CHAPTER 4   ALTERNATIVES ANALYSIS AND DEVELOPMENT OF BASELINE ROUTE ALTERNATIVES

Analyzing alternatives and developing a set of baseline routes is the next step in the NRHM route designation process. To complete this task, the study team developed a methodology for selecting possible roadways for inclusion in a potential route. The study team implemented the methodology using the Brownsville-Harlingen-San Benito roadway network. Additionally, the study team presented the results of the implemented methodology to the Advisory Committee. The Advisory Committee provided the study team with valuable insight regarding roadways that were unsuitable for truck traffic. Subsequently, the study team developed a baseline set of routes to begin the next step in the process based on the information received from the Advisory Committee.

METHODOLOGY

The methodology used for developing a baseline set of roadways suitable for safely moving NRHMs, involved several steps. First, the study team selected a compatible roadway network for Cameron County to utilize in the analysis. Secondly, the study team identified a set of potential entry points into the county based on the selected roadway. Thirdly, the study team, in consultation with the Advisory Committee, identified and removed all roadways, within the study area network, which were unsuitable for truck use. Fourthly, the study team used demographic and socioeconomic data to allocate a risk value to each roadway. Lastly, the team employed a GIS program to generate a baseline set of alternative NRHM routes that minimized the identified risk.

SELECTION OF A COMPATIBLE ROADWAY NETWORK

The first step in selecting candidate roadways to be included in a designated NRHM route involved selecting a roadway network for the study area. Both the Brownsville and Harlingen-San Benito MPO's have developed a network for regional planning purposes in Cameron County, known as the 2004 Travel Demand Model (TDM). The 2004 TDM is a suitable network to use for the baseline analysis because it contains all of Cameron County's major roadways. Additionally, the 2004 TDM contains essential information about each roadway such as the following: number of lanes; roadway length, and type; speed, capacity, volume. All of these attributes were useful in defining the suitability of each roadway for use by trucks caring NRHM's.

IDENTIFICATION OF POTENTIAL ENTRY POINTS

Next, the study team identified potential locations at which trucks carrying NRHM's would most likely enter the study area, also referred to as entry points. The study team selected all roadways intersecting the Cameron County boundary with Hidalgo and Willacy counties as shown in Map 5. These entry points included the following roadways:

- US Hwy 83 at the Hidalgo at the Cameron County boundary
- Business Hwy 83 at the Hidalgo at the Cameron County boundary
- Farm to Market Rd. 107 at the Hidalgo and Cameron County boundary
- US Hwy 281 at the Hidalgo at the Cameron County boundary
- US Hwy 77 at the Willacy at the Cameron County boundary
- Business Hwy 77 at Willacy at the Cameron County
- Farm to Market Rd. 507 at the Willacy and Cameron County boundary
- Farm to Market Rd. 1420 at the Willacy and Cameron County boundary
- Farm to Market Rd. 509 at the Los Indios Bridge
- Veterans International Bridge at Los Tomates

The entry points identified were useful to the baseline analysis for various reasons. First, entry points served as beginning and ending terminals for the route analysis. In effect, the analysis generated a profile of all possible routes to and from each entry point. Secondly, these locations provided the context for selecting the roadways that provide direct access to terminals on which trucks carrying NRHM's would mostly enter Cameron County. Thirdly, the entry points are the locations at which the Cameron County NHRM route would intersect with any other existing routes in adjacent counties.

Map 5: Initial Set of Entry Points

DETERMINATION OF EXISTING NRHM ROUTES IN ADJACENT COUNTIES

The study team performed research in order to determine whether NRHM routes existed in the bordering counties of Hidalgo and Willacy. From these inquiries, the study team determined that Willacy County did not have a NRHM route and Hidalgo County was in the process of updating their existing NRHM route. Subsequently, proposed updates to the Hidalgo County NRHM route included US Hwy 281 and US Hwy 83. The study team incorporated these roadways in the baseline analysis as entry points at the boundary of Cameron and Hidalgo County.

IDENTIFICATION ROADWAY ALTERNATIVES AND REMOVAL OF UNSUITABLE ROADWAYS

The next step in developing a baseline set of alternative NRHM routes was to begin the process of removing unsuitable roadways (including several of the identified entry points). The study team analyzed existing legal restrictions such as weight and height ordinances enacted by local municipalities in order to eliminate roadways. Based on this review, the study team removed any roadways that were legally unusable by trucks of the weight and size that typically carry substantial quantities of NRHMs from the TDM network.

Figure 5: Old Port Isabel Rd.

Then the study team performed an ancillary review of roadways that were physically unsuitable for truck travel based on various factors by analyzing the physical geometry of various roadways. For example, the study team removed (based on guidance from the Advisory Committee) several streets because they were narrow, unpaved, lacked shoulders, or lacked lane striping. As shown in Figures 5 and 6, multiple roadways in the Cameron County TDM are physically unsuitable for use by trucks carrying NRHM's.

Figure 6: Buena Vista Rd.

INITIAL RISK COMPONENT

After the base line route was developed, the study team began an initial assessment of risk for each roadway within the Cameron County TDM. To complete an initial risk assessment, the study team gathered demographic information such as population, employment, and household information from both the Brownsville and Harlingen-San Benito MPOs. Next, using a GIS program, the study team developed a count of population, employment, and households within one-half mile of the roadway, for each link in the network. To generate these counts for each roadway, the study team employed the overlay function, which created a one-half mile band around each roadway within the TDM network. Then, the study team selected the count option within the overlay function. The study team ran the overlay function for each region of the County and the overly function appended new columns to the TDM network, which included counts of population, employment, and households. Next, the study team summed-up all of the new population, employment, and household columns for the Brownsville and Harlingen-San Benito regions that fell within the defined buffer zone for each roadway segment. This information was combined with geo-coded crash data obtained each roadway to calculate a risk factor for each roadway segment or network link.

BASELINE ROUTES DEVELOPED

With all of the information acquired and initial risk component identified, the study team was able to prepare a baseline set of routes. To develop a set of baseline routes, the study team employed the GIS program TransCad. First, the team converted the Cameron County TDM file into a TransCad network file and used the "risk" attribute as the impedance factor.

Next, the study team employed the multiple paths function to generate potential routes. The team then selected entry points to represent external stations that trucks carrying NRHM would be most likely to use to enter and exit Cameron County. The next step, was to select the minimize impedance or the "risk" attribute. Finally, the study team executed the multiple paths function successfully and produced a baseline set of alternatives.

As displayed in Map 6, the baseline set of routes selected begin and end at each entry point. The Cameron County TDM avoided Routes near densely populated areas of the Cameron County, such as through the Harlingen or Brownsville downtown areas, because these areas have relatively high levels of population and employment. The avoidance of populated areas demonstrated that the risk component of the study team

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Map 6 Initial Route Analysis

methodology was effective. This starting point was used in the consultation process with the advisory committee to begin exploring the relative impacts of various alternative scenarios. With the input of the Advisory Committee, the analysis was refined and repeated in an iterative fashion to identify the route combinations that both minimized risks and met study objectives.

Map 6: First Round Analysis Results
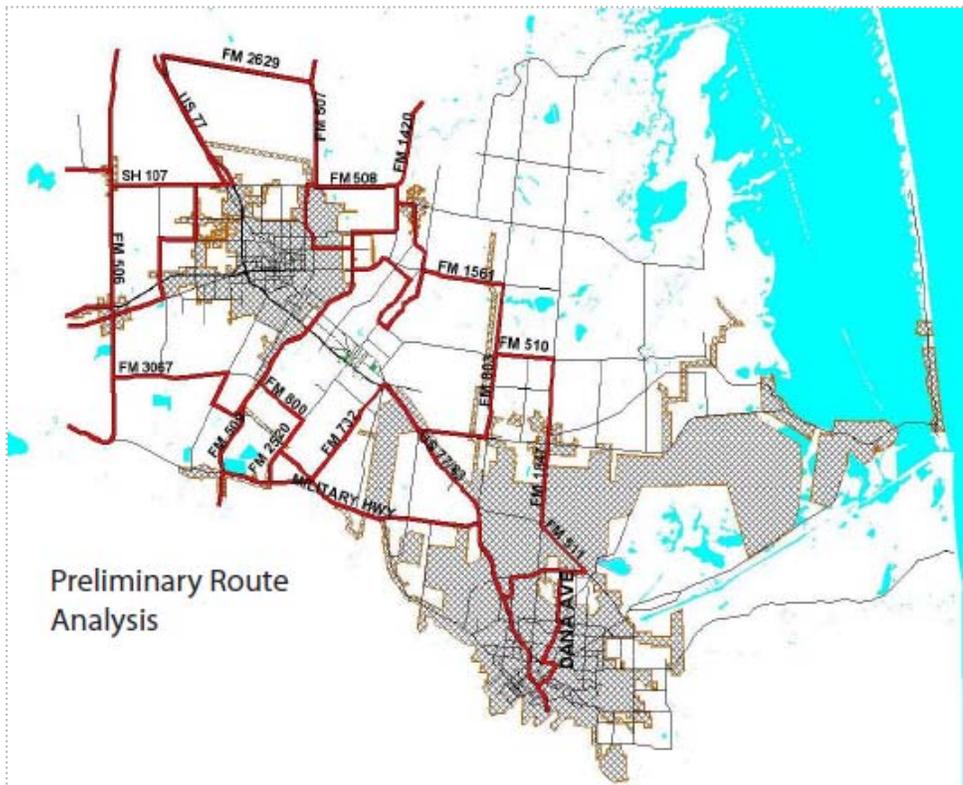
BASELINE ALTERNATIVE NRHM ROUTES PRESENTED TO ADVISORY COMMITTEE

The study team presented the results of the initial risk assessment and route generation to the Advisory Committee and received a wealth of feedback. Overall, the Advisory Committee stated that the baseline routes were adequate for an initial cut, but suggested various changes to the process. First, they pointed out key information regarding route suitability.   For example, the Advisory Committee suggested that entry points at FM 507, FM 506, FM 1420 were locations that trucks carrying NRHM's were unlikely to use to enter and exit the region. The Advisory Committee also suggested removing those entry points and replacing them with entry

points at the Port of Harlingen and the Port of Brownsville as both ports serve as gateways for the movement of NRHM in and out of the region and nation.

The Advisory Committee also provided valuable local knowledge regarding roadways that, due to their physical condition and risk of flooding, were not suitable to be included in a NRHM route. In particular, the committee suggested the removal of the following roadways from the routing analysis:

- Dana Avenue
- Old Port Isabel Road
- Cemetery Road
- Farm to Market Road 803
- Farm to Market Road 1561
- Farm to Market Road 1479
- Farm to Market Road 3067
- Farm to Market Road 1420
- Farm to Market Road 800
- Farm to Market Road 2520
- Farm to Market Road 3067
- Farm to Market Road 507

SUMMARY OF ALTERNATIVES ANALYSIS AND DEVELOPMENT OF BASELINE ROUTE ALTERNATIVES

The steps taken to develop a baseline set of alternative routes involved various steps. These steps included the following tasks: identifying potential entry points for trucks carrying NRHMs into Cameron County; selecting a suitable roadway network for routing analysis; removing unsuitable roadways based on an ancillary overview of roadways in the study area; developing a risk factor for each roadway in the network; performing the routing analysis; and presenting the results to the Advisory Committee for comment and feedback.

Once the study team received feedback from the presentation of the baseline alternatives routes to the Advisory Committee, the routes were ready to proceed to the next step of performing an extensive risk analysis.   The following section provides an overview of the methodology implemented to perform the risk analysis and the initial results of the risk assessment.