



SUMMARY OF PREVIOUS STUDIES

DRAFT
July 23, 2019



AECOM

I-45N Planning & Environmental Linkages Study
Beltway 8 to Loop 336 South



Introduction

The I-45 (North Freeway) Planning and Environmental Linkages (PEL) Study will explore transportation alternatives to address growing population and employment in the corridor. The study will evaluate needs and alternatives in a study area along I-45 between Beltway 8 and Loop 336 S. The PEL Study will build upon previous planning work in the area in order to address issues of growth, congestion, mobility, safety, freight, and asset management in the I-45 corridor. The Texas Department of Transportation (TxDOT) will work together with the Houston – Galveston Area Council (H-GAC) MPO, Harris and Montgomery Counties, and the many communities in and around the corridor to determine needs and reasonable alternatives for transportation improvements.

Study Area

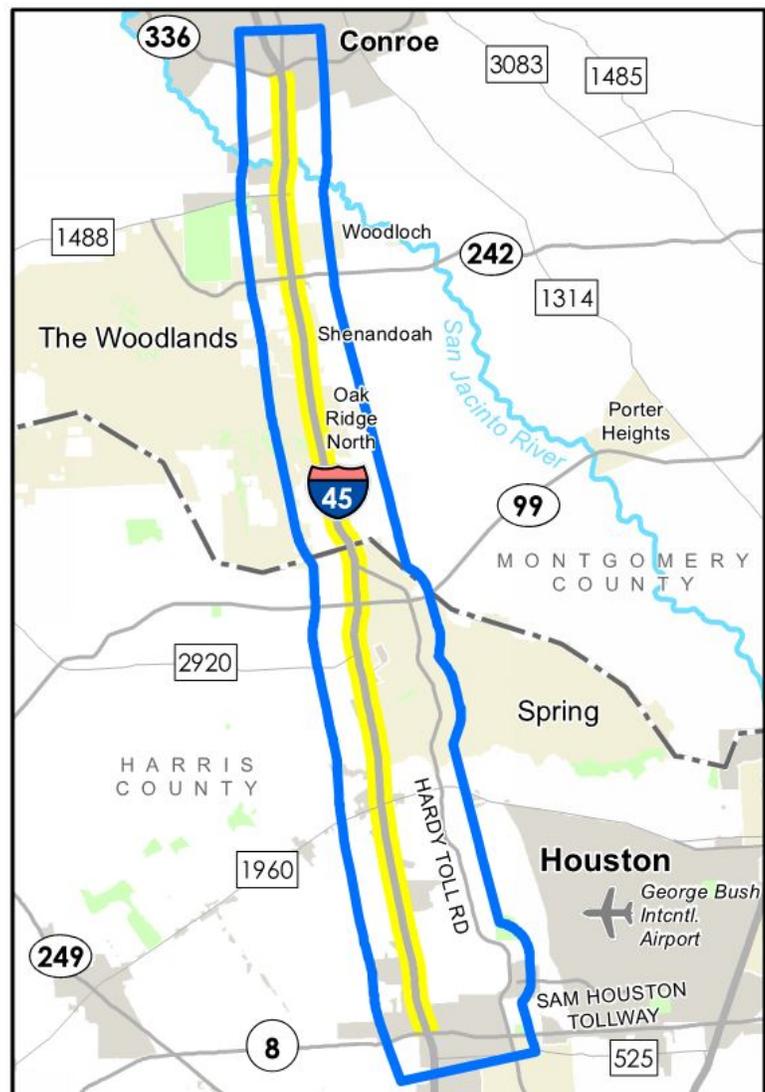
The study corridor extends along I-45 from south of Beltway 8 to north of Loop 336 S, a project length of 23.74 miles in Harris and Montgomery Counties. The study area includes the adjacent communities and roadways which are related to and directly impacted by the study corridor. Included in this study area are the communities of Houston, Spring, Shenandoah, Woodloch, Oak Ridge North, The Woodlands, and Conroe. Major points of interest on the corridor are the interchanges at Beltway 8, Hardy Toll Road and Grand Parkway SH 99, the arterial intersections at FM 1960, FM 2920, SH 242, and FM 1488, Woodlands Parkway and Loop 336 South. The study area map shown depicts the defined study area.

Previous Studies

The following pages contain information in the form of summary sheets from previously published studies, identified as related to the I-45 PEL Study area. This area is defined as I-45 North Freeway between Beltway 8 and Loop 336 S, and includes the surrounding roadways and communities. At this time, 45 previous studies have been identified and reviewed by the project team. As additional potentially relevant previous studies are found, they will be reviewed and their summary sheets added to this report.

The process of reviewing previous studies is an important part of the data collection phase of this study for several key reasons. First, previous studies collectively provide a history of the corridor and study area that can be used as a baseline on which to compare the current and known future conditions of the corridor. Similarly, goals and objectives defined in previous studies can be reevaluated and adapted based on current and known future conditions and needs in the study area. Second, information gathered from previous studies serves to inform the project team and prevent a potential duplication of effort in later stages of the study. Due to the scale of the project area, the most important aspect of this is for the project team to have a clear understanding of future projects for the corridor that are not shown in existing conditions as well as any alternatives that were considered in a previous study and deemed not feasible. This knowledge will be particularly pertinent during both the need and purpose and alternatives development phase of the study.

For consistency, each previous study one-page summary sheet contains a general summary as well as key findings related to the I-45 PEL Study. The purpose of the summary sheets is to provide a high-level view of the information in each reviewed previous study for interested project parties to utilize as a quick reference in lieu of reviewing the full study document.





Study Reference Guide

Study ID	Study Name	Corridor History / Background	Purpose and Need Info	Potential Alternatives Info	Environmental Info	Public Involvement Info	2019 Updates
1	Living, Working, and Moving Around Houston	X	X				
2	2016 Texas Transportation Poll - Houston Region	X		X		X	
3	2016 Texas Transportation Poll - Final Report			X		X	
4	2019 Unified Transportation Program	X		X			X
5	Houston-Galveston 2045 Regional Transportation Plan (RTP)	X	X	X			X
6	H-GAC 2045 RTP Appendix D – Fiscally Constrained Projects List by County			X			X
7	H-GAC 2045 RTP Appendix O – Public Comments					X	X
8	H-GAC 2045 RTP Appendix G - Gulf Coast Region Regionally Coordinated Transportation Plan Update		X	X			X
9	H-GAC 2045 RTP Appendix H – Regional Active Transportation Plan	X	X	X			X
10	2019-2022 Statewide Transportation Improvement Program (STIP) - Highway Projects	X		X			X
11	2019-2022 STIP - Transit Projects			X			X
12	2019-2022 Transportation Improvement Plan			X			X
13	The Woodlands Township Transit Plan (Choices Transit Plan) - Presentation			X		X	
14	The Woodlands Township Transit Plan		X	X			
15	Major Thoroughfare Access to SH 99 - Presentation	X		X			
16	Potential Effects of the Panama Canal Expansion on the Texas Transportation System		X				



Study ID	Study Name	Corridor History / Background	Purpose and Need Info	Potential Alternatives Info	Environmental Info	Public Involvement Info	2019 Updates
17	Statewide Freight Resiliency Plan - Stage 1: Prepare the Freight System	X	X				
18	Statewide Freight Resiliency Plan - Stage 2: Communication Needs and Capabilities			X			
19	Texas Freight Mobility Plan	X	X				
20	I-45 Freight Corridor Plan	X	X	X			
21	Regional Goods Movement Study		X				
22	North Hardy Planning - Alternatives Analysis Report (Highway)	X		X	X	X	
23	Draft EIS - North Houston Highway Improvement Project	X	X	X	X	X	
24	City of Conroe Comprehensive Plan - Chapter 5: Transportation	X				X	
25	IH 45 (North Freeway) between Lake Front Circle and Spring Cypress Road/FM 2920			X			
26	IH 45 (North Freeway) between Spring Cypress Road/FM 2920 and SL 8 North			X			
27	Development of a Freeway Traffic Management Project Through a Public-Private Partnership	X					
28	South County Mobility Plan – Needs Summary and Maps		X	X		X	
29	South County Mobility Plan – Executive Summary	X	X				
30	South County Mobility Plan	X	X			X	
31	Montgomery County Thoroughfare Plan	X	X	X			
32	The North Freeway Transitway: Evaluation of the Second Year of Barrier-Separated Operation	X					
33	Regional Commuter Rail Connectivity Study	X		X			
34	The Woodlands Origin-Destination Study	X		X			



Study ID	Study Name	Corridor History / Background	Purpose and Need Info	Potential Alternatives Info	Environmental Info	Public Involvement Info	2019 Updates
35	2005 Hurricane Rita Evacuation: FEMA Lessons Learned	X					
36	Harris County Truck Route Study	X		X			
37	North Houston Association Strategic Mobility Plan	X		X		X	
38	2018 Texas Freight Mobility Plan	X	X				X
39	City of Oak Ridge North Comprehensive Plan	X					
40	2018 Houston Major Thoroughfare & Freeway Plan	X		X			X
41	2015 IAH Airport Master Plan	X		X			
42	Port of Houston Freight Presentation	X	X				
43	Cypress Creek Hike Bike Trail			X			
44	IH 45 and FM 1488 Traffic Study	X		X			
45	North Houston Association 2018 Strategic Mobility Plan	X		X			

Study Name: Living, Working and Moving Around Houston
Agency: Texas A&M Transportation Institute (TTI) **Year Completed:** 2017
Study File Reference ID: 1

Summary of Study

The presentation reports results from the following study of the top 100 most congested road segments in all of Texas:

<https://mobility.tamu.edu/texas-most-congested-roadways/>

The presentation focuses on I-45 from downtown Houston to The Woodlands.

The presentation discusses economic impacts of congestion and a survey of funding options.

The presentation also discusses a survey of why people choose to live where they do.



Key Findings for I-45 PEL

I-45 from 2920 to Lake Woodlands Road is the 43rd most congested roadway in Texas

I-45 from Beltway 8 to 2920 is the 74th most congested roadway in Texas

The entire trip from downtown Houston to The Woodlands is all on roadways in the top 75 most congested roads in Texas.

Almost 75% of the costs of congestion in the State of Texas come from the top 50 most congested roadways.

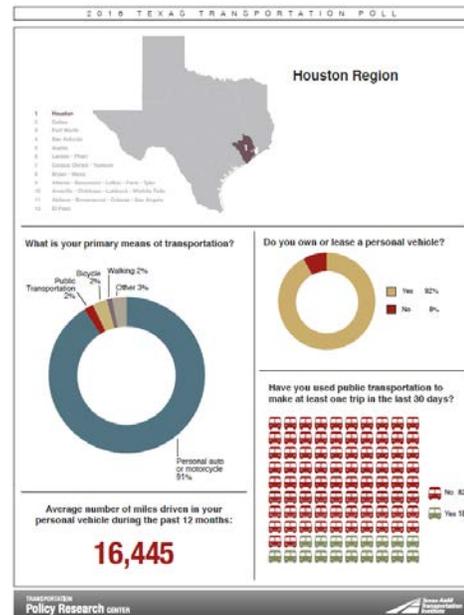
Study Name: 2016 Texas Transportation Poll; Houston Region
Agency: TTI Transportation Policy Research Center **Year Completed:** 2016
Study File Reference ID: 2

Summary of Study

The document summarizes the results of a Texas transportation poll for the Houston Region.

The survey asked questions on a variety of transportation topics in different formats:

- Yes / No
- Strongly Agree -> Strongly Disagree
- Scale of 0 to 10



Key Findings for I-45 PEL

91% of respondents use a personal automobile or motorcycle as their primary means of transportation
 2% use Public Transportation, 2% Bicycle and 2% Walk.

18% of respondents have used public transportation for at least one trip in the last 30 days.

75% of respondents have used a smart phone for navigation or route guidance. 49% tuned in to local radio news for traffic reports.

People agree that congestion is caused by influx of people wanting to live and work in Houston.

53% agree that congestion is caused by an underinvestment in public transportation & 48% agree congestion is caused by an underinvestment in roads.

41% disagree that public transportation is available to them. 53% disagree that they have travel options other than a personal vehicle.

The most supported possible solution to congestion in the study was “Encouraging more effective timing of traffic signals”. Others in order of support were: Telecommuting / Flexible work hours, Better incident management, Adding lanes to state roads, and encouraging public transportation.

Study Name: 2016 Texas Transportation Poll; Final Report

Agency: TTI Transportation Policy Research Center

Year Completed: 2016

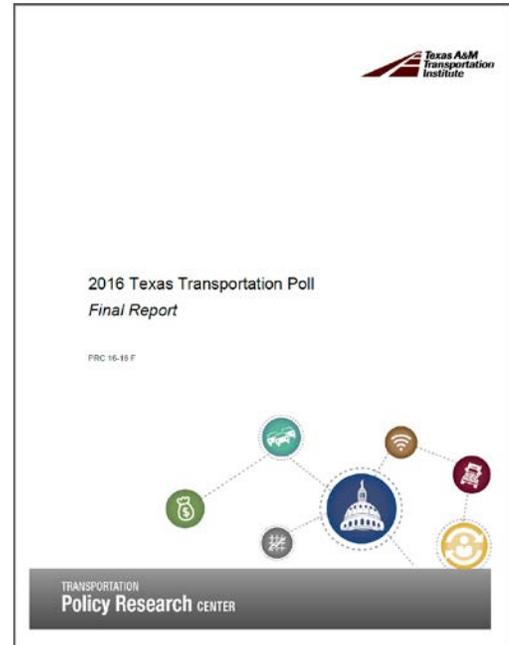
Study File Reference ID: 3

Summary of Study

This study details the methodology and results for the 2016 Texas Transportation Poll. This is the overarching poll that created results for the Houston area in Study File Reference ID #2.

The poll was done between 3/10/16 and 7/28/16:

- 80% via telephone / 16% via mail / 4% via web
- 94% English / 6% Spanish
- 51% White / 31% Latino / 13% Black / 3% Asian
- Even distribution of ages 18-65+



Key Findings for I-45 PEL

The Houston Region has 1009 respondents in the poll, 784 of which were registered voters.

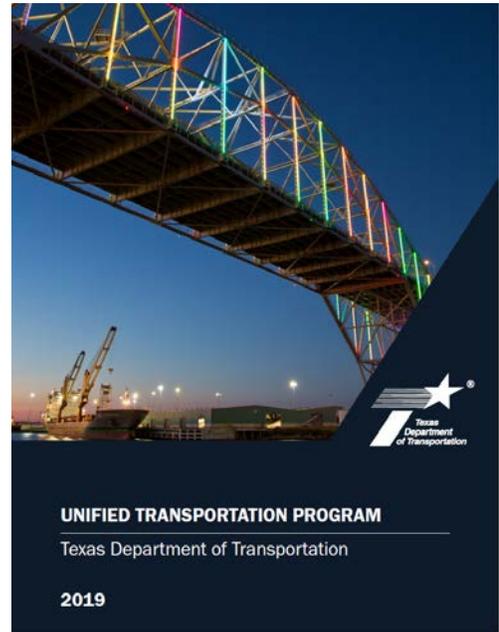
Detailed findings for the I-45 area are listed in the summary for Study File Reference ID #2.

Study Name: 2019 Unified Transportation Program (UTP)
Agency: Texas Department of Transportation **Year Completed:** 2019
Study File Reference ID: 4

Summary of Study

The Unified Transportation Plan (UTP) is a 10 year, mid-range planning document used by TxDOT to guide the state’s transportation project development. The UTP authorizes projects for construction, development and planning activities for highways and other transportation facilities. The UTP links the planning activities of the State Long Range Transportation Plan (SLRTP), Metropolitan Transportation Plans, and Rural Transportation Plans to the detailed programming activities under the STIP. Specifically, the UTP is a listing of projects that are planned to be developed or constructed within the first 10 years of the 24-year SLRTP.

The UTP discusses statewide funding available for projects.



Key Findings for I-45 PEL

Funding for construction of improvements on I-45 from Beltway 8 to SR 336 is not included in the UTP.

A Single Point Urban Interchange at I-45 & Woodlands Parkway is programmed with Ranking Tier 1. (pg. 154/310)

CSJ	District	COUNTY	UTP AUTHORITY	TOLL		Ranking Tier
0110-04-198	HOUSTON	MONTGOMERY	Develop	No	IH 45	1
Limits From	AT WOODLANDS PKWY					Previously Authorized
Limits To	.					
Project Description	CONSTRUCT SINGLE POINT URBAN INTERCHANGE (SPUI)					
Programmed Construction Funding						Est Const Cost: \$49,129,000
Category	Description	Authorized	Other	Total		
2M	METRO CORRIDOR	\$49,129,000	\$0	\$49,129,000		
Total		\$49,129,000	\$0	\$49,129,000		

SH 242 widening from 4 to 6 lanes from I-45 to Greenbridge Drive is programmed with Ranking Tier 3. (pg. 153/310)

FM 1960 ITS improvements from I-45 to SH 249 are programmed with Ranking Tier 3. (pg. 149/310)

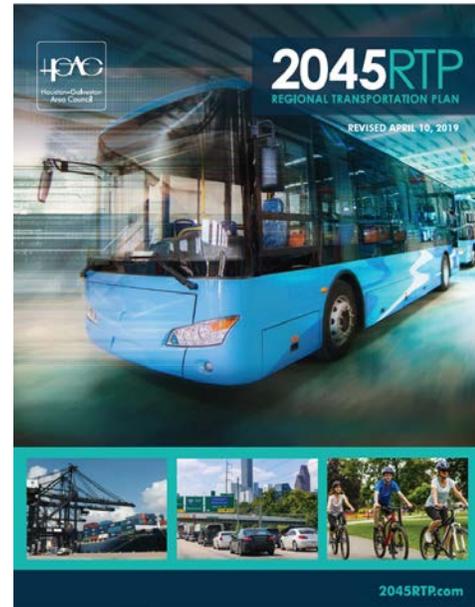
Study Name: Houston-Galveston 2045 Regional Transportation Plan (RTP)
Agency: Houston-Galveston Area Council (H-GAC) **Year Completed:** 2019
Study File Reference ID: 5

Summary of Study

The 2045 Regional Transportation Plan (RTP) provides a responsible guide for maintaining and improving the current transportation system and identifies priority transportation investments. The 2045 RTP is the latest update to the continuous planning process involving the eight central counties of the 13 county Houston-Galveston Area Council (H-GAC) region. The plan's goals are:

- Improve Safety
- Achieve and Maintain a State of Good Repair
- Move People and Goods Efficiently
- Strengthen Regional Economic Competitiveness
- Conserve and Protect Natural and Cultural Resources

The RTP guides transportation investments in the region.



Key Findings for I-45 PEL

Region Highlights:

- Motor vehicle crashes that occurred regionwide increased by more than 40% between 2012 and 2016.
- Fatalities from motor vehicle accidents increased by over 20% between 2012 and 2016.
- About 60% of the twenty most congested roads in Texas are in Harris County.
- Transit ridership in the region decreased by about 2% in 2017 due to a fall in park-and-ride usage and the impacts of Hurricane Harvey.

RTP performance measures may be a good guide of the project Purpose & Need.

The RTP lists I-45 North for proposed Toll Corridor.

The RTP lists I-45 for Express/Signature Bus for the entire project limits.

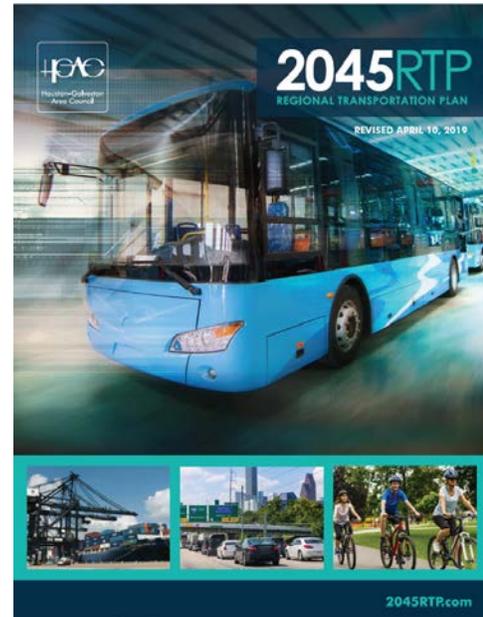
The RTP lists I-45/SH 242 intersection improvement project.

The RTP shows several bikeways crossing I-45 in the study area.

Study Name: H-GAC 2045 RTP Appendix D – Fiscally Constrained and Projects List by County
Agency: Houston-Galveston Area Council (H-GAC) **Year Completed:** 2019
Study File Reference ID: 6

Summary of Study

The corridor summary sheets include a description of improvements, facility type, cost and year of completion for each project included in the 2045 RTP.



Key Findings for I-45 PEL

The RTP lists new BRT connection from downtown to IAH Airport which includes 4 stations as a planned project.

The RTP lists extending the Hardy Toll Road into downtown Houston as funded project. It also lists providing direct connection ramps from Hardy Toll Road to Beltway 8 as a funded project.

The RTP lists widening Loop 336 east of I-45 near Conroe to 4-lane divided road as a funded project.

The RTP lists widening and restriping FM 1488 west of I-45 as a planned project.

The RTP lists widening SH 242 west of I-45 as funded project and lists installing fiber optic cable on SH 242 east of I-45 as a planning project.

The RTP lists raising northbound and southbound frontage roads, operational and drainage improvements as a planned project for I-45 between SH 242 and Shenandoah.

The RTP lists ramp modification, addition of auxiliary lanes and striping for I-45 from FM 2920 to Montgomery County Line as a planning project.

Study Name: H-GAC 2045 RTP Appendix O – Public Comments

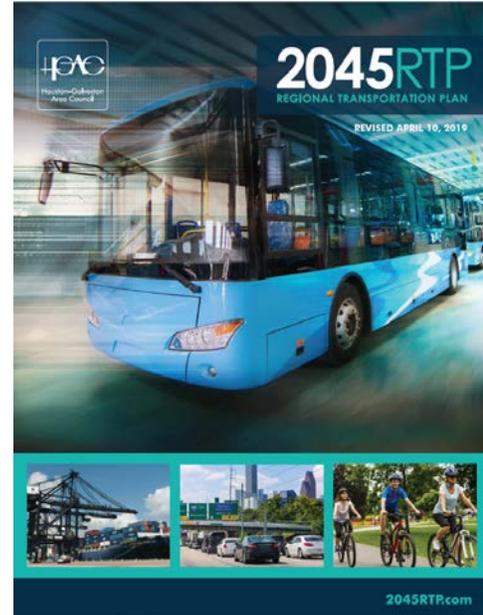
Agency: Houston-Galveston Area Council (H-GAC)

Year Completed: 2018

Study File Reference ID: 7

Summary of Study

This H-GAC RTP appendix summarizes the public meetings and the comments received associated with the development and adoption of the 2045 RTP.



Key Findings for I-45 PEL

Public comments included desire to permanently convert left lane on I-45 to HOV and convert HOV lane to light rail.

One resident from Houston mentioned Metro should construct commuter rail/bus in existing major transit corridors.

Several comments mentioned the need for bus service between downtown Houston and IAH Airport and high-speed rail between Houston and Dallas.

Several public commenters asked for increased funding for bike and pedestrian projects.

Study Name: H-GAC 2045 RTP Appendix G – Gulf Coast Region Regionally Coordinated Transportation Plan Update

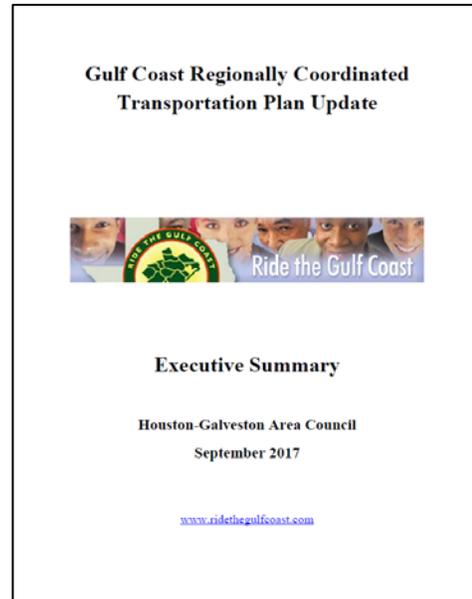
Agency: Houston-Galveston Area Council (H-GAC)

Year Completed: 2017

Study File Reference ID: 8

Summary of Study

The Gulf Coast Regionally Coordinated Transportation Plan (RCTP) is a comprehensive multi-agency plan to better coordinate public transportation services in the region. The purpose of the coordination plan is to ensure that all of the agencies that are responsible for planning and providing public transportation are working together to make their services more convenient for the customers and more efficient.



Key Findings for I-45 PEL

The plan notes the following results of transit surveys:

- 81% supported the addition of transit services in areas that do not currently have them.
- When questioned regarding the need for additional local revenue to fund general transit service, 79%, either strongly or somewhat favored that option.
- Additional funding for commuter rail was either strongly or somewhat favored by 76% of respondents, more funding for regular bus service by 72%, and additional funding for park and ride service by 77% of those who answered the survey.
- While responses were slightly more favorable in Harris County, all areas of the region expressed significantly positive sentiments towards transit.

Primary recommendations from gap analysis are:

- Development of additional revenue sources for transit
- Enhanced regional and intercity connectivity to improve mobility for all riders in travelling to and between locations throughout the Gulf Coast Region
- The implementation of new transit services in communities that have no or relatively limited transit services
- New transit in areas of growth and emerging demographic change

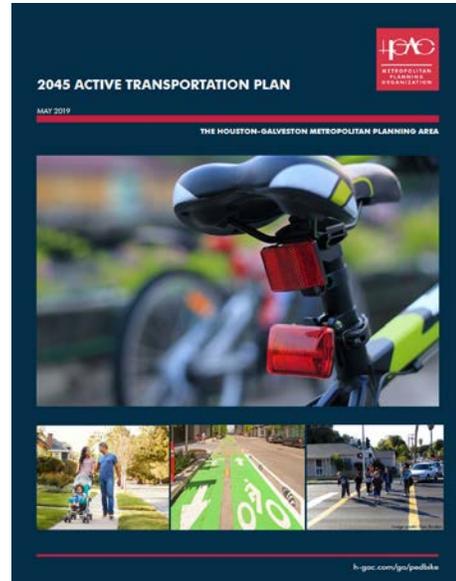
Study Name: H-GAC 2045 Active Transportation Plan
Agency: Houston-Galveston Area Council (H-GAC) **Year Completed:** 2019
Study File Reference ID: 9

Summary of Study

The Regional Active Transportation Plan is a long-range planning document that describes the region's vision for enhancing pedestrian and bicycle infrastructure within the eight-county Transportation Management Area (TMA). The plan summarizes the pedestrian and bicycle focus area analysis results and the vision for 2045 along with the strategies and measures. The plan evaluates the profiles for eight counties for pedestrian and bicycle infrastructure and the plans for improving the infrastructure.

The Regional Pedestrian and Bicycle Plan is intended to:

- Guide public investment in pedestrian & bike infrastructure
- Promote interjurisdictional coordination
- Identify Best Practices



Key Findings for I-45 PEL

The plan recommends to prioritize safety, ensure equity, connect, maintain and monitor, and encourage bridging the gap between the existing conditions and the future vision.

The plan shows proposed shared use path/trail crossing I-45 at Cypress Creek (waterway north of Cypress Creek Parkway) and Spring Creek (waterway near Hardy Toll Road connection).

The plan shows proposed shared use path/trail connection west of I-45 on North Fork Greens Bayou, W Rankin Rd and Greens Bayou.

The plan shows proposed bike lane crossing I-45 on Greens Rd.



Study Name: 2019 – 2022 Statewide Transportation Improvement Program – Highway Projects
Agency: Texas Department of Transportation **Year Completed:** 2019
Study File Reference ID: 10

Summary of Study

The Statewide Transportation Improvement Program is a list of projects with funding in the years 2019-2022. It contains information on project termini, sponsor, scope, and costs. It also lists the project phase; construction (C), engineering (E), Right of Way (R), and Transfer (T).



**2019-2022
Statewide Transportation
Improvement Program
Highway Projects**

Key Findings for I-45 PEL

The STIP includes a project to extend the Hardy Toll Road from I-610 to US 59 for a cost of \$250 million. The project is sponsored by HCTRA.

The STIP includes a project to construct EB-SB and NB-WB direct connectors at the interchange of Hardy Toll Rd and BW 8 for a cost of \$71 million. The project is sponsored by HCTRA.



Study Name: 2019 – 2022 Statewide Transportation Improvement Program – Transit Projects
Agency: Texas Department of Transportation **Year Completed:** 2019
Study File Reference ID: 11

Summary of Study

The Statewide Transportation Improvement Program is a list of transit projects with funding in the years 2019-2022. It contains information on project termini, sponsor, scope, and costs.



**2019-2022
Statewide Transportation
Improvement Program**
Transit Projects

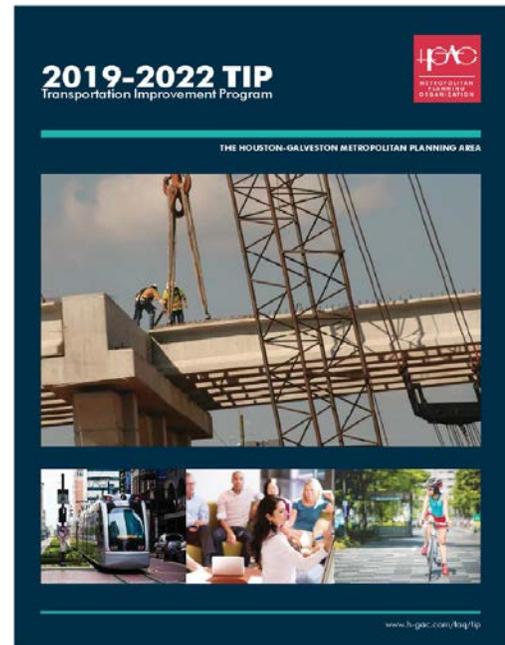
Key Findings for I-45 PEL



Study Name: 2019 – 2022 Transportation Improvement Program (TIP)
Agency: H-GAC **Year Completed:** 2018
Study File Reference ID: 12

Summary of Study

The Transportation Improvement Program (TIP) is a staged, four-year program of projects proposed for funding by federal, state and local sources within the Houston-Galveston Area Council (H-GAC) in cooperation with local governments, TxDOT, and local transportation agencies. Projects in the 2019-2022 TIP have been identified as priorities for the Houston Region.



Key Findings for I-45 PEL

The TIP includes the project to construct direct connectors from BW8 to Hardy Toll Road.
The TIP also includes the project to extend the Hardy Toll Road to downtown Houston.

The TIP shows a project delay for the traffic flow improvements at I-45 and Woodlands Parkway from FY 19 to FY 25.



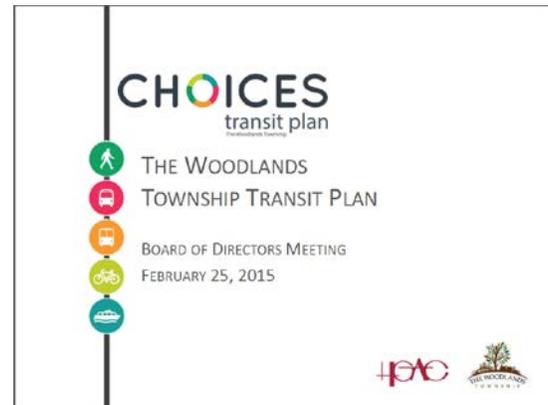
Study Name: The Woodlands Township Transit Plan (Choices Transit Plan) - Presentation
Agency: The Woodlands Township **Year Completed:** 2015
Study File Reference ID: 13

Summary of Study

This document is a presentation summarizing The Woodlands Township Transit Plan to the Board of Directors Meeting on 2/25/15.

The plan provides a path forward for the Township to advance future transit.

The presentation includes maps of existing Regional transit service serving The Woodlands.



Key Findings for I-45 PEL

The Woodlands expects population to grow by 55% and to double employment (100% growth) by 2040

The plan proposes a Town Center Bus Network with service from the Mall to surrounding areas west of I-45.

The plan proposes improvements to the 3 park & rides serving The Woodlands (Sawdust, Sterling Ridge, and Research Forest).

The plan also proposed reverse service from Houston to The Woodlands.

The plan proposed testing service from The Woodlands to Springwoods / ExxonMobile.

Study Name: The Woodlands Township Transit Plan
Agency: H-GAC **Year Completed:** 2015
Study File Reference ID: 14

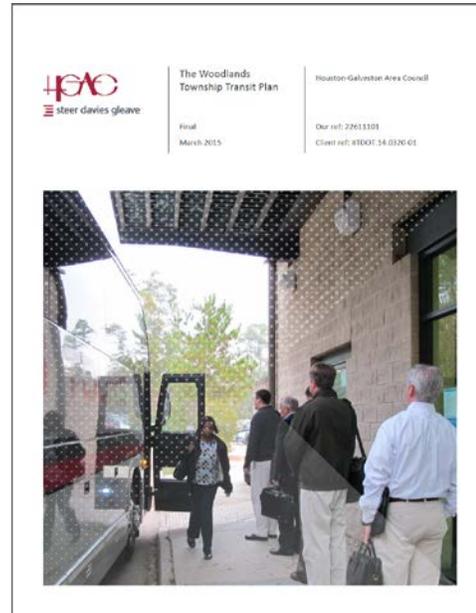
Summary of Study

The purpose of the Woodlands Township Transit Plan is to provide a comprehensive evaluation of The Woodlands’ existing transit options, as well as the need for future transit choices in and around The Woodlands.

The plan presents various options for consideration by the community to expand existing transit and develop new transit.

The study area for the plan is I-45 on the east, Grand Parkway (99) on the south, FM 2978 on the west and FM 1488 on the north.

The plan evaluated 50 transit options or transit supportive options (transit, roadway, cycle, pedestrian, parking, etc.) for examination.



Key Findings for I-45 PEL

The plan lists I-45 as a “major east/west barrier, further exacerbated by the existence of I-45 frontage roads”. It recommends including appropriate access for bikes and pedestrians as well as examining cycle and pedestrian only crossings.

The Woodlands expects population to grow by 55% and to double employment (100% growth) by 2040

The plan proposes a Town Center Bus Network with service from the Mall to surrounding areas west of I-45.

The plan proposes improvements to the 3 park & rides serving The Woodlands (Sawdust, Sterling Ridge, and Research Forest).

The plan also proposed reverse service from Houston to The Woodlands.

The plan proposed testing service from The Woodlands to Springwoods / ExxonMobile.

The plan promotes branding the transit options as “Choices”, with an attractive logo.





Study Name: Major Thoroughfare Access to SH 99 Presentation

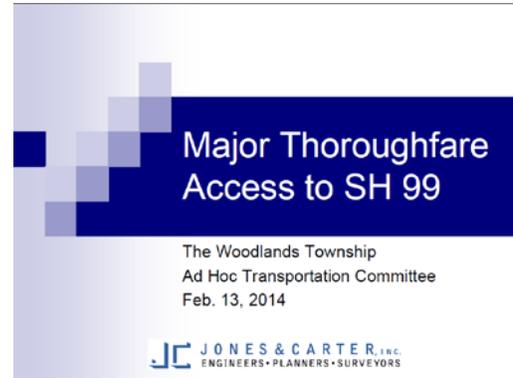
Agency: The Woodlands Township Ad Hoc Transportation
Committee

Year Completed: 2014

Study File Reference ID: 15

Summary of Study

The presentation investigates connections from The Woodlands to SH 99 (Grand Parkway). It includes information on two interchanges (Gosling & Kuykendahl). It reports traffic volumes on the 2 connections and notes traffic volume increases and poor traffic operations.



Key Findings for I-45 PEL

Connections from The Woodlands to SR 99 are also congested and may not relieve I-45 traffic.



Study Name: Potential Effects of the Panama Canal Expansion on the Texas Transportation System

Agency: TxDOT

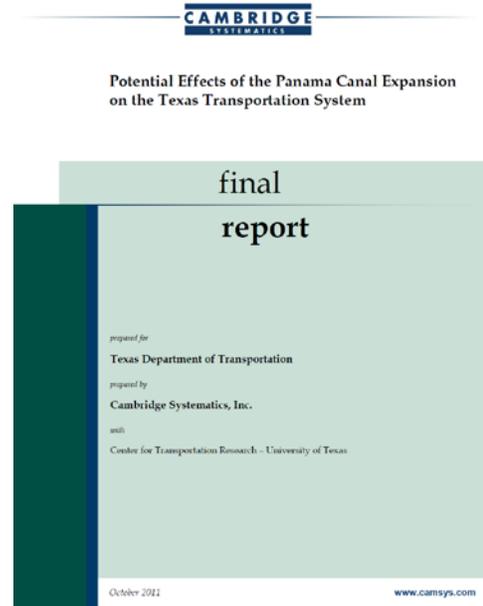
Year Completed: 2011

Study File Reference ID: 16

Summary of Study

The Panama Canal was undergoing expansion to increase the annual capacity by 75%. Ports along the west coast are facing physical and community constraints and it may be beneficial for freight to come through the canal and access ports in Texas.

Ports in Houston, Galveston and Corpus Christi are undertaking major capacity enhancement projects to attract a portion of the Canal's new traffic.



Key Findings for I-45 PEL

The Port of Houston is the home of the largest Wal-Mart import and distribution facility in the country. Home Depot also selected this location as its distribution base.

TxDOT should identify key freight bottlenecks that may be exacerbated by the anticipated freight growth.

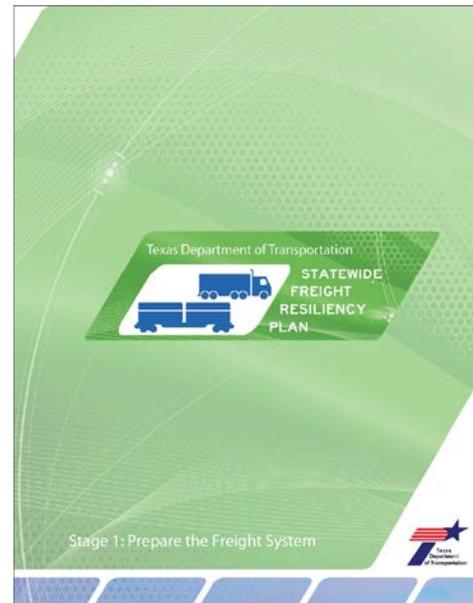
Study Name: Statewide Freight Resiliency Plan – Stage 1: Prepare the Freight System
Agency: TxDOT **Year Completed:** 2011
Study File Reference ID: 17

Summary of Study

Texas is the 12th largest economy in the world and the second largest in the US. A resilient freight network in Texas is important to economic health of the State and the Nation. The study identifies key freight infrastructure corridors and provides strategies to ensure a resilient freight transportation network.

Freight transportation system resilience is “the ability for the system to absorb the consequences of disruptions, to reduce the impacts of disruptions and maintain freight mobility.”

Stage 1 is focused on an assessment of the freight systems preparedness from the perspective of TxDOT.



Key Findings for I-45 PEL

I-45 falls in the “high exposure” category, meaning it has high truck volumes. I-45 falls in the upper end of the “low risk” category, meaning there is low risk of disaster.

The I-45 corridor serves one of the nation’s largest marine ports and population centers. The Houston area was not evaluated for resiliency because of the multiple redundancies afforded by the highway network surrounding Houston.

The I-45 West secondary route includes I-10, US 77 and I-35. The I-45 East secondary route follows US 59, US 69 and US 175. This area of the state has multiple routes available to create significant redundancy for I-45.

I-45 is a major petroleum and chemical route in Texas.

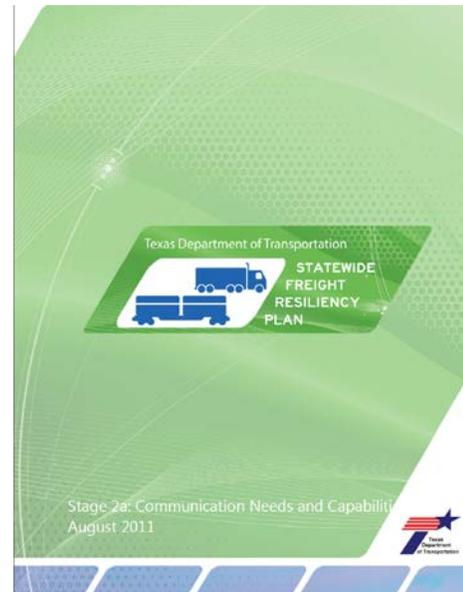
Study Name: Statewide Freight Resiliency Plan – Stage 2: Communication Needs and Capabilities
Agency: TxDOT **Year Completed:** 2011
Study File Reference ID: 18

Summary of Study

Texas is the 12th largest economy in the world and the second largest in the US. A resilient freight network in Texas is important to economic health of the State and the Nation. The study identifies key freight infrastructure corridors and provides strategies to ensure a resilient freight transportation network.

Freight transportation system resilience is “the ability for the system to absorb the consequences of disruptions, to reduce the impacts of disruptions and maintain freight mobility.”

Stage 2 is associated with communication and plan implementation during response to an actual event and its recovery.



Key Findings for I-45 PEL

The most important communication to convey for freight resiliency is:

- Real Time Road Closure Information
- Alternative Routing information
- Evacuation Routes
- Expected road openings and closures
- Real time incident situation updates

Study Name: Texas Freight Mobility Plan
Agency: TxDOT **Year Completed:** 2016
Study File Reference ID: 19

Summary of Study

The Texas Freight Mobility Plan (Freight Plan) is the TxDOT's first comprehensive multimodal transportation plan that focuses on the state's freight transportation needs. It identifies the state's freight transportation challenges and outlines investment strategies and policies needed to address them. The Freight Plan also provides a vision for a safe reliable and efficient freight transportation system for Texas that supports economic growth and global competitiveness.

The plan describes:

- Why freight is important
- Where the demand is coming from
- What are the freight transportation challenges
- What does the future look like?
- Interstate Highway Congestion and Freight Growth
- Creating a plan for success



Key Findings for I-45 PEL

Trucking in Texas provides over 4 Million jobs. Industries and businesses directly or indirectly impacted by freight transportation represent approximately 43% of the state's economy.

Interstates (3200 miles) are only 4% of the of the state's public road mileage, but are the primary component of the state's freight system. In 2014, the state's highways moved over 1 billion tons of freight. It is expected to double to 2.2 billion tons by 2040. Highways are expected to handle 59% of the freight in 2040, up from 52% in 2014.

I-45 is a very heavy freight corridor. It is also very congested in the project area.

George Bush Intercontinental Airport is the second busiest in Texas for annual air cargo tonnage.

I-45 was listed as a primary congested freight bottleneck in the 2014 Top US Freight Bottlenecks.

Texas measure freight mobility performance with; annual hours of truck delay, truck reliability index, reduction in freight bottlenecks, and LOS.

I-45 is expected to operate at LOS E/F in 2040 all the way from Dallas to Houston to Galveston.

I-45 is shown in the Freight Plan as needing further study for improvement needs.

The plan recommends prioritized investment in major freight interstates, including I-45, to maintain them in a state of good repair, and to identify needs for increased capacity.



Study Name: I-45 Freight Corridor Plan
Agency: TxDOT **Year Completed:** 2016
Study File Reference ID: 20

Summary of Study

The purpose of the plan is to identify corridor freight needs that can be addressed by public policy and investment through freight improvement strategies along the I-45 corridor. The I-45 Freight Corridor Plan (FCP) will serve as a master plan for freight system improvements in the I-45 corridor, identifying short and long term improvement strategies, including infrastructure enhancements, operational improvements and freight policies.

Nearly half of all truck freight traffic in Texas is moved through the 11 counties of the I-45 corridor.

The plan lays out performance objectives for I-45 including:

- Truck Safety
- Pavement & Bridge Condition
- Bridge Vertical Clearance
- Mobility (LOS D and 80% of posted speed)
- Reliability (PTI <3.0 @ 95th percentile)



Final Report
 I-45 Freight Corridor Plan
 February 2016

Key Findings for I-45 PEL

I-45 carries more than 10,000 trucks per day in the study area.

I-45 operates at LOS F in 2010 in the study area and rates “Very Poor” for freight mobility and economic competitiveness.

I-45 @ BW8 is the 74th worst bottleneck in the country and 13 worst in Texas.

There is significant tonnage on the UP rail line paralleling and crossing (near 99) I-45 in the project area.

The report says there is “Poor” Frontage Road continuity between SH 242 and FM1960.

In the medium term, I-45 should consider: interchange improvements, ITS, variable pricing HOV, adding lanes, expanding frontage roads, adding truck only lanes, providing dedicated truck ramps, and increasing bridge clearance to 18’-6”.

In the long term, I-45 should strive to be a “bridgeless” corridor (no mainline overpasses).

Bridge condition – 4 in poor or worse are in Houston – should verify if any are in study area.

Study Name: Regional Goods Movement Study

Agency: H-GAC

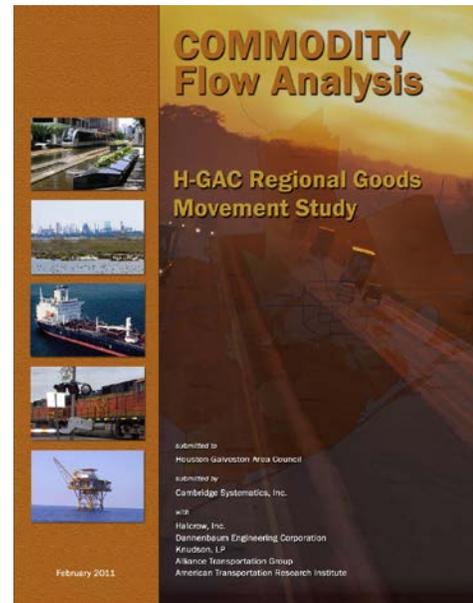
Year Completed: 2011

Study File Reference ID: 21

Summary of Study

The study evaluates the region's extensive multi-modal goods movement system, identifies critical issues, and develops strategies and recommendations for improving mobility and access for both commuters and freight.

The data source for the analysis is the TRANSEARCH commodity flow database.



Key Findings for I-45 PEL

The top 3 commodities account for nearly half of all freight moving in the region; petroleum and coal products, secondary traffic (to and from distribution centers / intermodal facilities), and chemical products.

I-45 should get more current TRANSEARCH data and try to be more specific about freight in the more narrowly defined study area.

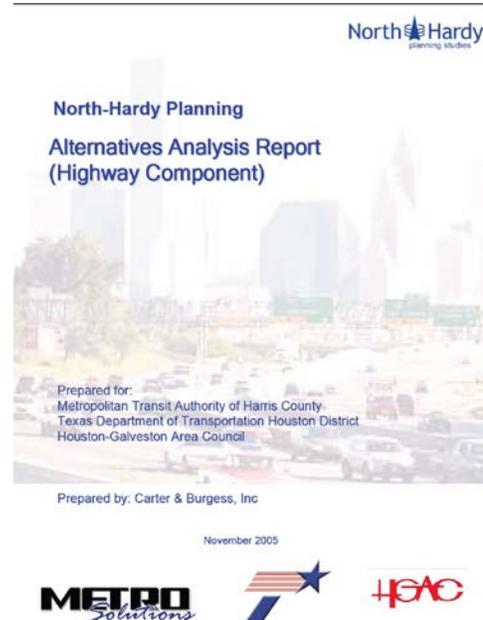
Study Name: North Hardy Planning – Alternatives Analysis Report (Highway)
Agency: METRO Transit, TxDOT, H-GAC **Year Completed:** 2005
Study File Reference ID: 22

Summary of Study

The North Hardy corridor extends from Downtown Houston to approximately The Woodlands and includes I-45 and the Hardy Toll Road. The study area also includes the George Bush Intercontinental Airport. This portion of the study discusses evaluation of highway alternatives. Transit is included in a different report.

The study includes extending the Hardy Toll Road to downtown, and widening the Hardy Toll Road to 6 lanes from Beltway 8 to I-45.

The report evaluates 6 Highway Build Alternatives that have varying numbers of general purpose / HOV lanes.



Key Findings for I-45 PEL

This study should be referenced in the background of improvements on the I-45 corridor.

Light rail transit is proposed from Downtown Houston to the Airport.

The report recommended Highway Build Alternative 2:

- From Beltway 8 to FM 1960 – 12 lane cross section – 10 General Purpose and 2 HOV
- From FM 1960 to SH 242 – 10 lane cross section – 8 General Purpose and 2 HOV

The recommendation was modified based on public concern about the potential right of way impacts and was modified to:

- From Beltway 8 to FM 1960 – add 2 HOV/HOT lanes to I-45
- From Downtown to FM 1960 – remove existing one-way reversible HOV lane

The report contains an evaluation of environmental resources that can be used to QC the results of the I-45 PEL environmental constraints map.

The report contains lists of public and stakeholder involvement that may be useful in developing lists for the I-45 PEL.



Study Name: Draft EIS – North Houston Highway Improvement Project (NHHIP)
Agency: TxDOT **Year Completed:** 2017
Study File Reference ID: 23

Summary of Study

This study is a Draft EIS that proposes the addition of 4 managed express (MaX) lanes on I-45 from Beltway 8 North to Downtown Houston, including reconstruction of mainlanes and frontage roads. It also includes rerouting I-45 in the Downtown area to be coincident with I-10 on the north side of Downtown and coincident with US 59/I-69 on the east side of Downtown. The existing elevated I-45 roadway on the west and south sides of Downtown would be removed.

The DEIS includes:

- Purpose & Need
- Affected Environment Analysis
- Greenhouse Gas / Climate Change Analysis
- Indirect and Cumulative Effects Analysis
- Public Involvement summary
- Environmental commitments



**Draft
Environmental Impact Statement**
North Houston Highway Improvement Project,
Houston District

From US 59/I-69 at Spur 527 to I-45 at Beltway 8 North
CSI: 0912-00-146
Harris County, Texas
April 2017

TxDOT will issue a single final Environmental Impact Statement and Record of Decision document pursuant to Public Law 112-141, 126 Stat. 405, Section 13119(b) unless TxDOT determines statutory criteria or practicability considerations preclude issuance of the combined document pursuant to Section 1315.

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by TxDOT pursuant to 23 U.S.C. 327, and a Memorandum of Understanding dated December 30, 2010 and executed by FHWA and TxDOT.

Key Findings for I-45 PEL

The purpose and need of this study may be similar to I-45 in the study area since this project is immediately south of the area. This study contains background on the North Hardy Planning Study (ref #23) that may also be used for the I-45 PEL.

The DEIS includes a Universe of alternatives that may serve as a starting point for identifying the universe alternatives for the I-45 PEL.

THE DEIS contains screening methodology to select alternatives that may be compatible with the I-45 PEL.

The DEIS proposes improvements that the I-45 PEL would need to match at the southern termini.

Study Name: City of Conroe Comprehensive Plan: Chapter 5: Transportation

Agency: City of Conroe

Year Completed: 2007

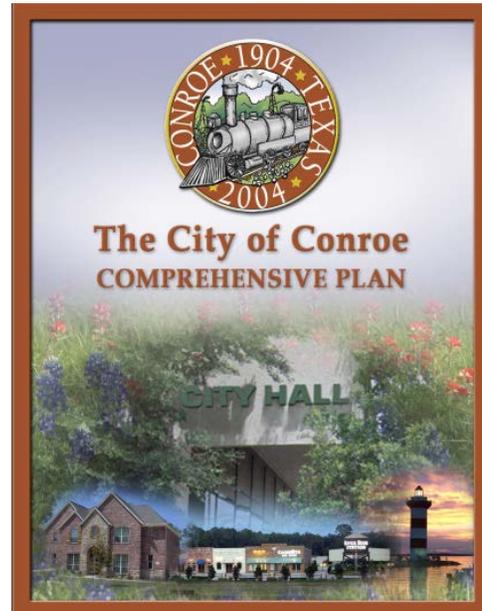
Study File Reference ID: 24

Summary of Study

The City of Conroe's comprehensive plan guides planning for the City's future. The transportation component will assist the City in preserving and acquiring right of way for future roadways to enhance mobility and provide for economic development opportunities. The goal is to create an efficient, integrated, and well connected transportation network that accommodates future growth and changing mobility needs.

The chapter identifies the following key issues:

- Future Growth and Mobility conditions
- Thoroughfare Capacity
- Maintenance of the existing system
- Connectivity
- Bicycle and Pedestrian Facilities



Key Findings for I-45 PEL

I-45 is identified as an "Existing Major Roadway" and a major truck route.

I-45 is listed as being widened from south of Loop 336 to north of Loop 336 to eight lanes with 2-3 lane frontage roads, with future HOV and TSM.

Widening of Loop 336 (east of I-45 to MP railroad) from 4 to 6 lanes is listed as an improvement.

Creighton Road is listed as being constructed as a new 4 lane undivided road from I-45 to Gosling Road.

The plan identifies transit needs, especially for seniors and low-income residents.

The plan notes that sidewalks are required on both sides of the street in the City. The plan also says to incorporate bicycle lanes (minimum 6') along collector roadways.

The Lone Star Executive Airport is located northeast of the city.

The plan identifies coordinating with ongoing TxDOT, H-GAC and Montgomery County projects to ensure appropriate connections to the City's roadway system.

The plan shows a new trail connecting the San Jacinto River into the city near the Railroad on the east side of I-45.



Study Name: IH 45 (North Freeway) between Lake Front Circle and Spring Cypress Road / FM 2920
Agency: - **Year Completed:** -
Study File Reference ID: 25

Summary of Study

This document contains items in the Metropolitan Transportation plan to improve I-45 in the project corridor. It discusses I-45, parallel corridors and regional TDM options.

Rank 45 – IH 45 (North Freeway) between Lake Front Circle and Spring Cypress Road/FM 2920

Currently in the Metropolitan Transportation Plan:

Corridor Specific:

- **Managed Lanes:** Reconfigure roadway to create two managed lanes on IH 45 from FM 1960 to LP 3365
 - **Cost Estimate:** \$2.6 Million
 - **Let Year:** FY 2015
- **Capacity Expansion/Operation Improvement Study:** Rider 42 suggests \$2,000,000 to study options for the IH-45 North Freeway.

Parallel Corridors:

- **Capacity Expansion:** Design-Build project to construct 4-lane tollway with interchanges and two non-continuous 2-lane frontage roads and direct connectors on SH 99 from US 290 to I-69N (Segments F-1, F-2 and G). To be completed by the end of Calendar Year 2015. Project cost is \$1.5 Billion.
- **Capacity Expansion:** The Hardy Downtown Connector project will extend the Hardy Toll Road from its current terminus at IH 610 North into downtown Houston and will consist of four toll lanes (two in each direction) for 3.6 miles. HCTRA recently reached the necessary agreements for the relocation of the rail line, an important milestone for the progression of this project, which will be completed in two phases. Phase I will include the relocation of the rail line, followed by the construction of overpasses at Galtman and Collingsworth, and an underpass at Lorraine Street to eliminate at-grade crossings. Phase II will be the construction of the toll lanes.
- **Capacity Expansion:** Widen the Hardy Toll Road from FM 1960 to the proposed intersection with Grand Parkway (SH 99) to provide an additional lane in each direction.
- **Operation Improvement:** Direct connectors linking the Hardy Toll Road to Beltway 8 will enable drivers to transit between the two roads without having to stop at traffic lights, improving mobility in the area.

Regionally:

- **ITS Intelligent Transportation Systems:** advanced traffic management, advanced public transit system, and emergency management.
- **Incident Management:** TxDOT along with other transportation and safety organizations within the Houston area co-sponsor Houston's Motorist Assistance Program (MAP), an incident management program.
- **Traffic Management Centers:** Houston: TransStar, a consortium of local governments in partnership with the state, is responsible for transportation operations and emergency management in the greater Houston area.
- **Regional Trip Reduction Program:** Regional TMD and Commute Solutions program support to promote alternative commute mode choices including carpool, vanpool, transit, telecommuting, and biking. Implement community-wide marketing and public relations campaigns to educate citizens on alternative commute mode choices.
- **Vanpools:** METRO supports the regional vanpool program which includes approximately 700 vans, 7,100 participants, 200,000 trips per month, 6,000,000 passenger miles per month, and 5,000,000 VMT reduction per month.

Key Findings for I-45 PEL

The document identifies the managed lane addition let in FY 15. It also identifies improvements to SH 99, the Hardy Toll Road Downtown Connector, the Hardy Toll Road expansion, and direct connectors from Hardy Toll Road to Beltway 8.

Regionally, the document identifies, ITS, Incident Management, Traffic Management Center, Regional Trip Reduction Program, Vanpools, and Pedestrian Improvements to reduce demand / improve operations on I-45.

The document identifies preparing a PEL to help determine major investments needed to improve safety and mobility along the I-45 corridor between BW8 and Loop 336 North.



Study Name: IH 45 (North Freeway) between Spring Cypress Road / FM 2920 and SL 8 North
Agency: - **Year Completed:** -
Study File Reference ID: 26

Summary of Study

This document contains items in the Metropolitan Transportation plan to improve I-45 in the project corridor. It discusses I-45, parallel corridors and regional TDM options.

Rank 61 – IH 45 (North Freeway) between Spring Cypress Rd/FM 2920 SL 8 North

Currently in the Metropolitan Transportation Plan:

Corridor Specific:

- **Managed Lanes:** Reconfigure roadway to create two managed lanes on IH 45 from FM 1960 to LP 3365
 - Cost Estimate: \$2.6 Million
 - Let Year: FY 2015
- **Capacity Expansion/Operation Improvement Study:** Rider 42 suggests \$2,000,000 to study options for the IH 45 North Freeway.

Parallel Corridors:

- **Capacity Expansion:** The Hardy Downtown Connector project will extend the Hardy Toll Road from its current terminus at IH 610 North into downtown Houston and will consist of four toll lanes (two in each direction) for 3.5 miles. HCTRA recently reached the necessary agreements for the relocation of the rail line, an important milestone for the progression of this project, which will be completed in two phases. Phase I will include the relocation of the rail line, followed by the construction of overpasses at Qulman and Collingsworth, and an underpass at Lorraine Street to eliminate at-grade crossings. Phase II will be the construction of the toll lanes.
- **Capacity Expansion:** Widen the Hardy Toll Road from FM 1960 to the proposed intersection with Grand Parkway (SH 99) to provide an additional lane in each direction.
- **Operation Improvement:** Direct connectors linking the Hardy Toll Road to Beltway 8 will enable drivers to transit between the two roads without having to stop at traffic lights, improving mobility in the area.

Regionally:

- **ITS:** Intelligent Transportation Systems: advanced traffic management, advanced public transit system, and emergency management.
- **Incident Management:** TxDOT along with other transportation and safety organizations within the Houston area co-sponsor Houston's Motorist Assistance Program (MAP), an incident management program.
- **Traffic Management Center:** Houston TransStar, a consortium of local governments in partnership with the state, is responsible for transportation operations and emergency management in the greater Houston area.
- **Regional Trip Reduction Program:** Regional TMO and Commute Solutions program support to promote alternative commute mode choices including carpool, vanpool, transit, telecommuting, and biking. Implement community-wide marketing and public relations campaigns to educate citizens on alternative commute mode choices.
- **Vanpools:** METRO supports the regional vanpool program which includes approximately 700 vans, 7,100 participants, 200,000 trips per month, 6,000,000 passenger miles per month, and 5,000,000 VMT reduction per month.
- **Pedestrian Improvements:** Strategically enhance bicycle and pedestrian infrastructure throughout the H-GAC region.

Key Findings for I-45 PEL

The document identifies the managed lane addition let in FY 15. It also identifies improvements to the Hardy Toll Road Downtown Connector, the Hardy Toll Road expansion, and direct connectors from Hardy Toll Road to Beltway 8.

Regionally, the document identifies, ITS, Incident Management, Traffic Management Center, Regional Trip Reduction Program, Vanpools, and Pedestrian Improvements to reduce demand / improve operations on I-45.

The document identifies preparing a PEL to help determine major investments needed to improve safety and mobility along the I-45 corridor between BW8 and Loop 336 North.

The document also identifies expansion of I-45 from BW 8 to I-610 with 4 additional managed lanes (\$1.35B, EIS Pending). The document also identifies removing the bidirectional HOV lanes and creating 2 managed lanes from FM 1960 to BW 8 (\$8.5M). The document says neither of these projects is currently funded.



Study Name: Development of a Freeway Traffic Management Project Through a Public-Private Partnership

Agency: TxDOT **Year Completed:** -

Study File Reference ID: 27

Summary of Study

The study describes a public-private partnership (PPP) to improve sources and use of real time travel information. The demonstration was on the I-45 North Freeway and adjacent Hardy Toll Road.

The project used cellular phone technology to provide probe data in 200 volunteer vehicles. Essentially, the volunteers called in their location to stand-by operators.

26

TRANSPORTATION RESEARCH RECORD 194

Development of a Freeway Traffic Management Project Through a Public-Private Partnership

STEVEN Z. LEVINE, WILLIAM R. MCCASLAND, AND DENNIS G. SMALLEY

If intelligent vehicle-highway system (IVHS) and traffic management systems are to be successful in the future, a good relationship must exist between the public and private sectors. To foster this relationship in the Houston area, a public-private sector partnership was organized by the Texas Department of Transportation. The mutual objective of this group was to improve the sources and use of real-time travel information. This partnership consisted of public-sector transportation agencies, commercial transportation companies, and traffic service organizations. The initial project of the partnership was the development and operation of a cellular phone probe project as a source of real-time travel information. This information was then used by commercial transportation companies and traffic service organizations. The project demonstrated how the public, public agencies, and the private sector can have effective roles in improving the sources and use of travel information.

• In the North Houston Corridor one of the major roadways, the US 59 Eastern Freeway, was to be reconstructed during a 3-year period. The monitoring of roadway and traffic conditions was essential for the implementation of congestion mitigation efforts.

• Although the original purpose of the partnership was a planning and technology sharing nature, it was decided that a short-term, successful implementation project for demonstration purposes would be needed to maintain the interest of all partners.

The North Houston Corridor offered the best potential for satisfying the requirements stated in those issues and for fostering the public- and private-sector cooperation needed for engineering and participating in the project. The project involved use of a technology for tracking vehicles through the corridor so that travel times could be monitored in real time. Automatic vehicle identification (AVI) and automatic vehicle locator systems were considered the best technologies, but a technique using manual data collection and transmission was selected for the first phase to meet the schedules for early implementation. Cellular telephones were issued to 200 volunteers who were asked to serve as traffic reporters (probes) along their commute trips to and from work. The experiences in involving the public, public agencies, and the private sector in the development and conduct of the study are reported in this paper. The results of the cellular telephonic demonstration study as a source of travel time information are also discussed.

To obtain the maximum benefits from intelligent vehicle-highway system (IVHS) and traffic management systems (TMS), the public and private sectors must have good working relationships. To encourage the formation of a cooperative relationship at the local level, the Houston Office of the Texas Department of Transportation (TxDOT) organized a partnership of public agencies and private-sector companies with the initial objective of increasing the sources and the use of real-time travel information. Public-sector participants were the City of Houston, Aviation, Police, and Transportation departments; Harris County Metropolitan Transit and Toll Road authorities; Texas Department of Transportation; and Texas Transportation Institute. Private-sector participants were Federal Express, Houston Lighting and Power, METRO Traffic Control, ATE Bus Lines, Skidow Traffic, and Traffic Control. During monthly meetings the partners defined issues that provided the basis for a short-term joint public-private implementation project in an area called the North Houston Corridor. These issues included the following:

• Travel time information for the study area was needed to operate eight changeable message signs (CMSs). The schedule for installation of these signs was accelerated when the Harris County Toll Road Authority (HCTRA) received funding.

• Travel time information was scheduled to be provided by TMS, which would be operational within 2 to 3 years.

S. Z. Levine, Texas Department of Transportation, P.O. Box 1386, Houston, Tex. 77251. W. R. McCasland and D. G. Smalley, Texas Transportation Institute, 701 North Post Oak, Suite 400, Houston, Tex. 77024.

FACTORS IN SELECTING THE PROJECT CORRIDOR

The North Houston Corridor study area is defined by the three parallel radial freeways (I-45 North Freeway, the Hardy Toll Road, and US 59 Eastern Freeway (Figure 1)). The High-occupancy vehicle (HOV) lane on IH 45 was also included in the study. Several factors favored the selection of this corridor:

• The three parallel freeways are spaced such that they can serve as alternate routes for each other.

• The US 59 Eastern Freeway was scheduled for reconstruction beginning in 1992, and installation of a TMS would not begin until completion of construction in 3 to 4 years.

• Eight electronic CMSs are installed in the corridor for traffic diversion operations (Figure 2). These signs were in-

Key Findings for I-45 PEL

The study is quite old, but demonstrates that private industry may be able to provide some assistance in managing traffic on I-45.



Study Name: South County Mobility Plan – Needs Summary and Maps
Agency: H-GAC **Year Completed:** 2014
Study File Reference ID: 28

Summary of Study

The study examines current and future mobility needs in South Montgomery County. H-GAC established a partnership with Montgomery County Precinct 3, The Woodlands Township, the City of Shenandoah, Oak Ridge North, The Woodlands Road Utility District #1 and TxDOT.

The vision of the South Montgomery County Mobility Plan is to protect and enhance the economic competitiveness and quality of life of the growing South Montgomery County area by designing a safe, efficient, interconnected, and cost-effective roadway network that recognizes the needs of all users: those traveling by autos, trucks and commercial vehicles, cyclists and pedestrians.

This document contains more detailed descriptions and maps of the improvement projects contained in the study (see reference 31)



Short and Long Term Needs

The short- and long-term programs of proposed projects listed below have been designed to address the mobility issues in South Montgomery County. These improvements to the transportation network have been identified as necessary to handle the existing and anticipated future traffic demand on the area's transportation network. As a result, the proposed projects listed below are expected to address the needs of this fast-growing area and allow for the reasonable access of the general public to homes, jobs, shopping and entertainment. It will be up to the responsible entities to implement the suggested solutions.

The proposed projects have been grouped into "Corridors" and each grouping includes a brief description of the project; estimated construction cost (2014 dollars, exclusive of potential right-of-way acquisition); implementing entity or entities (Shenandoah, Oak Ridge North, Woodlands Road Utility District #1 (WRUD#1), Montgomery County, TxDOT, Harris County and Conroe); potential funding sources (federal, state, local, etc.); plan goals met (economic development, maximization of mobility, quality of life, and project consensus); and mobility issues addressed (I-45 alternative, N/S and E/W connectivity, access to Grand Parkway, local circulation, overall mobility, bicycle/pedestrian, and intersection).

Short Term Needs (0-5 years)

(Note: Bicycle accommodations are recommended on all new or widened facilities. The type of accommodations will be determined by implementing entities and their partners during the design process.)

Key Corridors

Rayford Road

- Construct a roadway overpass on Rayford of the UP Railroad. Estimated cost: \$13.7 million
- Widen Rayford Road to six lanes, incorporating access management strategies, from the UP Railroad to Legends Run Drive and from Fox Ravine Drive to Grand Parkway. Estimated cost: \$21.5 million

Key Findings for I-45 PEL

The study recommends short and long term roadway improvements near or across I-45.

The study provides a framework for other roadway improvements to evaluate as part of a strategy to improve I-45.

The study recommends improving the following interchanges:

- Woodlands Parkway (Short Term), including direct connectors
- Research Forest (Long Term)
- Sawdust / Rayford (Long Term)

The study also recommends new grade crossings of I-45.

Study Name: South County Mobility Plan – Executive Summary

Agency: H-GAC

Year Completed: 2015

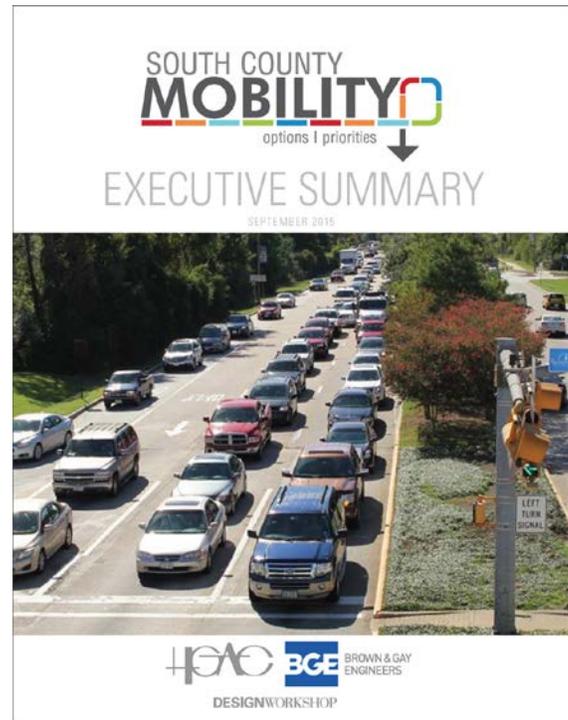
Study File Reference ID: 29

Summary of Study

The study examines current and future mobility needs in South Montgomery County. H-GAC established a partnership with Montgomery County Precinct 3, The Woodlands Township, the City of Shenandoah, Oak Ridge North, The Woodlands Road Utility District #1 and TxDOT.

The vision of the South Montgomery County Mobility Plan is to protect and enhance the economic competitiveness and quality of life of the growing South Montgomery County area by designing a safe, efficient, interconnected, and cost-effective roadway network that recognizes the needs of all users: those traveling by autos, trucks and commercial vehicles, cyclists and pedestrians.

The study identifies needs and makes recommendations for improvements. This document is the executive summary (see Reference 31 for full document)



Key Findings for I-45 PEL

The study identifies I-45 as being “severely over capacity”. It suggests new parallel alternatives to I-45 to connect to Grand Parkway. It also suggests modernizing the interchanges on I-45 and providing new crossings (between Research Forest and Lake Woodlands Dr. and between Woodlands Parkway and Rayford-Sawdust Roads). It also suggests improving the arterial grid network around Rayford Road, including crossing the UP railroad.

I-45 Interchange intersections rank as 5 out of the top 10 most congested signalized intersections studied.

The study recommends roadway improvements near or across I-45 (see Figure E4 & E5), including a major investment study of I-45.

The study provides a framework for other roadway improvements to evaluate as part of a strategy to improve I-45.

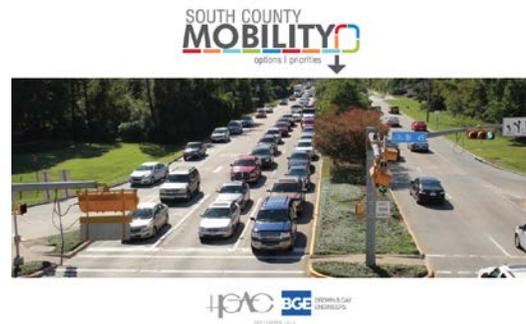
Study Name: South County Mobility Plan
Agency: H-GAC **Year Completed:** 2015
Study File Reference ID: 30

Summary of Study

The study examines current and future mobility needs in South Montgomery County. H-GAC established a partnership with Montgomery County Precinct 3, The Woodlands Township, the City of Shenandoah, Oak Ridge North, The Woodlands Road Utility District #1 and TxDOT.

The vision of the South Montgomery County Mobility Plan is to protect and enhance the economic competitiveness and quality of life of the growing South Montgomery County area by designing a safe, efficient, interconnected, and cost-effective roadway network that recognizes the needs of all users: those traveling by autos, trucks and commercial vehicles, cyclists and pedestrians.

The study identifies needs and makes recommendations for improvements.



Key Findings for I-45 PEL

In addition to the findings in Reference 29 & 30, this document contains descriptions of the communities involved with the study and lists of the parties involved. These lists may be helpful in developing the advisory and stakeholder groups for the project.

The report contains employment and population data that should be verified against the travel demand model for traffic forecasting.

The study collected Bluetooth speed data and travel behavior data in the corridor. The results are on page 45, showing many travelers are accessing I-45.

The project built Synchro Traffic Models for many intersections, including some I-45 interchanges (FM 1488, Lake Woodlands Drive & Woodlands Parkway/Robinson Road).

I-45 interchange ramps had the 3 highest crash events in the study area (SH 242, Rayford / Sawdust, & Research Forest).



Study Name: Montgomery County Thoroughfare Plan
Agency: H-GAC **Year Completed:** 2016
Study File Reference ID: 31

Summary of Study

H-GAC partnered with Montgomery County and the City of Conroe to update the thoroughfare plan. The intent of the thoroughfare plan is to provide the County with an updated planning tool that can be used to manage, guide, and design a transportation network that improves connectivity, mitigates congestion and accommodates new development and growth throughout the County. The primary objective is to ensure preservation of adequate rights of way.



Key Findings for I-45 PEL

Interchange intersections on I-45 are the top 6 crash event locations in all of Montgomery County.

Population in Montgomery County is expected to grow from 518,947 (2014) to almost 1.2 million by 2040. Montgomery County is the 13th fastest growing county in the nation.

The plan contains several thoroughfares around and crossing I-45 in the project area. See page 49 of document for a map. These will be helpful in developing improvement strategies for I-45.



Study Name: The North Freeway Transitway: Evaluation of the Second Year of Barrier-Separated Operation

Agency: TTI **Year Completed:** 1988

Study File Reference ID: 32

Summary of Study

The report documents the second year's operation of the I-45 North Freeway Transitway, from December 1985 to November 1986. Impacts to the freeway mainline traffic are assessed through an analysis of travel times and speeds. The study includes analysis of high occupancy vehicles, park and ride volumes, travel time savings, violation rates and a variety of other performance measures.

**THE NORTH FREEWAY TRANSITWAY:
EVALUATION OF THE SECOND YEAR
OF BARRIER-SEPARATED OPERATION**

Prepared by
Darrell Borchardt
Engineering Research Associate
and
Stephen E. Ranft
Research Associate

Research Report 339-12

Improving Urban Mobility Through Application
of High Occupancy Vehicle Priority Treatments

Research Study Number 2-10-84-339

Sponsored by
Texas State Department of Highways and Public Transportation
in Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

TEXAS TRANSPORTATION INSTITUTE
The Texas A&M University System
College Station, Texas 77843

March 1988

Key Findings for I-45 PEL

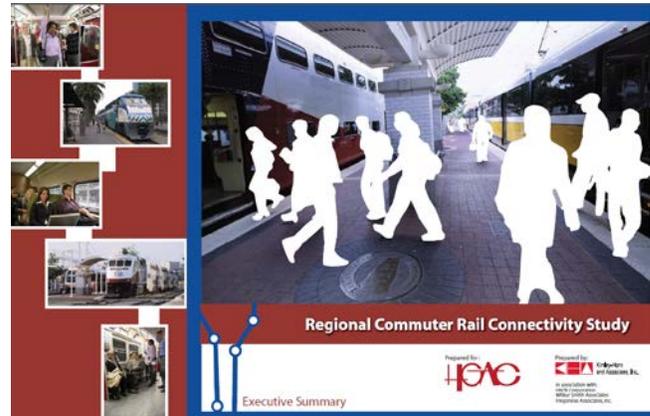
The report is quite old, but may be helpful in demonstrating how operations have changed over time.

Study Name: Regional Commuter Rail Connectivity Study
Agency: H-GAC **Year Completed:** 2008
Study File Reference ID: 33

Summary of Study

The study evaluates potential long-distance commuter rail in the Houston area. The study states that an FRA compliant, long distance rail system is feasible to develop and would be compatible with the existing freight rail system.

The study evaluated possible commuter rail corridors in the region. Corridors were evaluated on 2035 demand, capital costs per mile, implementability, urban center connectivity, and economic development potential.



Key Findings for I-45 PEL

The Hardy Toll Road option (roughly following Hardy Toll Road and I-45 North Freeway) was one of 5 corridors selected as the study principal corridors.

However, the Hardy Toll option is not shown on the Baseline System Plan map and is replaced by one roughly following SR 249 to the west because it provided a better connection to the proposed downtown hub.

This study may provide the framework for a commuter rail alternative strategy to alleviate I-45 congestion.

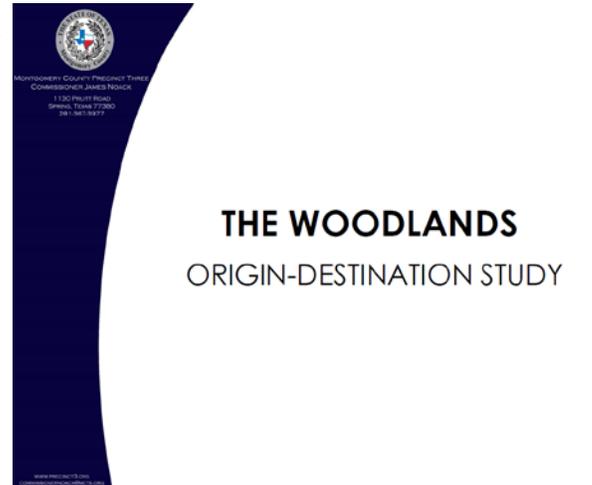
Study Name: The Woodlands Origin-Destination Study
Agency: Montgomery County Precinct 3 **Year Completed:** 2017
Study File Reference ID: 34

Summary of Study

The study is a summary of a Bluetooth origin-destination (OD) study in The Woodlands area.

The study sampled 2.4-5.2% of the daily traffic population.

The study shows OD patterns for twelve locations around The Woodlands, including I-45 north of FM 1488 and I-45 south of Grand Parkway.



Key Findings for I-45 PEL

I-45 north of FM 1488 – SB Traffic Origin:

- 31% to I-45 south of Hardy Toll Road, 10% to Hardy Toll Road
- 13% to The Woodlands west of I-45
- 32% to Sawdust

Hardy Toll Road near Grand Parkway - NB traffic Origin:

- 17% Sawdust
- 25% The Woodlands
- 49% I-45 north of FM 1488

I-45 south of Grand Parkway – NB traffic origin:

- 18% Sawdust
- 22% The Woodlands
- 50% I-45 north of FM 1488

Recommends:

- Work with TxDOT to alleviate traffic congestion on I-45 and The Woodlands Interchanges
- Construct Budde/Richard Road under I-45 to alleviate Sawdust / Rayford interchange
- Widen Sawdust to 8 lanes
- Develop The Woodlands Loop

Study Name: 2005 Hurricane Rita Evacuation: FEMA Lessons Learned

Agency: FEMA

Year Completed: 2008

Study File Reference ID: 35

Summary of Study

The document outlines an interactive hurricane evacuation map that aids travelers in the event an evacuation is ordered. It also contains some information on the 2005 Hurricane Rita event.

On September 20, 2005, Texas officials ordered the evacuation of 3 million residents in Chambers, Galveston, Harris and Matagorda counties in response to the approach of Hurricane Rita. Although the evacuation was staged, residents had significant confusion about the timing of the evacuation. Evacuees encountered heavy traffic congestion and experienced unprecedented delays on routes to Austin, Dallas and San Antonio (including I-45).

After the event, agencies worked to simplify the hurricane evacuation maps and prepared an interactive map on the web.



Key Findings for I-45 PEL

I-45 is a hurricane evacuation route. There is a significant system in place to stage and route hurricane evacuees.

The project may need to coordinate activities with Harris County Office of Homeland Security and Emergency Management (HCOHSEM) on project improvements.



Study Name: Harris County Truck Route Study
Agency: Harris County Engineering Department **Year Completed:** 2016
Study File Reference ID: 36

Summary of Study

The study identifies appropriate routes for investment that would serve the needs of the business community and enhance the efficient flow of truck traffic in the region.

The study uses a two-step approach to assess truck routes:

- Route suitability: planning-level classification of roads based on how appropriate truck traffic would be on a given route
- Route functionality: engineering-level classification of roads based on the ability of a truck to use a road given its current condition

The study identifies level 1 & 2 truck routes. Level 1 roads are routes which both legal and OSOW trucks are encouraged to travel. Level 2 roads are routes where truck travel is accepted.

Harris County Truck Route Study Phase I Report

Prepared for
Harris County Engineering Department

Prepared by
Dannenbaum Engineering Corp.
in association with
Cambridge Systematics, Inc.

December 7, 2016

Key Findings for I-45 PEL

There are several connections of the Harris County Truck Routes to I-45:

Level 1:

- Rankin Road
- Kuykendahl Road
- Airtex Drive
- Holzwarth Road
- Louetta Road
- Hardy Toll Road

Level 2:

- Richey Road
- Cypresswood Drive
- Meadow Edge Lane
- Spring Cypress Road
- Spring Stuebner Road
- Riley Fuzzel Road

These interchanges should accommodate large trucks at the interchanges.

Study Name: North Houston Association Strategic Mobility Plan
Agency: North Houston Association **Year Completed:** 2013
Study File Reference ID: 37

Summary of Study

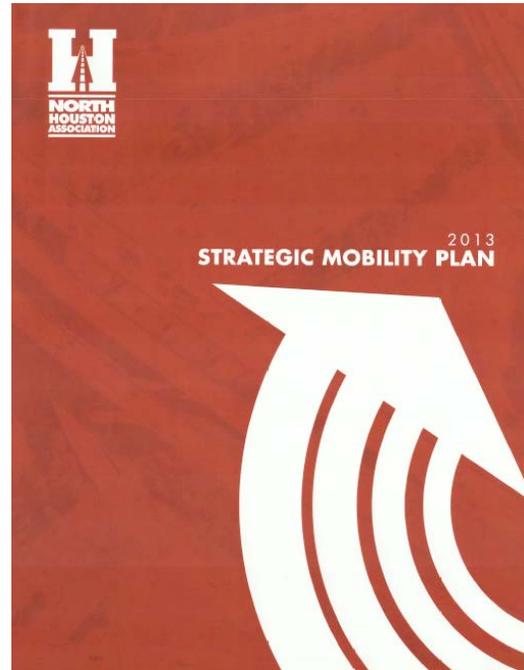
The purpose of the plan is to identify and advocate for specific regional strategic mobility projects that will improve mobility, connectivity, enhance business opportunities, and benefit the quality of life for businesses and residents in the Association's service area.

The group advocates the following Regional Traffic Flow Improvements:

- Park and Ride Lots
- HOV/HOT Facilities
- Traffic Signal Improvements
- Intersection Improvements
- Pavement Markings
- Access Management

They also advocate the following alternative commuting methods:

- Transit
- Bicycle / Pedestrian travel
- Compressed work weeks
- Telework
- Ridesharing
- Vanpooling



Key Findings for I-45 PEL

The plan includes I-45 North from Downtown Houston to Conroe (Implement managed improvements and extend HOV lanes from FM1960 to Loop 336, widen and include managed toll HOV lanes). It also identifies I-45 as a possible high speed rail corridor.

The North Houston Association should be a potential stakeholder for the project.

Study Name: 2018 Texas Freight Mobility Plan

Agency: TxDOT

Year Completed: 2018

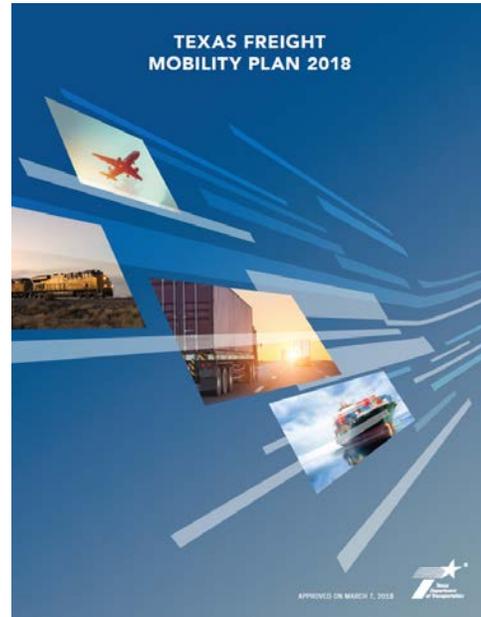
Study File Reference ID: 38

Summary of Study

The 2018 Texas Freight Mobility Plan expands on the 2016 Freight Plan to ensure a comprehensive approach for facilitating the efficient and safe movement of people and freight while meeting new federal requirements.

The 2018 Freight Plan builds on the framework for the state's comprehensive freight planning program and decision-making by:

- Outlining high-, medium-, and low-priority plans for freight investments and planning activities
- Identifying freight transportation facilities that are critical to economic growth and goods movement and updating the Texas Multimodal Freight Network through a comprehensive, data-driven, stakeholder-informed process
- Providing strategies to enhance economic growth and competitiveness by focusing on key freight intensive industries throughout the state and improvements on the Freight Network
- Updating the economic impact of all freight modes on Texas and its economy
- Validating and expanding policies and investment strategies to enhance Texas' freight transportation system
- Ensuring consistency with neighboring states and federal goals and objectives
- Providing a realistic implementation plan focused on immediate and robust strategies to ensure prioritized needs will be addressed within a reasonable timeframe



Key Findings for I-45 PEL

I-45 is identified as one of the key highway corridors being used by the agriculture industry in Texas.

I-45 is a major freight corridor, providing connections to major seaports and inland ports.

Houston has the most bottlenecks of any urban area in Texas with six of the nine which includes I-45 at US 59 and I-45 at I-610 N.

Truck tonnage is forecasted to increase by 108 percent between 2016 and 2045, and I-45 is expected to remain among the top three corridors carrying the most tonnage.

The Texas 5-Year Financially Constrained Freight Investment Plan (FIP), identifies I-45 as one of the highways eligible for the National Highway Freight Program.

Study Name: City of Oak Ridge North Comprehensive Plan

Agency: City of Oak Ridge North

Year Completed: 2013

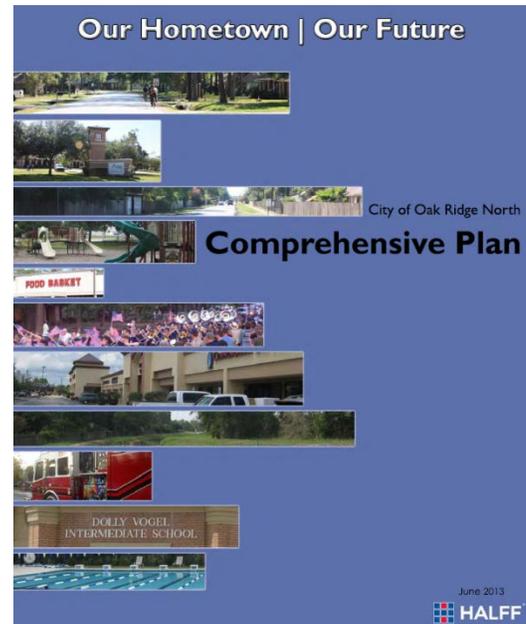
Study File Reference ID: 39

Summary of Study

The City of Oak Ridge North's comprehensive plan lays out the vision for the future of the city, while respecting the goals and priorities set by the citizens. Area transportation and traffic congestion was identified by residents as the top issue to address. The plan identifies transportation objectives and recommended strategies to improve transportation in the area.

The key transportation issues include:

- Maintaining access to other destinations in the region
- Facilitating movement within the City
- I-45 frontage road access to Woodlands Parkway/Robinson Road
- Addressing non-vehicular modes of travel in Oak Ridge North



Key Findings for I-45 PEL

One of the City's top transportation issues is to address potential changes to the ramping and configuration along the I-45 and Robinson Road intersections.

The increase in regional traffic volumes, primarily related to I-45 access, is acknowledged as a transportation concern.

The plan recommends collaboration between the City of Oak Ridge North and TxDOT to improve access to and from the I-45 frontage roads at the Woodlands Parkway and Robinson Road.

The plan recommends working with regional entities to develop regional transportation solutions that respect the small town character of the City.

The plan recommends the adoption of a complete streets policy, and the development of a network of sidewalks and bicycle lanes to encourage non-vehicular local trips.

Study Name: Houston Major Thoroughfare & Freeway Plan

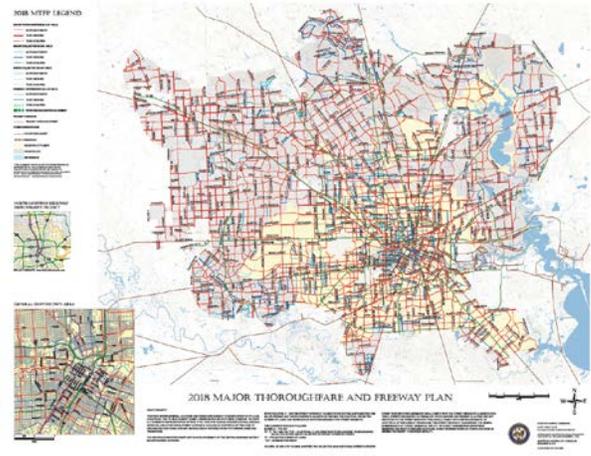
Agency: City of Houston

Year Completed: 2018

Study File Reference ID: 40

Summary of Study

This document is a schematic representation of ROW. It is a tool for guiding ROW dedications, building setbacks, and other development actions.



Key Findings for I-45 PEL

The document identifies the street ROW requirements within the I-45N PEL study area.

The document identifies I-45 as having a sufficient width. However, the document indicates that some major thoroughfares and major collectors within the study area require widening or acquisition.

Study Name: 2015 George Bush Intercontinental Airport/Houston Master Plan
Agency: Houston Airport System **Year Completed:** 2015
Study File Reference ID: 41

Summary of Study

The George Bush Intercontinental Airport/Houston (IAH) Master Plan provides a recommended implementation plan for near-term and long-term improvements to the airport based on the issues identified across the airfield, terminal, landside/access, and other areas. The IAH Master Plan provides recommendations that have been informed by an assessment of existing conditions, aviation forecasts, and facility requirements.

The Master Plan 2035 vision is to provide an airport that is safe and efficient, increasingly cost-competitive, aesthetically pleasing, and highly effective in serving the greater Houston community.



Key Findings for I-45 PEL

The IAH Master Plan references a Rail connection to IAH Airport. It is unclear if this affects I-45 near Beltway 8.

The roadways and parking facilities within the terminal area will require additional capacity as passenger activity increases and congestion worsens. It is unclear if this affects I-45.

Study Name: Houston and Port Houston – A History of Vision

Agency: Port of Houston Authority

Year Completed: -

Study File Reference ID: 42

Summary of Study

This presentation provides an overview of the Port of Houston's history, as well as the Port of Houston's modern day freight characteristics.

Growth in freight volume 2040:

- Rail freight will almost double in Texas
- Truck traffic will more than double in Texas
- Equivalent of over 5 million trucks per year being displaced by rail in the Houston area only

Expansion of the Panama Canal is anticipated to expand Asian imports through the Port of Houston, bringing larger and more ships.

Several projects are planned and underway to enhance the Port of Houston's capacity to accommodate anticipated growth in freight volume, including:

- Deepening, widening, and lengthening multiple channels to accommodate larger ships
- Improvement and replacement projects on wharves, sheds, dock areas, lower-level roads, and staging areas
- Improving and expanding roads to improve inland access



Key Findings for I-45 PEL

The Port of Houston is the #1 U.S. port by foreign waterborne tonnage (169.9M tons).

The turning basin capital investment project references direct on-deck rail access and direct interstate access. It is unclear if this affects I-45 near the Port of Houston.

TxDOT should identify key freight bottlenecks that may be exacerbated by the anticipated freight growth.

Study Name: Cypress Creek Hike & Bike Trail System
Agency: - **Year Completed:** -
Study File Reference ID: 43

Summary of Study

This presentation provides site plans for a proposed trail crossing underpass below I-45 and along Cypress Creek in Spring, Texas.

The plans illustrate design features to consider for the development of bicycle and pedestrian trail facilities underneath I-45 and its frontage roads. The proposed trail is in the flood zone.



Key Findings for I-45 PEL

The plans in this document should be considered if the improvement of bicycle and pedestrian accommodations is among the alternative solutions for the I-45 PEL study.



Study Name: IH 45 and FM 1488 Traffic Study

Agency: City of Conroe

Year Completed: 2016

Study File Reference ID: 44

Summary of Study

This traffic study evaluated the I-45 and FM 1488 interchange existing and projected traffic counts, and recommended alternative concepts that could improve future traffic flows.

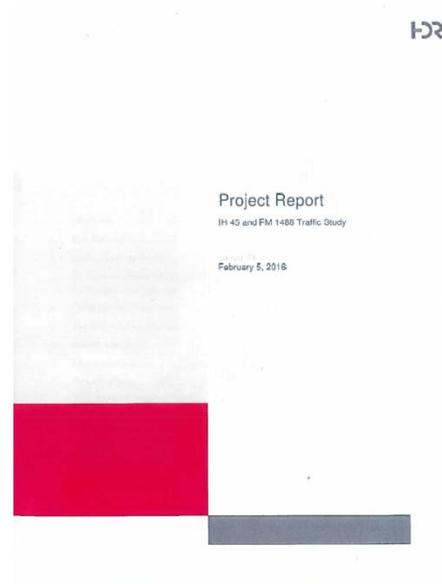
The study identified the following problem areas:

Cut-through traffic on the northwest side:

- No access to I-45 SB frontage road or EB FM 1488 from northwest side of intersection.
- One of the study objectives is to develop alternatives to provide access to the sports park in this area to avoid unsafe traffic movements.

I-45 northbound frontage road weave:

- Two loop ramps on east side of interchange entail 500 foot weave along the northbound I-45 frontage road.
- One of the study objectives is to develop alternatives to address high congestion in the weave area.



Key Findings for I-45 PEL

Consider identified problem areas and/or recommended solutions as part of I-45N PEL study.

The study recommends an alternative concept that would operate at an acceptable LOS based on 2025 traffic projections:

- Concept 3: remove loop ramps on east side of interchange and add proposed intersection with two exclusive left turn lanes and one through lane on eastbound approach
- Concept 4: Add diverging diamond interchange configuration; requires further evaluation

Study Name: 2018 Strategic Mobility Plan
Agency: North Houston Association **Year Completed:** 2018
Study File Reference ID: 45

Summary of Study

This Strategic Mobility Plan (SMP) identifies the top NHA mobility projects from a ranked list of over 75 projects that aim to address mobility concerns of over 20 agencies and organizations in the area.

NHA members ranked projects based on mobility, safety, economic development impact, and achievability. The resulting 19 prioritized projects require either financial or political/public support.



Key Findings for I-45 PEL

The following 10 prioritized projects fall within the PEL study boundary:

- Aldine Westfield Rd. (Riley Fuzzel Rd. to Jensen Dr.) (A)
- Ella Blvd. at Kuykendahl (B)
- Hardy Toll Rd. at Beltway 8 – DCs (G)
- Holzwarth Rd./Springwoods Village Pkwy. (H)
- I-45N – Downtown Houston to Conroe (I)
- I-45 at SH 99 – DCs (J)
- Old Conroe Magnolia Rd. Extension (M)
- Research Forest Dr. at Grogan's Mill Rd. (N)
- Richey Rd. (Ella to Veterans Memorial) (O)
- Robinson Rd. (P)

The North Houston Association should be a potential stakeholder for the project.

