Final MIS Report

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Houston District

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TxDOT Houston
US 290 Corridor
Major Investment Study

Lead Agency:	Texas Department of Transportation (TxDOT) Houston District
Project Manager:	Roger M. Gonzalez Consultant Contracts Department
Steering and Advisory Committees:	TxDOT - Houston Houston-Galveston Area Council (H-GAC) Metropolitan Transit Authority (METRO) City of Houston Harris County Federal Transit Administration (FTA) Federal Highway Administration (FHWA) Texas Commission on Environmental Quality *(Formerly TNRCC)* Corps of Engineers
Consultant Team:	Kimley-Horn and Associates, Inc. with Hicks & Company Knudson & Associates

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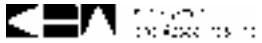

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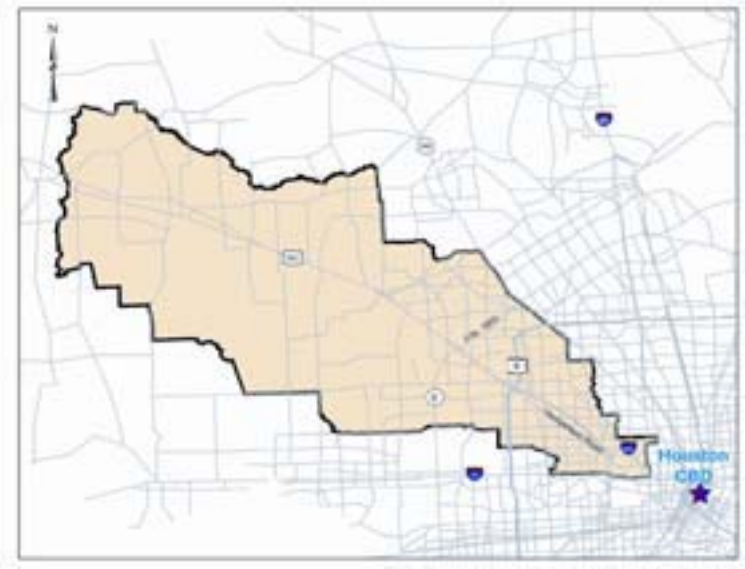
INTRODUCTION

The attached report represents the culmination of an intensive process called a Major Investment Study (MIS). An MIS is commissioned in order to study a federally funded highway or transit improvement of substantial cost that is expected to have a significant impact on capacity, traffic flow, level of service, or mode sharing within a transportation corridor.

In the case of the US 290 Corridor, the MIS was deemed necessary due to the exploding rates of growth in the Houston region. The City of Houston is the fourth largest metropolitan area in the United States and the largest in Texas; with growth-rate predictions at approximately 41% between the years 2000 and 2025 come traffic congestion and transportation-related problems. The regional transportation network will be unable to provide an acceptable level of service on many travel corridors in the study area. In particular, the US 290 Corridor has experienced considerable growth; with the current corridor population at 412,000 and a projected 2025 population of 708,000, this corridor is facing serious transportation issues. The study corridor (which includes Hempstead Highway) is of varying width and is approximately 38 miles long, extending from the interchange area of IH 10 / IH 610 / US 290 northwest to the community of Waller, Texas, at Farm-to-Market 2920.



The study team for the US 290 MIS began work in 1999 and includes the Texas Department of Transportation-Houston District (TxDOT); Kimley-Horn and Associates, Inc.; Knudson & Associates; and Hicks & Company. TxDOT served as the lead agency and was responsible for initiating the MIS and establishing the MIS Steering and Advisory Committees that were responsible for guiding the development of the study. The Steering and Advisory Committees were made up of representatives from various federal, state, and local agencies, as well as elected officials. Kimley-Horn was the prime consultant for the project, responsible for the technical issues and analysis of various transportation

alternatives, ultimately arriving at the locally preferred alternative. This process is described in greater detail below. Knudson & Associates led the public involvement effort throughout the project, and Hicks & Company identified and evaluated social, economic, and environmental impacts along the corridor.

The team's objectives and goals were to evaluate alternatives for improvements within the study corridor and to recommend a locally preferred alternative best suited to meet the corridor's transportation needs, while minimizing impacts to the surrounding environment. As a result of an extensive public involvement program and an evaluation of current and projected deficiencies within the corridor, the study team arrived at the following six corridor-specific goals:

- Improve public safety
- Improve and maintain mobility
- Increase opportunities for transit
- Avoid or minimize adverse social, economic, and environmental effects
- Contribute to air quality attainment
- Maximize use of existing right-of-way

These goals, along with incorporated regional goals from the Houston-Galveston Area Council's (H-GAC) *2022 Metropolitan Transportation Plan*, were the driving force behind the evaluation and screening processes that eventually yielded a locally preferred alternative.

In order to fully understand what an MIS is and what it aims to accomplish, one must understand the various components that come into play. These include the following:

- Knowing existing conditions
- Keeping the public involved
- Identifying a full range of alternatives
- Evaluating and screening the alternatives
- Recommending the locally preferred alternative

The following sections give a broad-brushed view of the components above and the various processes involved in the development of the US 290 MIS through the selection of the locally preferred alternative.

EXISTING CONDITIONS

Existing conditions in the US 290 Corridor are comprised of traffic characteristics (with an accompanying analysis) and corridor influences. The former are further broken down into functional classifications (freeways, major thoroughfares, major

collectors, local streets, etc.), typical sections, rights-of-way, horizontal and vertical alignments, drainage, interchanges, intersections and traffic signals, lighting, utilities, railroads, transit and high-occupancy-vehicle (HOV) facilities (both operated by the Metropolitan Transit Authority [METRO] of Harris County, Texas), and ITS (intelligent transportation systems).

All of these components were studied and reported upon in the *Existing Conditions Report*, published in June 2001. The following is a summarization of the study area's existing conditions.

Currently, the corridor contains each functional classification, varied right-of-way, and generally slight changes in horizontal / vertical alignments. Interchange types in the corridor include diamond, full directional, and trumpet. There are 37 signalized intersections in the corridor: 20 along US 290, and 17 along Hempstead Highway (which is also referred to as Hempstead Road in certain locations within the study area). Roadway lighting generally consists of high-mast, pressurized sodium or mercury vapor fixtures along US 290. Along Hempstead Highway, lighting generally consists of standard mast-arm fixtures mounted on utility poles and is located predominantly on the north side of the roadway. Utilities within the study area include municipal sewer / water lines, underground electrical and gas lines, buried fiber-optic cable, and overhead electrical lines. Union Pacific Railroad owns, operates, and maintains the rail line in the corridor, which generally parallels Hempstead Highway and US 290. METRO facilities include bus routes, paratransit services, vanpool / carpool programs, transit centers, and park-and-ride lots. METRO also operates an HOV facility, located in the center of US 290. The study area also houses several ITS components, including a computerized transportation management system and an automated vehicle identification system, and is served by Houston TranStar.

An analysis of existing traffic conditions takes into account the levels of service identified along the corridor. Levels of service (LOS) are defined as "A" through "F," with A being least congested and F being the most. An acceptable level of service for the US 290 Corridor is D, which is defined as not congested.

Levels of service currently range in the corridor, varying by location. In some areas, where urbanization is not yet prevalent, the freeway generally operates at level of service C. Traffic levels increase toward downtown Houston. In these areas, the overall level of service is typically E (bordering on F) and, in some cases, reaches F (most congested). Those parts of the corridor that do not currently meet LOS D standards experience congestion that causes delay and contributes to air pollution. In addition to inadequate levels of service, there are substandard shoulders and auxiliary lanes that can have a negative impact on the safety and operations of the corridor.

Corridor influences are another component of the existing conditions within the corridor. For purposes of this study, the corridor influences evaluated include land use and socioeconomics / demographics.

MIS Process

The MIS process implemented for the US 290 Corridor provided a focused analysis and extensive evaluation of mobility needs, identified a set of multimodal options to address problems and needs throughout the corridor, developed measures of benefits, established costs and impacts, and allowed for a comprehensive analysis and evaluation of the selected options. The process used for the US 290 Corridor MIS is shown at left.

The process for the US 290 MIS involved an extensive public involvement campaign throughout. The study team first established a universe of alternatives; this universe comprised all plausible alternatives for the corridor. From the universe of alternatives, conceptual alternatives were developed that included no-build, freeway, managed facility, and transit options. These were then screened in order to arrive at viable alternatives, which are defined as alternatives that are more likely to perform well in light of the study goals and objectives (outlined previously). The viable alternatives were then analyzed in order to determine the locally preferred alternative, which can be defined as the alternative that is most likely to rank high in terms of each goal / objective. The locally preferred alternative (or variation) must be approved and adopted by H-GAC's Transportation Policy Council (TPC).

Public Involvement

The public involvement program for the US 290 MIS was intended to provide information, promote open communication, and gather input regarding corridor needs and transportation preferences. The desired outcome was to achieve consensus on a locally preferred alternative.

Informing and educating the public about the MIS process and the particulars of the US 290 MIS were the first aspects of promoting a cooperative planning process. It was important that citizens felt a part of the MIS, so various tools — many bilingual — were used as part of an outreach program. Newsletters, presentations, a project website, direct mail campaigns, public notices, media coverage, questionnaires designed to garner public opinion, and public meetings all played a role in touching as many project stakeholders as possible. These stakeholders included residents, business owners, employees, commuters, environmental and historic preservation groups, transit riders, trucking and rail representatives, civic and homeowners' associations, community planning groups and city councils, resource agencies, major land owners, and others who are affected by transportation issues in the corridor.

Universe of Alternatives

The approach used in an MIS is to consider many alternatives, evaluating the most promising and selecting the best or most appropriate. This approach is based on understanding the conditions, needs, and goals of the corridor first and foremost. For purposes of the US 290 MIS, a universe of alternatives was established for initial consideration; this included all plausible ideas within the categories of transit, freeway, streets and highway, transportation system management (TSM) strategies, and transportation demand management (TDM) strategies. The following table shows the universe of alternatives used to develop the conceptual alternatives.

Transit		
Rail	Bus	Other
Light rail	Local service	Personal rapid transit
Commuter rail	Bus rapid transit (BRT)	Carpool / vanpool
Heavy rail	Express with HOV	Park-and-ride
Monorail	Charter or subscription bus service	Transfer facilities
Stations	School buses	
Freeway		
General-purpose lanes	Service roads	Truck lanes
Managed facility	Interchanges	Intelligent transportation systems (ITS)
Express facility	Express lanes	Ramp system modifications
Toll lanes / facility	Non-barrier (Diamond) HOV lanes	Auxiliary lanes
High-occupancy-vehicle lanes (HOV)	Express Hempstead	Dual freeway
Meet current roadway standards		
Streets & Highway		
Arterial network	Signal system (ITS)	Hempstead — 6-lane, 8-lane
Parallel arterial	TSM improvements	Grade separation
Super street		
Transportation System Management (TSM) Strategies		
Arterial widening	Access management	Emergency / special event management
Intersection improvements	Traffic operations and signal system improvements	Intelligent transportation systems (ITS)
Travel Demand Management (TDM) Strategies		
Employee trip reduction programs	Public transportation improvements	Bicycle / pedestrian strategies
Transportation management associations	Traffic restricted zones	Value pricing

Conceptual Alternatives

The universe of alternatives was screened through criteria developed by consensus between the public, the Steering and Advisory Committees, and the study team. Each alternative was screened based on the documented needs and goals of the corridor — improve public safety, improve and maintain mobility, increase opportunities for transit, minimize adverse environmental and social effects, contribute to air quality attainment, and maximize use of existing right-of-way. As a result of this screening, conceptual alternatives in four general categories — no-build, freeway expansion, managed facilities, and transit — were determined. Detailed descriptions of each of the conceptual alternatives can be found in ***Chapter 5*** of the report; however, descriptions of some of the components have been included in this summary.

The baseline (also called no-build) alternative is the description of projected, study-year conditions even if no major transportation improvements are made in the corridor. Typically, the baseline alternative includes all improvements identified in H-GAC's most current *Metropolitan Transportation Plan*, except for those that are proposed in the corridor.

The TSM / TDM alternative incorporates lower-capital components of the region's transportation investment strategy. Both TSM and TDM strategies reduce congestion by implementing strategies on both the supply and demand sides of transportation. Intelligent transportation systems complement and help facilitate both TSM and TDM. Even though TSM / TDM / ITS constitutes its own, standalone conceptual alternative, most of these strategies will be incorporated into the preferred alternative.

A managed facility is a separate facility within the freeway that operates essentially as an expanded, two-way version of the HOV facilities that are in operation today. Managed facilities have limited entry and exit opportunities, serve relatively long trips, and may collect tolls, which could fluctuate by occupancy or levels of congestion.

Advanced high capacity transit (AHCT) is a general term used to address the type of advanced transit system that might be implemented in the corridor. The transit chosen will be high capacity and likely take the form of light rail transit, bus rapid transit, or some yet-undeveloped future transit technology.

The 11 conceptual alternatives (CA) are as follows:

No-build
- CA-1A Baseline (no-build)
- CA-1B TSM / TDM

Freeway expansion
- CA-2A Expand US 290 and extend HOV
- CA-2B Expand US 290 and remove HOV

Managed facilities
- CA-3A Four-lane, two-way, barrier-separated managed facility
- CA-3B Two-lane, reversible HOV, expand US 290
- CA-3C High capacity, partially grade-separated Hempstead Highway

Transit alternatives
- CA-4A Advanced high capacity transit (AHCT) along US 290 and SH 249, expand US 290
- CA-4A-1 AHCT along US 290, expand US 290
- CA-4B AHCT along Hempstead Highway, expand US 290
- CA-4C Express busway, expand US 290

Screening process

Once the conceptual alternatives were established, the project team once again went through a thorough screening process in order to arrive at viable alternatives, which represent the best elements from the conceptual alternatives in regard to those that are most likely to meet the needs of the US 290 Corridor. A system to evaluate and compare the conceptual alternatives was created that ranged from two plus marks (more positive) to two minus marks (more negative). Zero was used to identify those alternatives that had a neutral effect on the defined goals and objectives as compared to the indicated alternative or baseline. Following is a matrix showing a breakdown of the various alternatives and their ratings in regard to the screening criteria:

		No-Build Alternatives		Freeway Alternatives		Managed Facility Alternatives			Transit Alternatives			
		CA-1A	CA-1B	CA-2A	CA-2B	CA-3A	CA-3B	CA-3C	CA-4A	CA-4A-I	CA-4B	CA-4C
	-- More Negative - Negative O Neutral + Positive ++ More Positive	Baseline	TSM/TDM	Expand US 290, Extend HOV	Expand US 290, Remove HOV	Four-Lane, Two-Way, Barrier Separated	Two-Lane, Reversible HOV, Expand US 290	High-Capacity, Partially Grade-Separated Hempstead Rd.	AHCT along US 290 and SH 249	AHCT along US 290	AHCT along Hempstead	Express Busway
Improve Public Safety	Consistency with Design Standards	--	--	++	++	++	++	+	++	++	++	++
	Reduce Weaving Volumes	--	-	+	+	++	+	+	+	+	+	+
	Accident Locations Eliminated	--	-	+	++	++	+	+	+	+	+	+
Improve Mobility	Congestion	--	--	+	-	++	+	++	-	-	-	-
	Person Capacity	--	-	+	+	++	+	++	O	O	+	+
	User Benefits	O	+	++	--	++	++	++	-	--	--	--
Increase Transit Opportunities	Transit Ridership	-	-	O	--	+	+	-	++	++	++	+
	METRO Plan Consistency	-	-	+	-	+	+	+	+	+	+	-
Avoid or Minimize Adverse Social, Economic and Environmental Effects	Social Effects	+	+	-	-	-	-	-	-	-	-	-
	Economic Effects	O	+	-	-	-	-	-	-	-	+	-
	Environmental Effects	++	++	-	-	-	-	-	-	-	-	-
Contribute to Air Quality Attainment	VOC (lbs)	--	-	O	--	+	++	-	+	+	+	+
	CO (lbs)	--	-	O	--	-	++	+	+	+	-	+
	NOx (lbs)	--	-	O	--	+	+	--	++	++	++	+
Maximize Use of Existing ROW	US 290	O	O	-	-	--	--	-	-	-	-	-
	Hempstead/ UP Corridor	O	O	O	O	O	O	++	O	O	++	O

Generally, the findings of the conceptual analysis were as follows: more general-purpose lanes are needed, the HOV lane is being utilized and should not be removed, managed facilities performed well, and AHCT generates additional transit riders.

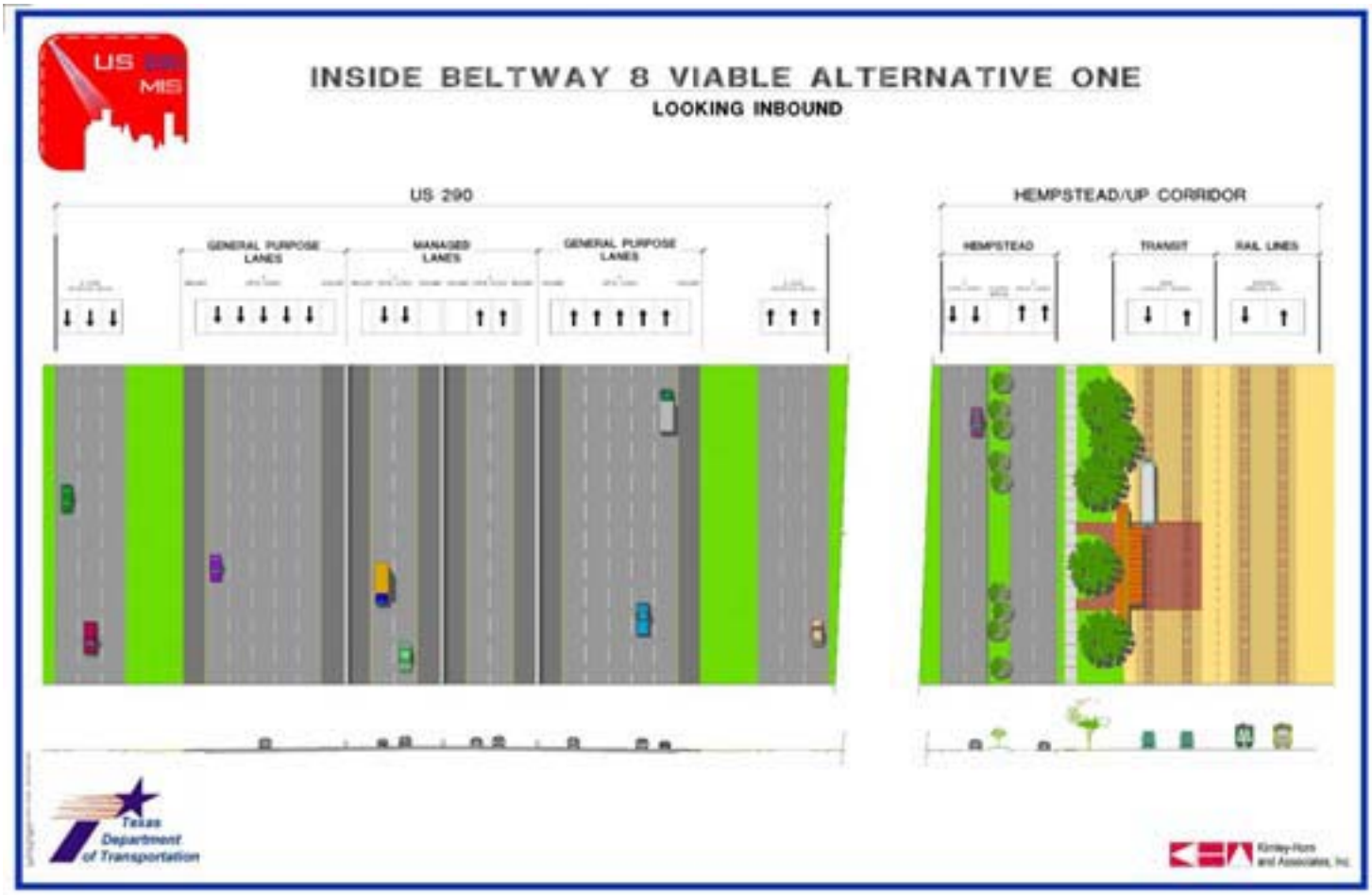
Viable Alternatives

Six conceptual alternatives or elements from conceptual alternatives were recommended for further screening. Excluding the no-build alternative, the components of these conceptual alternatives were incorporated to produce four viable alternatives that allowed the study team to merge the positive influences that each alternative had on the corridor. The build viable alternatives incorporated general-purpose lanes, managed facilities, and AHCT — **all of which were proven to be necessary components of the locally preferred alternative** through the use of H-GAC's regional travel model, a major tool used

in the mobility analyses. The no-build alternative, including the TSM / TDM components, was also considered as a viable alternative.

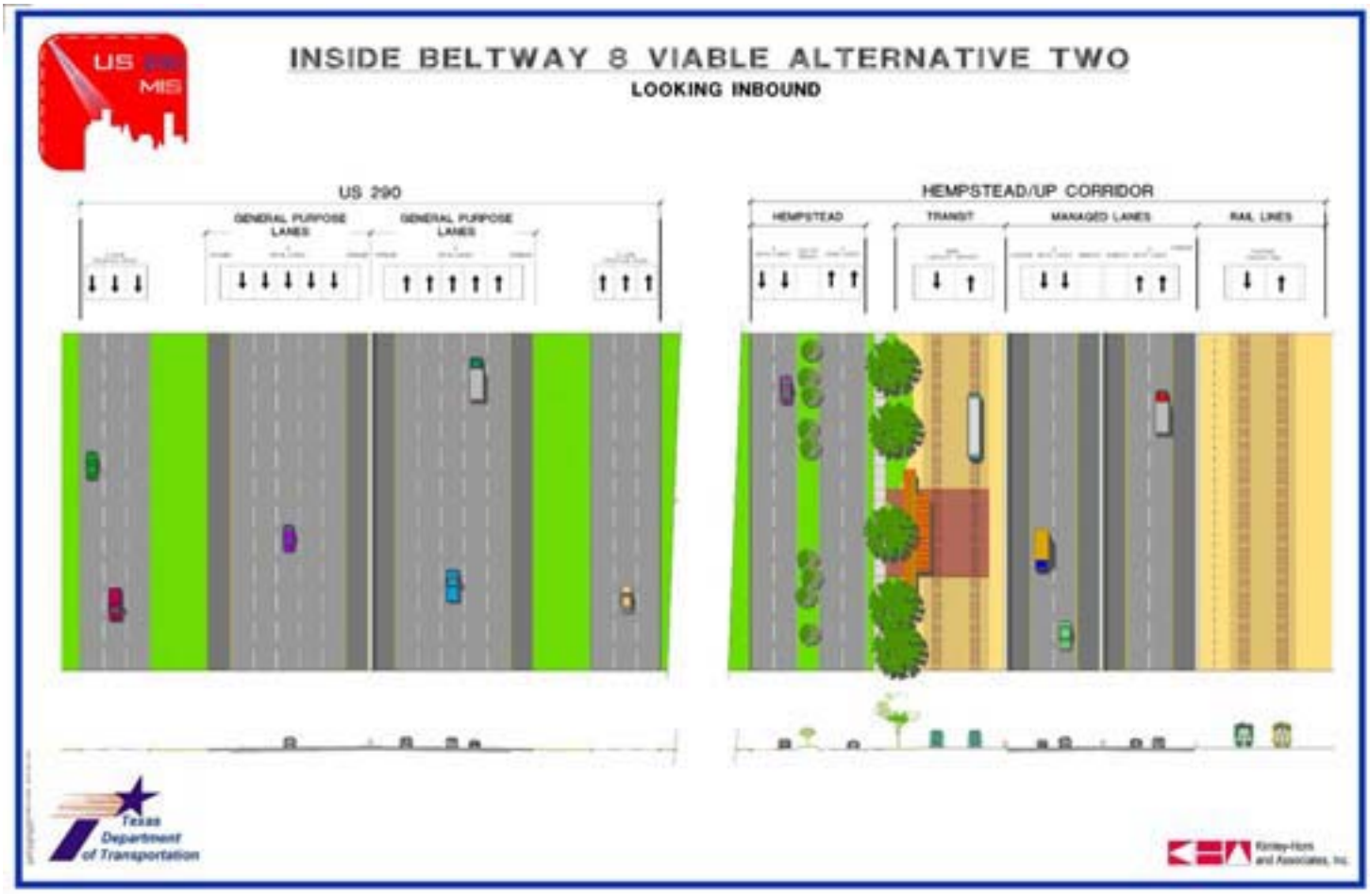
Viable alternative 1 generally involves the following improvements:

- Five general-purpose lanes in each direction from IH 610 to Beltway 8 (excluding auxiliary lanes)
- Four general-purpose lanes in each direction from Beltway 8 to the west study limit (excluding auxiliary lanes)
- Four-lane, two-way managed facility in the middle of US 290 from IH 610 to the future Grand Parkway
- Two general-purpose lanes in each direction along Hempstead Highway
- Advanced high capacity transit envelope along Hempstead Highway Corridor from the Northwest Transit Center to the future Grand Parkway



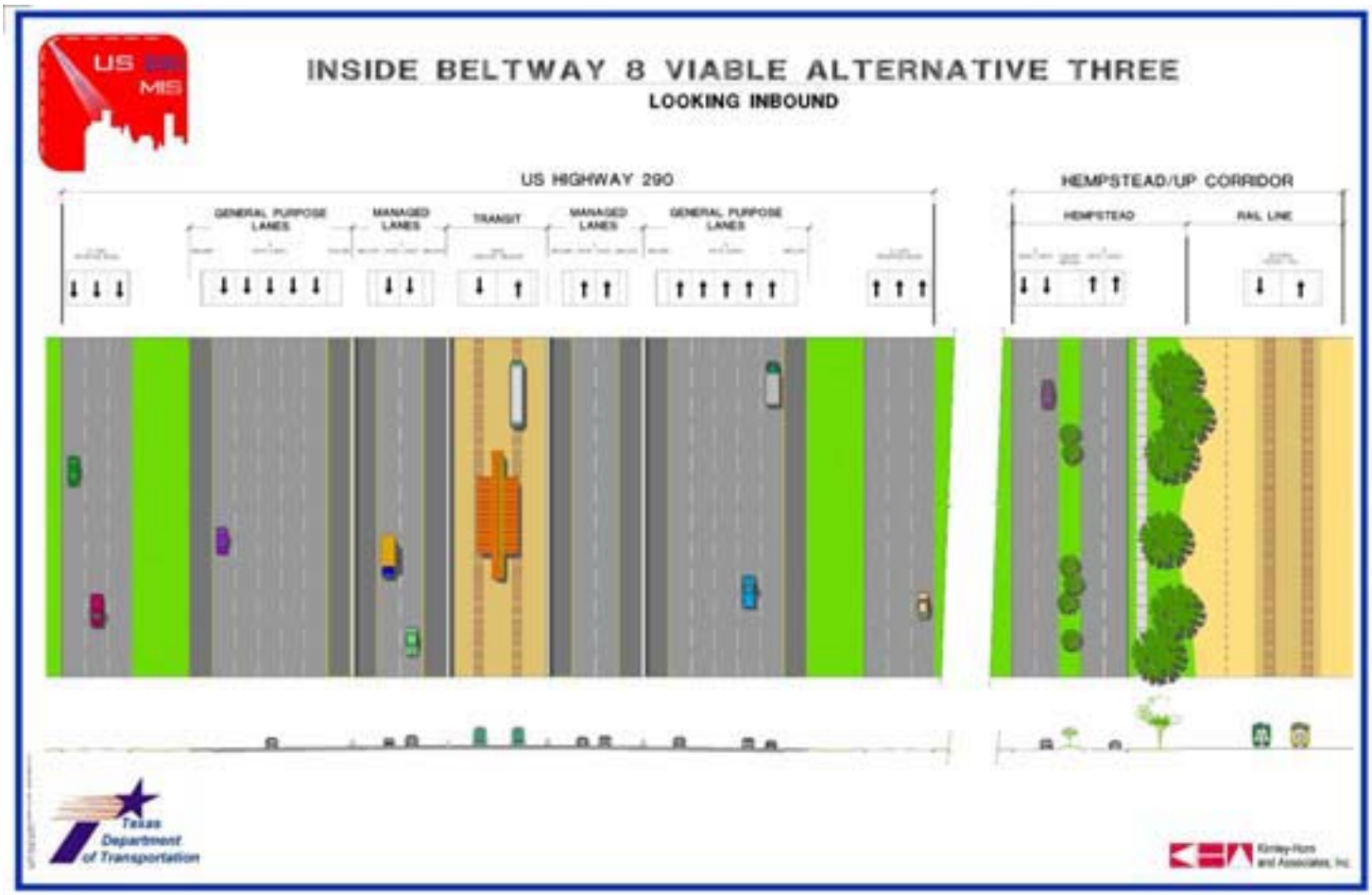
Viable alternative 2 generally involves the following improvements:

- Five general-purpose lanes in each direction from IH 610 to Grand Parkway (excluding auxiliary lanes)
- Four general-purpose lanes in each direction from Grand Parkway to the west study limit (excluding auxiliary lanes)
- Four-lane, two-way managed facility along the Hempstead Highway Corridor from IH 610 to the future Grand Parkway
- Two general-purpose lanes in each direction along Hempstead Highway
- Advanced high capacity transit envelope along Hempstead Highway Corridor from the Northwest Transit Center to the future Grand Parkway



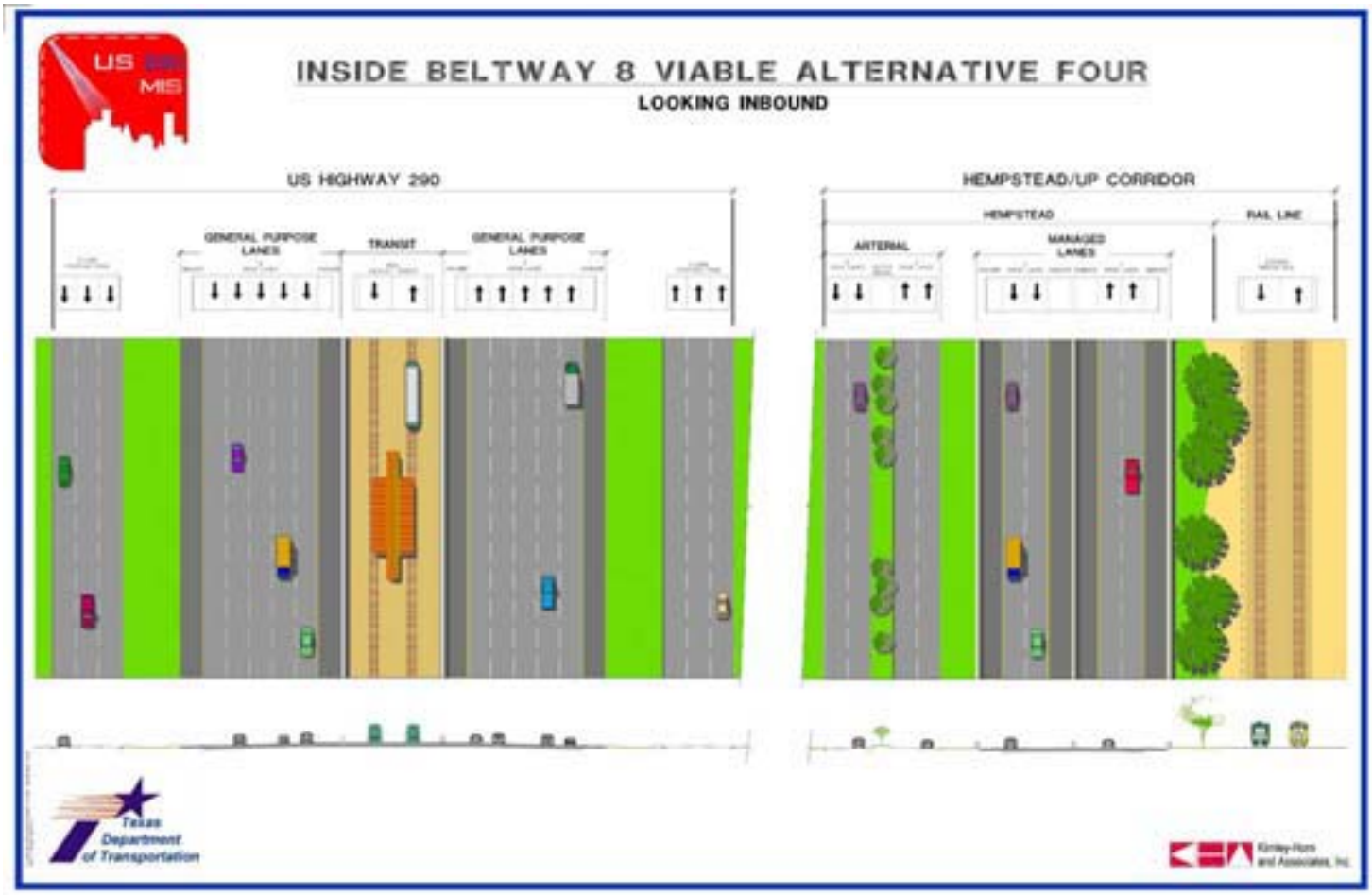
Viable alternative 3 generally involves the following improvements:

- Five general-purpose lanes in each direction from IH 610 to Beltway 8 (excluding auxiliary lanes)
- Four general-purpose lanes in each direction from Beltway 8 to the west study limit (excluding auxiliary lanes)
- Four-lane, two-way managed facility along US 290 from IH 610 to the future Grand Parkway
- Two grade-separated Hempstead general-purpose lanes in each direction
- Advanced high capacity transit envelope along US 290 from the Northwest Transit Center to the future Grand Parkway



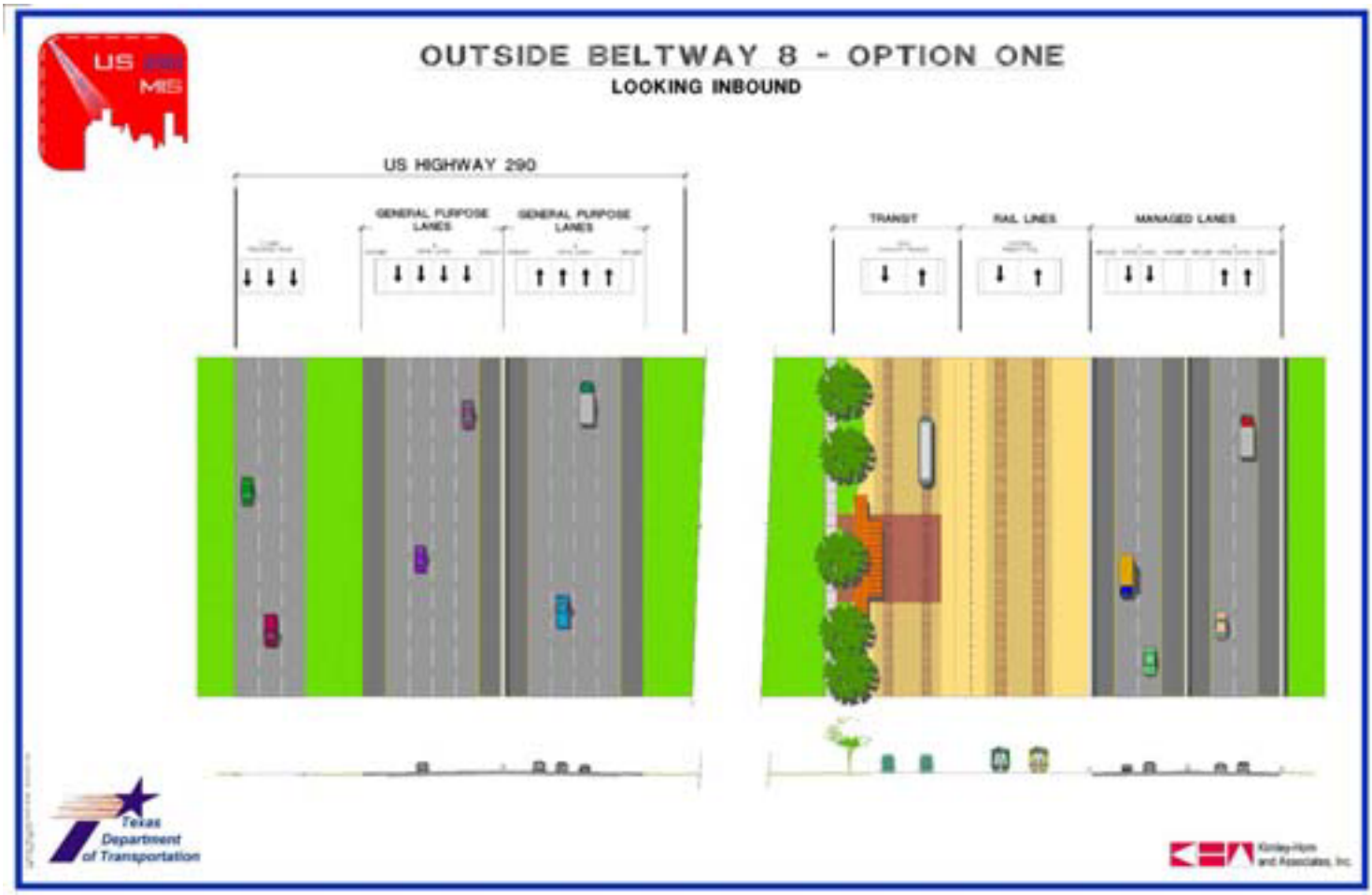
Viable alternative 4 generally involves the following improvements:

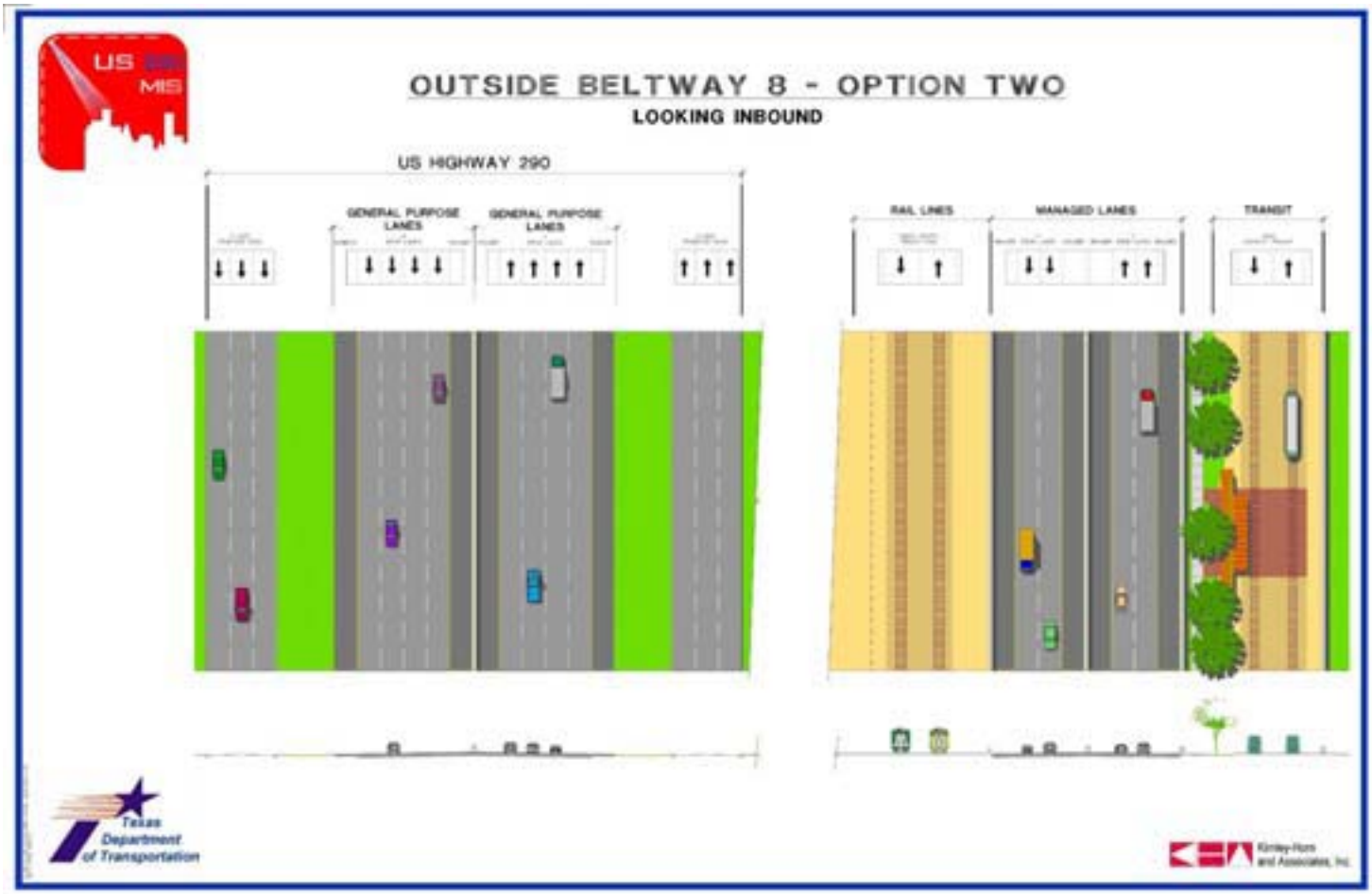
- Five general-purpose lanes in each direction from IH 610 to Grand Parkway (excluding auxiliary lanes)
- Four general-purpose lanes in each direction from Grand Parkway to the west study limit (excluding auxiliary lanes)
- Four-lane, two-way managed facility along the Hempstead Highway Corridor from IH 610 to the future Grand Parkway
- Two grade-separated Hempstead general-purpose lanes in each direction
- Advanced high capacity transit envelope along US 290 from the Northwest Transit Center to the future Grand Parkway

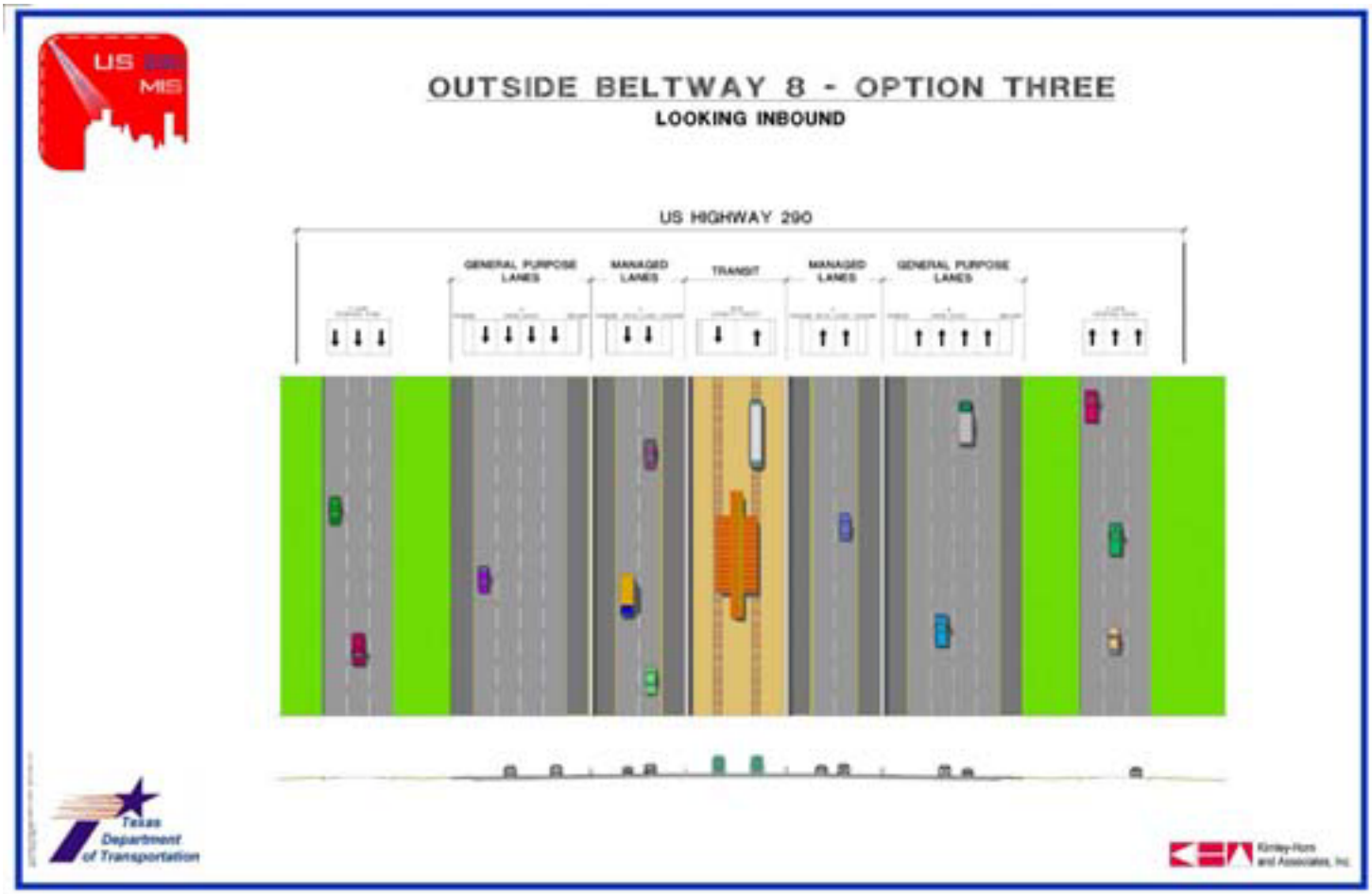


Three alternative options were developed west of Beltway 8 because of the nature of the area and the absence of Hempstead Highway. The options describe alternate placements of the managed facility and AHCT facility.

Due to the underdeveloped nature of the US 290 Corridor west of Beltway 8, any of the three options could be paired with the geometry described on the previous page for viable alternatives 1 through 4 inside Beltway 8. Note that the terminus of both the AHCT and managed facility is near the future Grand Parkway.







Analysis of Viable Alternatives

In an effort to determine a locally preferred alternative, analysis of the viable alternatives involved screening and evaluating alternatives using a process similar to that used in culling down the conceptual alternatives. However, several slight adjustments were made in order to refine the process and produce a more detailed analysis.

The results of the various viable alternatives' performance against the goals and objectives of the study team are as follows:

Public Safety

- Each build alternative is capable of meeting the public safety goal (through the addition of shoulders, auxiliary lanes, the elimination of weaving sections, new ramps and interchanges, etc.).
- Viable alternatives 2 and 4 allow for the design of a seamless interchange directly from the managed facility to IH 610; other alternatives would create weaving and circulation issues at the US 290 / IH 610 interchange.

Mobility

- Each build alternative demonstrates improvement over the baseline (no-build).
- Viable alternative 2 performs best in regard to congestion, person capacity, and user benefits (fewer hours of delay as compared to the baseline).

Transit

- Each build alternative is consistent with METRO's *2025 Mobility Plan*.
- Transit ridership in the corridor remained fairly consistent with each build alternative.

Social, Economic, and Environmental

- Of the build alternatives, viable alternative 2 offers the least amount of adverse impacts for all land use categories along US 290 inside Beltway 8.
- Of the build alternatives, viable alternative 3 offers the fewest acres of land use displacement inside Beltway 8 along Hempstead Highway; however, it has the greatest impact on land adjacent to US 290 inside Beltway 8.

Air quality

- The viable alternatives all perform similarly to one another in this category except for the baseline, which performs significantly worse than all the other alternatives.
- Due to increases in speeds and vehicle miles of travel (VMT), some pollutant levels drop while others rise; the various pollutants have different degrees of sensitivity and plateaus based on travel speeds and VMT. Air quality conformity will be addressed by H-GAC after the adoption of the locally preferred alternative.

Maximization of existing right-of-way

- Of the build alternatives, viable alternative 2 requires less right-of-way along US 290 inside Beltway 8; however, it requires the most right-of-way along Hempstead Highway inside Beltway 8.
- Of the build alternatives, viable alternative 3 requires the greatest amount of right-of-way along US 290 inside Beltway 8; however, it requires the least right-of-way along Hempstead Highway inside Beltway 8.

Determining Locally Preferred Alternative

After thoroughly reviewing the previously described results, discussing alternatives with the Steering and Advisory Committees, coordinating with TxDOT, and gathering opinions and concerns expressed at public meetings, the study team recommended a locally preferred alternative (generally viable alternative 2 with some modifications) that includes the following improvements:

- Five general-purpose lanes in each direction from IH 610 to just west of Beltway 8, plus auxiliary lanes where appropriate
- Four general-purpose lanes in each direction from just west of Beltway 8 to near the future Grand Parkway / SH 99
- Three general-purpose lanes in each direction from near the future Grand Parkway / SH 99 to the west study limit
- Four-lane, two-way managed facility along Hempstead Highway from IH 610 to some location near the future Grand Parkway / SH 99
- Two general-purpose lanes (possibly three) with curb and gutter in each direction will be reconstructed along Hempstead Highway
- Advanced high capacity transit along Hempstead Highway from IH 610 to near the future Grand Parkway / SH 99
- TSM / TDM / ITS improvements
- Bicycle and pedestrian improvements
- Two- or three-lane frontage roads in each direction (will be determined during schematic design)
- Planning-level cost estimates indicate that the locally preferred alternative will cost $883 million in roadway construction (mobilization, contingency, and traffic control included), $35 million in right-of-way acquisition, and $873 million in AHCT construction

The locally preferred alternative represented the most appropriate choice for the corridor when taking into account cost, constructibility, environmental impacts, and construction staging. The analysis of the alternatives led to the conclusion that all three of the major components studied in this MIS (general-purpose lanes, managed facility, and AHCT) are necessary elements of the locally preferred alternative. The locally preferred alternative provides congestion relief by having an acceptable LOS throughout the corridor; the new design presents a

great opportunity to improve public safety in the corridor and it meshes well with METRO's plans for transit in the corridor.

H-GAC's Transportation Policy Council is the policy board ultimately responsible for adopting the locally preferred alternative. The implementation sequence for the locally preferred alternative is as follows:

- Locally preferred alternative adoption by Transportation Policy Council
- Harris County Toll Road Authority toll study for managed facility
- METRO alternative analysis and environmental impact statement (AHCT details)
- TxDOT schematic design and environmental impact statement
- Plans, specifications, and estimates
- Construction