

# PLANNING AND ENVIRONMENTAL LINKAGES STUDY

## Universe of Alternatives Technical Report

### STUDY LIMITS

SH 225

I-610 TO SH 146

I-610E

TELEPHONE ROAD TO GELLHORN DRIVE

CSJ 0502-01-228



**ENTECH**  
CIVIL ENGINEERS, INC



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### 1. INTRODUCTION

The following Universe of Alternatives Technical Report describes the process and conclusion to developing high-level modal alternative concepts that satisfy the needs identified for this study.

#### 1.1 Study Description

The Texas Department of Transportation (TxDOT) has authorized Entech Civil Engineers (Entech) to conduct a Planning and Environmental Linkages (PEL) Study for both State Highway (SH) 225 and Interstate (I)-610 East (SH 225 and I-610E PEL) in Harris County, TX. This PEL study is a high-level, early planning study that helps to identify the following aspects:

- Existing environmental and socio-economic conditions
- Transportation issues and deficiencies
- Development of a purpose and need
- Evaluation of corridor alternatives

#### 1.2 Goals of the PEL Study

The goal of this PEL study is to develop a more seamless decision-making process that minimizes the duplication of effort, promotes environmental stewardship, and streamlines project delivery. The reports, analyses, and information obtained for the SH 225 and I-610E PEL Study can be used to help document planning information and decisions for the subsequent environmental review (i.e., NEPA) process. This PEL study will streamline the process by providing a purpose and need, identifying recommended alternative(s), and eliminating unreasonable and infeasible alternatives. This study provides an early opportunity for stakeholders and the public to provide meaningful input on potential future projects identified through the study's progression.

## 2. PEL STUDY LIMITS

This PEL study is comprised of two roadways, one along SH 225 and another along I-610E. SH 225 begins at I-610 and ends at SH 146 (approximately 14.60 miles). I-610E begins at Telephone Road and ends at Gellhorn Drive (approximately 8 miles). The limits of the SH 225 and I-610E PEL Study are represented in **Figure 1**.



Figure 1 SH 225 and I-610E PEL Study Limits

### 3. PURPOSE AND NEED

The purpose and need (P&N) statement describes the underlying needs to be met and any other factors relevant to the choice between alternatives. TxDOT is developing this study which provides a basis for the development and evaluation of conceptual alternatives for potential future projects. Each alternative proposed throughout this PEL study will be analyzed in terms of the extent to which it would or would not satisfy the identified needs.

#### 3.1 Purpose and Need Statement

Based on the analysis of the existing conditions of the study area, public comments, and stakeholder/agency remarks, the needs of the SH 225 and I-610E corridor are:

1. Safety Issues
2. Inadequate multimodal movement of people
3. Inefficient movement of freight and maritime cargo
4. Inefficient emergency evacuation
5. Aging infrastructure

The above needs will be the precursor to moving forward with any potential alternative(s) and ultimately identify the recommended alternative(s). The full purpose and need statement can be found in the *SH 225 and I-610E PEL Purpose and Need Report*.

## **4. UNIVERSE OF ALTERNATIVES**

The Universe of Alternatives (UOA) are high level modal concepts. Through the evaluation of the UOA against the P&N, Conceptual Alternatives will be identified to progress forward to the next step of evaluation. The following sections describe the development, screening, and conclusion of the UOA.

### **4.1 Development of the Universe of Alternatives**

Using existing conditions analysis results, public comments and stakeholder/agency input, the study developed the UOA. Alternatives varied and were organized into five categories:

1. No-Build
2. Mainlanes
3. Frontage Roads
4. Alternative Routes
5. Multimodal

#### **4.1.1 No-Build**

The No-Build Alternative would have no actions made to the corridor, except for regular maintenance activities. This alternative will be used as a baseline to compare build alternatives, on whether positive or negative impacts are made to the considered build alternatives throughout the corridor.

#### **4.1.2 Mainlanes**

The Mainlanes category consists of alternatives where improvements only impact the mainlanes or elements of the mainlanes (e.g., ramps, direct connectors) within the corridors. Five alternatives were developed for this category:

##### **4.1.2.1 Reconstruct to Current Standards**

The alternative described as “Reconstruct to Current Standards” would solely update the corridor to current design standards, maintaining the same number of general purpose and frontage road lanes. This would consist of updating the corridor to current drainage standards, roadway geometry standards, hurricane evacuation requirements, vertical clearances, and pavement thickness. This alternative would accommodate updating the corridor to having a consistent design standard. This alternative does not provide additional capacity or update the existing I-610 Ship Channel Bridge to current vertical clearances.

### **4.1.2.2 Reconstruction to Current Standards and Add General Use Lanes**

The alternative described as “Reconstruct to Current Standards and Add General Use Lanes” would update the corridor within TxDOT ROW to current design standards and would add general use lanes to accommodate projected increases in traffic volumes. This would consist of updating the corridor to current drainage standards, roadway geometry standards, hurricane evacuation requirements, vertical clearances and pavement thickness to accommodate current traffic. In addition to the updated design standards, general use lanes would be added to ease current congestion and mitigate projected congestion due to forecasted increases in traffic volumes.

### **4.1.2.3 Improve Ramp Configurations**

The alternative described as “Improve Ramp Configurations” could update some or all the ramp configurations, reverse entrance and exit ramps to improve mainlane operations, increase ramp capacity and add auxiliary lanes. This alternative may only apply to certain segments of the corridor.

### **4.1.2.4 Improve Interchanges**

The alternative described as “Improve Interchanges” would reconstruct major interchanges, develop innovative interchange designs, and analyze improvements for the use of the collector-distributor system.

### **4.1.2.5 Incorporate Technology**

The alternative described as “Incorporate Technology” would add innovative technologies to the corridor such as a safety warning detection system, truck parking availability system, freight specific traffic management and intelligent transportation system (ITS) messaging.

## **4.1.3 Frontage Roads**

The Frontage Roads category consists of alternatives in which there are improvements only to the frontage roads throughout the corridor. Three alternatives were developed for this category.

### **4.1.3.1 Improve Frontage Roads**

The alternative described as “Improve Frontage Roads” would the frontage roads to meet the current needs for drainage and pavement, adding auxiliary lanes, adding turn lanes, and reviewing access management improvements.



### **4.1.3.2 Connect Discontinuous Frontage Roads**

The alternative described as “Connect Discontinuous Frontage Roads” would connect the existing frontage roads throughout the corridor to improve mobility and access along the corridor.

### **4.1.3.3 Improve Intersections**

The alternative described as “Improve Intersections” would add turn lanes, develop innovative intersections, upgrade traffic signals, and adjust signal timing to reduce congestion and crashes.

### **4.1.4 Alternative Routes**

The Alternatives Routes category consists of alternatives that adjust or extend the current corridor, or provide an alternate route, to better connect existing or proposed streets. These alternatives do not consider reconstructing the roadway to current design standards. Three alternatives were developed for this category.

#### **4.1.4.1 Improve Existing Alternative Routes**

The alternative described as “Improve Existing Alternative Routes” would improve the existing parallel or crossing roadways to the corridor for improved connectivity and operations.

#### **4.1.4.2 New Alternative Routes**

The alternative described as “New Alternative Routes” would identify existing roadways to modify or construct entirely new roadways near the corridor to divert traffic from the existing corridor. This alternative would involve no improvements to the existing corridor but consider improvements outside of the study area.

#### **4.1.4.3 New Road Extension**

The alternative described as “New Road Extension” would extend the current roadway(s) within the corridor to better connect to existing major roadways outside of the corridor.

### **4.1.5 Multimodal**

The Multimodal category consists of alternatives that would add improvements to the corridor that accommodate different modes of transportation. This category is subdivided by mode of transportation. Some of these alternatives would require coordination and implementation to be done by other agencies outside of TxDOT. If these alternatives pass the first level of screening, they will be provided to those agencies for further consideration; however, the study team will not further analyze those alternatives beyond the UOA phase. Three sub-categories for the Multimodal Alternatives were established, including: transit/High Occupancy Vehicle (HOV), freight/cargo, and bicycle and pedestrian.

#### **4.1.5.1 Transit/High Occupancy Vehicle (HOV)**

The “Transit/HOV” sub-category has alternatives that accommodate transit or HOV. Suitable alternatives will be provided to the appropriate agencies for consideration if the alternative prove to be beneficial to the corridor by the screening process.

#### **Park & Ride/Transit Centers/Multimodal HUBs**

The alternative described as “Park & Ride/Transit Centers/Multimodal HUBs” would have a transit agency implementing bus routes and constructing transit centers throughout the corridor. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

#### **Transit – Commuter Rail**

The alternative described as “Transit – Commuter Rails” would implement a commuter rail throughout the corridor. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

#### **Transit - Bus**

The alternative described as “Transit - Bus” would implement bus routes and transit stops throughout the corridor. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

#### **Transit – Bus Rapid Transit (BRT)**

The alternative described as “Transit - BRT” would implement a BRT line and transit stations throughout the corridor. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

### **Add Managed Lanes**

The alternative described as “Add Managed Lanes” would add managed lanes either to the outside or in the center of the study roadways. These managed lanes could be express, HOV/High Occupancy Transit (HOT), Autonomous Vehicles (AV), or Connected and Autonomous Vehicles (CAV). Due to the addition of the lanes, this alternative could require reconstruction of the existing facility.

### **Re-purpose Existing Lanes as Managed Lanes**

The alternative described as “Re-purpose Existing Lanes as Managed Lanes” would re-purpose an existing travel lane to a managed lane. These managed lanes could be express, HOV/HOT, AV, or CAV.

#### **4.1.5.2 Freight/Cargo**

The “Freight/Cargo” sub-category has alternatives that primarily focus on the efficient movement of freight and maritime cargo based on the industry surrounding the corridor (Port Houston, oil refineries, etc.).

### **Add Truck Lanes**

The alternative described as “Add Truck Lanes” would add truck lanes either to the outside or center of the study roadways. Due to the addition of the lanes this alternative could require reconstructing the existing facilities to current design standards.

### **Re-purpose Existing Lanes as Truck Lanes**

The alternative described as “Re-purpose Existing Lanes as Truck Lanes” would re-purpose select existing general use lanes to be designated for truck use only.

### **Freight Shuttle**

The alternative described as “Freight Shuttle” would have a third party implement a guideway rail throughout the corridor for freight use only. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

### **Freight Hub/Truck Parking**

The alternative described as “Freight Hub/Truck Parking” would implement additional truck stops/centers and parking areas along the corridor to mitigate safety issues with trucks parking along the frontage roads or other roads within the corridor. This alternative does not consider reconstructing the roadway to current design standards or any other improvements within the corridor.

### Ship Cargo

The alternative described as “Ship Cargo” relates to ship traffic along the ship channel. This would entail improvements such as reconstructing and/or modifying the Sidney Sherman Bridge and/or Washburn Tunnel to accommodate specific design criteria for maritime cargo. Due to the modification or reconstruction of either structure, this alternative may require reconstruction or modification of the existing facilities to meet current design standards.

#### **4.1.5.3 Bicycle and Pedestrian**

This is a sub-category as well as an alternative for the bicycle and pedestrian modes of transportation. The alternative described as “Bicycle and Pedestrian” may include the following modifications or reconstruction along the corridor:

- Upgrade bicycle and pedestrian facilities at intersections
- Enhance bicycle and pedestrian crossings under bridges
- Improve existing sidewalks and trails
- Add bicycle and pedestrian facilities in non-industrial areas
- Add bicycle and pedestrian facilities to routes or corridors near the study corridor

### 4.2 Screening of the Universe of Alternatives

The purpose of screening the Universe of Alternatives is to identify the Conceptual Alternatives that will progress to the next level of screening. The screening of the UOA will be a qualitative screening consisting of a pass or fail system based on whether the alternative meets at least one out of the five needs of the P&N statement. If the alternative does not meet at least one of the needs within the P&N statement it is then eliminated from further consideration.

The alternatives that met at least one out of the five needs in the P&N statement were divided into the following categories based on their ability to serve the entire study corridor:

- Primary Alternative (P)
  - Alternatives that can meet the corridor-wide purpose and need and can solve major problems by themselves.
- Supplemental Alternative (S)
  - Alternatives that only meet localized transportation needs and can supplement the Primary Alternatives.
- Alternatives by Others (O)
  - Alternatives that are outside TxDOT jurisdiction.

## 5. CONCLUSION

The primary and supplemental alternatives for Universe of Alternatives were screened and categorized as they met the needs of the corridor. After the screening of the UOA, all the alternatives developed were either placed in the primary or supplemental categories. No alternatives were eliminated at this stage of screening.

### 5.1 Primary Alternatives

Table 1 describes the seven primary alternatives that were identified through the UOA screening:

**Table 1 Primary Alternatives**

Primary Alternative Name	SH 225 and I-610E Corridor Needs				
	Enhance Safety	Multimodal Movement of People	Efficient Movement of Freight and Maritime Cargo	Enhance Emergency Evacuation	Upgrade Aging Infrastructure
No Build	No	No	No	No	No
Reconstruct to Current Design Standards	Yes	No	No	No	Yes
Add General Use Lanes	Yes	No	No	Yes	Yes
Add Managed Lanes	Yes	Yes	Yes	Yes	Yes
Add Truck Lanes	Yes	No	Yes	Yes	Yes
Repurpose an Existing Lane as a Managed Lane	Yes	Yes	No	No	Yes
Re-purpose an Existing Lane as a Truck Lane	Yes	No	Yes	No	Yes

*Notes:*

1. At a minimum all the primary alternatives reconstruct to current standards except for the no-build alternative.
2. The no-build alternative is included as a baseline option although it meets none of the needs.

### 5.2 Supplemental Alternatives

Table 2 describes the 11 supplemental alternatives that were identified through the UOA screening:

Table 2 Supplemental Alternatives

Primary Alternative Name		SH 225 and I-610E Corridor Needs				
		Enhance Safety	Multimodal Movement of People	Efficient Movement of Freight and Maritime Cargo	Enhance Emergency Evacuation	Upgrade Aging Infrastructure
Mainlanes	Improve Ramp Configurations	Yes	Yes	Yes	Yes	Yes
	Improve Interchanges	Yes	Yes	Yes	Yes	Yes
	Incorporate Technology	Yes	Yes	Yes	Yes	No
Frontage Roads	Improve Frontage Roads	Yes	Yes	Yes	Yes	Yes
	Connect Discontinuous Frontage Roads	Yes	Yes	Yes	Yes	No
	Improve Intersections	Yes	Yes	Yes	Yes	Yes
Alternative Routes	Improve Existing Alternative Routes	Yes	Yes	Yes	Yes	No
	New Alternative Routes	Yes	Yes	Yes	Yes	No
	New Road Extension	Yes	Yes	Yes	Yes	No
Multimodal	Ship Cargo	Yes	No	Yes	No	Yes
	Bicycle and Pedestrian	Yes	Yes	No	No	Yes

5.3 Alternatives by Others

Table 3 describes the following seven alternatives to be done by other agencies that were identified through the UOA screening:

Table 3 Alternatives by Others

Alternatives by Others	SH 225 and I-610E Corridor Needs				
	Enhance Safety	Multimodal Movement of People	Efficient Movement of Freight and Maritime Cargo	Enhance Emergency Evacuation	Upgrade Aging Infrastructure
Freight Hub/Truck Parking	Yes	No	Yes	No	No
Freight Shuttle	Yes	No	Yes	No	No
Commuter Rail	Yes	Yes	No	Yes	No
Light Rail	Yes	Yes	No	Yes	No
Bus	Yes	Yes	No	Yes	No
BRT	Yes	Yes	No	Yes	No
Park & Ride/Transit Centers/Multimodal Hubs	No	Yes	No	No	No