

*Evaluation Plan and Methodology*  
for the  
**Galveston-Houston Mobility Corridor  
Alternatives Analysis**



*Submitted to*

**Federal Transit Administration**



*Prepared for*

**City of Galveston**



*Prepared by*

**The Goodman  Corporation**

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# *Contents*

## **Section 1 – Project Summary**

Introduction.....	1-1
Goals and Objectives .....	1-2

## **Section 2 – Evaluation Criteria**

Identification of Evaluation Criteria .....	2-1
Evaluation Criteria .....	2-2
Design Criteria .....	2-2
Modeling Outputs .....	2-3
Public Involvement .....	2-4
Environmental Concerns.....	2-4
Evaluation Methodology.....	2-7

## **Section 3 – Conducting Evaluation**

Evaluation Resources.....	3-1
Evaluation Coordination .....	3-2
Interpreting the Results of the Evaluation Criteria .....	3-2
Reporting Evaluation Findings .....	3-3

## **Section 4 – Conclusion**

This project was funded in part through the Federal Transit Administration. The contents of this report reflect the analysis of The Goodman Corporation which is responsible for the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Transit Administration.

## Section 1 – PROJECT SUMMARY



### *Introduction*

The City of Galveston, Texas, in cooperation with the Houston-Galveston Area Council (H-GAC), Texas Department of Transportation (TxDOT), Metropolitan Transit Authority of Harris County-Houston, Texas (METRO), Gulf Coast Rail District, Galveston County, Harris County, City of Houston, and 11 other cities that will be served by the mobility improvements in the mobility corridor, is conducting an Alternatives Analysis (AA) of prospective transit improvement options for the corridor to enhance mobility and reduce congestion in the heavily traveled corridor. Improved mobility in the Galveston-Houston Mobility Corridor will allow the southeast portion of the Houston metropolitan region to keep pace with its growing share of regional activity that is home to three ports, seven major colleges and universities, three medical centers, and NASA/Johnson Space Center. The AA will be evaluating all suitable transit alternatives that offer the ability to meet the goals and objectives that were presented in the Purpose and Need Statement in the Project Initiation Package.

The AA is being conducted in strict compliance with applicable Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) guidelines. The alternatives that will be developed and evaluated include four potential mobility solutions:

- No Build Alternative
- Transportation Systems Management (TSM) Alternative
- Bus Rapid Transit (BRT) Alternative
- Commuter Rail Transit (CRT) Alternative

These alternatives will be evaluated in an unbiased and consistent manner by applying a number of planning variables and service assumptions to allow for the direct comparison of costs, benefits, and impacts. The purpose of this Evaluation Plan is to outline the criteria, methodology, and process for conducting the AA evaluation. Detailed evaluation criteria and methodology are presented in this report, which will be distributed to the City of Galveston, FTA, and other relevant agencies for review, comments, and approval. Following these reviews, the evaluation criteria and methods will be modified as appropriate, in response to the comments received. The evaluation process outlined in FTA's *Procedures and Technical Methods for Transit Project Planning; Part II: Conduct of the Analysis; and Chapter 9, Evaluation of Alternatives* will serve as guidelines in conducting the AA. The evaluation criteria will focus on the established goals and objectives of the study and specific regional activities associated with the mobility corridor.

The evaluation process will reflect a detailed assessment of the technical aspects of each alternative, including procedures addressing impacts and influences on transportation systems, mobility, and travel patterns, and any impacts to and compatibility with the natural, manmade, and social environments. The analysis will include an examination of any opportunities for Transit-Oriented Development (TOD) and private sector economic investments. The evaluation process will focus on, but will not be limited to, the following basic measurement categories:

- **Effectiveness** – Extent to which the alternatives solve the stated transportation problems in the corridor;
- **Impacts** – Extent to which alternatives impact, positively or negatively, nearby natural resources and neighborhoods, air quality, the adjacent transportation network and facilities, land use, the local economy, TOD, and other area concerns;
- **Cost-Effectiveness (or cost/benefit analysis)** – Extent to which the costs of the project, both capital and operating, are commensurate with its benefits;
- **Financial Feasibility** – Extent to which the funds required for the construction and operation of the alternative are readily available and do not place undue burdens on the sources of those funds; and
- **Equity** – Extent to which the costs and benefits are distributed fairly across different population groups.

Typically, the goals and objectives of transportation improvement projects can best be met by assessing the alternatives based on the evaluation measurements that fall into the above categories. For the most part, the measurements are quantitative and allow for an effective comparative analysis among alternatives.

## ***Goals and Objectives***

The initial step in developing this Evaluation Plan is having a strong understanding of the background and context in which the AA is being conducted and having well-defined goals and objectives for the project. The Purpose and Need Statement in the Project Initiation Package includes a problem statement and describes the goals and objectives that are the focus of the AA. Ultimately, the goal of the selected Locally Preferred Alternative (LPA) is to attract a large number of new transit riders, save time, fuel and money while improving job access, reducing emissions, assisting with evacuation in a hurricane event, improving the quality of life for area residents, and supporting and being supported by a more successful Houston region; the fourth largest city in the nation.

In addition to the corridor-specific goals inherent to the southeast quadrant of the Houston metropolitan region, the goals of H-GAC, as stated in its *2035 Regional Transportation Plan (RTP)*, are also to be served. The RTP goals include the following:

- Improve mobility and reduce congestion;
- Improve access to jobs, homes, and services;
- Increase transit options;
- Coordinate transportation and land use plans; and
- Create a healthier environment.

In developing the evaluation framework, the evaluation process must focus on local mobility needs and the issues of concern that justify the development of the transit improvement. The specific objectives associated with the defined purpose and need for the mobility corridor, include the following:

- Improve travel times in the corridor;
- Increase access to employment opportunities;
- Provide connectivity between downtown Houston and Galveston and the many communities and activity centers in between;
- Continue development of a comprehensive, multimodal, and interconnected regional transit network;
- Support and sustain economic development within the mobility corridor;
- Reduce traffic congestion;
- Reduce fuel consumption and automobile emissions;
- Increase mobility options for residents and employees;
- Provide mobility alternatives to support the needs of low-income, minority, and physically disabled individuals;
- Reduce energy consumption and carbon footprint of the mobility corridor;
- Balance the costs (capital and operating) with benefits (e.g., reduction in VMT);
- Support mixed-use, smart, high-density sustainable mixed-use/infill development; and
- Increase evacuation capacity.



## Section 2 – EVALUATION CRITERIA

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# 2

This section presents descriptions of the evaluation criteria to be employed to evaluate and compare the alternatives in the AA. The selected criteria have been designed to focus on the attributes and liabilities of each alternative in an unbiased and consistently applied process. Each criterion will be defined and the measurement application will be described.

### *Identification of Evaluation Criteria*

The identification of evaluation criteria requires that the purpose and need are clearly defined and the goals and objectives of the project are outlined. While there are prescribed evaluation criteria required by FTA when applying for funding for a New Starts project, the evaluation criteria also should specifically address local needs and concerns. The evaluation process has been designed to address specific needs in the corridor. There are a number of considerations that impact the identification and development of the evaluation criteria and measurements:

- Evaluation criteria should relate to local concerns and be developed with appropriate input from local decision-makers and stakeholders. The Evaluation Plan and Methodology Report will be forwarded to the City of Galveston, FTA, and other relevant agencies for review and comment prior to evaluating the alternatives. Where appropriate, input received will be incorporated into the plan;
- Evaluation measures should be comprehensive to address the stated objectives;
- Efforts should be made to apply evaluation measures that quantify impacts rather than convey qualitative judgments on the nature of the impact;
- Evaluation measures should provide the proper perspective on the magnitude of the impacts. While some impacts may seem large in absolute numbers, these numbers must be interpreted within the context of the project life and the noticeable impact or benefit that can be directly attributable to the alternative; and
- Discussion of measurements should indicate the level of accuracy or margin of error reflected in the measurement. The greater the margin of error, the less profound the impact may be.

In identifying the evaluation criteria and measurements, a goal is to develop an evaluation plan and methodology that addresses the mobility concerns of the corridor while effectively providing a comparison of strengths and weaknesses, costs and benefits, constructability, and mitigation requirements. The evaluation criteria address a wide range of issues that are important to the vitality of the corridor. The evaluation procedures analyze impacts and influences on transportation systems, mobility, and travel patterns and examine impacts to and compatibility with the natural, manmade, and social environments.

The evaluation process is iterative and the broad range of identified evaluation criteria will be applied at various stages of the AA and refinement processes. There will be a two-tiered process for screening the alternatives, using the well-defined set of criteria. The evaluation criteria for both the initial and final screening will be the same; however, the application and specificity of

the criteria will be in greater detail during the second phase of the evaluation in an effort to select the LPA that most effectively meets the goals and objectives of the project. The evaluation criteria identified in the Project Initiation Package and the Project Management Plan will be employed as the comparative measurements for assessing the alternatives.

## *Evaluation Criteria*

A comprehensive list of evaluation criteria has been identified that will provide a thorough assessment of the alternatives. The criteria are designed to provide tangible, measurable scales of performance in comparing the alternatives. The evaluation criteria are divided into the following six categories that group the criteria with related measurements and focus on specific project objectives.

- Design
- Modeling Results
- Financial
- Public Involvement
- Environmental
- Demographics

Each category is equally important in evaluating the alternatives and will provide a better understanding of the advantages and disadvantages of each alternative by grouping related evaluation criteria. The following presents detailed descriptions of the evaluation categories and the criteria that will be applied to assess the alternatives in the AA. *Table 2.1* provides a matrix of the evaluation criteria, descriptions, and associated measurements.

## *Design Criteria*

- ***Capital Costs*** – Conceptual costs associated with the construction of the transit improvement, including the estimated cost for building the alignment, signalization, and signage; station and parking lot development; associated traffic improvements; and other associated facility amenities. The costs will be measured in unit costs to allow for consistent comparison and possible alternative refinement, as needed.
- ***Right-of-Way Requirements*** – The real estate that will be acquired to accommodate the construction of the alignment and the stations and facilities associated with each alternative. The evaluation in the AA will include a comparison of the number of parcels impacted per alternative. In addition, estimates will be developed of the aggregate square footage of right-of-way required per alternative and a corridor average cost per square will be applied. A more detailed assessment of the right-of-way required will be conducted in the second tier evaluation and as part of the environmental assessment.
- ***System Connectivity/Compatibility with Other Plans and Policies*** – The ability to provide regional transit service within the context of H-GAC's 2035 RTP, and to be transparent in the delivery transit service between various providers. Compatibility with other regional and community transportation plans to avoid duplicative and/or conflicting

services. System connectivity will be measured by the relative seamless provision of transit service through the reduction travel times to key regional destinations. A summary review of planned projects within or adjacent to the corridor will identify inconsistencies among plans.

- ***Physical Ease of Implementation*** – An analysis that assesses the impact of right-of-way acquisition and the engineering constraints (e.g., relocation of high-tension power lines, grade separation over/under multiple railroad tracks, crossing bodies of water, impacts to other public properties) affecting the constructability of the project, the timeliness to complete, and any resultant disruptions to businesses along the corridor. Impacts to constructability will be measured by: a) the additional cost to construct or required mitigation, and b) the estimated time required to resolve the physical obstacle.

### *Modeling Outputs*

- ***Travel Demand/Ridership*** – Based on the most current demographic data and the defined operating characteristics of each alternative, the approved regional travel demand model will produce ridership projections for each alternative. The projected link trip volumes for each alternative will be compared.
- ***Ridership Capacity*** – The ability to provide the recommended service levels and prescribed link volumes based on travel demand projections and operating capacity of facility. The Level of Service (LOS) achieved in the corridor, along with the projected Passenger-Miles Traveled (PMT), will be the measures employed to compare the effectiveness of each alternative. These measurements will be obtained from the model outputs for each defined alternative.
- ***Travel Time Savings*** – The competitiveness of the travel time for each alternative will be assessed. This will be measured by the average travel time per passenger for each alternative. Travel times, for specific trips from origin to destination, will be compared for each alternative.

### *Financial*

- ***Financial Ease/Risks of Implementation*** – The extent of support or resistance to raise the necessary local funding share to support each alternative. Measured by the real and perceived ability to obtain local funding support, as evidenced by advisory committee feedback and letters of endorsement.
- ***Financial/Operating Plan*** – The ability to operate and maintain the service, as defined by the alternative, over time, given existing local financial capacity and constraints. Measured by lifecycle cost estimates and projected annualized operating costs.
- ***Cost/Benefit Analysis*** – The extent to which the cost of each alternative is commensurate with the measurable benefits of the project. The combined performance standards, such as ridership projections, improved air quality, and travel time savings, are measured against estimated capital and operating unit cost valuations.

## *Public Involvement*

- ***Community Involvement/Stakeholder Consensus*** – The concern and input conveyed by the community regarding the defined alternatives as expressed *support* or *opposition* by affected neighborhoods, businesses, public agencies, and other entities with a vested interest. The community consensus will be measured by tabulated votes taken at public meetings and by the volume of comments received through the public involvement process. A Galveston-Houston Mobility Corridor website has been established and the comments and input received at the website will be documented and monitored as part of the ongoing evaluation of alternatives.
- ***Interagency Coordination*** – The expressed interest and support in proceeding with a preferred alternative by the City of Galveston, City of Houston, H-GAC, TxDOT, METRO, Freight Rail District, Galveston County, Harris County, and the 11 other cities to be served by mobility improvements. Support or resistance to a particular alternative will be measured by the strength of the support or opposition and by the number and nature of the trade-offs that may be required to reach consensus among a large and diverse group of area agencies and governments.

## *Environmental Concerns*

- ***Environmental Impacts*** – The documented impact of an alternative on a number of prescribed environmental concerns, such as noise, vibration, traffic, flooding, and cultural and historical resources. The environmental impacts will be measured by the magnitude of impact defined by the cost to mitigate.
- ***Land Use/Development Impacts*** – The compatibility or impact to adjacent land uses as a direct or indirect result of implementation of an alternative. Land use impacts will be measured by the cost to mitigate or reduce disruptions to adjacent landowners. In addition, benefits of land use compatibility may be measured by reduced capital cost to construct facilities and opportunities for shared use operations and coordination.
- ***Air Quality*** – The extent to which each alternative leads to the reduction of air pollutants and helps the region meet federally mandated air quality standards. For each alternative, improved air quality will be measured by metric tons of reduced emissions for NOx and other pollutants per the lifetime dollar cost (both capital and annualized operating costs) of the completed project.
- ***Emergency Evacuation*** – The extent of each alternative to play an effective role in the evacuation of Galveston and Houston residents in the event of an emergency. The benefit will be measured by the compatibility of the transit improvement alternative with the regional evacuation plan and the input received from evacuation authorities. The ease and ability to provide evacuation services also will be measured by service capacity.

## *Demographic/Social Concerns*

- ***Transit-Oriented Development Opportunities*** – The potential for joint use and high density development as a direct or indirect result of the implementation of a transit alternative. The positive impact of the TOD will be measured by projected reduction in

VMT and in emissions associated with walkability, densities, and mixed-use development affected within 1,500 feet of a station location.

- ***Service to Jobs and Housing Densities*** – The ability to maximize the connections and travel times to key employment and housing centers. The alternatives will be measured by the Longitudinal Employer-Household Dynamics (LEHD) data base tool.
- ***Transit Needs Index (TNI) Performance*** – The ability of an alternative to serve geographical areas within the corridor with the greatest transit need, based on a series of demographic data (age, income, auto ownership per household, etc.). The alternatives will be measured as to the ability to effectively serve those locations with the highest TNI scores.
- ***Environmental Justice/Title VI Requirements*** – The consideration of potential disproportionate impacts on “traditionally underserved” communities as a result of implementation of an alternative. Measured by the number of impacts to an area or community as it relates to other communities in each alternative.

<b><i>Criteria</i></b>	<b><i>Description</i></b>	<b><i>Measurements</i></b>
Conceptual Capital Costs	Conceptual capital cost estimate to construct transit improvements & associated amenities	Initial expenditures measured in unit costs
Right-of-Way Requirements	Real estate to be acquired to implement alternative	Measured number of parcels impacted or aggregate square footage required
System Connectivity/Compatibility with Other Plans & Policies	Ability to provide regional transit service within context of H-GAC’s 2035 RTP & other area plans	Measured by relative seamless service & resulting travel time savings to key regional destinations without redundancy in services
Physical Ease of Implementation	Consideration of available ROW needed for each alternative, constructability of each alternative, business disruptions, & time to construct	Alternatives will be measured by cost to construct & estimated additional time required to resolve physical obstacles
Travel Demand/Ridership	Ridership projections of each alternative	Ridership forecasts will be produced for each alternative using the approved regional travel demand model
Ridership Capacity	Alternative's ability to provide the recommended service levels & prescribed link volumes	Measured by LOS provided compared to LOS of other alternatives.
Travel Time Savings	Competitiveness of travel time for a given alternative	Measured by average trip travel time per passenger for each alternative
Ease/Risks of Implementation Financially	Sources for & extent of support or resistance to raising the local funding share to support each alternative	Measured by perceived ability to obtain local funding support
Financial/Operating Plan	Ability to operate & maintain service over time given existing local financial capacity & constraints	Lifecycle cost estimates & projected annualized operating costs

Cost/Benefit	Extent to which the costs of each alternative is commensurate with the measurable benefits	Combined performance measures such as ridership, improved air quality, travel time savings vs. capital & operating costs unit measurements
Community Involvement/ Stakeholder Consensus	Concern & input from community regarding alternatives; support or opposition of affected neighborhoods, businesses, & other entities	Measured by tabulated votes taken at public meetings & volume of comments received through the public involvement process
Interagency Consensus	Extent of support or resistance for each alternative	Measured by strength of support or opposition & trade-offs required to reach consensus among area agencies & governments
Environmental Impacts	Alternative's impact on a number of prescribed environmental concerns, such as noise, vibration, flooding, & cultural & historic resources	Environmental impacts measured by magnitude of impact defined by cost to mitigate
Land Use/Development Impacts	the compatibility or impact to adjacent land uses as a direct or indirect result of implementation of an alternative	Cost to mitigate adverse impacts as result of implementation of an alternative
Air Quality	Extent to which each alternative leads to the reduction of air pollutants & helps region meet federally mandated air quality standards	Measured by metric tons of reduced emissions for NOx & other pollutants per lifetime dollar cost (capital & annualized operations)
Emergency Evacuation	Extent of each alternative to play an effective role in the evacuation Galveston/Houston residents in the event of an emergency	Measured by supportive relationship with regional evacuation plan & input received from evacuation authorities
TOD Opportunities	Potential for TOD, redevelopment, and/or revitalization in the corridor as a direct or indirect result of implementation of an alternative	Measured by resultant reductions in VMT & emissions associated with walkability, density, & mix uses affected within 1,500 feet of each station; also measured by proposed development opportunities
Ability to Serve Jobs & Housing Densities	Ability to maximize connections to key job & housing clusters	Alternatives will be measured by LEHD data base tool
TNI Performance	Ability of an alternative to serve geographical areas within corridor with the greatest transit need, based on demographic data	Alternatives will be measured as to the ability to service locations with the highest TNI scores
Environmental Justice/Title VI Requirements	Consideration of potential disproportionate impact on "traditionally underserved" communities as a result of project implementation per alternative	Measured by number of impacts to a particular area within corridor as it relates to other areas in each alternative

The proposed evaluation criteria and associated measurements will be presented to FTA, the City of Galveston, and other relevant agencies for review and comment. The criteria will be modified and the methodology redefined, as appropriate, to reflect the input received.

### *Evaluation Methodology*

The evaluation criteria selected have been designed to compare the performances of the alternatives and provide tangible, measurable results. The evaluation process will be conducted in an unbiased manner and the criteria will be consistently applied to allow for a fair comparison of the strengths and weaknesses, costs and benefits of each alternative. Each criterion provides one aspect of the performance of the alternatives. The criteria, grouped in the six evaluation categories, effectively address the goals and objectives of the project and are comprehensive in assessing the overall performance of an alternative.

The evaluation of alternatives will be conducted in a two-tiered evaluation screening process. The same criteria will be applied in both the first- and second-tier evaluation. The difference between the two screening applications will be the level of detail employed in determining adequate performance measures that separate one alternative from another. The first-tier evaluation will identify what may be considered fatal flaws or major problems associated with an alternative. The evaluation criteria will be used to establish an order-of-magnitude in terms of the performance and impacts of each alternative. This phase of the evaluation will focus on measuring the relative strengths and weaknesses of the alternatives. Through the first-tier evaluation, the findings will identify the negative impacts of poorer performing alternatives. Changes or modifications to those alternatives will be made to mitigate the negative impacts and enhance performance. The results of the first-tier evaluation screening will direct the refinement of the alternatives in an effort to strengthen and make the alternatives more viable. The first-tier evaluation screening will highlight the criteria that separate the best-performing alternatives from the weaker-performing ones and, as a result, additional analysis may be required to address performance across those criteria and the treatments taken to produce a stronger set of alternatives.

An alternative may perform poorly in a number of criteria in the first-tier evaluation screening, and refinement may do little to improve the performance of the alternative; therefore, the alternative may be eliminated from further screening. The goal of a two-tier evaluation screening process is to develop and refine alternatives in order to most effectively achieve the goals and objectives of the project. The alternatives must exhibit a threshold level of performance in order to be refined and included in the second level of screening and, ultimately, be considered as a candidate for selection of the Locally Preferred Alternative (LPA).

In the second-tier evaluation screening, a more detailed and empirical analysis will be conducted using the same set of evaluation criteria. The evaluation will be comprehensive; however, it will focus primarily on the criteria that must be met in order to effectively achieve the stated goals and objectives of the project. While the first-tier evaluation screening will provide an order-of-magnitude evaluation, the second-tier evaluation screening will provide a detailed technical analysis of the operational characteristics, patronage, technical feasibility, community and environmental impacts, costs, and capacity of each alternative. Criteria on which of the alternatives perform similarly will be refined and the measurement methodology further developed in order to distinguish the advantages and disadvantages of each alternative across

particular criterion. The candidate alternatives that proceed beyond the first screening will be analyzed carefully in comparison with one another and as an effective part of the regional base transportation system. In order to clearly distinguish the advantages and disadvantages between alternatives, the second-tier screening will utilize the following:

- Refined travel demand model results;
- Additional in-depth analyses to more closely scrutinize alternatives and identify any discriminating characteristics that would make it easier to compare the alternatives that are closely ranked; and
- Close examination on all issues that have been uncovered since the initial screening that might lead to the discovery of fatal flaws.

The FTA-approved travel demand model for the Houston-Galveston region, as developed by METRO in cooperation with its consultant HDR, will be used to model each of the alternatives carried through to final screening. The model produces a number of variables that will be used in the second-tier evaluation screening. These variables include, but are not limited to, the following:

- Total number of daily trips made by auto and transit in the region
- Average daily transit ridership by transit sub-modes
- Average mode split by geographic region
- Average trip length of transit and auto trips
- Total vehicle miles and vehicle hours of travel made by all vehicles on a typical weekday in the entire Houston METRO region and sub-regions
- Maximum peak loads on trains
- Revenue train miles and hours
- Daily and peak period ridership on commuter rail
- Transportation systems user benefits produced by the rail alternative
- Number of auto trips diverted from freeways to rail

The evaluation criteria and methodologies will be employed as described to assess and compare the alternatives. A comprehensive comparative analysis between alternatives will be conducted addressing mobility impacts and benefits, environmental concerns and benefits, conceptual capital and operating costs, stakeholder support, and compatibility with existing and planned conditions. The two-tier screening process will allow for multiple alternative reviews and refinements, so that the strongest set of project alternatives are analyzed and evaluated prior to selecting an LPA.

## **Section 3 – CONDUCTING EVALUATION**

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# 3

With a comprehensive set of evaluation criteria identified and corresponding measurement methodology defined, the proposed framework has been established for implementing the evaluation process. Each of the alternatives will be developed sufficiently to support the evaluation process. The first tier evaluation screening will be conducted at a conceptual level, and will serve as an order of magnitude analysis between the alternatives based on the series of evaluation criteria. As a result of the first screening, the alternatives will be modified and where possible, the negative impacts will be mitigated by adjusting or redefining the alternative. The second-tier evaluation screening will be a more detailed technical evaluation with closer examination of specific characteristics of each alternative. In turn, the alternatives will be developed more fully for the second phase of evaluation, making the differences between alternatives more distinguishable. The process for conducting the two-tier evaluation screening and reporting the evaluation findings is outlined in this section.

### *Evaluation Resources*

The Galveston-Houston Mobility Corridor serves a very dynamic and diverse sector of the Houston metropolitan region. Mobility improvements are critical for the continued growth and development along the corridor. The AA is being conducted in order to select an LPA for a major transit improvement along the corridor. The Purpose and Need Statement in the Project Initiation Package identified problems along the corridor and established multiple goals and objectives that the project is designed to achieve. These goals included a broad spectrum of objectives that not only improve mobility, but also environmental and quality-of-life concerns within the corridor.

The identified evaluation criteria provide a comprehensive means for assessing the alternatives and employ a number of evaluation measurements in order to analyze the alternatives from different perspectives. The evaluation criteria focus on a number of concerns including but not limited to costs, ridership, the environment, travel time savings, ease of access, community support and coordination, economic development and environmental justice. Data from a variety of sources will be used to effectively evaluate the each alternative. Much of the data needed to conduct the evaluation is available using local and federal resources; these include US Census bureau, IRS, city and county traffic and transportation departments, county appraisal districts, metropolitan planning organization (H-GAC) and local planning and development agencies. Statistics from both the H-GAC *Commuter Rail Connectivity Study* and the *Galveston-Houston ITS Commuter Rail Study* may be employed where appropriate to analyze various demographic and land use data. Data will be utilized in order to gain an accurate and current picture of the demographic profile and development opportunities that characterize the corridor. It should be noted that the study area for the corridor is narrowly defined and much of the demographic and economic development data is consistent in all alternatives.

The travel demand model will be employed to provide comparative data with regards to ridership projections, travel times, ridership capacity, and sizing requirements. The model is the one developed by METRO in cooperation with its consultant, HDR Inc., who is also a part of the AA

project team. The travel demand forecasting tool, approved by FTA for the Houston-Galveston region, will be used to model each of the alternatives carried through to final screening.

All current engineering standards and methodologies will be used to develop capital cost estimates, right-of-way requirements, operating procedures, and facility design. The engineering estimates will be produced at a conceptual level in order to identify fatal flaw and order of magnitude impacts or benefits. Costs estimates will be developed employing industry standard unit cost measurements. More detailed engineering refinements may be required to make adjustments to an alternative prior to conducting the second-tier screening and selecting the LPA. However, at this stage of the analysis, the engineering will be considered conceptual for evaluation purposes. More detailed engineering will be conducted following the selection of the LPA when the project enters the Preliminary Engineering (PE) phase of development.

As part of the evaluation process, FTA, the City of Galveston, and all relevant agencies will be provided with a summary of data sources and evaluation methodology and procedures. Review and comments will be solicited and the input from these agencies will be incorporated as appropriate into the evaluation process and documented in the report. Updated and newer data sources may become available during the course of the evaluation and this information will be incorporated in the evaluation criteria measurements, as applicable, to support the consistent and unbiased comparison of alternatives. All modifications and additions to the evaluation criteria measurements and methodology will be reviewed by the project manager, submitted to FTA and other relevant agencies for review, and documented in the evaluation report.

### *Evaluation Coordination*

The evaluation of alternatives will be a technical analysis in which impacts and benefits will be quantified and the application of the criteria will produce tangible, measurable levels of performance. The coordination with the AA project team and the City of Galveston, City of Houston, H-GAC, TxDOT, METRO, Gulf Coast Freight Rail District, Harris County, Galveston County, and the 11 cities in between will be encouraged to effectively conduct the evaluation process. Stakeholders and the AA technical advisory committee will review the identified evaluation criteria and defined methodology and concur on the criteria and proposed evaluation process. It is important that the concerns of the multiple stakeholders are addressed and that the evaluation criteria and methodology satisfactorily provide an effective framework for assessing the alternatives and addressing the needs of the community.

### *Interpreting the Results of the Evaluation Criteria*

Each of the identified evaluation criteria examines an aspect of the performance of an alternative. Together, the criteria provide a comprehensive multifaceted evaluation of each alternative, highlighting the advantages, disadvantages, and differences of the alternatives. The evaluation process has been designed to produce a strong set of alternatives and separate the best-performing candidates from the worst-performing ones. The evaluation will focus on the criteria that have a measurable impact on achieving the goals and objectives of the project. The evaluation methodology will assess performance and focus on the major differences between alternatives. In some cases, an evaluation criterion may produce similar impacts among the alternatives due to the general location of all of the improvements or the conceptual nature of the criterion. This may be true particularly of existing land use development and compatibility with

other regional plans. In other cases, the differences between alternatives may seem significant, but may not measurably change the overall impact of an alternative in achieving the stated goals of the project. Assessing air quality may result in large numeric differences among alternatives in measuring the reduction of emissions of various pollutants, but the impact may account for only a minor reduction in the overall air quality calculation for the region.

Upon completion of the second-tier screening, the evaluation will focus on those performance measures where there are clear differences among alternatives. Capital costs, right-of-way acquisition, projected ridership, and travel time are critical elements that will impact the outcome of the final evaluation and will require close scrutiny and detailed analysis. Conducting a cost/benefit analysis will provide a method for assessing the projected benefits of an alternative within the context of the relative cost to implement. The cost/benefit analysis will combine a series of performance measures, such as ridership, travel time, TOD opportunities, air quality versus capital and operating costs, and land use and environmental impacts, producing a ratio that can be compared between the alternatives. The results of the evaluation process will be measured by analyzing the differences associated with each alternative and identifying those measurements that most effectively make use of public resources to achieve the transportation goals and benefits of the project.

### *Reporting Evaluation Findings*

The evaluation methodologies and findings will be documented and developed in two phases as the two-tier evaluation screening is being conducted. The first section will include a list of the evaluation criteria. Included with the list will be a short description of the criteria, measurements, and identification of the evaluation data sources. A summary of the evaluation methodology will be provided and an explanation of the performance measurements and associated significance of the impact and the degree of accuracy will be detailed. The findings of the first-tier screening will be expressed in comparative terms and will be exhibited in a matrix to provide for a visual comparison of alternatives.

As a result of the first-tier screening, fatal flaws will be identified and alternatives will be refined to address deficiencies and mitigate negative impacts. Throughout this process, a stronger set of alternatives will evolve. The worst-performing alternatives will be either modified to perform better in the second-tier evaluation screening or eliminated from consideration because the impacts are too great to effectively mitigate. Any modifications to alternatives that occur as a result of the first-tier evaluation screening will be documented and detailed in the evaluation report. In addition, in the cases where the evaluation criteria result in the same or similar impacts, these findings will be documented and more detailed criteria measurements will be defined for use in the second-tier evaluation screening. The redefined evaluation criteria will be designed to address the specific characteristics of the alternatives and detect the differences in levels of performance.

The second-tier evaluation screening will include documentation of the refined definition of alternatives and more detailed application of the evaluation criteria and measurement methodology. Any differences in the level of detail between the first-tier and the second-tier evaluation screenings will be highlighted and measurement expectations will be summarized. The results of the second-tier evaluation screening will be summarized and the measurement methodology will be outlined and sourced. The findings will be included in a final evaluation

matrix. Upon the conclusion of the evaluation process, an LPA will be recommended and justification for the LPA selection documented. The evaluation methodology and the findings of both phases of the two-tier evaluation screening will be included in the final Evaluation Summary report, along with the quantifiable data and qualitative input used to support the selection of the LPA.

## Section 4 – CONCLUSION

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# 4

The evaluation of defined alternatives is a critical part of the AA. The identification of the evaluation criteria and measurement methodology provide a framework for assessing an alternative's ability to achieve the goals and objectives of the transit project. The evaluation criteria are a comprehensive set of performance measurements that employs both industry standards prescribed for evaluating the merit of the improvement project and project-specific objectives for assessing how effective the improvement is in addressing the specific needs and issues of the community.

A two-tier evaluation process will assess the defined alternatives in two phases to best compare and select the most appropriate improvement alternative for the Galveston-Houston Mobility Corridor. The first-tier evaluation screening will provide an initial evaluation of alternatives at a conceptual level and allow for the refinement and enhancement of the alternatives in order to produce a better set of alternatives for the final evaluation. The second-tier evaluation screening will employ more detailed evaluation measures and will specifically analyze the differences that separate the alternatives from one another. The evaluation process will provide a comparative analysis of the mobility impacts and benefits, environmental impacts and benefits, travel demand and costs, and compatibility with existing or planned conditions, resulting in the recommendation of an LPA. Through a comprehensive evaluation process, the strengths and weakness of the alternatives will be identified and measured and the benefits and costs will be assessed and quantified. The findings will provide a means for selecting the best-performing alternative and will allow for adjustments to that alternative to achieve the goals of the project, focusing on the efficient use of public resources and maximizing the public benefit.