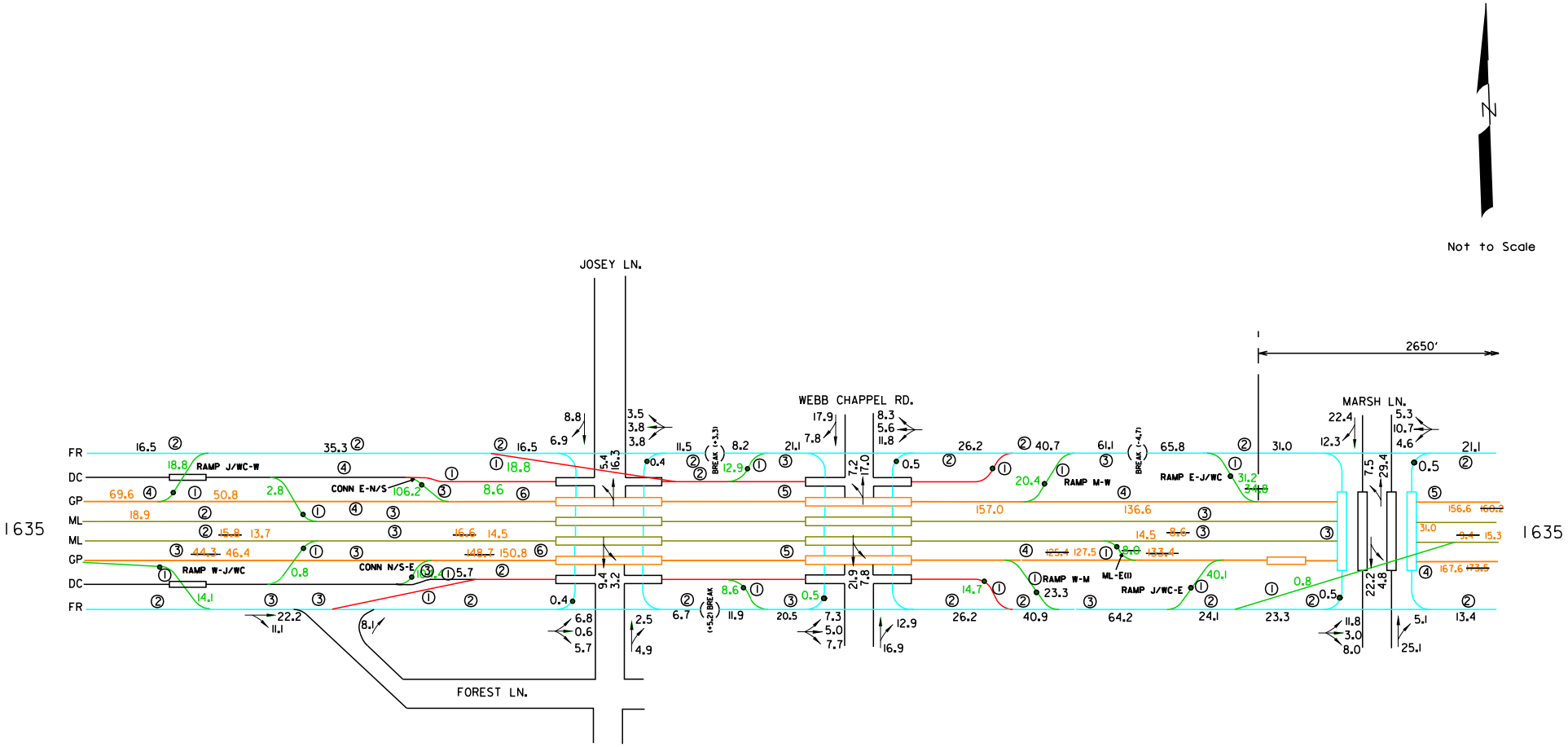
2. MANAGED LANES ARE DIAGRAMMATICALLY LOCATED FOR ACCESS/ EGRESS PURPOSES
3. TRAFFIC NUMBER (ADT) = *1000
4. ⊙ NUMBER OF LANES
5. XXX.X ORIGINAL VOLUME (LATER REVISED)
6. XXX.X REVISED VOLUME
7. FOR RAMP NAMES REFER TO REPORT

EXHIBIT 1

2020 DAILY TRAFFIC PROJECTIONS
TP&P PROJECTIONS
SHEET 1 OF 4

I 635 (LBJ) CORRIDOR WEST SECTION



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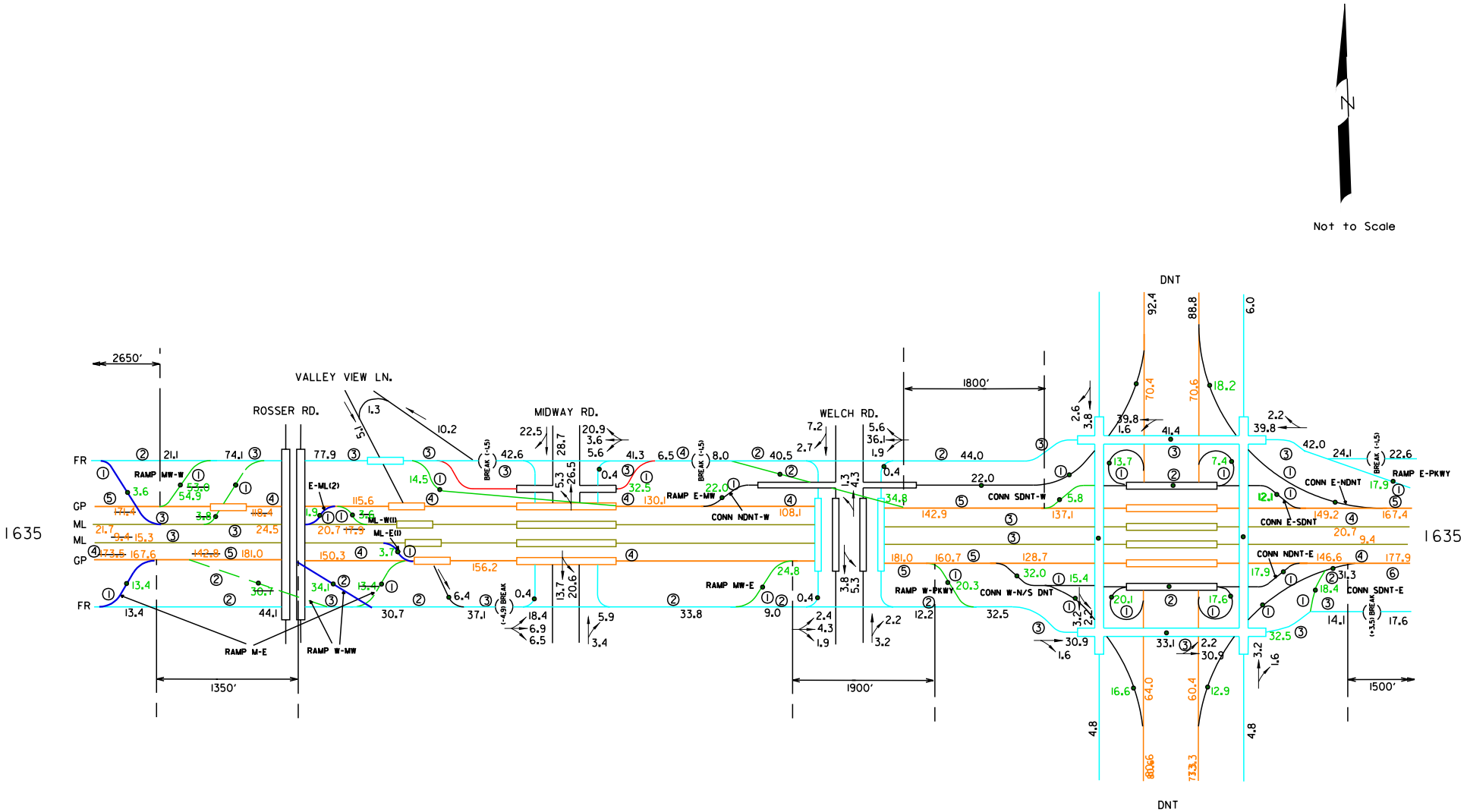

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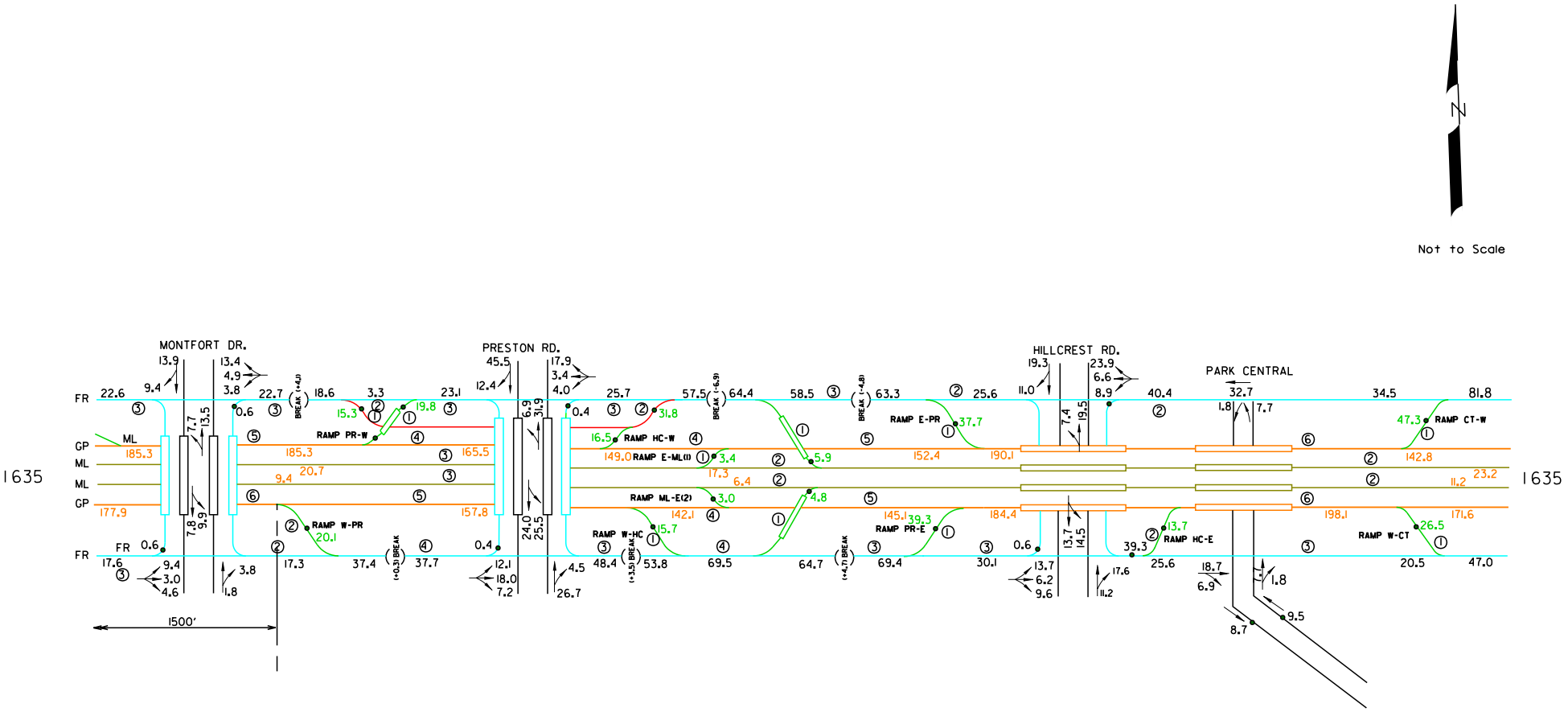

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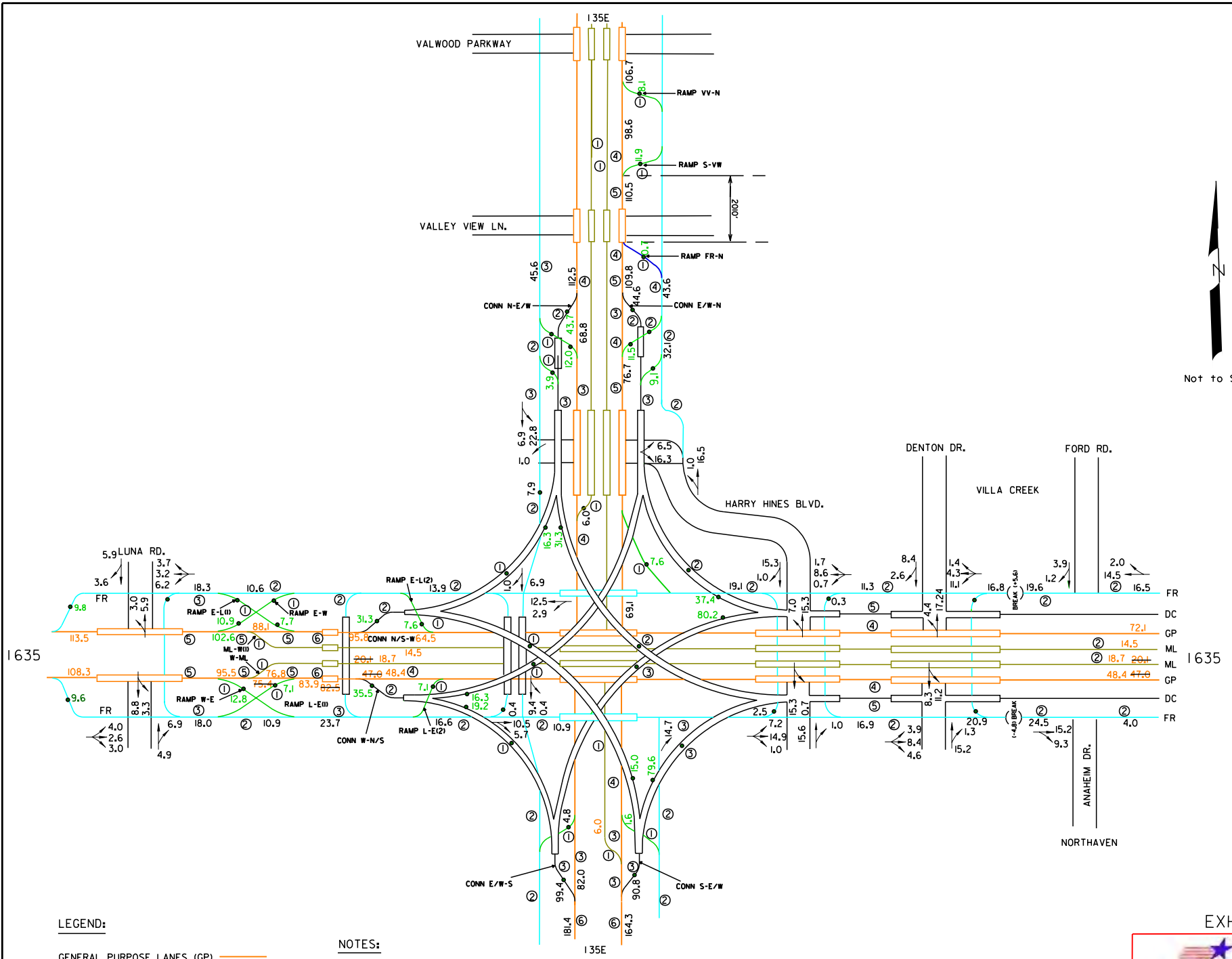

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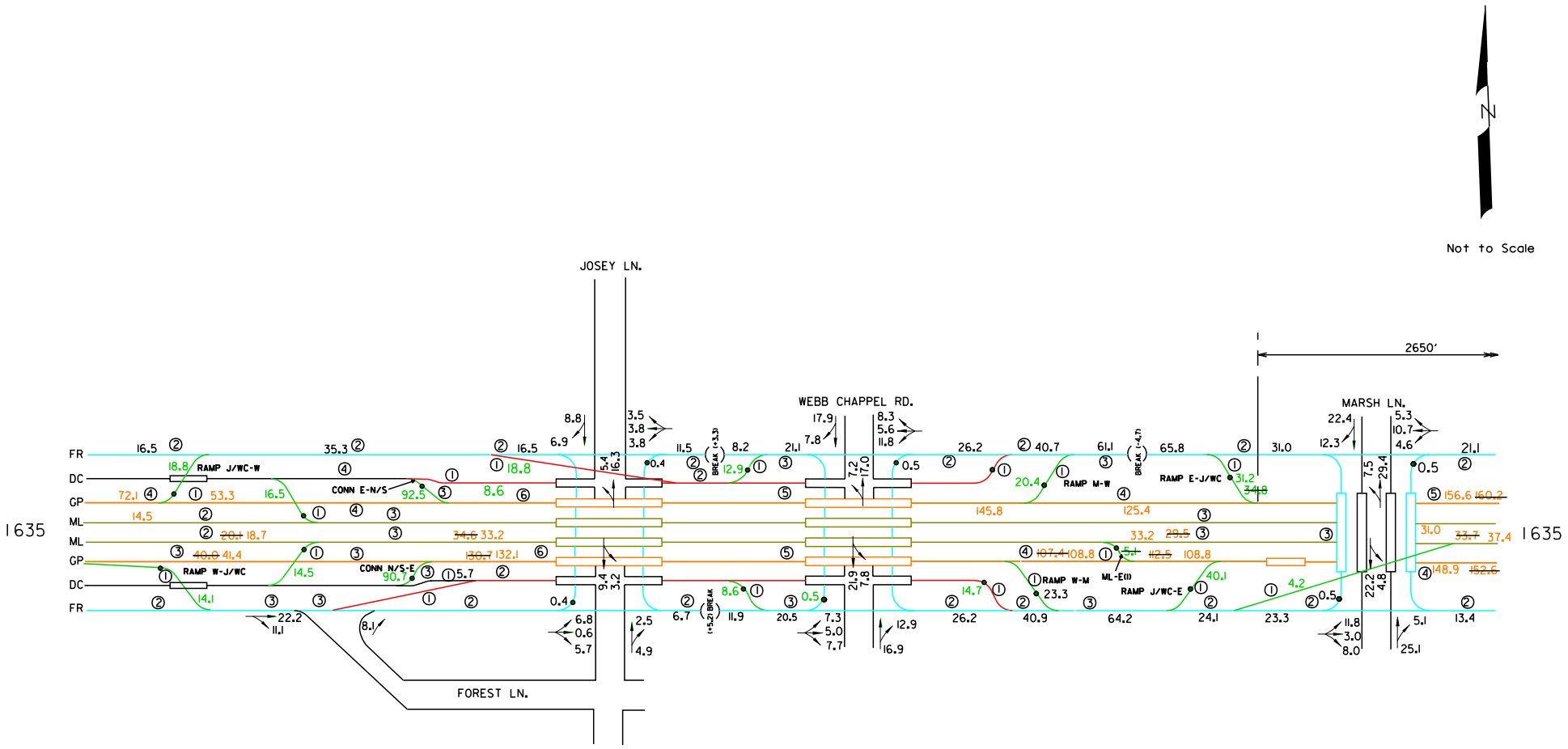
2020 DAILY TRAFFIC PROJECTIONS
TRAFFIC AND REVENUE STUDY-WSA
SHEET 1 OF 4

I 635 (LBJ) CORRIDOR WEST SECTION



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SHEET 2 OF 4

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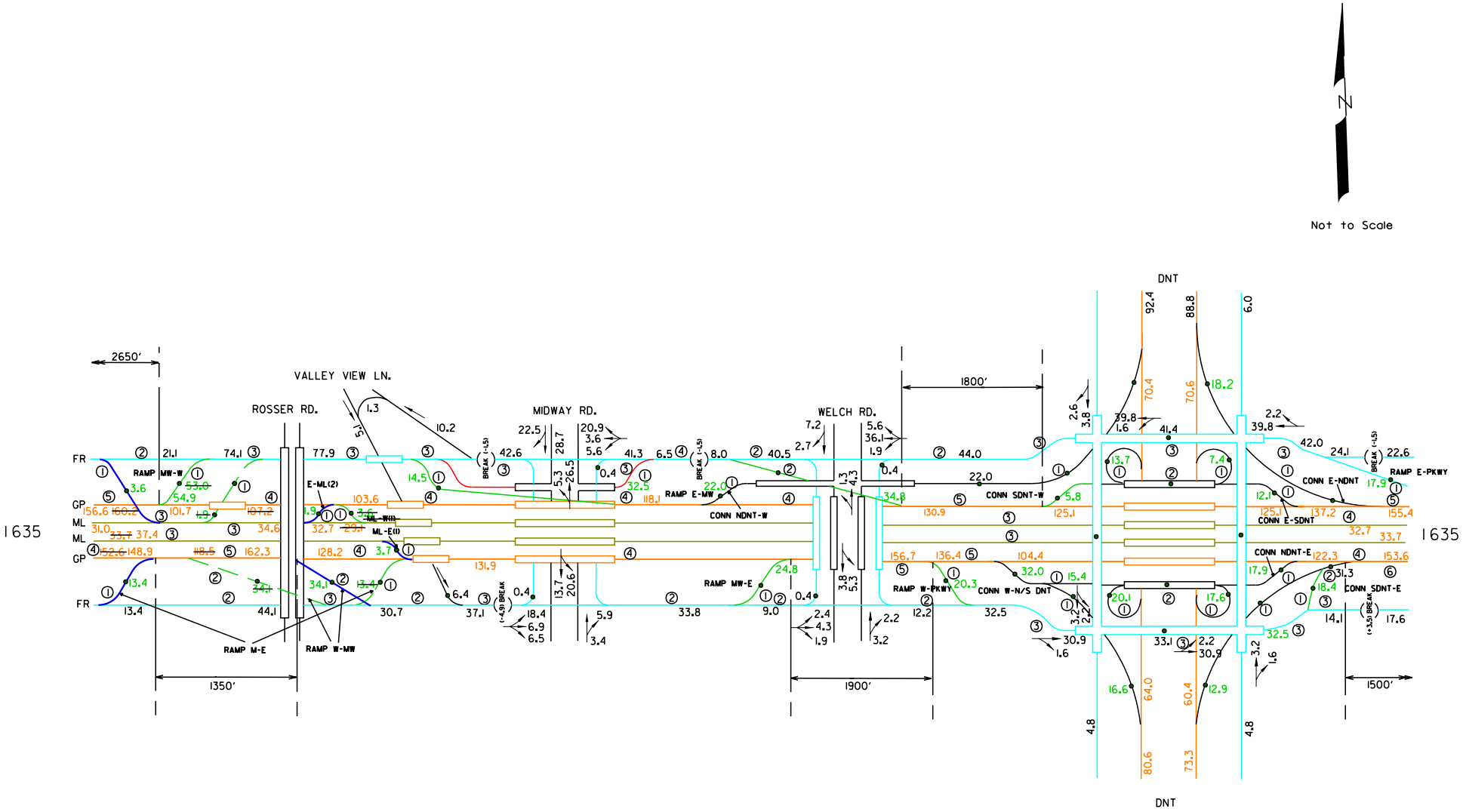

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TRAFFIC AND REVENUE STUDY-WSA
SHEET 3 OF 4

1635 (LBJ) CORRIDOR WEST SECTION

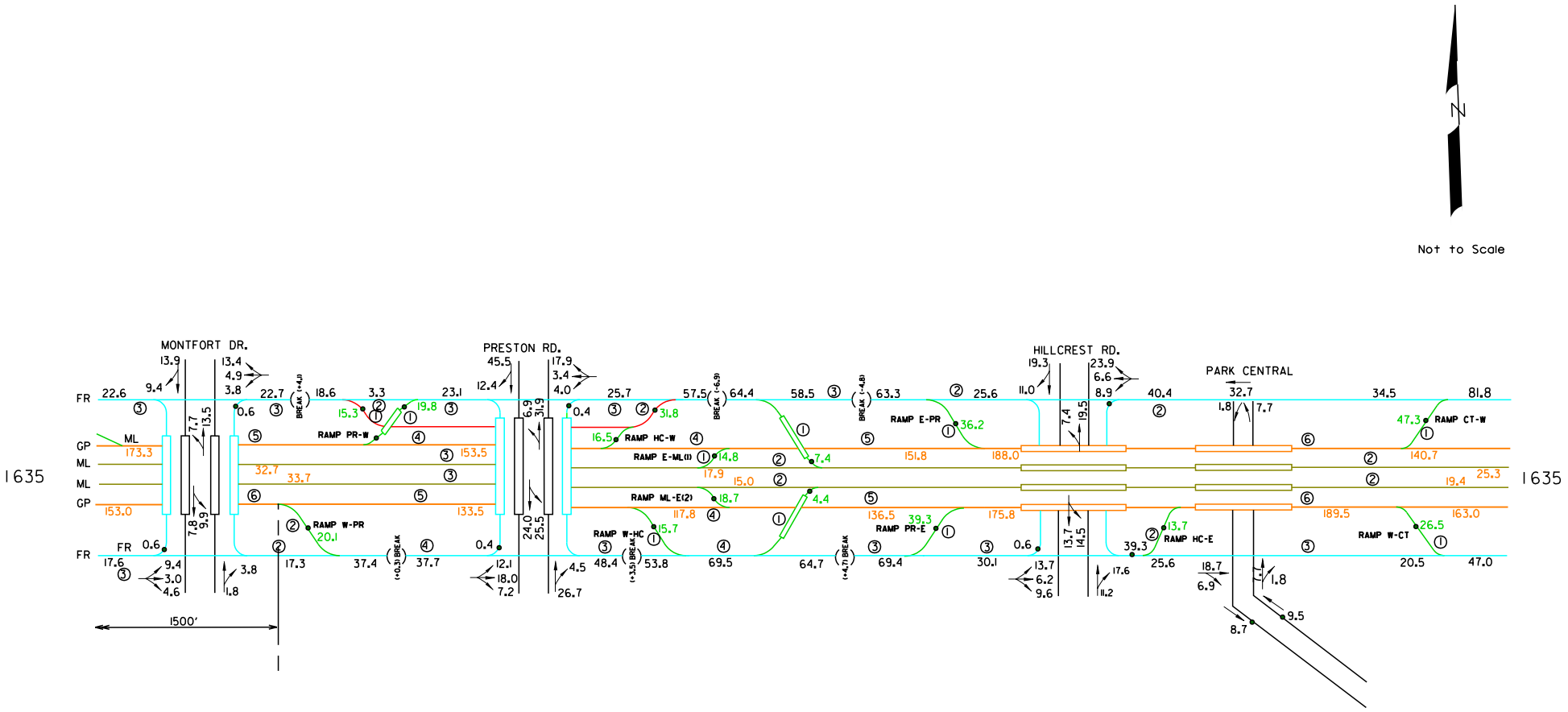

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EXHIBIT 2

2020 DAILY TRAFFIC PROJECTIONS
TRAFFIC & REVENUE STUDY - WSA
SHEET 4 OF 4

1635 (LBJ) CORRIDOR WEST SECTION

Appendix

Appendix A

ACCESS JUSTIFICATION
I 635 CORRIDOR WEST SECTION
(August 22, 2003)

INTERSTATE HIGHWAY (IH) 635

FROM: LUNA ROAD
TO: PARK CENTRAL BLVD
DALLAS COUNTY

CSJ: 2374-07-046 & 2374-01-068

ACCESS JUSTIFICATION
IH 635 CORRIDOR WEST SECTION

August 22, 2003

Texas Department of Transportation

Dallas District LBJ Project Office

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ACCESS JUSTIFICATION
LBJ Corridor West Section

Introduction

The IH 635 (LBJ Freeway) corridor is located in the Dallas/Fort Worth metropolitan area. The corridor is approximately 21 miles in length extending from Luna Road, west of IH 35E, to US 80, in the City of Mesquite. Its width extends from Beltline Road to the North and Loop 12 to the south. Municipalities located along this corridor include the cities of Farmers Branch, Dallas, Garland and Mesquite.

The LBJ freeway corridor encompasses one of the most highly developed commercial and residential areas in North Texas. The completion of LBJ freeway in the 1970's resulted in significant population and employment growth in the region. This growth in conjunction with the opening of DFW International Airport led to traffic demand that greatly exceeded predictions.

The LBJ freeway serves a variety of trip purposes. It serves long distance trips accessing other regional facilities such as IH 35E, Dallas North Tollway (DNT), US 75, IH 30 and US 80. The residential and commercial developments within the region serve as origins and destinations for shorter and local trips. The combination of these users has resulted in significant congestion for many hours each day. Predicted development and travel demand growth for the area indicate that the problem will continue to worsen.

The corridor is divided into 4 sections. The West section is from Luna Road to Park Central Boulevard. The Dallas High Five section is from Park Central Boulevard to West of Greenville Ave. The East section is from East of Greenville Ave including the Greenville Ave underpass to North of Town East Boulevard. The Mesquite section is from North of Town East Boulevard to US 80. Exhibit 1 depicts the general area.

The Dallas High Five is currently under construction. The Mesquite section access justification has been separately performed and approved by the FHWA and TxDOT's Design Division. The Public Hearing for Mesquite Section was held on May 7, 2002 and a Category Exclusion (CatEx) was obtained on September 6, 2002. The NEPA process for the Mesquite Section has been completed. In addition, the Mesquite Section phase I construction has started and the phase II PS&E is in process.

The Public Hearing for the East Section was held on October 10, 2002 and a Finding of No Significant Impact (FONSI) was obtained on January 30, 2003. The NEPA process for the East Section has also been completed. In addition, the East Section access justification had been submitted to FHWA as separate report and

was approved on December 24, 2002.

The West Section is in its final stages of the NEPA process. The design schematic has been approved. The Environmental Assessment (EA) has obtained a "Satisfaction for Further Processing" status from FHWA. The West Section Public Hearing was held in June 5, 2003. The final "IH 635 West Section Public Hearing Documentation Package" has been submitted to FHWA via TxDOT Environmental Affairs Division to seek FONSI.

This report covers the access justification for the West Section of LBJ freeway corridor. It describes the existing facility, its relation to the regional transportation and land use plan, other alternatives evaluated, and the design and operational characteristics of the proposed ramps.

Existing Roadway Network

The LBJ Freeway generally consists of eight mainlanes except at interchanges. One-way service roads are generally two and three lanes wide and are not continuous. Right-of-way (ROW) width varies from 330' to 450' depending on the existence of service roads, interchange design and drainage requirements.

Within the West section, there are two major crossing facilities, IH 35E and the Dallas North Tollway (DNT). In addition, there are 15 cross street intersections. Access situations vary from full access to no access from the LBJ freeway. Interim HOV lanes also exist in the West Section. Exhibit 2 demonstrates the detailed access situation at each cross street, and the IH 35E and DNT interchanges. The average daily traffic (ADT) in the year 1997 and number of lanes on the West Section existing roadway network are also shown in the Exhibit 2.

Transportation and Land Use Plans

The North Central Texas Council of Government (NCTCOG), the metropolitan planning organization (MPO) for this region, is responsible for preparing financially constrained regional transportation plans. A Major Investment Study (MIS) was completed for the entire corridor in 1996. The LBJ freeway has been a major factor in commercial development. In 1995, total employment for Dallas County was approximately 1.44 million. The LBJ corridor study boundaries contained nearly 80% of the total employment in Dallas County. The results of this study have been included in each of the region's Mobility plans since that time.

The proposed action is consistent with the area's financially constrained Metropolitan Transportation Plan, Mobility 2025 Plan Update.

Regional Traffic Needs

The dramatic population growth and the variety of trip purposes served within the LBJ corridor led to travel demands that far exceeded original projections for the freeway. The average daily traffic for LBJ freeway has continued to increase each year from 100,000 vehicle per day (vpd) in 1976 to 230,000 vpd in 1994 to a projected volume of over 400,000 vpd in 2020. The extremely high traffic volumes result in significant congestion for many hours each day. The high travel demand for the freeway has forced traffic to spread out beyond the normal peak hours and creating congested conditions for most of the day. For example, the Texas Transportation Institute (TTI) of Texas A&M University made traffic counts at two EB IH 635 mainlane locations east of IH 35E on February 1, 2001 (Friday). The 15-hour (6AM to 9PM) traffic volumes are 59,087 vehicles with the highest hourly volume of 5,310 (4PM to 5PM) and lowest hourly volume of 2,838 (10AM to 11AM).

Transportation improvements implemented on and near LBJ freeway have not been able to satisfy the ever-increasing travel demand in the area or reduce congestion on the facility. Predicted development and travel demand growth for the area indicate that the problem will continue to worsen in the foreseeable future. The current and projected travel demand clearly warrants a need for improvements.

Reasonable Alternatives

The following reasonable alternatives were evaluated to determine if they meet the traffic demand in the corridor.

- Programmed Improvements (no-build)
- Transportation System Management (TSM)
- Transportation Demand Management (TDM)

It was concluded after the evaluation that these alternatives could not help much in meeting the traffic demand. The following is a discussion of each alternative.

Programmed Improvements (no-build): Programmed improvements are projects that are included in the regional transportation plan, Mobility 2025 plan, and have funding programmed for their construction. The local parallel streets that can be used as partial relief routes are Forest Lane to the south and Spring Valley to the north. These streets are currently serving at full capacities with their own congestion problems during peak hours. In addition, the President George Bush Turnpike (PGBT) is a toll road and is more than 4 miles to the north of LBJ freeway. Although the PGBT is offering a reasonable alternative to some current LBJ travelers, it is already experiencing peaking conditions that would not encourage greater diversion from LBJ.

Thus, without the extensive reconstruction and improvements of the LBJ freeway, the future traffic demand cannot be adequately accommodated.

TSM Strategies: TSM strategies improve the flow of traffic through improvements to the transportation network and include traffic signal timing improvements, signing improvements and intersection geometry improvements. NCTCOG, TxDOT and the surrounding cities have identified and been working on various intersection improvement projects. These improvements will mostly benefit and smoothen the local/off-system traffic flow. Their impacts on the LBJ freeway mainlanes are negligible.

TDM Strategies: TDM strategies reduce or manage traffic demand. They include strategies such as Employer Trip Reduction (ETR) program, telecommuting, flexible work hours and ride sharing. The private corporations and public entities along the LBJ corridor have already implemented various such programs. In addition, non-work related trips such as dropping children off at daycare or school, shopping, lunch, along with the geographic diversification of land uses create the dependency on the private automobile. The Dallas Area Rapid Transit (DART) lines are basically radial lines in relation to IH 635, see Exhibit 3. DART will relieve radial traffic congestion such as congestion on US 75, DNT and IH 35E, rather than the congestion on IH 635. It is evident that TDM strategies alone cannot help much to improve the congestion significantly.

Connections and Design

The proposed West Section schematic calls for

- continuous frontage roads;
- 8 mainlanes with wider inside shoulders for the future flexibility to expand to 10 mainlanes;
- 4 HOV/HOT lanes (2 in each direction) from Luna Road to west of Josey;
- 6 HOV/HOT lanes (3 in each direction) from west of Josey to east of Preston; and
- 4 HOV/HOT lanes (2 in each direction) from east of Preston through the IH 635/US 75 interchange.

The diagrammatic representation of the West Section is shown in Exhibit 4. The projected average daily traffic (ADT) in the year 2020 and number of lanes on the West Section proposed roadway network are also shown in the Exhibit 4.

The existing and proposed mainlane access locations from Luna Road to Park Central Blvd are summarized in the following table in reference to the Exhibits 2 and 4.

TABLE 1: Existing and Proposed Mainlane Access Locations

Proposed		Existing	
East Bound Traffic			
Ramp	Type	Ramp	Type
Fr EB ML to FR (Ramp W-E)	Off		
Fr EB ML to HOV (Ramp W-HOV)	Off		
Fr Luna to EB ML (Ramp L-E(1))	On	Fr Luna to EB ML	On
Fr Luna/FR to EB ML (Ramp L-E(2))	On		
IH 635/IH 35E Interchange			
Access Point on IH 635		Access Point on IH 635	
Fr EB ML to DC (Conn W-N/S)	Off	Fr EB ML to NB IH 35E	Off
		Fr EB ML to SB IH35E	Off
Fr DC to EB ML (Conn N/S-E)	On	Fr SB IH 35E to EB ML	On
		Fr NB IH 35E to EB ML	On
Fr WB ML to DC (Conn E-N/S)	Off	Fr WB ML to NB IH 35E	Off
		Fr WB ML to SB IH 35E	Off
Fr DC to WB ML (Conn N/S-W)	On	Fr NB IH 35E to WB ML	On
		Fr SB IH 35E to WB ML	On
Access Point on IH 35E		Access Point on IH 35E	
Fr EB/WB IH 635 to SB IH 35E (Conn E/W-S)	On	Fr WB ML to SB IH 35E	On
		Fr EB ML to SB IH 35E	On
Fr NB IH 35E to EB/WB IH 635 (Conn S-E/W)	Off	Fr NB IH 35E to EB ML	Off
		Fr NB IH 35E to WB ML	Off
Fr EB/WB IH 635 to NB IH 35E (Conn E/W-N)	On	Fr WB ML to NB IH 35E	On
		Fr EB ML to NB IH 35E	On
Fr SB IH 35E to EB/WB IH 635 (Conn N-E/W)	Off	Fr SB IH 35E to EB ML	Off
		Fr SB IH 35E to WB ML	Off

Table 1 Continue

East Bound Traffic (continue)			
		Fr Anaheim to EB ML	On
Fr EB ML to Josey/Webb Chapel (Ramp W-J/WC)	Off	Fr EB ML to Josey	Off
		Fr EB ML to Webb Chapel	Off
Fr EB ML to Marsh (Ramp W-M)	Off	Fr Josey/Webb Chapel to EB ML	On
Fr EB HOV to ML (Ramp HOV-E(1))	On		
Fr Josey/Webb Chapel to EB ML (Ramp J/WC-E)	On	Fr EB ML to Marsh	Off
Fr EB ML to Midway (Ramp W-MW)	Off	Fr Marsh to EB ML	On
Fr Marsh to EB ML (Ramp M-E)	On	Fr EB ML to Midway	Off
Fr Midway to EB ML (Ramp MW-E)	On	Fr Midway to EB ML	On

Fr EB ML to FR (Ramp W-PKWY)	Off		
IH 635/DNT Interchange			
Fr EB ML to DC (Conn W-N/S DNT)	Off	Fr EB ML to SB DNT	Off
		Fr EB ML to NB DNT	Off
Fr SB DNT to EB ML (Ramp NDNT-E)	On	Fr SB DNT to EB ML	On
Fr NB DNT to EB ML (Conn SDNT-E)	On	Fr NB DNT to EB ML	On
Fr WB ML to NB DNT (Conn E-NDNT)	Off	Fr WB ML to NB DNT	Off
Fr WB ML to SB DNT (Conn E-SDNT)	Off	Fr WB ML to SB DNT	Off
Fr NB DNT to WB ML (Conn SDNT-W)	On	Fr NB DNT to WB ML	On
Fr SB DNT to WB ML (Conn NDNT-W)	On	Fr SB DNT to WB ML	On
East Bound Traffic (continue)			
		Fr EB FR to EB ML	On
Fr EB ML to Preston (Ramp W-PR)	Off	Fr EB ML to Preston	Off
		Fr Montfort to EB ML	On
Fr EB ML to Hillcrest (Ramp W-HC)	Off	Fr EB ML to Hillcrest	Off
Fr EB HOV to ML (Ramp HOV-E(2))	On		
Fr Preston to EB ML (Ramp PR-E)	On	Fr Preston to EB ML	On
Fr Hillcrest to EB ML (Ramp HC-E)	On	Fr Hillcrest to EB ML	On

Table 1 Continue

Fr EB ML to Coit (Ramp W-CT)	Off	Fr EB ML to Coit	Off
West Bound Traffic			
Fr Coit to WB ML (Ramp CT-W)	On	Fr Coit to WB ML	On
		Fr WB ML to Hillcrest	Off
Fr WB ML to Preston (Ramp E-PR)	Off	Fr WB ML to Preston	Off
Fr WB ML to HOV (Ramp E-HOV)	Off		
Fr Hillcrest to WB ML (Ramp HC-W)	On	Fr Hillcrest to WB ML	On
		WB Fr WB ML to Montfort	Off
Fr Preston to WB ML (Ramp PR-W)	On	Fr Preston to WB ML	On
Fr WB ML to FR (Conn E-PKWY)	Off	Fr WB ML to FR	Off
Fr WB ML to Midway (Ramp E-MW)	Off	Fr WB ML to Midway	Off

Fr WB ML to Marsh (Ramp E-M)	Off	Fr Midway to WB ML	On
Fr WB HOV to ML (Ramp HOV-W(1))	On		
Fr Midway to WB ML (Ramp MW-W)	On	Fr WB ML to Marsh	Off
Fr WB ML to Josey/Webb Chapel (Ramp E-J/WC)	Off	Fr WB ML to Josey/Webb Chapel	Off
Fr Marsh to WB ML (Ramp M-W)	On	Fr Marsh to WB ML	On
Fr Josey/Webb Chapel to WB ML (Ramp J/WC-W)	On	Fr Webb Chapel to WB ML	On
		Fr Josey to WB ML	On
		Fr WB ML to FR	Off
Fr WB ML to FR/Luna (Ramp E-L(2))	Off		
Fr WB ML to Luna (Ramp E-L(1))	Off	Fr WB ML to Luna	Off
Fr HOV to WB ML (Ramp HOV-W(2))	On		
Fr WB FR to WB ML (Ramp E-W)	On		
Summary			
# of EB ML/Cross Street On Ramps	7		9
# of EB ML/Cross Street Off Ramps	8		7
# of EB ML/HOV Access	3		0

Table 1 Continue

# of IH 635/IH 35E Interchange Access	8		16
# of IH 635/DNT Interchange Access	7		8
# of WB ML/Cross Street On Ramps	7		7
# of WB ML/Cross Street Off Ramps	7		9
# of WB ML/HOV Access	3		0

Notes:

(1) Ramp name convention: For off-ramp, the first letter shows "from" what direction (west, east, south or north) and the second letter denotes "to" which cross street. For example, ramp W-MW indicates the ("from" west) EB off-ramp "to" Midway Road. For on-ramp, the first letter shows "from" which cross street and the second letter denotes "to" what direction. For example, ramp MW-E indicates "from" Midway Road "to" east (EB mainlane).

(2) The existing interim HOV lane in the West Section is not a barrier separated HOV lane from the mainlanes. The access between the mainlane and the HOV is not connected by conventional ramps and thus, the existing mainlane and HOV

access locations are not listed in the above table.

There are three categories of access included in the proposed schematics that need to be justified.

- Category 1: Category 1 access is for any ramps that will provide mainlane on/off access that does not exist today (including mainlane/HOV access).
- Category 2: Category 2 access is for reconfigured interchanges. The proposed IH 635/IH 35E and IH 635/DNT interchanges in the West Section fall into this category, according to the FHWA guidance.
- Category 3: Category 3 access is for eliminated ramp access and reversed ramp access that will be investigated case by case to ensure that no adverse effect exists.

In reference to the Exhibits 2, 4 and Table 1, Table 2 lists ramps that are classified as Category 1 access.

Table 2: Category 1 - Added Ramps

Ramps	Note
1. EB W-E	Mainlanes/FR Access
2. EB L-E(2)	Mainlanes/FR Access
3. EB W-PKWY	Mainlanes/FR Access
4. WB E-L(2)	Mainlanes/FR Access
5. WB E-W	Mainlanes/FR Access
6. EB W-HOV	Mainlanes/HOV Access
7. EB HOV-E(1)	Mainlanes/HOV Access
8. EB HOV-E(2)	Mainlanes/HOV Access
9. WB E-HOV	Mainlanes/HOV Access
10. WB HOV-W(1)	Mainlanes/HOV Access
11. WB HOV-W(2)	Mainlanes/HOV Access

Table 3 shows the reconfigured IH 635/IH 35E interchange connectors and revised access locations on IH 635 of IH 635/DNT interchange. These connectors and access locations are defined as Category 2 access. The access locations on DNT of IH 635/DNT interchange will remain the same and thus, are not listed in the Table 3.

Table 3: Category 2 - Reconfigured Ramps

Direct Connectors	Note
IH 635/IH 35E Interchange	
1. Conn W-N/S	EB IH 635 Exit to NB/SB IH 35E

2. Conn N/S-E	Entrance from NB/SB IH 35E to EB IH 635
3. Conn E-N/S	WB IH 635 Exit to NB/SB IH 35E
4. Conn N/S-W	Entrance from NB/SB IH 35E to WB IH 635
5. Conn S-E/W	NB IH 35E Exit to EB/WB IH 635
6. Conn E/W-S	Entrance from EB/WB IH 635 to SB IH 35E
7. Conn N-E/W	SB IH 35E Exit to EB/WB IH 635
8. Conn E/W-N	Entrance from EB/WB IH 635 to NB IH 35E
IH 635/DNT Interchange	
1. Conn W-N/S DNT	EB IH 635 Exit to NB/SB DNT
2. Conn NDNT-E	Entrance from SB DNT to EB IH 635
3. Conn SDNT-E	Entrance from NB DNT to EB IH 635
4. Conn E-NDNT	WB IH 635 Exit to NB DNT
5. Conn E-SDNT	WB IH 635 Exit to SB DNT
6. Conn SDNT-W	Entrance from NB DNT to WB IH 635
7. Conn NDNT-W	Entrance from SB DNT to WB IH 635

Due to the proposed continuous frontage roads, widened mainlanes, added HOV lanes and reconstruction of all cross street overpasses/underpasses, all the cross street access ramps will be revised from their existing conditions. Table 4 lists all eliminated access and on/off reversed ramps (Category 3 access).

Table 4: Category 3 - Eliminated/Revised Ramps

Ramps	Note
1. EB from Anaheim to ML	Eliminated Access
2. EB from ML to Webb Chapel	Eliminated Access
3. EB from Montfort to ML	Eliminated Access
4. WB from ML to Hillcrest	Eliminated Access
5. WB from ML to Montfort	Eliminated Access
6. WB from Webb Chapel to ML	Eliminated Access
7. WB from ML to FR	Eliminated Access
8a. EB W-M	Pair Reversed on/off Order (off-ramp followed by on-ramp)
8b. EB J/WC-E	
9a. EB W-MW	Pair Reversed on/off Order (off-ramp followed by on-ramp)
9b. EB M-E	
10a. WB E-M	Pair Reversed on/off Order (off-ramp followed by on-ramp)
10b. WB MW-W	

Operational Analysis

The operational analyses of mainlanes that are affected by the above three (3) categories of access ramps have been performed in accordance with the procedures outlined in the 2000 Highway Capacity Manual (HCM), using Highway Capacity Software (HCS). The analysis consists of freeway analysis, weaving analysis, ramp analysis and major merge/diverge analysis, whenever applicable. The projected year 2020 daily traffic volumes on IH 635 mainlanes, HOV/HOT and ramps are from TxDOT Transportation

Planning and Programming (TP&P) Division and shown in Exhibit 4. The average daily traffics (ADTs) have been converted to the busiest one hour (peak hour) traffic volume by a factor of "K" for calculation of the year 2020 peak hour level of service (LOS) to have a general understanding of the "worst" traffic operation conditions during a day. The factor "K" ranges from 0.08 to 0.12 for general urban facilities based on the TxDOT's Roadway Design Manual Chapter 2 Section 2. For IH 635 that serves a highly urbanized and fully developed area, the factor "K" is close to 0.8 (for example, K=0.078 as computed from TTI February 1, 2001 traffic count at east of IH 35E). In addition, the year 1997 daily traffic volumes on IH 635 mainlanes and ramps are also from TxDOT TP&P Division and shown in Exhibit 2. They are used for the computation of the peak hour level of service in the existing conditions.

As discussed in the "Regional Traffic Needs" section, the LBJ corridor is located in and serves a highly urbanized region. The heavy traffic is not limited to only one "peak hour" defined above. It actually spreads out to most of the day. For instance, the average hourly EB two lane traffic volume at east of IH 35E was 3,939vph in a 15-hour span (6AM to 9PM) according to the February 1, 2001 traffic count by TTI. This 15-hour span is defined as "peak period" on the LBJ corridor in this report. The "K" factor used to compute the "peak period" hourly traffic volume from the ADT was calculated as 0.058 in this example. Further detailed data analysis has indicated that there were only 5 hours' K greater than 0.06 (1 hour K=0.08 and 4 hours' K=0.07) within our defined 15-hour "peak period" at this location. From the available field data, we concluded that using a factor of "K=0.08" to compute the LOS would be helpful to have a first glance of the traffic operation conditions in the LBJ corridor. But the results represented the worst scenario - the level of service at the real "peak hour" during the day. In this report, each LOS will first be computed using K=0.08. Special attention will then be given to those LOS=F where further analysis for the "peak period" (K=0.06) is performed by considering the above traffic characteristics on LBJ corridor. The majority actual hour by hour LOS will be equal or better than the calculated LOS using K=0.06 within the defined 15-hour "peak period".

The term "Value Pricing Strategy" would appear in the report extensively and used to analyze the traffic operation. The basic idea of the "Value Pricing Strategy" is to manage the HOV lanes in such a manner that will not either under-use or over-use the HOV lane capacity. The managed HOV lanes are defined as HOV/HOT lanes, i.e., High-Occupancy-Vehicle (Toll) lanes, in this report. The mechanism of the "Value Pricing Strategy" can be simply explained as to encourage the single-occupancy-vehicle (SOV) to use the HOV/HOT lanes when traffic volume on HOV/HOT lanes is below the capacity by lowering the toll price. On the other hand, the SOV will be limited to use the HOV/HOT lanes when traffic flow on HOV/HOT lanes is at capacity by raising the toll price.

The ultimate purpose of the "Value Pricing Strategy" is to balance the traffic demands and capacities on the general mainlanes and HOV/HOT lanes. For example, when the LOS=A or B on the HOV/HOT lanes and LOS=F on the general mainlanes are observed, the toll price would be lowered to divert some traffic to the HOV/HOT lanes. The level of services would probably be "C" on the HOV/HOT lanes and "E" on the general mainlanes in this case. The fundamental difference between the common concept of "toll" road and "Value Pricing Strategy" is that "toll" road concept is to maximize revenue while "Value Pricing Strategy" is to optimize traffic operation. The "Value Pricing Strategy" is a separate research project and is currently under study. The "Value Pricing Strategy" is currently planned to be adopted for the entire LBJ corridor. TxDOT TP&P Division projected year 2020 traffic volumes in the network of IH 635 corridor (Exhibit 4) did not take into consideration of the "Value Pricing Strategy". In order to introduce the "Value Pricing Strategy" into traffic operation analysis in this report, Wilbur Smith Associates had provided the year 2020 HOV/HOT lane traffic demand projection (see Exhibit 5), per TxDOT request, from its existing ongoing Traffic Revenue Study contract with TxDOT.

The operational analysis in this report will use TxDOT TP&P Division projected year 2020 traffic volume (Exhibit 4) as the foundation. The peak hour (K=0.08) level of service or capacity will first be calculated or checked. If the computed level of service would be "F" or capacity check would fail, the traffic operation during a broader "peak period" (K=0.06) defined above would then be investigated. Finally, when all the above fail to show an acceptable traffic condition (LOS=E or better), the year 2020 traffic number by Wilbur Smith Associates, Exhibit 5, will be applied to the level of service calculation and capacity check.

Although the HCS forms the foundation of operational analysis in this report, the traffic at a few mainlane locations have also been "spot checked" by the micro-simulation software CORSIM, with the assistance of Wilbur Smith Associates, to understand the operational characteristics, see Exhibit 6.

For weaving analysis, there would be a small volume of traffic that would take the entrance ramp followed by the exit ramp (ramp to ramp weaving traffic). This percentage is assumed to be half the percentage of exiting traffic in the weaving area. For example, if 20% of the vehicles in the weaving area will exit the freeway, then 10% of the entrance ramp traffic would be exiting the freeway. The HCS can only analyze weaving sections with a maximum of five lanes. For six-lane weaving area (5 upstream lanes plus 1 auxiliary lane) analysis, a factor of 4/5 is applied to the mainlane volume upstream from the weaving area to proportionally project volume to a five lane weaving section.

The level of service of Category 1 ramps is shown in Table 5. The

freeway analysis evaluates the LOS of freeway segment due to the addition of traffic volume by proposed access ramps. The ramp analysis studies the LOS of ramp-freeway junctions due to the addition of the proposed access ramps. The weaving analysis investigates the potential weaving between the proposed access ramp and adjacent ramps.

Table 5: Category 1 Ramp LOS

Ramp	Level of Service			Note
	Freeway	Weaving	Ramp	
W-E	D	No Weaving	E	Due to continuous FR, the ramp provides access to Harry Hines Blvd, Denton Dr. and Ford Rd. where no direct access from EB ML has been provided.
L-E(2)	C	No Weaving	B	This ramp relieves ramp L-E(1) whose major function is to provide access to IH 35E DC.
W-PKWY	F D(I)	F E(I)	F E(I)	This is a revised access to FR and Montfort compared with the existing condition.
E-L(2)	C	No Weaving	C	This ramp relieves ramp E-L(1) whose major function is to provide access from NB&SB IH 35E to FR and Luna Road.
E-W	D	No Weaving	C	Due to continuous FR, the ramp provides access for Harry Hines Blvd., Denton Dr. and Ford Rd. where no direct access to WB ML has been provided.
W-HOV	D	No Weaving	E	This is the EB beginning of HOV.
HOV-E(1)	F E(II)	NO Weaving	F C(II)	This ramp provides HOV access to Midway, Welch, DNT, Montfort and Preston.
HOV-E(2)	E	No Weaving	N/A	One lane addition. Analyze as freeway segment with one more lane. This ramp provides access to Coit and US 75 from EB HOV.

E-HOV	F D(III)	No Weaving	Capa-city Check OK	One lane drop, analyze as Ramp roadway 3400vpd x 0.08 = 272vph 272vph/(PHF0.90xFhv0.96) =315pc/h < 2200 pc/h from Exhibit 25-3
HOV-W(1)	F D(IV)	No Weaving	F C(IV)	Provide access to Josey/Webb Chapel from WB HOV.
HOV-W(2)	D	No Weaving	C	End of HOV.

(I) The peak hour LOS=F is simply because the 5 general mainlanes cannot handle the projected year 2020 peak hour flow of 14,480vph that is converted from the 181,000vpd by a factor of K=0.08. It is noted that the originally projected year 2020 daily traffic of 9,400vpd on the 3-lane HOV/HOT is well below the capacity. Based on the study and modeling by Wilbur Smith Associates, 33,700vpd is projected on the HOV/HOT lanes by the "Value Pricing Strategy". Thus, the LOS would be improved to an acceptable level on the general mainlanes for the "peak period".

(II) The 4 general mainlanes in this area cannot provide the needed capacity for the projected year 2020 peak hour flow of 10,672vph and thus, the peak hour level of service would be "F". The level of service would be improved for the freeway segment and ramp when the "peak period" traffic is analyzed.

(III) The projected peak hour volume of 12,192vph exceeds the capacity of 5 general mainlanes. However, the level of service would be "D" for the "peak period".

(IV) The 9,472vph of the projected year 2020 peak hourly flow cannot be absorbed appropriately by the 4 general mainlanes in the area. But, the LOS would be at a comfortable level for the "peak period".

Based on the level of service calculations, the peak hour traffic would experience "break down" at four (4) newly added ramps/access locations. One (1) is for mainlane/FR access and three (3) are at mainlane/HOV access locations. The sole reason for the "break down" is that the projected year 2020 peak hour traffic volumes in these areas exceed the capacity. However, by successfully applying the "Value Pricing Strategy" and/or looking at a big picture of "peak period" traffic, the LOS would generally be improved to an acceptable level. The benefit of adding these ramps listed in Table 2 far outweighs the disadvantages of not providing these access locations. The proposed access points all connect to public roads and provide for all traffic movements. By providing these ramps, the LBJ corridor network traffic time will be saved, mobility will be improved, and the traffic burden on frontage roads and cross

street intersections will be significantly relieved.

Category 2 access characteristics are summarized in Table 6. IH 635/IH 35E interchange will be totally reconstructed and these access locations must be provided. The operational analysis shows the improvements from the proposed intersection access configuration (sheet 1 of Exhibit 4) over the existing interchange access locations (sheet 1 of Exhibit 2). The IH 635/DNT interchange will only be partially reconstructed. While all the access points on IH 635 will be revised, all the access locations on DNT will remain as is. Therefore, only the access locations on IH 635 will be analyzed in this report.

Table 6: Category 2 Ramp LOS

Proposed	Existing	Note
IH 635/IH 35E Interchange		
Access Points on IH 635		
1. Conn W-N/S a) Weaving with ramp L-E(1) LOS = C Major Diverge Area 86800vpd x 0.08 = 6944vph 6944vph/(PHF0.9xFhv0.96) = 8037 pc/h Average Density D = 0.0109 x 8037/6 = 14.6 Eq.(25-12) LOS = B Exhibit (25-4) Depart leg-4 LN Freeway 51300vpd x 0.08 = 4104vph 4104vph/(PHF0.90xFhv0.96) = 4750 pc/h < 9000 pc/h from Exhibit 25-14 Depart leg-2 LN Conn 35500vpd x 0.08 = 2840vph 2840vph/(PHF0.90xFhv0.96) = 3287 pc/h < 4500 pc/h from Exhibit 25-14 b) Consolidated one exit point	a) Freeway Analysis LOS = C One lane drop, analyze as ramp roadway 10200vpd x 0.08 = 816vph 816vph/(PHF0.90xFhv0.96) =944pc/h < 2200 pc/h from Exhibit 25-3 b) Two consecutive exit points 1,500' apart	EB IH 635 Access NB/SB IH 35E Location.

Table 6 Continue

2. Conn N/S-E a) Major Merge Area Approach leg-3 LN Freeway 44300vpd x 0.08 = 3544vph 3544vph/(PHF0.95xFhv0.96) = 3886 pc/h < 6750 pc/h from Exhibit 25-7 (I) Approach leg-3 LN Conn 104400vpd x .08 = 8352vph 8352vph/(PHF0.95xFhv0.96) =9158 pc/h > 6750 pc/h from Exhibit 25-7 Depart leg - 6 LN Freeway 148700vpd x .08 =11896vph 11896vph/(PHF0.95xFhv.96) =13043 pc/h < 13500 pc/h from Exhibit 25-7 b) Consolidated one entrance point	a) Two lanes are added consecutively from SB IH 35E and NB IH 35E to EB IH 635. Analyze as freeway segment. LOS = F b) Two consecutive entrance (right and left) points 800' apart	NB/SB IH 35E access EB IH 635 location.
3. Conn E-N/S a) Major Diverge Area 157000vpd x 0.08=12560vph 12560vph/(PHF0.9xFhv0.96) = 14537 pc/h Average Density D = 0.0109 x 14537/6 = 26.4 Eq.(25-12) LOS = C Exhibit (25-4) Depart leg-4 LN Freeway 50800vpd x 0.08 = 4064vph 4064vph/(PHF0.90xFhv0.96) = 4704 pc/h < 9000 pc/h from Exhibit 25-14 (II) Depart leg-3 LN Conn 106200vpd x .08 = 8496vph	a) WB ML to NB IH 35E Ramp Analysis LOS = F WB ML to SB IH 35E Major Diverge Area 101000vpd x 0.08=8080vph 8080vph/(PHF0.9xFhv0.96) = 9352 pc/h Average Density D = 0.0109 x 9352/4 = 25.5 Eq.(25-12) LOS = C Exhibit (25-4) Depart leg-3 LN Freeway 50800vpd x 0.08=4064vph 4064vph/(PHF.90xFhv0.96) = 4703 pc/h < 6750 pc/h from Exhibit 25-14	WB IH 635 Access NB/SB IH 35E Location.

8496vph/(PHF0.90xFhv0.96) = 9833 pc/h > 6750 pc/h from Exhibit 25-14 b) Consolidated one exit Point	Depart leg-2 LN Conn 50200vpd x 0.08=4016vph 4016vph/(PHF.90xFhv0.96) = 4648 pc/h > 4500 pc/h from Exhibit 25-14 b) Two consecutive exit (right and left) points 500' apart	

Table 6 Continue

4. Conn N/S-W a) Weaving with ramp E-L(1) LOS = C Major Merge Area Approach leg-4 LN Freeway 62000vpd x 0.08 = 4960vph 4960vph/(PHF0.95xFhv0.96) = 5439 pc/h < 9000 pc/h from Exhibit 25-7 Approach leg-2 LN Conn 31300vpd x .08 = 2504vph 2504vph/(PHF0.95xFhv0.96) =2746 pc/h < 4500 pc/h from Exhibit 25-7 Depart leg - 6 LN Freeway 93300vpd x .08 =7464vph 7464vph/(PHF0.95xFhv.96) =8184 pc/h < 13500 pc/h from Exhibit 25-7 b) Consolidated one entrance point	a) Two lanes are added consecutively from NB IH 35E and SB IH 35E to WB IH 635. Analyze as freeway segment. LOS = C b) Two consecutive entrance points 1,300' apart	NB/SB IH 35E access WB IH635 Location.
Access Points on IH 35E		
5. Conn S-E/W a) Major Diverge Area 164300vpd x 0.08=13144vph 13144vph/(PHF.95xFhv0.96) = 14412 pc/h Average Density D = 0.0109 x 14412/6 = 26.2 Eq.(25-12) LOS = C Exhibit (25-4) Depart leg-3 LN Freeway 73500vpd x 0.08 = 5880vph 5880vph/(PHF0.95xFhv0.96) = 6447 pc/h < 6750 pc/h from Exhibit 25-14 (III) Depart leg-3 LN Conn	a) Major Diverge Area 105200vpd x 0.08=8416vph 8416vph/(PHF.95xFhv0.96) = 9228 pc/h Average Density D = 0.0109 x 9741/5 = 20.1 Eq.(25-12) LOS = C Exhibit (25-4) Depart leg-3 LN Freeway 55400vpd x 0.08=4432vph 4432vph/(PHF.95xFhv0.96) = 4860 pc/h < 6750 pc/h from Exhibit 25-14 Depart leg-2 LN Conn 49800vpd x 0.08=3984vph	NB IH 35E Access EB/WB IH 635 Location.

90800vpd x .08 = 7264vph 7264vph/(PHF0.95xFhv0.96) = 7965 pc/h > 6750 pc/h from Exhibit 25-14 b) Consolidated one exit Point	3984vph/(PHF.95xFhv0.96) = 4368 pc/h < 4500 pc/h from Exhibit 25-14 b) Two consecutive exit (right and left) point 1,100' apart	

Table 6 Continue

6. Conn E/W-N a) Major Merge Area Approach leg-3 LN Freeway 65200vpd x 0.08 = 5216vph 5216vph/(PHF0.95xFhv0.96) = 5719 pc/h < 6750 pc/h from Exhibit 25-7 Approach leg-2 LN Conn 44600vpd x .08 = 3568vph 3568vph/(PHF0.95xFhv0.96) =3912 pc/h < 4500 pc/h from Exhibit 25-7 Depart leg - 5 LN Freeway 109800vpd x .08 = 8784vph 8784vph/(PHF0.95xFhv.96) =9632 pc/h < 11250 pc/h from Exhibit 25-7 b) Consolidated one entrance point	WB IH 635 to NB IH 35E Ramp Analysis LOS = F EB IH 635 to NB IH 35E Ramp Analysis LOS = F	EB/WB IH 635 access NB IH 35E Location.
7. Conn N-E/W a) Major Diverge Area 112500vpd x 0.08=9000vph 9000vph/(PHF0.9xFhv0.96) = 10417 pc/h Average Density D = 0.0109 x 10417/4 = 28.4 Eq.(25-12) LOS = D Exhibit (25-4) Depart leg-3 LN Freeway 68800vpd x 0.08 = 5504vph 5504vph/(PHF0.90xFhv0.96) = 6370 pc/h < 6750 pc/h from Exhibit 25-14 Depart leg-2 LN Conn 43700vpd x 0.08 = 3496vph 3496vph/(PHF0.90xFhv0.96) = 4046 pc/h < 4500 pc/h from Exhibit 25-14 b) Consolidated one exit Point	SB IH 35E to EB IH 635 Ramp Analysis LOS = F SB IH 35E to WB IH 635 Ramp Analysis LOS = F	SB IH 35E Access EB/WB IH 635 Location.

Table 6 Continue

8. Conn E/W-S a) Major Merge Area[IV] Approach leg-3 LN Freeway 82000vpd x 0.08 = 6560vph 6560vph/(PHF0.95xFhv0.96) = 7193 pc/h > 6750 pc/h from Exhibit 25-7 Approach leg-3 LN Conn 99400vpd x 0.08 = 7952vph 7952vph/(PHF0.95xFhv0.96) =8719 pc/h > 6750 pc/h from Exhibit 25-7 Depart leg - 6 LN Freeway 181400vpd x .08 =14512vph 14512vph/(PHF0.95xFhv.96) =15912 pc/h > 13500 pc/h from Exhibit 25-7 b) Consolidated one entrance Point	a) Major Merge Area (SB IH 35E and entrance ramp from WB ML to SB IH 35E) Approach leg-3 LN IH 35E 48100vpd x 0.08 =3848vph 3848/(PHF0.95xFhv0.96) = 4219 pc/h < 6750 pc/h from Exhibit 25-7 Approach leg-2 LN ramp 50200vpd x 0.08 =4016vph 4016/(PHF0.95xFhv0.96) =4404 pc/h < 4500 pc/h from Exhibit 25-7 Depart leg - 5 LN IH 35E 98300vpd x .08 = 7864vph 7864vph/(PHF0.95xFhv.96) =8623 pc/h < 11250 pc/h from Exhibit 25-7 b) Weaving Area (between entrance ramp from EB ML to SB IH 35E and IH 35E exit ramp to Royal Lane) LOS = C Note: Only 250' between the Major Merge Area and Weaving Area.	EB/WB IH 635 access SB IH 35E Location.

Table 6 Continue

IH635/DNT Interchange		
1. Conn W-N/S DNT a) Major Diverge Area 160700vpd x 0.08=12856vph 12856vph/(PHF.97xFhv0.96) = 13806 pc/h Average Density D = 0.0109 x 13806/5 = 30.1 Eq.(25-12) LOS = D Exhibit (25-4) (V)Depart leg-4 LN Freeway 128700vpd x 0.08=10296vph 10296vph/(PHF.97xFhv0.96) = 11057 pc/h > 9000 pc/h from Exhibit 25-14 Depart leg-2 LN Conn 32000vpd x 0.08 = 2560vph 2560vph/(PHF0.97xFhv0.96) = 2749 pc/h < 4500 pc/h from Exhibit 25-14 b) Consolidated one exit point, provide room for new ramp W-PKWY	Weaving between entrance ramp from Midway and exit ramp to SB DNT Weaving Analysis LOS = F	EB IH 635 Access NB/SB DNT location.
2. Conn NDNT-E Same configuration as existing. Ramp Analysis LOS = F (C(VI))	Ramp Analysis LOS = F	SB DNT access EB IH 635 Location.
3. Conn SDNT-E Reconfigured entrance ramp to EB ML from FR such that it merged with Conn SDNT-E first to reduce one access location on the ML. Weaving with ramp W-PR LOS = F (D(VII))	Ramp Analysis LOS = F Three consecutive entrance ramps within 1,800'. Weaving between entrance ramp from FR and exit ramp to Preston LOS = F	NB DNT access EB IH 635 Location.
4. Conn E-NDNT One land drop, analyzed as ramp roadway. 17900vpd x 0.08 =1432vph 1432vph/(PHF0.90xFhv0.96) =1657pc/h < 2200 pc/h from Exhibit 25-3	Ramp Analysis LOS = D	WB IH 635 access NB DNT Location.

Table 6 Continue

5. Conn E-SDNT	Ramp Analysis	WB IH 635

Same configuration as existing Ramp Analysis LOS = F (E[VIII])	LOS = E	access SB DNT Location.
6. Conn SDNT-W Weaving with ramp E-MW LOS = F (D[IX])	Ramp Analysis LOS = C	NB DNT access WB IH 635 Location.
7. Conn NDNT-W Removed entrance point further west and eliminated existing weaving. Ramp Analysis LOS = F (C[X])	Weaving between entrance ramp from SB DNT and exit ramp to Midway LOS = F	SB DNT access WB IH 635 Location.

[I]The projected year 2020 peak hourly flow of 8,352vph would simply be too heavy a burden on the 500' long 3-lane final leg of the 5-lane connector. However, the "Value Pricing Strategy" would put 14,500vpd (not 800vpd as shown in the page 2 of Exhibit 4) to the HOV/HOT lanes from the connector via the HOV/HOT access ramp 500' upstream. The capacity check process would show the "peak period" demand of 5,967 pc/h that is less than the capacity of 6,750 pc/h. It is important to note that for the majority of the connector that is 5-lane and 2000' long, the projected year 2020 peak hour demand of 9,728 pc/h is less than the capacity of 11,250 pc/h.

[II]Similar to the footnote (I) above, the projected year 2020 peak hourly flow of 8,496vph would exceed the capacity of the 1,200' long 3-lane beginning leg of the 5-lane connector. The traffic demand on the connector would be reduced to 92,500vpd from 106,200vpd by the "Value Pricing Strategy". The capacity check would indicate the "peak period" demand of 6,423 pc/h that is less than the capacity of 6,750 pc/h from Exhibit 25-14. It is worth noting that for the 2000' long 5-lane connector downstream, the projected year 2020 peak hour demand of 10,888 pc/h is less than the capacity of 11,250 pc/h.

[III]The projected year 2020 peak hour volume of 7,264vph exceeds the capacity of the 3-lane connector. However, the 6,750 pc/h capacity meets the "peak period" demand of 5,974 pc/h.

[IV]The projected year 2020 peak hour demands of 6,560vph, 7,952vph and 14,512vph on the 3-lane upstream freeway, 3-lane upstream connector and 6-lane downstream freeway exceed the capacity of the major merge area. The "peak period" demands were calculated as 5,395 pc/h, 6,539 pc/h and 11,934 pc/h for the upstream freeway, connector and downstream freeway, respectively. The proposed improvements would be able to handle the demand during "peak period".

[V]The projected year 2020 peak hour volume of 10,296vph exceeds the capacity of the 4-lane mainlane section. The traffic volume in this location would become 104,400vpd down from 128,700vpd

when the "Value Pricing Strategy" was considered. Therefore, the peak hour traffic demand on the mainlane would be reduced to 8,969 pc/h that is less than the capacity of 9,000 pc/h.

(VI) Same as footnote (V) above, the level of service of this ramp would be improved to "C" for the "peak period" if 104,400vpd on the mainlane was used in the HCS computation due to the "Value Pricing Strategy".

(VII) Same logic applies to this ramp. The LOS would be improved to "D" for the "peak period" when 33,700vpd (not 9,400vpd shown in the page 3 of Exhibit 4) was projected to HOV/HOT lanes by the "Value Pricing Strategy".

(VIII) The LOS would be improved to "E" for the "peak period" when the mainlane demand is reduced from 149,200vpd shown in page 3 of Exhibit 4 to 137,200vpd under the "Value Pricing Strategy".

(IX) This connector is immediate downstream to the connector in footnote (VIII) above. The LOS would be improved to "D" for the "peak period" when 32,700vpd (not 20,700vpd in the page 3 of Exhibit 4)) could be diverted to HOV/HOT lanes by the "Value Pricing Strategy".

(X) Although the LOS=F for the peak hour, the LOS would be generally "C" for the "peak period".

Consolidating the existing dual points access situation into the proposed single point access for the IH 635/IH 35E interchange will eliminate the existing two closely spaced consecutive exit and entrance access locations. Although the traffic conditions at the interchange area would be generally improved as the Table 6 shows, the peak hour traffic demand in the year 2020 will still exceed the capacity for those traveling between the downtown Dallas business district and LBJ business corridor (from WB IH 635 to SB IH 35E and from NB IH 35E to EB IH 635). In order to improve the traffic operation in general during the "peak period", it will be very critical to correctly apply the "Value Pricing Strategy" to maximize the HOV/HOT usage.

For IH 635/DNT interchange, no dramatic access location revisions have been called for as that for IH 635/IH 35E interchange. The access ramps on DNT would remain the same, and only the access points on IH 635 to/from DNT are revised and analyzed in this report. The existing EB two exit ramps to SB & NB DNT have been consolidated into one exit ramp. In addition, an existing entrance ramp from FR to EB mainlane has been merged with the NB DNT to EB mainlane ramp to reduce another access point on IH 635 mainlane. Finally, the existing entrance ramp from SB DNT to WB IH 635 mainlane has been extended further west. This eliminates the heavy weaving between the entrance ramp and the exit ramp to Midway that exists today. As the Table 6 demonstrates, the

traffic operations at the DNT area would be enhanced. Considering the projected year 2020 near 350,000vpd demand on the IH 635 mainlanes in the IH 635/DNT interchange area, the fundamental solution to improve the level of service will be to use the 6-lane HOV/HOT efficiently by the "Value Pricing Strategy".

Category 3 access is summarized in the table 7. Seven ramps that exist today have been eliminated in the proposed schematic.

Table 7: Category 3 Ramp LOS

Proposed	Existing
1. Eliminate direct entrance Ramp from Anaheim to EB IH 635 Freeway Analysis LOS = C	Direct entrance from Anaheim. Ramp Analysis LOS = F
2. Eliminate direct exit ramp From EB IH 635 to Webb Chapel Freeway Analysis LOS = E Heavy weaving with IH 35E DC if this ramp is not eliminated.	Direct exit ramp to Webb Chapel. Ramp Analysis LOS = F
3. Eliminate direct entrance Ramp from Montfort to EB IH 635 Freeway Analysis LOS = F (E, D) (I)	Direct entrance ramp from Montfort. Ramp Analysis LOS = F

Table 7 Continue

4. Eliminate direct exit ramp From WB IH 635 to Hillcrest Access to Hillcrest has been moved further east and has been constructed with Dallas High Five project. Freeway Analysis LOS = F (E(II))	Weaving between on-ramp from Coit to WB IH 635 and off-ramp From WB IH 635 to Hillcrest. LOS = F
5. Eliminate direct exit ramp From WB IH 635 to Montfort Freeway Analysis LOS = F (E(III))	Direct exit to Montfort Ramp Analysis LOS = F
6. Eliminate direct entrance Ramp from Webb Chapel to WB IH 635 Freeway Analysis	Direct entrance ramp from Webb Chapel Ramp Analysis LOS = F

LOS = F (E[IV]) Heavy weaving with DC to IH 35E if this ramp is not eliminated.	
7. Eliminate direct exit ramp from WB IH 635 to FR Eliminate weaving with the on ramp from Josey/Webb Chaple to WB IH 635 Freeway Analysis LOS = C	Weaving between on-ramp from Josey to WB IH 635 and off-ramp from WB IH 635 to FR. LOS = F
8a & 8b. Reversed ramps EB off-ramp to Marsh (Ramp W-M) followed by EB on-ramp from Webb Chapel (Ramp J/WC-E). Weaving between J/WC-E and W-MW LOS = F (E[V])	EB on-ramp from Webb Chapel followed by EB off-ramp to Marsh. Freeway Analysis LOS = F
9a & 9b. Reversed ramps EB off-ramp to Midway (Ramp W-MW) followed by EB on-ramp from Marsh (Ramp M-E). Weaving analysis as (8a & 8b) above.	EB on-ramp from Marsh followed by EB off-ramp to Midway. Freeway Analysis LOS = F
10a & 10b. Reversed ramps WB off-ramp to Marsh (Ramp E-M) followed by WB on-ramp from Midway (Ramp MW-W). Weaving between WB on ramp from Midway (MW-W) and WB off ramp to Josey/Webb Chapel (E-J/WC). LOS = F (E[VI])	WB on-ramp from Midway followed by WB off-ramp to Marsh. Freeway Analysis LOS = F

[I] LOF=F is simply because the 5 general mainlanes cannot handle the projected year 2020 peak hour flow, 12,624vph, in this area. The level of service would be improved to "E" for the general "peak period". Furthermore, the level of service would be enhanced to "D" if "Value Pricing Strategy" was considered and LOS was computed using revised HOV/HOT traffic numbers by Wilbur Smith Associates.

[II] The 6 general mainlanes cannot provide the needed capacity for the projected year 2020 peak hour traffic volume of 15,208vph. The level of service would be improved to "E" for the general "peak period".

[III] The projected year 2020 peak hour demand of 14,824vph exceeds the capacity of 5 general mainlanes. The level of service would be improved to "E" for the general "peak period".

[IV] The 5 general mainlanes cannot absorb the projected year 2020 peak hour flow of 12,560vph. The level of service would be improved to "E" for the general "peak period".

[v] Based on the study and modeling by Wilbur Smith Associates, 29,500vpd, not firstly assumed 8,600vpd, is projected on the HOV/HOT lanes by the "Value Pricing Strategy". The level of service would be improved to "E" for the general "peak period".

[vi] The projected year 2020 daily traffic volume of 53,000vpd is too heavy a burden for a 1-lane entrance ramp (Ramp MW-W). The level of service would be "F" no matter what "strategy" is adopted under the current schematic. The following schematic revision is proposed to improve the traffic operation.
Schematic Revision:

1. Revise the 1-lane entrance ramp (Ramp MW-W) into a 2-lane ramp.
2. Add one WB general mainlane between the Ramp MW-W and Ramp M-W. This will make it a 6-lane section between Ramp MW-W and Ramp E-J/WC and a 5-lane section between Ramp E-J/WC and Ramp M-W.

Therefore, the level of service was calculated as "E" for the general "peak period" using 31,000vpd on the HOV/HOT lanes projected by the Wilbur Smith Associates with the "Value Pricing Strategy". It is understood that it is not easy to carry out the proposed schematic revision due to the unknown ROW and displacement impact. This particular issue should be kept in mind for the future designers.

By eliminating access locations on the IH 635 mainlanes, the proposed schematic would generally improve the traffic operation conditions over the existing configurations, as Table 7 indicated. These improvements were obtained even without considering the potential benefit of the "Value Pricing Strategy". Once the "Value Pricing Strategy" is used to encourage more traffic to the HOV/HOT lanes and balance the traffic demands and capacities on the general mainlanes and HOV/HOT lanes, such as footnote (I) of Table 7 showed, the level of service would be further improved.

There are three pairs (6 ramps) of mainlane on/off ramp configurations that have been revised from an existing "Diamond" type to the proposed "X" type design, i.e., revising the existing "on" ramp followed by "off" ramp configuration to the proposed "off" ramp followed by "on" ramp configuration. For example, the existing EB mainlane between Webb Chapel Road and Marsh Lane showed the "on" ramp from Webb Chapel Road followed by the "off" ramp to Marsh Lane (see sheet 2 of Exhibit 2). The proposed design calls for the "off" ramp to Marsh Lane followed by the "on" ramp from Webb Chapel Road (see sheet 2 of Exhibit 4). The general design concepts to support the reconfigurations are listed below.

1. The traffic on the proposed "X" type "off" ramp will have a higher speed (e.g., 55 MPH, since it is farther away from the destined intersection) than that on the existing "Diamond"

type "off" ramp (e.g., 35 MPH, since it is closer to the destined intersection). Therefore, the proposed "X" type design will remove traffic from the mainlane to the frontage road more efficiently than the existing "Diamond" type design. In addition, the proposed "X" type design will provide better queuing at the intersection signal, preventing traffic from queuing onto the exit ramp during peak traffic conditions.

2. The proposed "X" type design forces the local traffic to stay on the frontage road longer (entering the mainlane further downstream) and removes traffic from the mainlane to frontage road earlier than that of the existing "Diamond" type design, and thus, improve the mainlane traffic flow.
3. For the five-lane mainlane portions of the LBJ West Section, the weaving created by the proposed "X" type design for upstream and downstream ramps is limited to the outside two lanes. By removing traffic from the mainlane to frontage road earlier and injecting traffic from frontage road to mainlane later, the inside three mainlanes will have a better traffic operation condition.

Finally, real-time traffic operation has been simulated by CORSIM at selected IH 635 west section mainlane locations for K=0.08 (peak hour), K=0.07 and K=0.06 (peak period). The speed, level of service, traffic demanded and processed are tabulated in Exhibit 6. Although the CORSIM simulation and HCS computation lead to similar results, the peak hour LOS simulated by CORSIM is generally better than those listed in the IH 635 West Section Environmental Assessment document and those calculated in this report. This is because the LOS computation in the EA document did not take into consideration of the "Value Pricing Strategy" and the CORSIM only "processed" part of the traffic "demand" while the "full" traffic volume was used in the LOS calculation by HCS in this report. In addition, both the CORSIM simulation and HCS computation revealed the worst area in the IH 635 west section, i.e., in the vicinity of Ramp E-J/WC. The LOS would be "F" and schematic revision is discussed in this report, see footnote (VI) of Table 7.

Conclusion

Both sides of IH 635 west section have been fully developed. The Right of Way (ROW) is severely constrained and it is impractical to provide more general mainlanes. This is the compelling reason that a majority of the proposed HOV/HOT lanes will be in the tunnel or in a cut-and-cover box underneath the frontage road. A Value Engineering Study that was held in 1999 thoroughly investigated all avenues (moving, eliminating or braiding ramps, adding auxiliary lanes, etc.) to balance the traffic operation and demand, and to geometrically fit the area and satisfy the adjacent property/home owner's request (such as no elevated roadway in LBJ corridor). The study and other planning process

had resulted in the current schematic layout that had been approved by both TxDOT and FHWA. There is only limited leverage in this report to recommend any revisions of the approved schematic.

Although adding an additional general mainlane is practically not feasible at this time, a wider than usual concrete inside shoulder has been proposed in the schematic. It has provided the potential in the future that the mainlanes would be re-striped with one more lanes in each direction with reduced inside shoulder. As a result, the level of services computed in this report would be further improved. A design exception will be needed for such re-striping.

"Peak period" is an important concept introduced in this report. Considering the reality that the existing and future peak hour level of service would be "F" almost in the entire IH 635 west section, the level of service in "peak period" provides us a different angle to see a broader "picture" of traffic operation. However, It should be clearly understood that by showing a better "peak period" (K=0.06) LOS does not mean the worst peak hour (K=0.08) LOS not exist. Furthermore, a deeper investigation by a sample data analysis of TTI February 1, 2001 traffic count at east of IH 35E indicated that there were only 5 hours' K greater than 0.06 (1 hour K=0.08 and 4 hours' K=0.07) within the defined 15-hour "peak period". The "peak period" broader "picture" demonstrated that the majority actual hour by hour LOS would be equal or better than the calculated LOS using K=0.06 within the defined 15-hour "peak period".

In addition to the "peak period" concept, the "Value Pricing Strategy" is another tool introduced in this report to analyze the traffic operation. For such a highly congested (today and future), full commercially developed IH 635 west section with adding more general mainlanes almost impossible, the calculated level of service cannot be improved from "F" to "E" or better in numerous sections without considering the "Value Pricing Strategy" as a factor in the access justification analysis. The TxDOT ongoing Traffic Revenue Study with the Wilbur Smith Associates clearly indicates that the "Value Pricing Strategy" would certainly divert more vehicles from the general mainlanes to the HOV/HOT lanes. The operational analysis demonstrated the importance of the "Value Pricing Strategy".

HCS is an efficient tool to study the traffic operation characteristics in a big corridor. The micro-simulation model such as CORSIM would provide more detailed information and let the planners "visualize" the congestion. However, to establish and fine-tune the model would need a huge amount of effort for a big corridor.

The proposed new ramp access points (Category 1 Access) provide direct connections to the IH 635 mainlanes from major local cross streets and HOV/HOT lanes, and relieve the traffic on adjacent ramps. There are a few cases where the projected year 2020 mainlane peak hour LOS would be "F". But this is not due to the addition of these new ramps. It is because the projected year 2020 peak hour traffic volume exceeds the mainlane capacity in the area. On the other hand without these ramps, vehicles will have to use the next or previous ramps to get to and leave from the cross streets. This will increase the congestion at these intersections that already exists today.

For the reconfigured IH 635/IH 35E interchange (Category 2 Access), the existing 16 dual-point "on" and "off" access connectors have been revised to an 8 single-point "on" and "off" access connectors. The LOS has been significantly improved at the interchange area.

For the revised access locations on IH 635 mainlanes of IH 635/DNT interchange (Category 2 Access), the traffic operation for both EB and WB IH 635 mainlanes has been enhanced, as discussed in the "Operational Analysis" section.

Seven existing ramps have been eliminated in the proposed schematic, so do the seven LOS=F ramp-freeway junctions for the LBJ freeway at peak hour. However, due to the projected heavy mainlane traffic volume in the year 2020, further eliminating a few more ramps would not help the peak hour mainlane level of service much. In addition, there is so much congestion in the parallel facilities and latent demand along the corridor.

Three pairs of ramps (six ramps) have been reversed. They have been converted from the existing "Diamond" configuration to proposed "X" configuration. In addition to the advantages discussed in the "Operational Analysis" section for Category 3 access, a specific schematic revision has been recommended for the future designer to consider to improve the traffic operation conditions in WB IH 635 mainlanes at Midway, Webb Chapel area.

The proposed new access ramps and revised access points meet the current standards for Federal-aid projects on the Interstate System as required in the revision of the FHWA policy statement issued in the Federal Register on February 11, 1998.

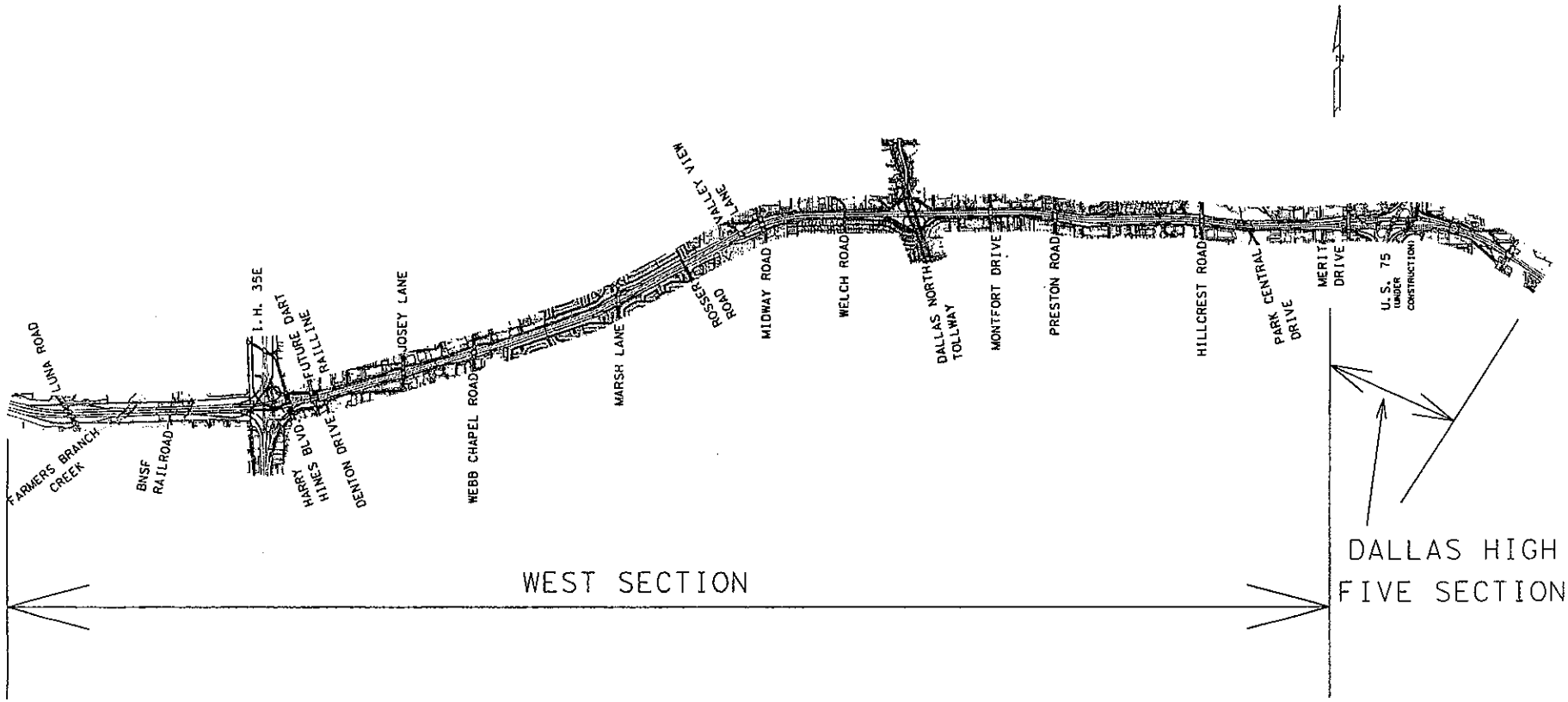
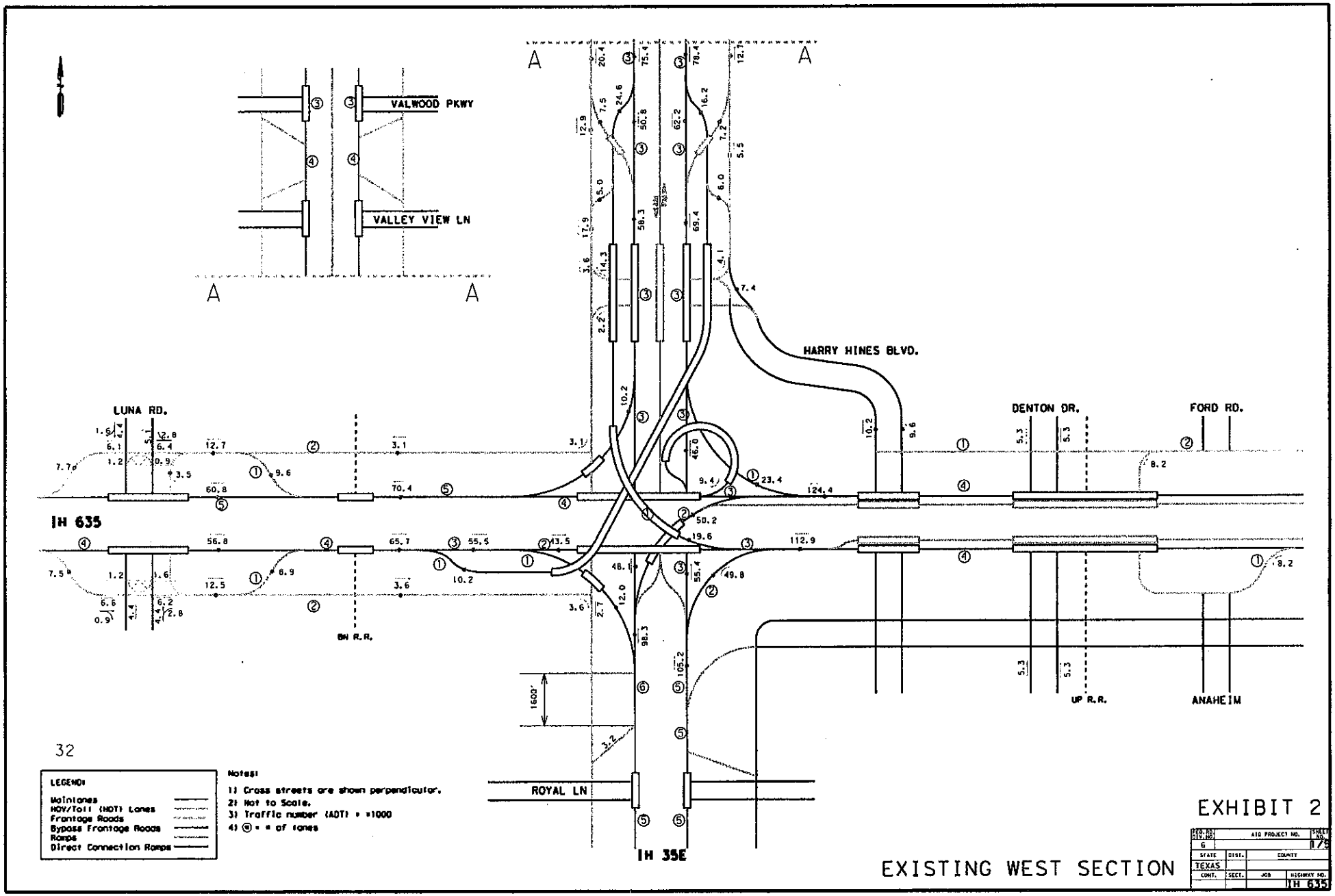
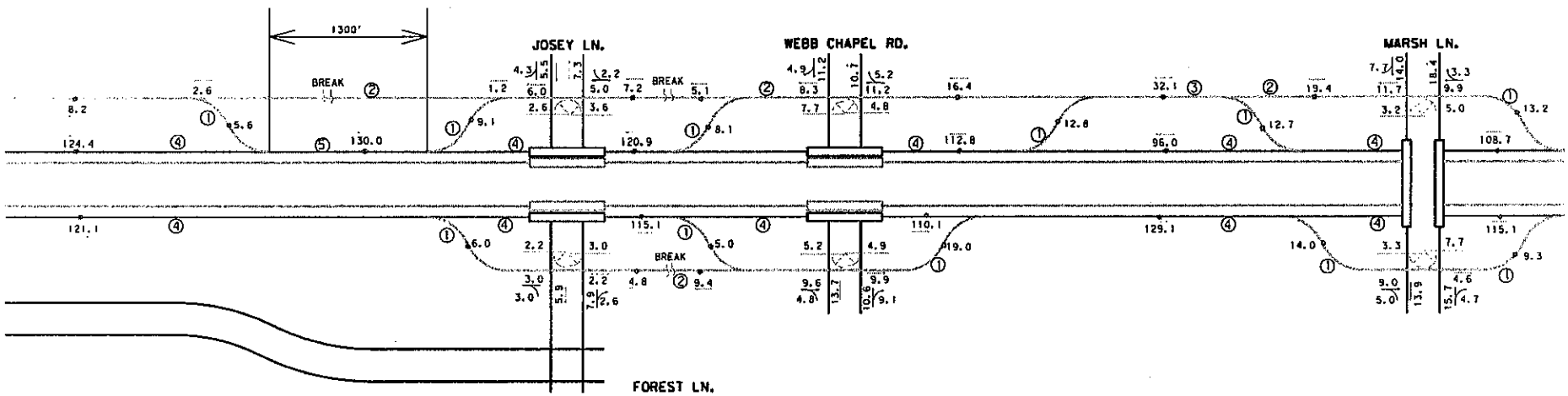


EXHIBIT 1

IH 635 CORRIDOR LAYOUT

6		1/2
TEXAS	1B	
		IH 635


VALWOOD PKWY
VALLEY VIEW LN
A
A
A
A
HARRY HINES BLVD.
LUNA RD.
DENTON DR.
FORD RD.
IH 635
BN R.R.
UP R.R.
ANAHEIM
ROYAL LN
IH 35E
1600'
LEGEND:
Mainlanes
HOV/Toll (HOT) Lanes
Frontage Roads
Bypass Frontage Roads
Ramps
Direct Connection Ramps
Notes:
1) Cross streets are shown perpendicular.
2) Not to Scale.
3) Traffic number (ADT) = x1000
4) ③ = # of lanes
EXHIBIT 2
EXISTING WEST SECTION
STATE
TEXAS
COUNTY
JOB
HIGHWAY NO.
IH 635



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LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

Notes:

1) Cross streets are shown perpendicular.
2) Not to Scale.
3) Traffic number (ADT) = *1000
4) ◎ = # of lanes

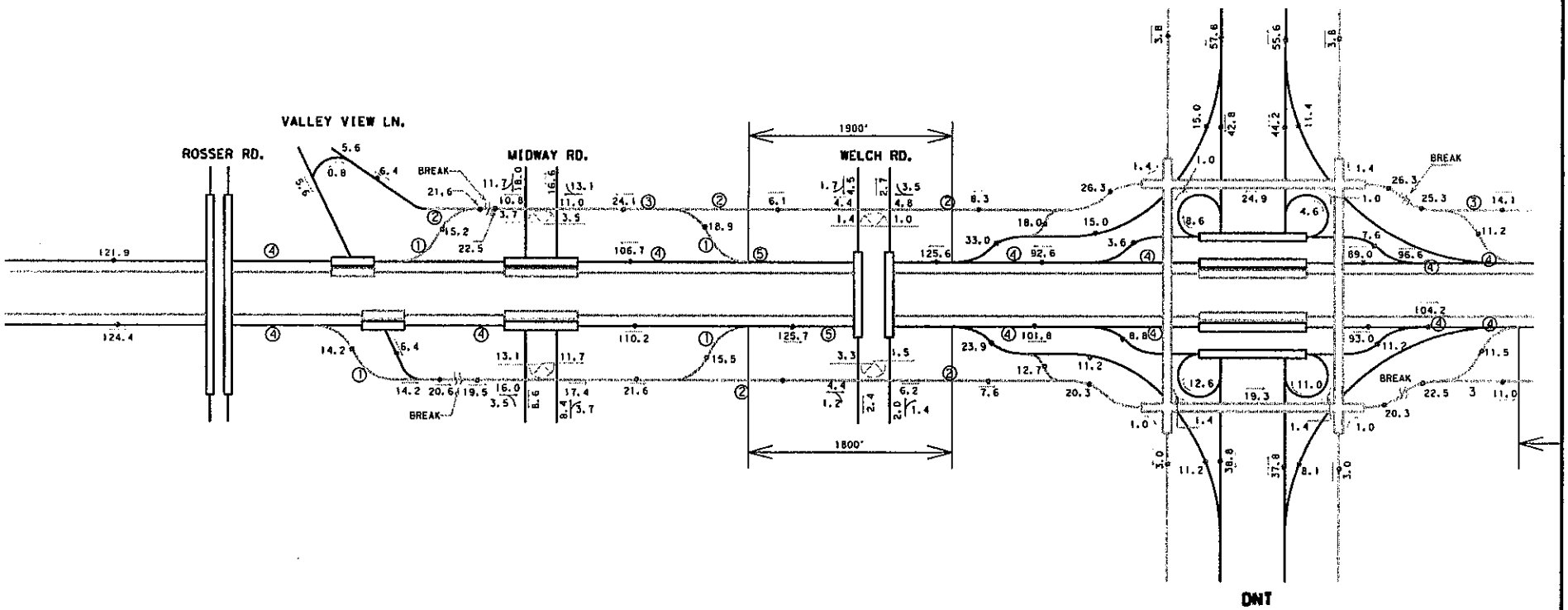
EXHIBIT 2

EXISTING WEST SECTION

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		27

STATE	DIST.	COUNTY
TEXAS		

CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635



34

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

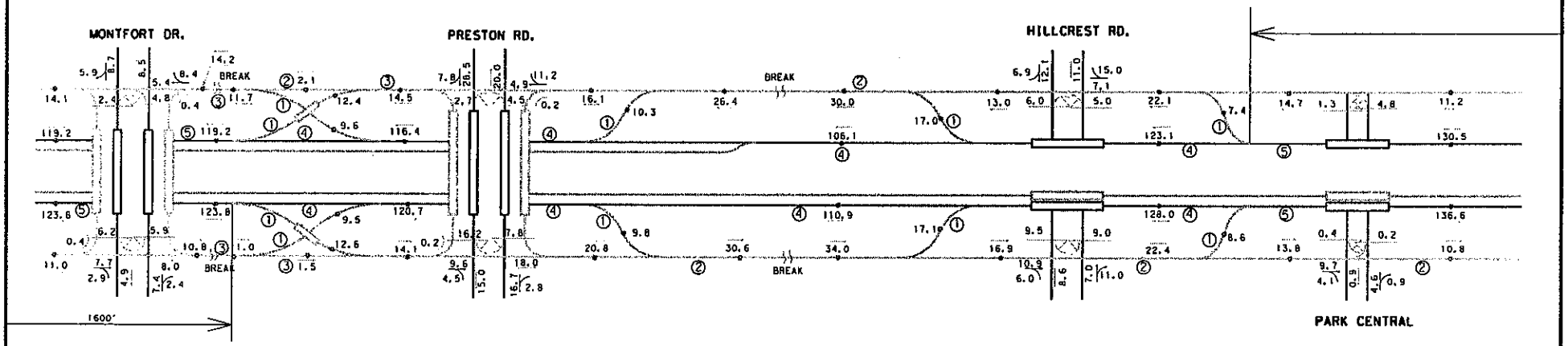
Notes:

1) Cross streets are shown perpendicular.
2) Not to Scale.
3) Traffic number (ADT) = *1000
4) ⓝ = # of lanes

EXHIBIT 2

EXISTING WEST SECTION

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		375
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.



35

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

Notes:

1) Cross streets are shown perpendicular.
2) Not to Scale.
3) Traffic number (ADT) = *1000
4) ⓔ = # of lanes

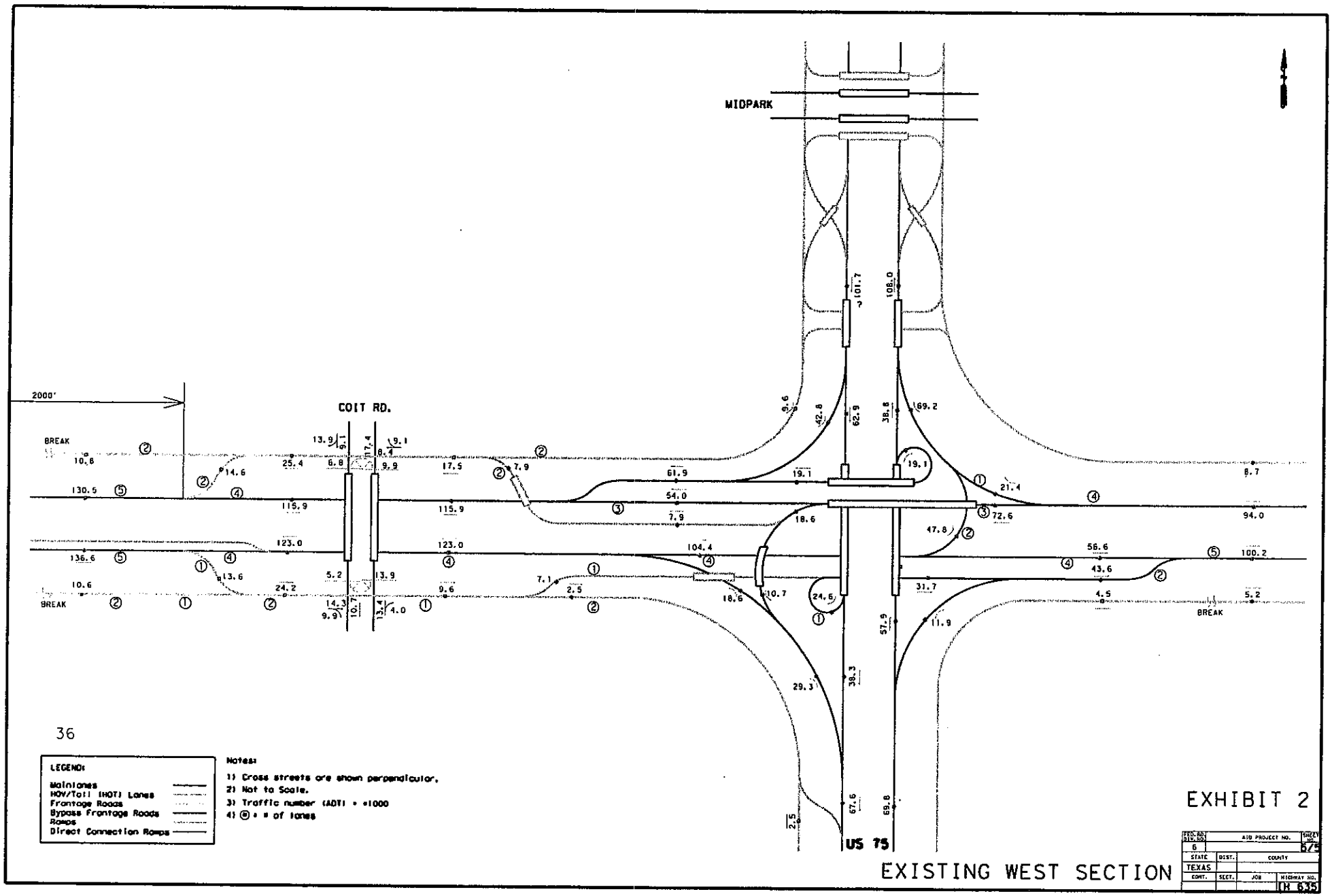
EXHIBIT 2

EXISTING WEST SECTION

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		4/5

STATE	DIST.	COUNTY
TEXAS		

CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635


MIDPARK
COIT RD.
2000'
BREAK
BREAK
BREAK
US 75
LEGEND:
Mainlanes
HOV/Toll (HOT) Lanes
Frontage Roads
Bypass Frontage Roads
Ramps
Direct Connection Ramps
Notes:
1) Cross streets are shown perpendicular.
2) Not to Scale.
3) Traffic number (ADT) = *1000
4) ⓝ = # of lanes
EXHIBIT 2
EXISTING WEST SECTION
FED. RD. DIV. NO. 6
AID PROJECT NO.
SHEET NO. 6/5
STATE TEXAS
DIST.
COUNTY
CONT.
SECT.
JOB
HIGHWAY NO. IH 635

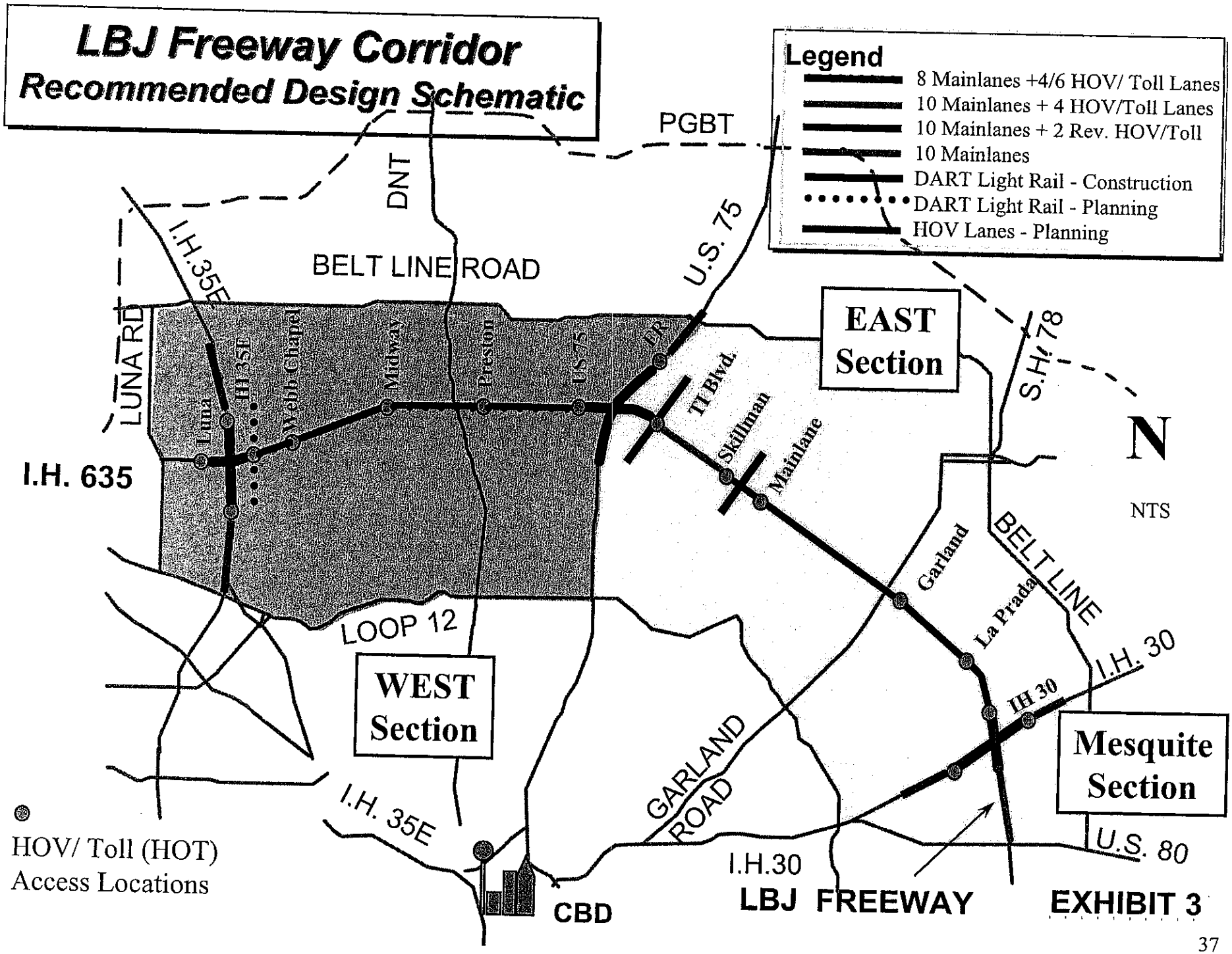
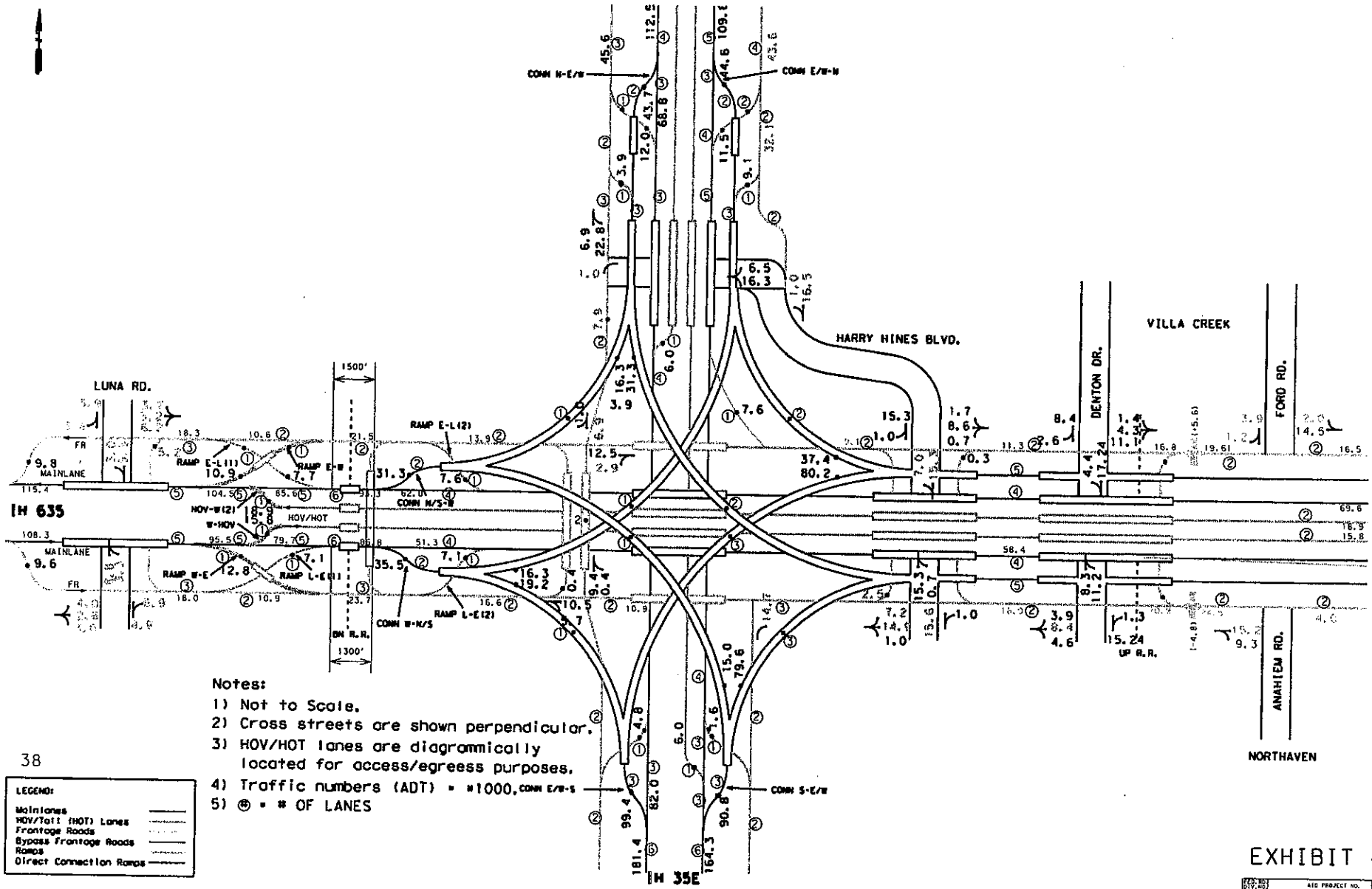

LBJ Freeway Corridor
Recommended Design Schematic
Legend
8 Mainlanes +4/6 HOV/ Toll Lanes
10 Mainlanes + 4 HOV/Toll Lanes
10 Mainlanes + 2 Rev. HOV/Toll
10 Mainlanes
DART Light Rail - Construction
DART Light Rail - Planning
HOV Lanes - Planning
PGBT
DNT
BELT LINE ROAD
I.H.35E
LUNA RD
U.S. 75
EAST Section
S.H. 78
N
NTS
I.H. 635
Luna
IH 35E
Webb Chapel
Midway
Preston
US 75
PP
TI Blvd.
Skillman
Mainlane
Garland
BELT LINE
La Prada
I.H. 30
IH 30
LOOP 12
WEST Section
Mesquite Section
GARLAND ROAD
I.H. 35E
U.S. 80
I.H.30
LBJ FREEWAY
CBD
HOV/ Toll (HOT) Access Locations

EXHIBIT 3



Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egress purposes.
4) Traffic numbers (ADT) = #1000.
5) ⊕ = # OF LANES

LEGEND:

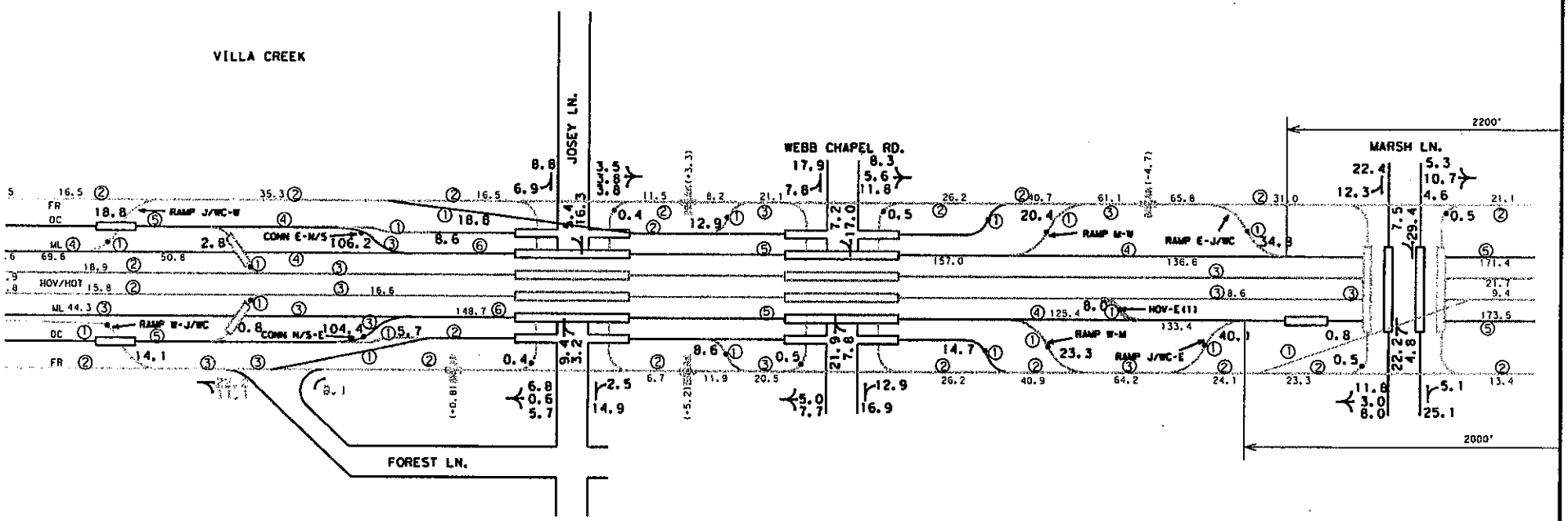
- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

EXHIBIT 4

PROPOSED WEST SECTION

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		1/4

STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
		IH 635



39

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egress purposes.
4) Traffic numbers (ADT) = #1000.
5) ⑥ = # OF LANES

EXHIBIT 4

PROPOSED WEST SECTION

FED. RD. DIV. NO.	FED. AID PROJECT NO.	SHEET NO.
6		2/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635

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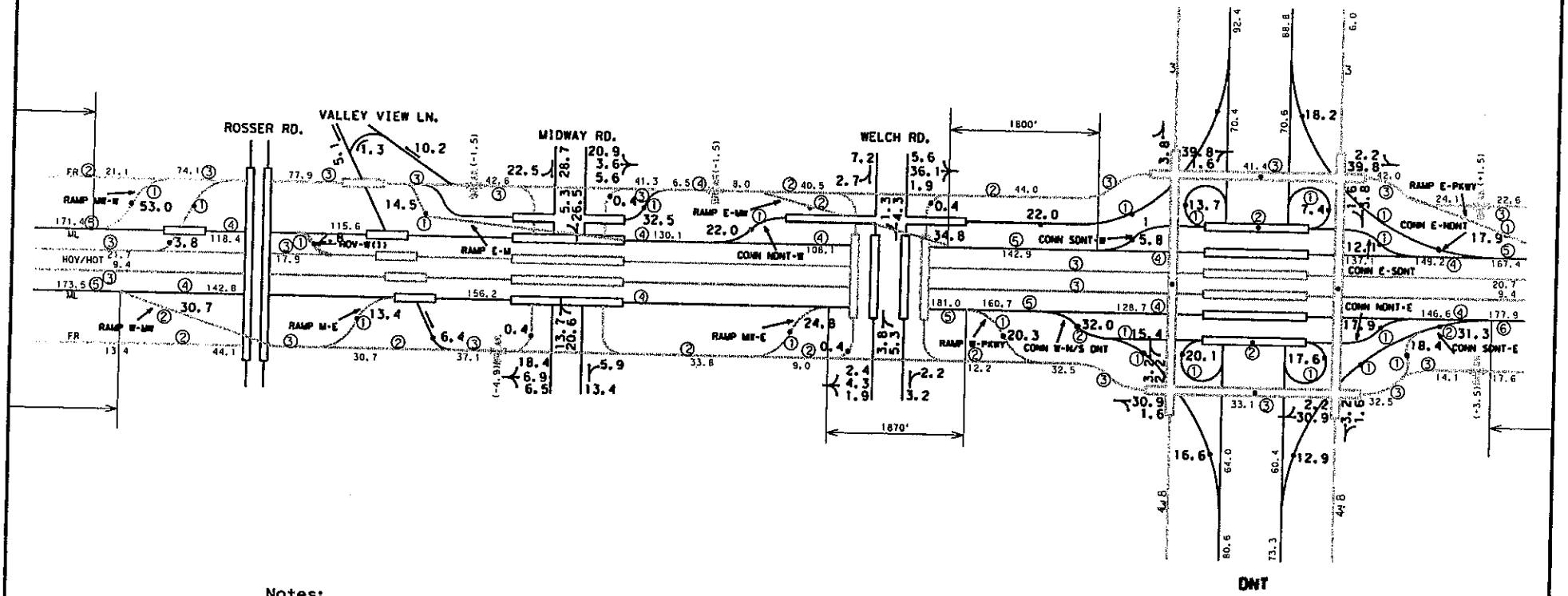


Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egreess purposes.
4) Traffic numbers (ADT) = #1000.
5) ⓝ = # OF LANES

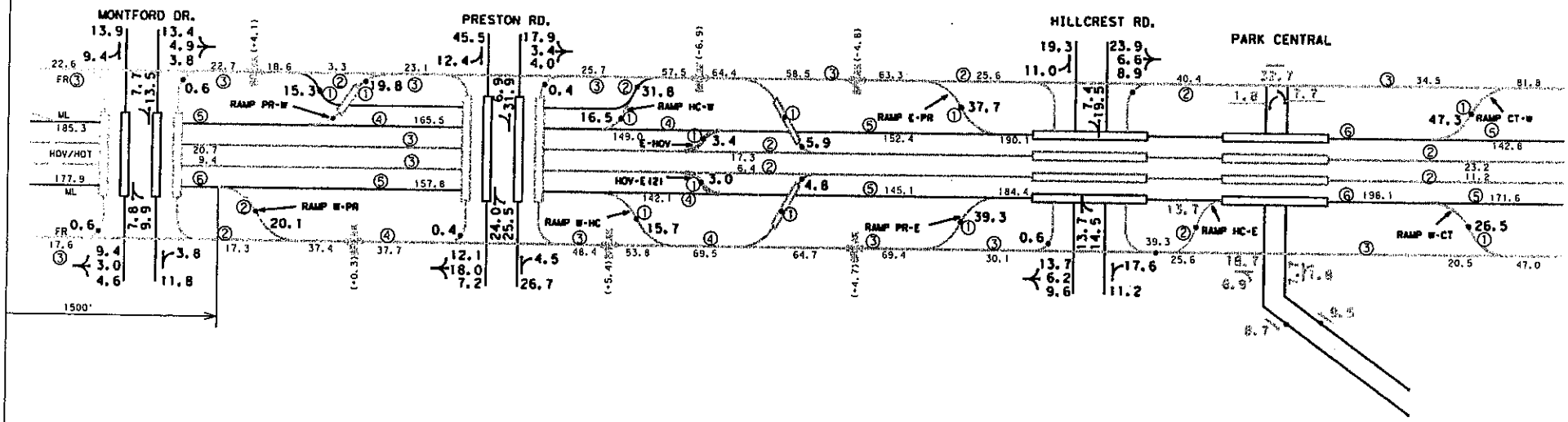
LEGEND:

- Mainlanes Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

EXHIBIT 4

PROPOSED WEST SECTION

FED. RD. DIV. NO.	FED. AID PROJECT NO.	SHEET NO.
6		3/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB
		HIGHWAY NO. IH 635



41

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egreess purposes.
4) Traffic numbers (ADT) = #1000.
5) ⊛ = # OF LANES

EXHIBIT 4

PROPOSED WEST SECTION

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		4/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635

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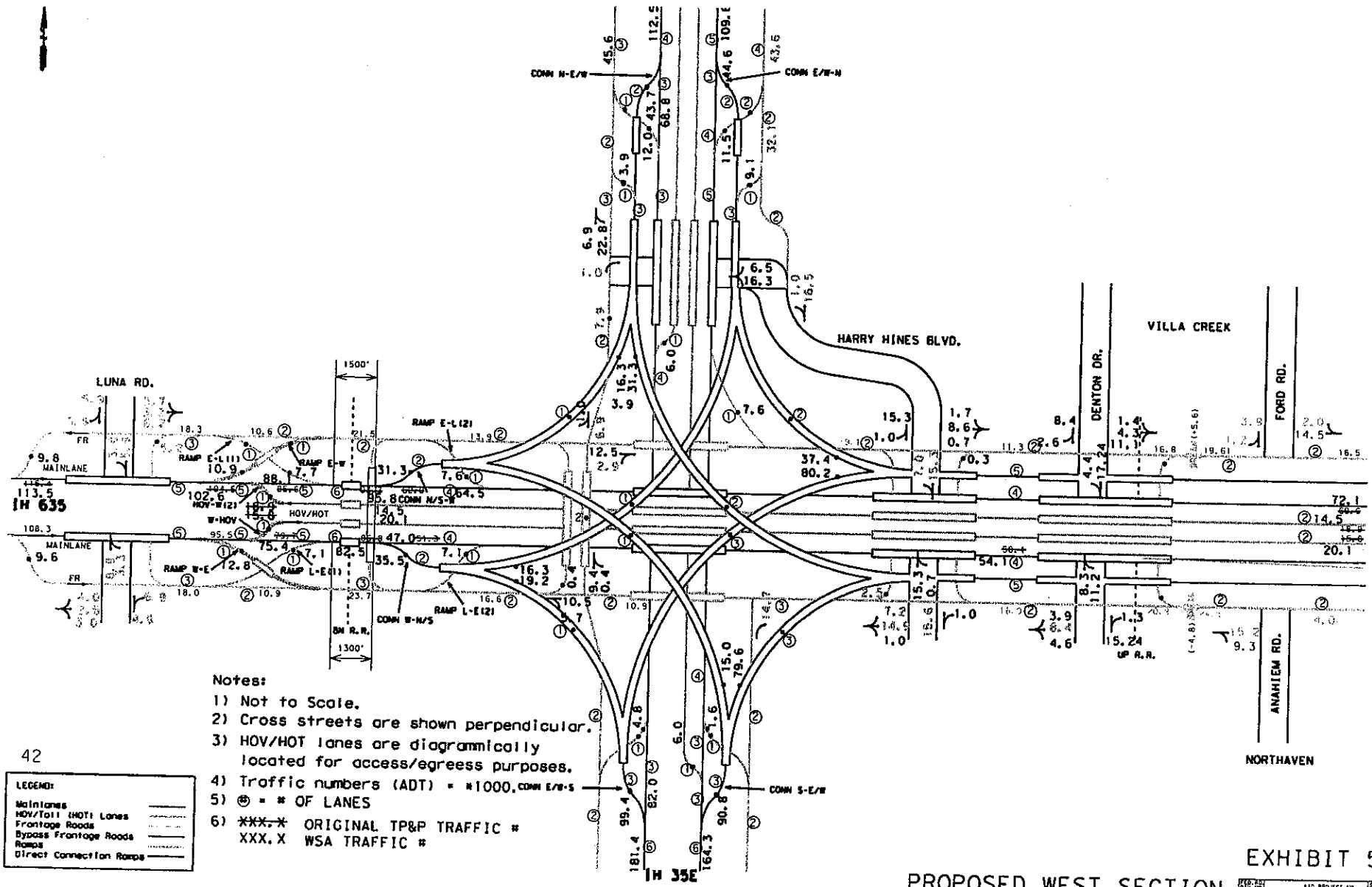

Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egress purposes.
4) Traffic numbers (ADT) = *1000.
5) ⊕ = # OF LANES
6) ~~XXX.X~~ ORIGINAL TP&P TRAFFIC #
   XXX.X WSA TRAFFIC #

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

EXHIBIT 5

PROPOSED WEST SECTION

(TRAFFIC # BY WSA)

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		1/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635

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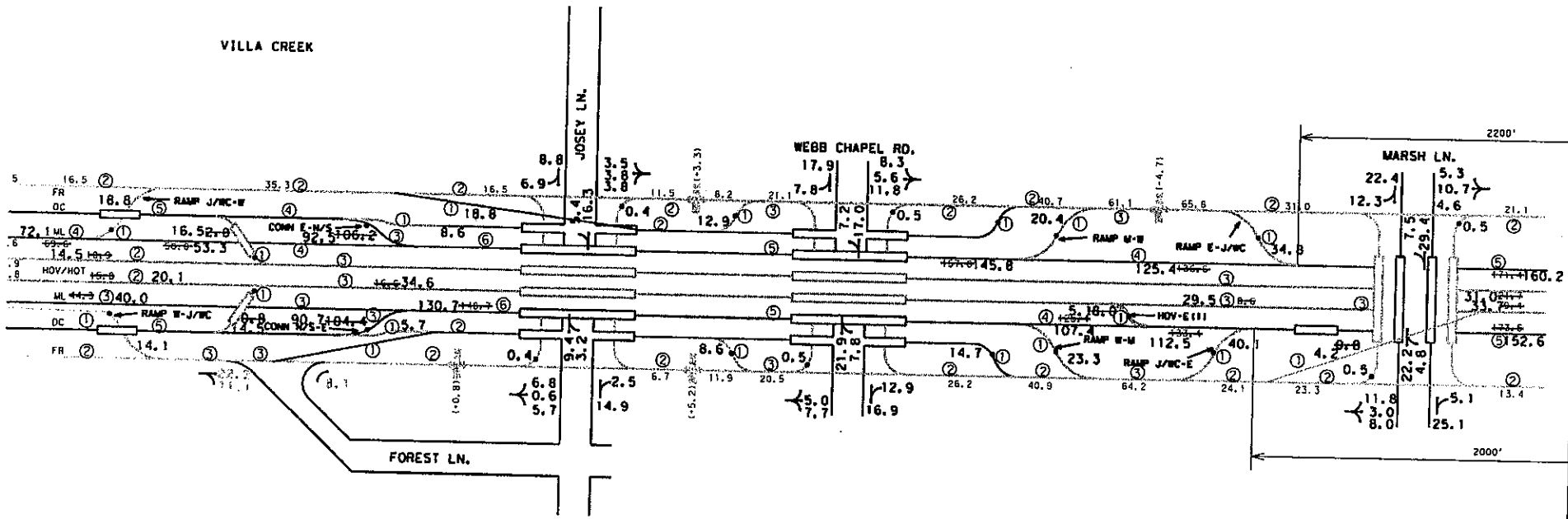


43

LEGEND:

- Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

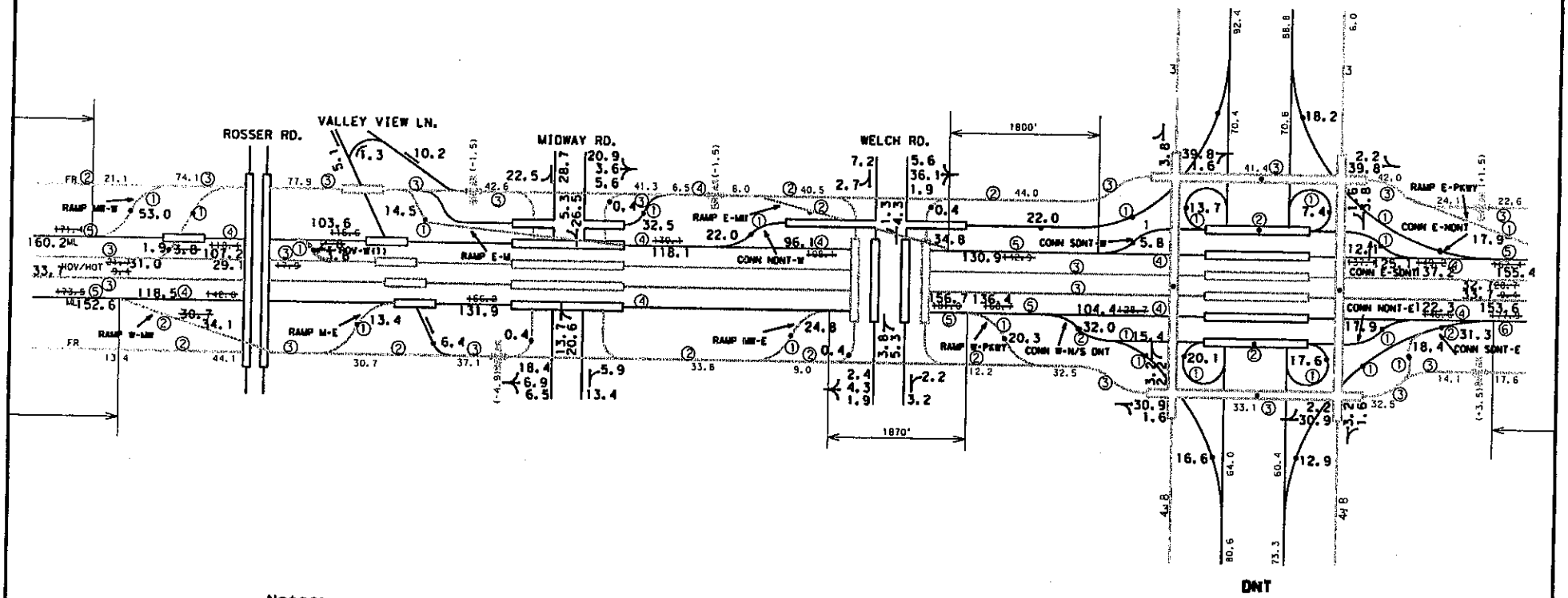
Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egreess purposes.
4) Traffic numbers (ADT) = *1000.
5) ⑥ = # OF LANES
6) ~~XXX.X~~ ORIGINAL TP&P TRAFFIC #
   XXX.X WSA TRAFFIC #

EXHIBIT 5

PROPOSED WEST SECTION
(TRAFFIC # BY WSA)

DIST. NO. / DIV. NO.	AID PROJECT NO.	SHEET NO.
6		274
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635



Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egress purposes.
4) Traffic numbers (ADT) = *1000.
5) ⓝ = # OF LANES
6) ~~XXX.X~~ ORIGINAL TP&P TRAFFIC #
   XXX.X WSA TRAFFIC #

44

LEGEND:

- Mainlanes Mainlanes
- HOV/Toll (HOT) Lanes
- Frontage Roads
- Bypass Frontage Roads
- Ramps
- Direct Connection Ramps

EXHIBIT 5

PROPOSED WEST SECTION
(TRAFFIC # BY WSA)

FED. RD. DIV. NO.	AID PROJECT NO.	SHEET NO.
6		3/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635

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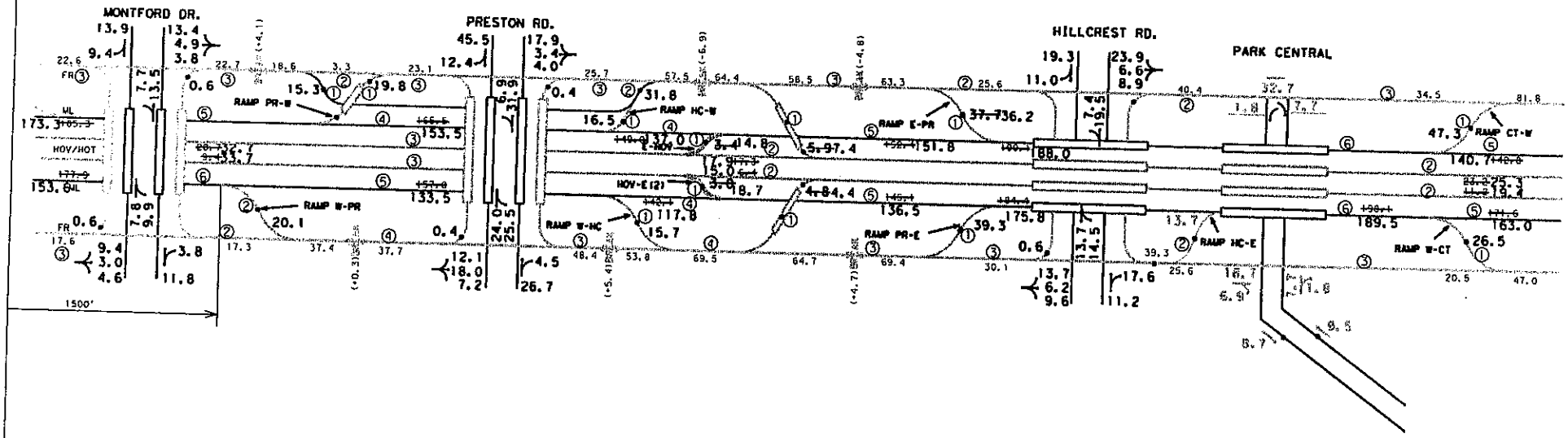

Notes:

1) Not to Scale.
2) Cross streets are shown perpendicular.
3) HOV/HOT lanes are diagrammically located for access/egreess purposes.
4) Traffic numbers (ADT) = *1000.
5) ⊛ = # OF LANES
6) ~~XXX.X~~ ORIGINAL TP&P TRAFFIC #
   XXX.X WSA TRAFFIC #

45

LEGEND:
Mainlanes
HOV/Toll (HOT) Lanes
Frontage Roads
Bypass Frontage Roads
Ramps
Direct Connection Ramps

EXHIBIT 5

PROPOSED WEST SECTION
(TRAFFIC # BY WSA)

FED. RD. DIV. NO.	AIS PROJECT NO.	SHEET NO.
6		4/4
STATE	DIST.	COUNTY
TEXAS		
CONT.	SECT.	JOB	HIGHWAY NO.
			IH 635

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Appendix B

NCTCOG
MANAGED LANE POLICY

North Central Texas Council of Governments

MANAGED LANE POLICIES

1. A fixed-fee schedule will be applied during the first six months of operation; dynamic pricing will be applied thereafter.

2. The toll rate will be set up to $0.75 per mile during the fixed-schedule phase. The established rate will be evaluated and adjusted, if warranted, with Regional Transportation Council (RTC) approval.

3. Toll rates will be updated monthly during the fixed-schedule phase.

4. Market-based tolls will be applied during the dynamic-pricing phase.

5. Transit vehicles will not be charged a toll.

6. Single-occupant vehicles will pay the full rate.

7. Trucks will pay a higher rate, and no trucks will be permitted in the LBJ tunnel.

North Central Texas Council of Governments

MANAGED LANE POLICIES (continued)

8. High-occupancy vehicles of two or more occupant and vanpools will pay the full rate in the off-peak period.

9. High-occupancy vehicles of two or more occupants will receive a 50 percent discount during the peak period.* This discount will phase out after the air quality attainment maintenance period. RTC-sponsored public vanpools are permitted to add peak-period tolls as eligible expenses. Therefore, the Comprehensive Development Agreement (CDA) firm will be responsible for the high-occupancy vehicle discount and the Regional Transportation Council will be responsible for the vanpool discount.

10. The toll rate will be established to maintain a minimum average corridor speed of 50 miles per hour.

*6 hours per weekday: 6:30 a.m. - 9:00 a.m. and 3:00 p.m. - 6:30 p.m.

North Central Texas Council of Governments

MANAGED LANE POLICIES (continued)

11. During the dynamic-pricing phase, travelers will receive rebates if the average speed drops below 35 mph. Rebates will not apply if speed reduction is out of the control of the operator.

12. Motorcycles qualify as high-occupancy vehicles.

13. No discounts will be given for "Green Vehicles."

14. No scheduled inflation adjustments will be applied over time.

15. Every managed lane corridor will operate under the same policy.

16. There will be no change to the Regional Transportation Council Excess Revenue Policy.

North Central Texas Council of Governments

MANAGED LANE POLICIES (continued)

17. The Regional Transportation Council requests that local governments and transportation authorities assign representatives to the Comprehensive Development Agreement procurement process.

18. The duration of the Comprehensive Development Agreement should maximize potential revenue.

19. Tolls will remain on the managed lanes after the Comprehensive Development Agreement duration.

RTC Approved – May 11, 2006
RTC Modified – September 14, 2006