

*Results Summary*  
for the  
**Galveston-Houston Mobility Corridor  
Alternatives Analysis**



*Submitted to*

**Federal Transit Administration**



*Prepared for*

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## Results Summary

### Background

Two recently completed studies have relevance to the Alternatives Analysis (AA) effort. The first study is the Houston-Galveston Area Council's (H-GAC) *Commuter Rail Connectivity Study*, conducted by Kimley-Horn and Wilbur Smith, which addressed commuter rail within H-GAC's eight-county region. This study addressed only commuter rail and did not address BRT. The second study, *Galveston-Houston ITS Commuter Rail Study*, developed the rail alternatives that are proposed for further study. Although this study addressed BRT, it was not at a level necessary for a comprehensive comparison with other alternatives, as anticipated in the AA.

The AA effort is being conducted as part of a federalized process that sets forth requirements to guarantee that all relevant alternatives are analyzed in a consistent and unbiased manner. Therefore, a variety of alternatives have been developed, including a low capital cost TSM alternative; a Bus Rapid Transit (BRT) alternative operating on exclusive transitways on either IH 45 or a combination of SH 3, Old Galveston Road, and IH 45; and a commuter rail alternative (CRT) that would use an existing freight rail line (GH&H) owned by Union Pacific (UP) Railroad.

The AA effort began in December 2009 at the bequest of the City of Galveston, as supported by Galveston County. Many of the documents referenced here have been reviewed by the Federal Transit Administration (FTA) as part of the New Starts process designed to support projects worthy of federal assistance and to eliminate those that do not qualify for federal funding. The AA effort has progressed to the stage where the alternatives developed and analyzed can be compared across a set of criteria that meet federal requirements as presented in FTA's Guiding Principals for Conducting an Alternatives Analysis, which include the following:

- Analysis and evaluation of alternatives at a level of detail necessary to support the decision-at-hand. The AA should produce reliable information that illuminates the trade-offs between alternatives.
- Selection of a Locally Preferred Alternative (LPA) based on full disclosure and understanding of the estimated costs, benefits, and impacts of all of the alternatives.

### Introduction

A set of alternative technologies and alignments were designed to address the mobility needs of the corridor. This document presents a summary of the results of the alternatives being analyzed, the criteria used, and the results obtained to date for the Galveston-Houston Mobility Corridor. Specific references are made to other documents that support and provide details for this results summary.

## Alternatives

- **Do Nothing** is limited to current H-GAC fiscally constrained projects contained in H-GAC's Long-Range Regional Transportation Plan.
- **Transportation Systems Management (TSM)** is designed to improve transit services by enhancing efficiency and providing priority to transit without a significant investment in new infrastructure. The alignments include use of the existing HOV lane on IH 45 and diamond lanes on SH 3 and either Broadway or Harborside on Galveston Island.
- **Bus Rapid Transit (BRT) IH 45** is designed to provide two-way service on a predominantly exclusive guideway or transitway. The alignments include provision of a two-way transitway within the IH 45 ROW as expanded and diamond lanes on either Broadway or Harborside on Galveston Island. Three different options were developed within this alternative. A Standard option that meets current TxDOT and FHWA standards; an Interim, or temporary, option; and a Minimum option that would use existing buffers and shoulders. The Interim and Minimum BRT IH 45 options have been eliminated because they failed to meet TxDOT or FHWA standards. The Standard option is advancing forward to be compared to the other alternatives.
- **Bus Rapid Transit (BRT) SH 3** is designed to provide two-way service on a predominantly exclusive guideway or transitway. The alignments include SH 3, Old Galveston Road, IH 45 between 610 and the Dowling intersection at IH 45, and diamond lanes on either Broadway or Harborside on Galveston Island.
- **Commuter Rail Transit (CRT)** is designed to provide two-way service within the existing UP Railroad ROW on the GH&H alignment located approximately one mile to the east of IH 45.

These alternatives are presented in *Figures 1 through 4*.



Figure 2

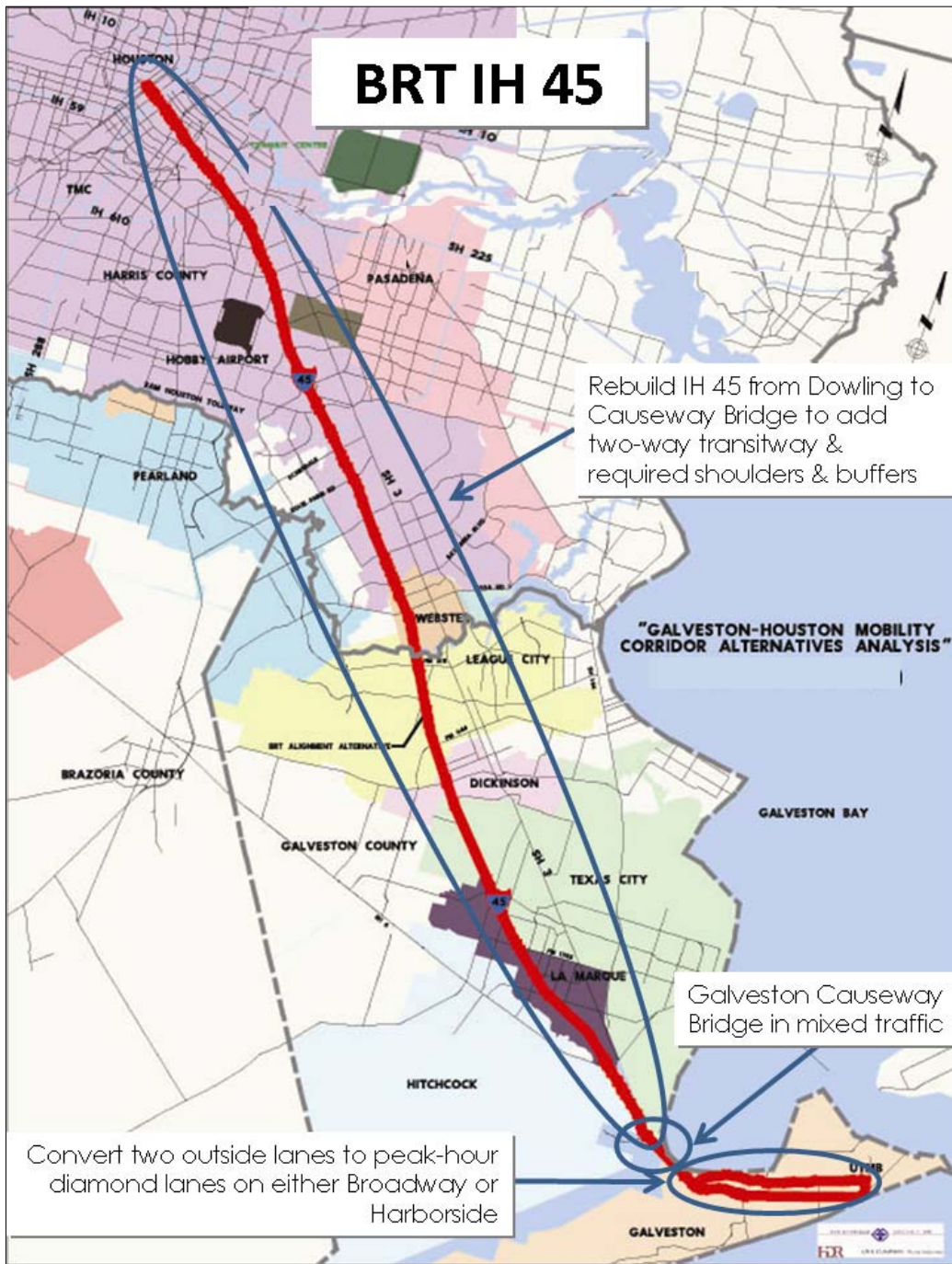
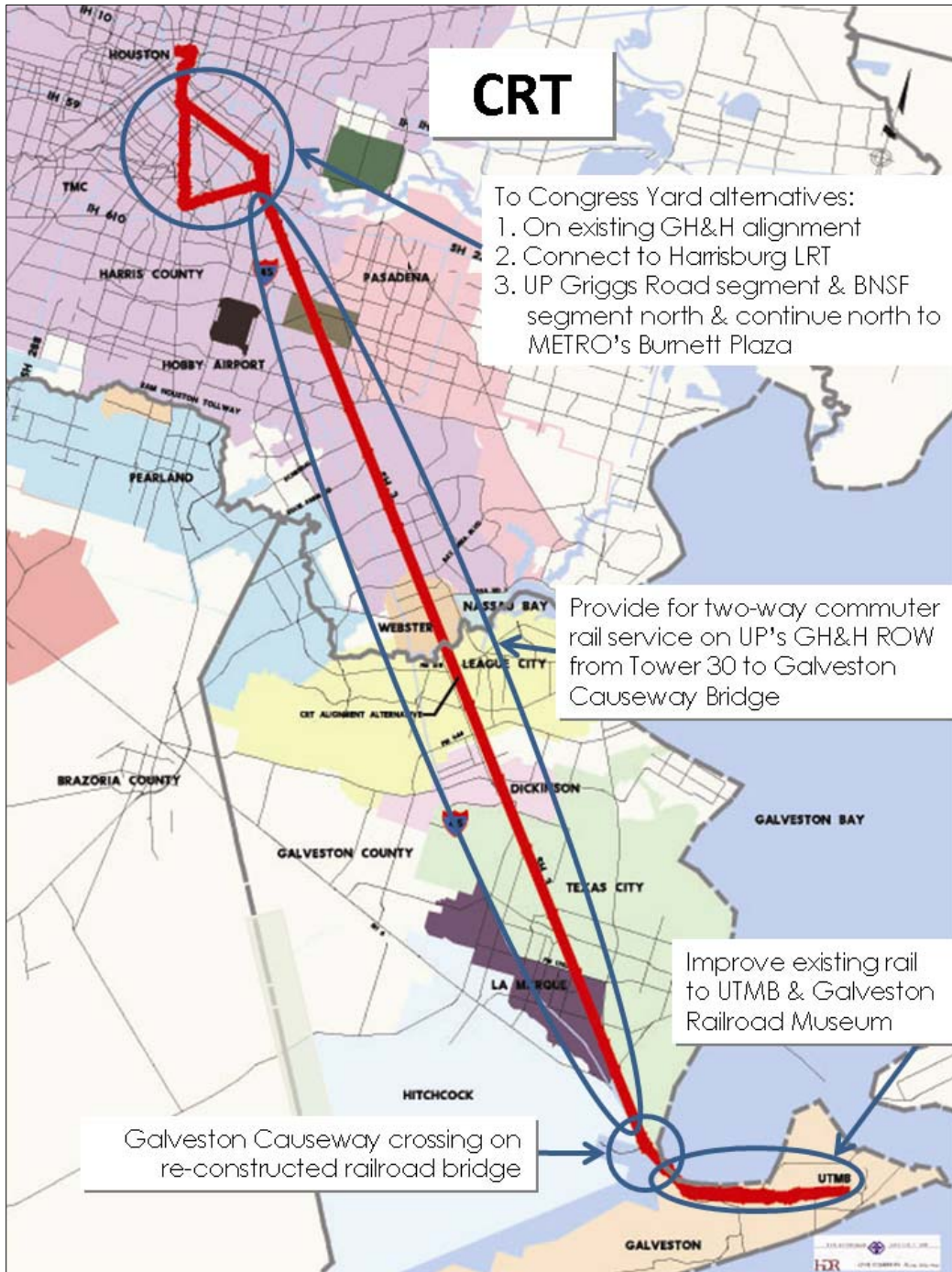




Figure 4



These alternatives are described in a companion document titled Corridor Alternatives for the Galveston-Houston Mobility Corridor Alternatives Analysis. The methodology and criteria applied in the AA are described in a companion document titled Evaluation Plan and Methodology for the Galveston-Houston Mobility Corridor Alternatives Analysis. *Table 1* presents the evaluation criteria and source of supporting documentation.

<b>Table 1 – Evaluation Criteria and Documentation References</b>	
<b>Criteria</b>	<b>Supporting Documentation</b>
<b>DESIGN</b>	
ROW Requirements	ROW Requirements, Community Disruption, Costs, Timeline
Park & Ride Requirements	ROW Requirements, Community Disruption, Costs, Timeline
System Connectivity - Other Transit Services	Addressed in <i>Table 2</i>
Engineering Constraints	ROW Requirements, Community Disruption, Costs, Timeline
<b>MODELING OUTPUTS</b>	
Travel Demand/Ridership	Ridership Forecast Methodology
Reduced Emissions	Ridership Forecast Methodology
Travel Time	Ridership Forecast Methodology
<b>FINANCIAL</b>	
Conceptual Capital Costs	ROW Requirements, Community Disruption, Costs, Timeline
Annual Operating and Maintenance Cost	ROW Requirements, Community Disruption, Costs, Timeline
Operating and Maintenance Cost per Passenger Trip	ROW Requirements, Community Disruption, Costs, Timeline
<b>PUBLIC INVOLVEMENT</b>	
Community Involvement	Demographic, Land Use, and Social Concerns
Interagency Consensus	Not available at this time
Stakeholder Consensus	Not available at this time
<b>ENVIRONMENTAL IMPACTS</b>	
Environmental Analysis	Environmental Analysis
Land Use/Development Impacts	Demographic, Land Use, and Social Concerns
<b>DEMOGRAPHIC/LAND USE/SOCIAL CONCERNS</b>	
Emergency Evacuation	Demographic, Land Use, and Social Concerns
Transit Oriented Development (TOD)	Demographic, Land Use, and Social Concerns
Ability to Serve Jobs and Housing Densities	Demographic, Land Use, and Social Concerns
Transit Needs Index (TNI) performance	Demographic, Land Use, and Social Concerns
Environmental Justice/Title VI	Environmental Justice - Title VI

These criteria were applied to each alternative in the analysis of the cost and benefits associated with each in order to produce reliable information that illuminates the trade-offs between alternatives, thereby responding to FTA’s Guiding Principals for Conducting an AA. *Table 2* presents these results.

<i>Evaluation Criteria</i>	<i>No Build</i>	<i>TSM</i>	<i>BRT IH 45 Standard</i>	<i>BRT SH 3</i>	<i>CRT</i>
<b>DESIGN CRITERIA</b>					
ROW Requirements	n/a	none	627 parcels (157 acres)	663 parcels (171 acres)	6 to 82 parcels (4.3 to 5 acres)
Park & Ride Requirements	n/a	300 spaces (3 acres)	2,550 spaces (25 acres)	3,075 spaces (31 acres)	3,925 spaces (39 acres)
System Connectivity- Other Transit Services	No Build Alternative is the approved & funded RTP	All build alternatives provide direct connections to METRO Solutions, METRO fixed routes, Island Transit, Harris County Transit, Texas City/La Marque Transit, & (via shuttles) Hobby Airport, Johnson Space Center, Texas Medical Center, Eastwood Transit Center, UH, & TSU			
Engineering Constraints	n/a	None	Rebuilding IH 45 between SH 146 & Dowling	Rebuilding SH 3, Old Galveston Road, & IH 45 between IH 610 & Dowling	New bridges over Towers 30 & 85; light rail interface on Harrisburg
<b>MODELING OUTPUTS</b>					
Weekday Ridership (Trips)	n/a	1,000	8,250	9,400	10,300
Weekday Reduced Emissions (NOx, VOC, CO)	n/a	90.41 Kg	550.69 Kg	626.67 Kg	658.06 Kg
Travel Time	n/a	101 minutes	84 minutes	87 minutes	67 minutes
<b>FINANCIAL</b>					
Conceptual Capital Costs	n/a	\$35 million	\$2.6 billion	\$2.2 billion	\$860 to \$975 million
Annual Operating & Maintenance Costs	n/a	\$4.6 million	\$8.9 million	\$9.6 million	\$12.8 million
Operating & Maintenance Cost per Trip	n/a	\$17.90	\$4.25	\$4.00	\$4.90
<b>PUBLIC INVOLVEMENT</b>					
Community Involvement	n/a	little support	little support	unknown	strong support
Interagency Consensus	n/a	unknown	unknown	unknown	unknown
Stakeholder Consensus	n/a	unknown	unknown	unknown	unknown
<b>ENVIRONMENTAL IMPACTS</b>					
Environmental Analysis	n/a	Some impacts; no fatal flaws			
Land Use/Development Impacts	n/a	Compatible; located in travel corridor			
<b>DEMOGRAPHIC/LAND USE/SOCIAL CONCERNS</b>					
Emergency Evacuation	n/a	Meetings with Galveston County’s Emergency Management Association to review the alternatives resulted in a preference for the CRT alternative			
TOD Opportunities	n/a	None	Moderate potential	Moderate potential	High potential
Ability to Serve Jobs & Housing Densities	n/a	Comparable performance			
TNI Performance	n/a	Comparable performance			
Environmental Justice/Title VI	n/a	No disproportionate impacts			

*Table 2* presents the results of applying the criteria presented in *Table 1* to the alternatives under study. These results are supported by the analysis presented in the documents listed in *Table 1* each corresponding to the criteria they support. For example, if there is a question concerning the criteria results, the supporting document is given in order to facilitate further exploration of the supporting research.

A simple rank ordering was applied to the results presented in *Table 2*. The score given is based on the performance of each alternative compared to the other alternatives. For example, on the ROW requirements criteria the range of required parcels and acres is ranked with a score of 4, for the least required, to 1 for the most required. In this case, the alternatives are ranked 4, 3, 2, or 1. Therefore, based on ROW required, the rankings show a score of 4 for the alternative needing the least ROW and a score of 1 for the alternative needing the most ROW.

The rankings presented next do not account for the order of magnitude of the differences between alternatives. The best performing alternative for the ROW criteria is the TSM alternative because it would require no ROW. The BRT IH 45 and the SH 3 alternatives would require more than 600 parcels and over 150 acres each, while the CRT alternative would require no more than 82 parcels and five acres. Although there is a significant difference in the performance of the alternatives on these criteria, they are ranked in order from 4, the best performing alternative, to 1 the worst performing alternative.

<b>Table 3 – Rankings of Alternatives</b>					
<i>Evaluation Criteria</i>	<i>No Build</i>	<i>TSM</i>	<i>BRT IH 45 Standard</i>	<i>BRT SH 3</i>	<i>CRT</i>
<b>DESIGN CRITERIA</b>					
ROW Requirements	n/a	4	2	1	3
Park & Ride Requirements	n/a	4	3	2	1
System Connectivity- Other Transit Services	No Build Alternative is the approved & funded RTP	Comparable performance			
Engineering Constraints	n/a	4	2	1	3
<b>MODELING OUTPUTS</b>					
Weekday Ridership (Trips)	n/a	1	2	3	4
Weekday Reduced Emissions (NOx, VOC, CO)	n/a	1	2	3	4
Travel Time	n/a	1	3	2	4
<b>FINANCIAL</b>					
Conceptual Capital Costs	n/a	4	1	2	3
Annual Operating & Maintenance Costs	n/a	4	3	2	1
Operating & Maintenance Costs per Trip	n/a	1	3	4	2
<b>PUBLIC INVOLVEMENT</b>					
Community Involvement	n/a	2	2	2.5	4
Interagency Consensus	n/a	unknown	unknown	unknown	unknown
Stakeholder Consensus	n/a	unknown	unknown	unknown	unknown
<b>ENVIRONMENTAL IMPACTS</b>					
Environmental Analysis	n/a	Comparable performance			
Land Use/Development Impacts	n/a	Comparable performance			
<b>DEMOGRAPHIC/LAND USE/SOCIAL CONCERNS</b>					
Emergency Evacuation	n/a	1	2	2	4
TOD Opportunities	n/a	1	2	2	4
Ability to Serve Jobs & Housing Densities	n/a	Comparable performance			
Transit Needs Index (TNI) Performance	n/a	Comparable performance			
Environmental Justice/Title VI	n/a	Comparable performance			
<b>Total</b>	<b>n/a</b>	<b>28</b>	<b>27</b>	<b>27</b>	<b>37</b>

The resulting scores of the alternatives rank both BRT alternatives the lowest, with a score of 27 each. TSM performs only slightly better with 28. CRT ranks as the best performing alternative with a score of 37. A quality check was performed on these ranking by focusing on some of the most important criteria, including the following: cost to build and implement, operating and maintenance costs, ROW required, ridership, and major engineering constraints. These criteria illustrate the most significant differences in order of magnitude, most of which favor either TSM or CRT. It was concluded that the rank ordering from 1 through 4 has underrated these order-of-magnitude differences; however, it has resulted in the same conclusions as those ranked in the ordinal method. In other words, the TSM and CRT alternatives would rank as the better of the alternatives by a wider margin if the order-of-magnitude method were used.

### *Recommendations*

Based on this evaluation and ranking, it is recommended that the CRT alternative be developed further to minimize implementation costs and optimize the service, and thereby address congestion and congestion effects in the corridor and improve performance across the New Starts criteria. The TSM alternative will be carried forward as it is a benchmark against which the build alternative, in this case the CRT alternative, will be compared for purposes of FTA's New Starts evaluation.