

Hazardous Cargo Community Risk Assessment and Transportation Route Alternative Analysis for the City of Laredo

final

report

prepared for

City of Laredo

prepared by

Cambridge Systematics, Inc.

with

Alliance Transportation Group, Inc.

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Executive Summary

At present, carriers transporting non-radioactive hazardous materials (NRHM) through the Laredo Metropolitan Area can only cross the border between Mexico and the U.S. via the Colombia Solidarity Bridge. Given that the location of many drayage warehouses and storage facilities for hazardous cargoes is on the southwest side of the City in proximity to Bridges 1 and 2, carriers have petitioned to allow for transportation of hazardous cargo across the World Trade Bridge. This study evaluates the potential risks associated with alternative NRHM route designations that would include the World Trade Bridge as an option to cross the U.S.-Mexican border.

The methodology for this study follows the hazardous material routing guidelines established in 1996 by the Federal Highway Administration (FHWA). The analysis entails seven tasks: 1) definition of objectives and responsibilities, 2) definition of alternative routes, 3) determination of risk, 4) application of through routing criterion, 5) additional analysis, 6) comparison of alternative routes, and 7) public input.

Definition of Objectives and Responsibilities

This task consists of determining the purpose of the study and identifying parties that might be directly or indirectly affected by the establishment of a NRHM route.

The study objectives and responsibilities were established by meeting with key city staff, representatives of the Texas Department of Transportation (TxDOT) District Office, Customs and Border Protection staff, and by reviewing correspondence and previous reports and hazardous materials risk assessments.

The main purposes of this study are: 1) to determine if risks to human populations and the natural environment from hazardous cargo spills or releases along the appropriately designated highway routes would increase if the World Trade Bridge is opened for hazardous cargo transportation; and 2) to revisit the risks associated with the use of all currently designated truck routes for hazardous materials transportation given alternative routing options, current locations of storage warehouses, and current population and employment patterns.

Definition of Alternative Routes

This task defines potential alternative routes to be evaluated.

The alternative routes were chosen by identifying those routes that 1) satisfied jurisdictional objectives, 2) were reasonably comparable with existing hazardous material trucking patterns and allowed access to terminals and other facilities, 3) were devoid of obvious physical and legal constraints, and 4) were consistent with adjoining routes in adjacent jurisdictions.

Based on the previous elements, four alternative routes were defined:

1. **Alternative Route 1.** The City's designated truck route was used as a base, though segments were added and omitted as deemed pertinent for the study, see Figure 3.3.
2. **Alternative Route 2.** Carriers are allowed to cross both bridges the Colombia Solidarity and the World Trade. This route includes all segments of Route 1, plus the segment connecting the World Trade Bridge with Bob Bullock Loop (see Figure 3.4).
3. **Alternative Route 2A.** This is a sensitivity analysis of Alternative Route 2. Given that most warehouses are located on the west side of the city along three major corridors starting in the downtown area and ending north of Killam Industrial Blvd, in proximity to the World Trade Bridge, it is likely that most of the NRHM truck traffic crossing the border will divert from the Colombia Solidarity Bridge to the World Trade Bridge to reduce travel times. Thus, Alternative Route 2A's purpose is to measure how much population risk would change if all NRHM truck traffic crossed the border through the World Trade Bridge instead of crossing through both bridges.

In Alternative Route 2A, all the existing truck route segments of Alternative Route 2 with the exception of segments over the Colombia Solidarity Bridge, including the Camino Colombia Toll Road, Las Tiendas Road, and Mines Road north of the intersection with Las Tiendas Road were included (see Figure 3.5).

4. **Alternative Route 3.** Proposes to limit NRHM traffic through the downtown area. Given that in the downtown area a high concentration of sensitive sites is observed, this route suggests the elimination of the following segments from the segments on Alternative Route 2:
 - a. I-35 between Saunders Street and Houston Street;
 - b. Jefferson Street between I-35 and Santa Isabel Avenue; and
 - c. Scott Street between I-35 and Santa Isabel Avenue.

Alternative Route 3 also proposes the inclusion of some additional segments in the southwest part of the City to ensure that trucks entering the City from U.S. Highway 83 can access their destinations either to the southwest of the City or proceed further to access warehouses in the north (see Figure 3.6). The following segments were added:

- a. Houston Street between I-35 and Santa Isabel Ave; and
- b. Matamoros Street between I-35 and Santa Isabel Avenue

Population Risk Assessment

This task assesses population risk exposure to hazardous material spills.

The risk associated with exposures to hazardous material spills resulting from truck accidents is represented in terms of the product of the probability of a truck accident and the population exposed to the accident.

Based on the risk results and assuming Alternative Route 1 as the point of comparison between routes, Alternative Route 3 presents the lowest population risk, since it decreases risk relative to Alternative Route 1 by 8.70 percent. Alternative Routes 2 and 2A do not represent any significant change in risk compared to Alternative Route 1. Both alternatives slightly increase population risk by 0.20 and 0.17 percent, respectively.

Application of Through Routing Criterion

According to the FHWA's guidelines, one of the criteria that must be considered is through route criterion which addresses "continuity of movement of NRHM transportation, so that it is not impeded or unnecessarily delayed by routing designations."

The FHWA's guidelines require that all the proposed alternative routes be compared to the current NRHM route. The criterion states that only if the proposed routes reduce population risk and do not impose significant burden on commerce, then they could be considered as NRHM alternative routes. If we assume Alternative Route 1 as the current NRHM designated route, and since only Alternative Route 3 diminishes population risk and does not impose any additional burden in terms of the distance traveled, then Alternative Route 3 is the only route that could be assigned as a NRHM truck route. However, if we assume that the City of Laredo does not have any NRHM-designated route, as is currently the case, and we undertake the through routing analysis for the rest of the alternatives, the results suggest that neither Alternative Route 2 nor Alternative Route 2A impose any additional burden in the distance traveled, and thus, they could be considered as potential NRHM-designated routes.

Additional Analysis

This section analyzes additional factors to be considered as input to the risk assessment of alternative NRHM routes, such as sensitive environments, emergency response capabilities, and congestion and transportation delays.

Congestion Delay

Comparing congestion delay of the proposed routes with Alternative Route 1, Alternative Route 2A would present the lowest congestion delay followed by Alternative Route 3. The former would present approximately 7 percent lower delay, while the latter would reduce delay by 0.1 percent compared with Alternative Route 1. Alternative Route 2 would present a 6 percent higher delay than Alternative Route 1.

Environmental Risk

If we compare environmental risk of the proposed routes with environmental risk of Alternative Route 1, Alternative Routes 2A and 3 have the lowest environmental risk, since they decrease environmental risk by 2.1 and 1.7 percent, respectively; whereas, Alternative Route 2 increases it slightly by 0.2 percent relative to Alternative Route 1.

Emergency Response Capabilities

Emergency response capabilities do not differ significantly among the proposed routes. Alternative Route 2A has the highest route length coverage within 10-minute emergency response time, 55 percent of the route is within that response time, while Alternatives Routes 2 and 3 have coverage of 41 and 42 percent of the route, respectively.

Comparison of Alternatives

If we compare Alternative Route 1 with the other alternatives, Alternative Route 3 reduces the risk exposure to population; does not impose any additional mileage; and has lower congestion delay, lower environmental risk, and lower travel times relative to Alternative Route 1. Alternative Routes 2 and 2A do not differ considerably from Alternative Route 1; both alternatives slightly increase population risk by 0.20 and 0.17 percent, respectively, compared to Alternative Route 1. But none impose any additional burden on commerce, nor have significantly different environmental risk than Alternative Route 1.

Public Input

The FHWA's guidelines require that input is being solicited to the potentially affected parties and by holding a public meeting. Cambridge Systematics contacted several Federal, state, and local agencies to request their comments or concerns regarding the alternative routes selected for risk assessment. Additionally, a Public Hearing was held on October 26, 2006 at the Laredo Civic Center to present the results of the study.

Conclusions

In a strict sense, the City of Laredo does not have an officially designated NRHM route. However, it does have a designated truck route, Alternative Route 1, which functions as de facto NRHM route system. Based on this definition and a strict application of the FHWA guidelines, only Alternative Route 3 can be designated as an alternative NRHM route, since it is the only route that reduces population risk relative to Alternative Route 1, besides not imposing any burden on commerce, and having lower environmental risk, lower congestion delay, and lower travel times than Alternative Route 1. However, since Alternative Routes 2 and 2A do not differ significantly in population risk from Alternative

Route 1 and since they satisfy the Federal guidelines in other respects, they could be considered as designated NRHM routes subject to TxDOT approval.

1.0 Introduction

Currently, hazardous material cargo in Laredo, Texas can only cross the border between the U.S. and Mexico using the Colombia Solidarity Bridge, Bridge 3, located northwest of Laredo, Texas, which provides straight access to FM-255. Prior to construction of this bridge and its designation as a commercial crossing, trucks crossed the border at Bridge 1, Gateway to the Americas Bridge, and Bridge 2, Juarez Lincoln International Bridge.

With the designation of the Colombia Solidarity Bridge as the only bridge allowing carriage of non-radioactive hazardous materials (NRHM), many motor carriers and local businesses have complained that routing of these cargoes is very circuitous given that the location of many drayage warehouses and storage facilities for hazardous cargoes is on the southwest side of the City in proximity to Bridges 1 and 2, and therefore crossing through Colombia Solidarity Bridge involves extra time and cost for these shipments. For this reason, carriers have petitioned to allow for transportation of hazardous cargo across the World Trade Bridge.

Though the City of Laredo does not have a hazardous material designated route it does have a truck designated route system which was evaluated in 1997 as part of a hazardous material route risk assessment analysis conducted by Rust Lichlter/Jameson. An update of the study is opportune at this time not only because since 1997, geographic and policy conditions have changed; new roads were built, new development occurred, and thus, population and environmental risk exposure to hazardous materials might not correspond to the risk levels identified nine years ago, but also because the last hazardous material route study was undertaken prior to the opening of the World Trade Bridge, and therefore it was not included in the risk analysis.

With this background, the main purposes of this study are: 1) to determine if risks to human populations and the natural environment from hazardous cargo spills or releases along the appropriately designated highway routes would increase if the World Trade Bridge is opened for hazardous cargo transportation; and 2) to revisit the risks associated with use of all current designated truck routes for hazardous materials transportation given alternative routing options, current locations of storage warehouses, and current population and employment patterns.

The methodology for this study follows the hazardous material routing guidelines established in 1996 by the FHWA, as stipulated by Federal regulations for revising or establishing a NRHM route. The analysis entails seven tasks: 1) definition of objectives and responsibilities, 2) definition of alternative routes, 3) determination of risk, 4) application of through routing criteria, 5) additional analysis, 6) comparison of alternative routes, and 7) public input.

1.1 STUDY AREA

The study area of this analysis extends outside the limits of the City of Laredo in order to consider road segments that are currently used, but are located outside the City such as Camino Colombia and FM-3338. Figure 1.1 presents a basic overview of the study area including major roads.

Figure 1.1 Laredo Study Area



1.2 ORGANIZATION OF REPORT

The report is organized as follows: **Section 2.0** describes the purpose of the study and the stakeholders involved, **Section 3.0** presents the selection process of the alternative routes, **Section 4.0** documents the risk assessment for each proposed alternative, **Section 5.0** presents the application of through routing criteria, **Section 6.0** focuses on the additional analysis, **Section 7** compares the alternative routes, **Section 8.0** documents the public input process, and **Section 9.0** provides the conclusions of the study.

2.0 Definition of Objectives and Responsibilities

This task consists of determining the purpose of the study and identifying parties that might be directly or indirectly affected by the establishment of a NRHM route.

The study objectives and responsibilities were established by meeting with key city staff, representatives of TxDOT District Office, Customs and Border Protection staff, and by reviewing correspondence and previous reports and hazardous materials risk assessments.

As stated in Section 1.0, the purposes of the study are: 1) to determine if risks to human populations and the natural environment from hazardous cargo spills along the designated highway routes would increase if the World Trade Bridge is opened for hazardous cargo transportation; and 2) to revisit the risks associated with the use of all current designated truck routes for hazardous materials transportation given alternative routing options, current locations of storage warehouses, and current population and employment patterns.

3.0 Definition of Alternative Routes

3.1 PROCESS OF SELECTION

This task defines potential alternative routes to be evaluated. The alternative routes were chosen by identifying those routes that 1) satisfied jurisdictional objectives, 2) were reasonably comparable with existing hazardous material trucking patterns and allowed access to terminals and other facilities, 3) were devoid of obvious physical and legal constraints, and 4) were consistent with adjoining routes in adjacent jurisdictions. The following factors were considered in the process of defining alternative routes for hazardous material transportation in Laredo:

- NRHM routing patterns;
- Location of NRHM warehouses;
- Location of sensitive sites (hospitals, schools, public places, etc.);
- Physical constraints on route segments; and
- Legal routing considerations.

NRHM Routing Patterns

An understanding of origin and destination patterns of hazardous cargo is essential in determining the alternative routes selected, so that routes are reasonably comparable with existing NRHM trucking patterns, and allow access to terminals and other facilities. To accomplish this task, information on existing hazardous materials routing patterns of origin-destination movements was obtained from telephone surveys of warehouses handling non-radioactive hazardous materials.¹ The results from the surveys suggest that: 1) most of the warehouses that are permitted for storing NRHM in Laredo handle NRHM that are in-transit for exports to Mexico rather than imports from Mexico; 2) virtually all cross border hazardous cargoes stop in the City and are stored/transloaded for eventual through movement; and 3) carriers use I-35 and U.S. 83 as the primary routes to enter and exit the Laredo study area from and to other regions in the U.S.

¹ A directory with data on the location and contact information of warehouses handling non-radioactive hazardous materials were provided by the Environmental Service Department, Hazardous Material Division of the City of Laredo.

Location of NRHM Warehouses

Origin-destination truck movements of non-radioactive hazardous materials involve flows from and to warehouses; and consequently, location of NRHM warehouses plays an important role in the process of defining alternative routes to serve origin-destination movements. According to the information provided by the City on the location of NRHM warehouses, most warehouses are located on the west side of the City along three major corridors starting in the downtown area and ending north of Killam Industrial Boulevard. The first cluster of warehouses is located in the southwest part of the City along Santa Isabel Avenue between Saunders Street and Houston Street. The second cluster is located along Old Santa Maria Road from Markley Street to the intersection between I-35 and Old Santa Maria Road, where it separates into 2 segments, one along I-35 and the other along FM-1472 or Mines Road (which in this report are used interchangeably), both segments ending before the intersection with Bob Bullock Loop. The third cluster is located northwest of Bob Bullock Loop along Mines Road between Killam Industrial Boulevard and Pan American Boulevard, as shown in Figure 3.1. Based on the locations of NRHM warehouses, all major access routes connecting these facilities to the primary truck routes have been included in the route alternatives to ensure that there are no restraints in terms of the connectivity to and from NRHM warehouses for origin-destination movements.

Location of Sensitive Sites

Location of sensitive sites like schools, public parks, hospitals, and environmental resources (wildlife, water bodies, etc.) is a critical consideration in the process of defining alternative hazardous material routes in order to avoid, to the maximum extent possible, their exposure to NRHM spills or releases. According to information on sensitive site locations provided by the City, the highest concentration of sensitive sites is observed in and around the downtown area lying in close proximity on the east and west of the segment of I-35 between U.S. Highway 83 and U.S. Highway 59, as shown in Figure 3.2. This segment is a major NRHM truck traffic corridor, since most of the trucks entering and exiting Laredo from and to U.S. Highway 83 use this segment. In order to minimize the risk of exposure to these sensitive sites, an optimal routing scheme would be to prohibit NRHM trucks from using this roadway segment, and routing them instead through Houston and Matamoros Streets and Santa Isabel Avenue to enable access to and from warehouses. This routing scheme has been employed as part of an alternative route and is described in the subsequent section.

Figure 3.1 NRHM Warehouse Locations in Laredo

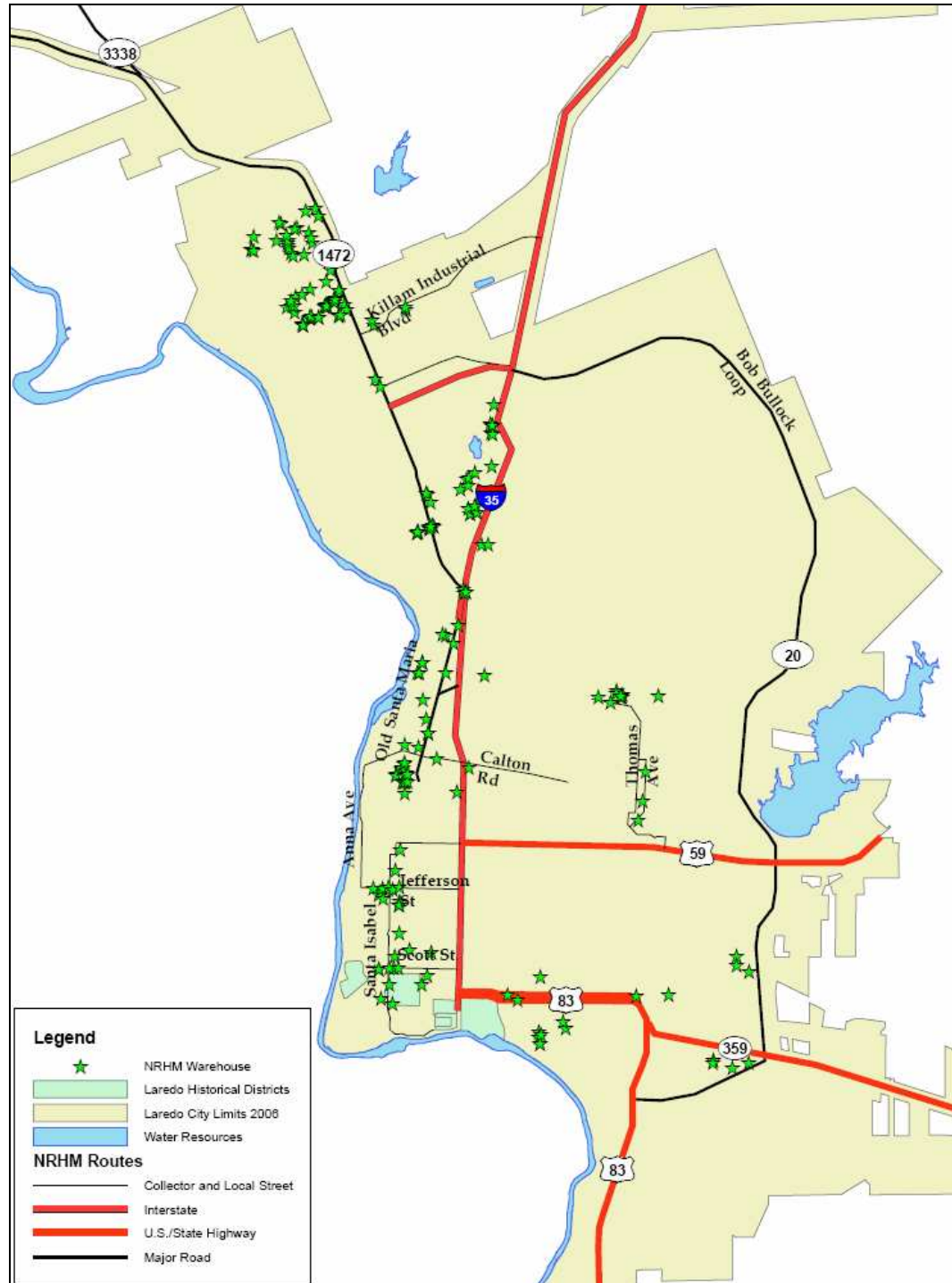
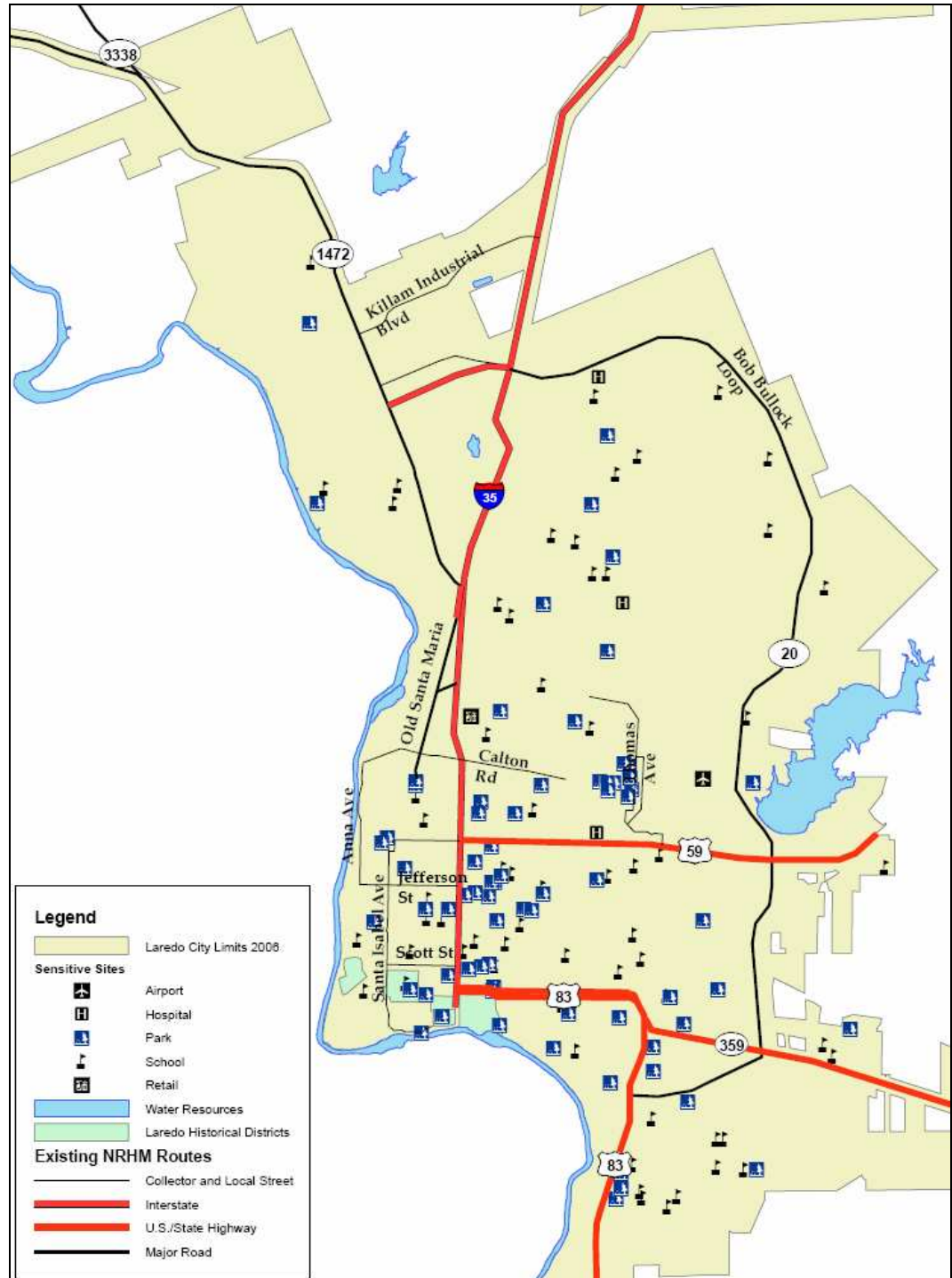


Figure 3.2 Sensitive Sites in Laredo



Physical Constraints

Weight limitations on bridges and height restrictions on overpasses, along with other physical constraints on roadways like inadequate shoulders for break-downs, steep gradients, or inadequate turning radii, were analyzed so that the routes selected for the NRHM truck routing analysis do not impede the movements of NRHM trucks due to their physical characteristics.

Legal Routing Considerations

Among the alternative routes selected, no segment presents any legal restriction to the passage of trucks carrying non-radioactive hazardous materials with the exception of the section of Loop 20 west of FM-1472 leading to the World Trade Bridge (WTB), since NRHM trucks are not allowed on the WTB. Regarding this subject, TxDOT agreed to support the designation of the World Trade Bridge as a NRHM route on the condition that the City of Laredo undertakes an NRHM routing analysis incorporating the World Trade Bridge and its connections with the Texas highway system as a through route. It has been subsequently determined through contacts with the U.S. Department of State that an amendment to the Presidential Permit will not be required for this designation as long as the NRHM route analysis is conducted in compliance with Federal and state regulations and statutes.

3.2 ALTERNATIVE ROUTES

Based on existing NRHM routing patterns, locations of NRHM warehouses, location of sensitive sites, legal constraints, and physical routing considerations, three alternative routes were defined for the routing analysis. The following section describes each alternative route in detail.

Alternative Route 1

Alternative Route 1 was designed using the City’s existing designated truck route, though some segments were added or omitted as deemed pertinent for the study, such as the segment along Bob Bullock Loop between the World Trade Bridge and FM-1472, since NRHM trucks do not have any reason to use this segment given that their passage through the World Trade Bridge is prohibited. The roadway segments included in this routing alternative are listed in Table 3.1. Figure 3.3 shows the segments considered in Alternative Route 1.

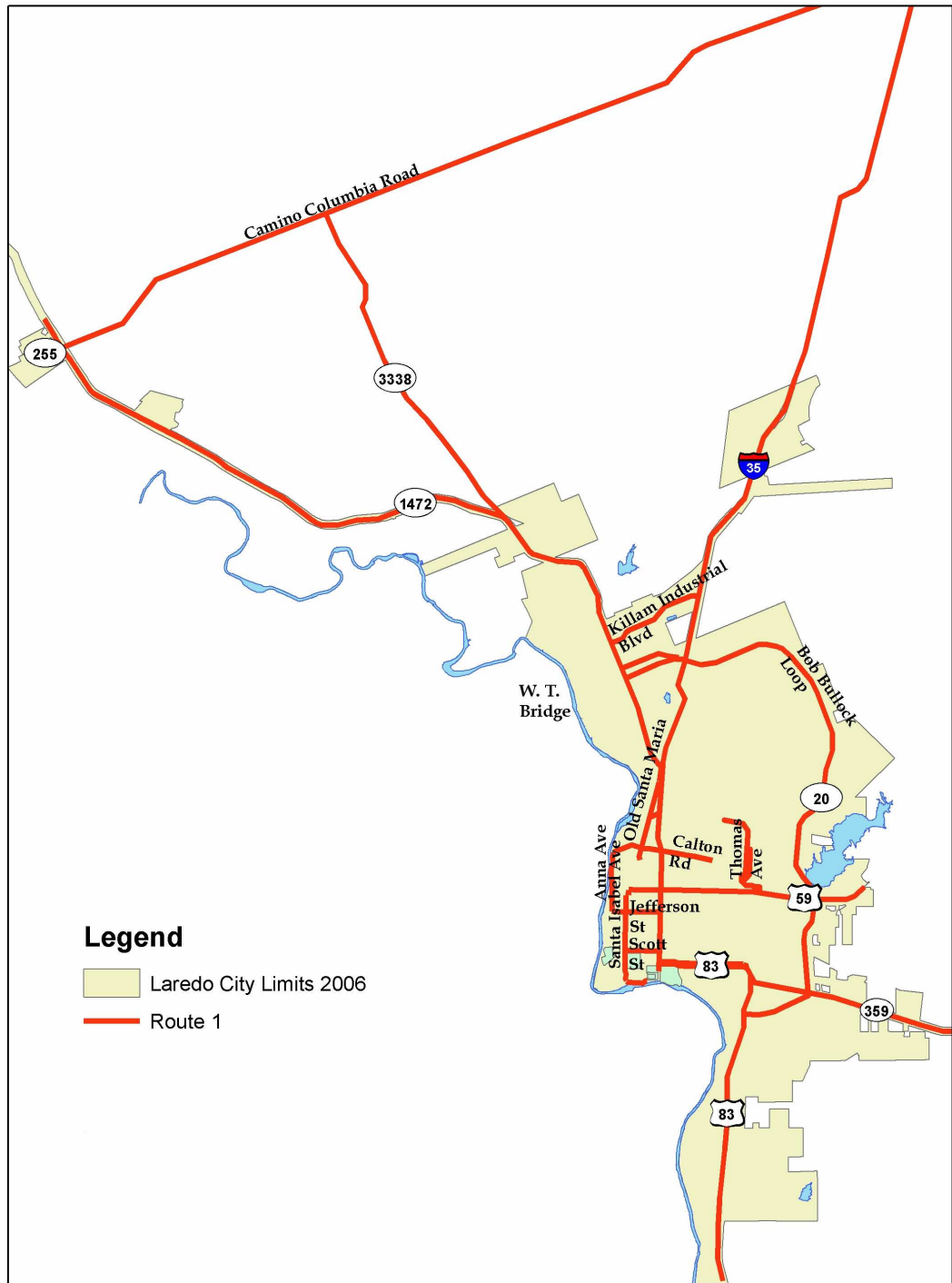
Table 3.1 Roadway Segments in Alternative Route 1

Roadway	Segment	
	Beginning Point	Ending Point
FM 1472	Camino Colombia Road	Interstate 35
Camino Colombia Road	FM 1472	Interstate 35

FM 3338	Camino Colombia Road	FM 1472
Interstate 35	Northern Study Area Boundary	U.S. Highway 83
Bob Bullock Loop	U.S. Highway 83	FM 1472
U.S Highway 59	Eastern Study Area Boundary	Interstate 35
State Highway 359	Eastern Study Area Boundary	U.S. Highway 83
U.S. Highway 83	Southern Study Area Boundary	Interstate 35
Scott St	Santa Isabel Ave	Interstate 35
Jefferson St	Anna Ave	Interstate 35
Lafayette St	Interstate Highway 35	Vidaurri Ave
Vidaurri	Burnside	Lafayette
Santa Isabel Ave	River Road	Burnside St
Burnside	Sta Isabel	Vidaurri Ave
Anna Ave	Jefferson Street	Calton Road
Calton Road	Anna Ave	McPherson
Old Santa Maria Road	FM 1472	Markley St.
Mann Road	Old Santa Maria Road	Interstate 35
River Road	Santa Isabel Ave	Convent Ave
Killam Industrial Blvd	FM 1472	Interstate 35
FM 3464	FM 1472	Interstate 35
Gale Street	Thomas Ave	McPherson
Thomas Ave	Gale Street	Pappas St
Pappas Ave	Thomas Ave	Daugherty Ave
Daugherty Ave	Pappas Street	Bustamante St
Bustamante Street	Daugherty Ave	Airpark
Airpark Dr	Airpark Ct.	Saunders St.
Maher	Hillside	Bustamante
Hillside	Thomas	Maher
State Highway 255	FM 1472	Bridge III

Source: Cambridge Systematics, Inc.; and Alliance Transportation Group, Inc.

Figure 3.3 NRHM Truck Route Alternative 1



Alternative Route 2

Alternative Route 2 allows import or export NRHM trucks to haul their shipments over both the Colombia-Solidarity Bridge and the World Trade Bridge. The purpose of including both bridges in this alternative and comparing it with Alternative Route 1 is to determine to what extent risk of NRHM exposure increases with the inclusion of the World Trade Bridge as an additional option for crossing the U.S.-Mexican border.

Alternative Route 2 considers all segments of the current designated truck routes in Laredo (see Table 3.1) in addition to the segment that connects the World Trade Bridge with Bob Bullock. Figure 3.4 shows all the segments included in Alternative Route 2.

Alternative Route 2.A

Given that most of hazardous material warehouses are located in downtown, while a few are located south of the intersection between Mines Road and Las Tiendas Road, it is likely that most of the hazardous material truck traffic crossing the border between Mexico and the U.S. will divert from the Colombia Solidarity Bridge to the World Trade Bridge. Therefore, changes in traffic volumes in the routes connecting with each bridge will have an impact on the accident rates affecting population exposure. Since it is uncertain how much traffic will divert, a sensitivity analysis was undertaken assuming that all hazardous material truck traffic will cross the border using solely the World Trade Bridge. This alternative's purpose is to measure how much population risk would change if all NRHM truck traffic crossed the border through the World Trade Bridge compared to Alternative Route 2, which allows truck traffic on both bridges.

In Alternative Route 2A all the existing truck route segments with the addition of the World Trade Bridge as an option for transporting hazardous materials were included with the exception of segments over Colombia Solidarity Bridge, including the Camino Colombia Toll Road, Las Tiendas Road, and Mines Road north of the intersection with Las Tiendas Road. The latter roadways are primarily connecting routes to the Camino Solidarity Bridge and therefore likely to see little NRHM traffic with diversion to the World Trade Bridge. Figure 3.5 shows all the segments included in Alternative Route 2A.

Figure 3.4 NRHM Truck Route Alternative 2



Figure 3.5 Alternative Route 2A



Alternative Route 3

Alternative Route 3 allows trucks carrying NRHM for imports or exports to haul their shipments across both the Colombia-Solidarity Bridge and the World Trade Bridge as shown in Figure 3.6. The difference between Alternative Routes 2 and 3 is that the latter eliminates some roadway segments in the downtown area where a high concentration of sensitive sites is observed.

According to information on sensitive sites, the highest concentration of sensitive sites, such as schools and parks, is observed in and around the downtown area, lying in close proximity to I-35, on the east and west of the segment between U.S. Highway 83 and U.S. Highway 59 (see Figure 3.2).

As a measure to reduce their risk of exposure, this alternative proposes to limit the movements of NRHM trucks in the downtown area by elimination of the following segments from the segments on Alternative Route 2:

- I-35 between Saunders Street and Houston Street;
- Jefferson Street between I-35 and Santa Isabel Avenue; and
- Scott Street between I-35 and Santa Isabel Avenue.

The segment of I-35 between Saunders Street and Houston Street is a critical link in the existing through NRHM truck routing system in Laredo, since almost all the trucks with their origin and destination locations outside the City (through trucks) that use U.S. Highway 83 pass through this segment. In order to ensure that this alternative avoids disruption to normal flow of through trucks carrying NRHM, the Bob Bullock Loop is proposed, as part of this alternative, as the designated through NRHM truck route. In other words, all the NRHM trucks with their origin and destination locations lying outside the region of Laredo bounded by the Bob Bullock Loop will be using the Bob Bullock Loop to pass through the City of Laredo.

This alternative also proposes the inclusion of some additional segments in the southwest part of the City as NRHM truck routes to ensure that trucks entering the City from U.S. Highway 83 can access their destinations either to the southwest of the city (where several NRHM warehouses are located), or proceed further to access warehouses in the north or pass through the City. These additional segments will also provide a continuous routing scheme for NRHM trucks exiting the City from the south through U.S. Highway 83. The following are the additional segments to be included in this routing alternative:

- Houston Street between I-35 and Santa Isabel Avenue; and
- Matamoros Street between I-35 and Santa Isabel Avenue.

Figure 3.6 shows all the segments included in Alternative Route 3.

Figure 3.6 NHRM Truck Route Alternative 3



4.0 Risk Assessment

The FHWA has compiled a comprehensive document entitled *Highway Routing of Hazardous Materials: Guidelines for Applying Criteria* (FHWA/NHI, 1996) which describes in technical detail the Federal guidelines that states, territories, and Indian tribes must follow when designating NRHM routes. These techniques factor in population density, type of highway, emergency response capabilities, terrain/environmental factors, accident statistics, and other parameters.

This section of the report describes how the quantitative techniques contained in the FHWA guidelines were used to specifically tailor a community risk assessment methodology for this study, and how this methodology was applied to calculate the risk of alternative proposed hazardous material routes in the City of Laredo.

4.1 METHODOLOGY

The risk associated with exposures to hazardous material spills resulting from truck accidents is represented in terms of the product of the probability of a truck accident and the population exposed to the accident. To provide more accurate estimations of risk exposure, calculations were differentiated by time of day. Following the recommended procedures, risk calculations were conducted for each route segment, as well as for entire routes.

Analysis segments were designated logically based on available data and the path of the truck routes. The same segments were used in calculations of accident probability, potential population exposed, and other calculations. These analysis segments follow census geography boundaries and changes in roadway types. Total values for the individual segments are greater than the value for the route due to the nature of the analysis, considering the population affected on each segment and the overlap of impact zones. Therefore, the total values displayed in the analysis tables were calculated separately for each route.

Accident Rate

Accident calculations were made using the most recently available TxDOT accident and traffic count data. The number of accidents represents the total number of accidents involving commercial vehicles in 2005. This value was divided by the traffic volume on the segment using TxDOT 2003 traffic count (latest available data) to derive an accident rate for the segment.

To determine volume in links with no count data, an average of existing counts was used to assign values to intermediate links. This represents a reasonable estimate of volume for these links and for this level of analysis. Where there were no existing counts along a roadway, the 2003 24-hour unadjusted counts

from TxDOT and the volumes on the Laredo Urban Transportation Study 2005 TransCAD Model² were consulted. In some areas, counts obtained for I-35 included the volume of the main lanes and frontage roads – San Dario and Santa Ursula Avenues. To assign a volume to each segment individually, two-thirds of the average calculated volume was assigned to the main lanes of I-35, and the remaining third was evenly divided between the two frontage roads. Truck percentages for roads with no counts were imputed from segments of the same roadway class.

Impact Area

To determine the impact distance of a hazardous material spill, the FHWA guidelines call for the selection of a hazardous cargo commodity typically transported in the study area. According to a telephone survey of hazardous material carriers located in the City of Laredo conducted by Cambridge Systematics, oxidizer is one of the most frequently transported hazardous materials. Based upon the specific characteristics of the commodity selected, the risk analysis considers the results of an accident on a 0.5-mile impact zone extending in all directions from the potential release site. This 0.5-mile value is typical of a majority of NRHM cargo and is also recommended in the Federal guidelines as a default value.

Exposed Population

The exposed population refers to the number of persons located within the impact area. The total number was calculated using the following data:

- Residential population by block level, including age splits and group quarters obtained from the U.S. Bureau Census;
- Employment population available at the Traffic Analysis Zones (TAZ) level;
- School enrollment obtained from the Laredo and United Independent School District; and
- Patients in hospitals estimated based on the square footage of the facility.

The calculations presented in this risk analysis are provided for a 24-hour period. Daytime and nighttime population risk factors are presented in the attached worksheets for any potential consideration of time-of-day limits on NRHM transportation. The process for determining daytime residential population was taken directly from the Cleveland method cited in the Federal guidelines, but adjusting the age threshold for children to all under 5 instead of all under 6 due to the age splits reported on the Census. The number of children under 5 was multiplied by two (assuming one caregiver per child) and was added to the total

² The TransCad model is a travel demand model that analyzes the impact of population growth on both travel patterns and the roadway network.

of the over 65 population. Employment totals, school enrollment, group quarters, and daily hospital patients were also included in the daytime population calculation. Nighttime population was based on the total residential population as reported in the U.S. Census 2000.

4.2 POPULATION RISK ASSESSMENT RESULTS

Though the City of Laredo does not have a designated hazardous material truck route, it does have a truck designated route, Alternative Route 1, and thus for comparative purposes, Alternative Route 1 was assumed as the “current hazardous material-designated truck route.”

As Table 4.1 shows, if we compare the alternatives routes with the current designated truck route, Alternative Route 1, Alternative Route 3 presents the lowest population risk, since it decreases it by 8.70 percent relative to Alternative Route 1; whereas, Alternative Routes 2 and 2A do not represent any significant change in risk compared to Route 1. Both alternatives slightly increase population risk by 0.20 and 0.17 percent, respectively.

Table 4.1 Population Risk Assessment Route Comparison

Routes	Total Risk	% Difference Compared With Route 1
Alternative Route 1	28,558,989,086	NA
Alternative Route 2	28,615,233,654	0.20%
Alternative Route 2.A	28,607,588,826	0.17%
Alternative Route 3	26,064,666,896	-8.70%

Source: Cambridge Systematics, Inc.; and Alliance Transportation Group, Inc.

5.0 Through Routing Criterion

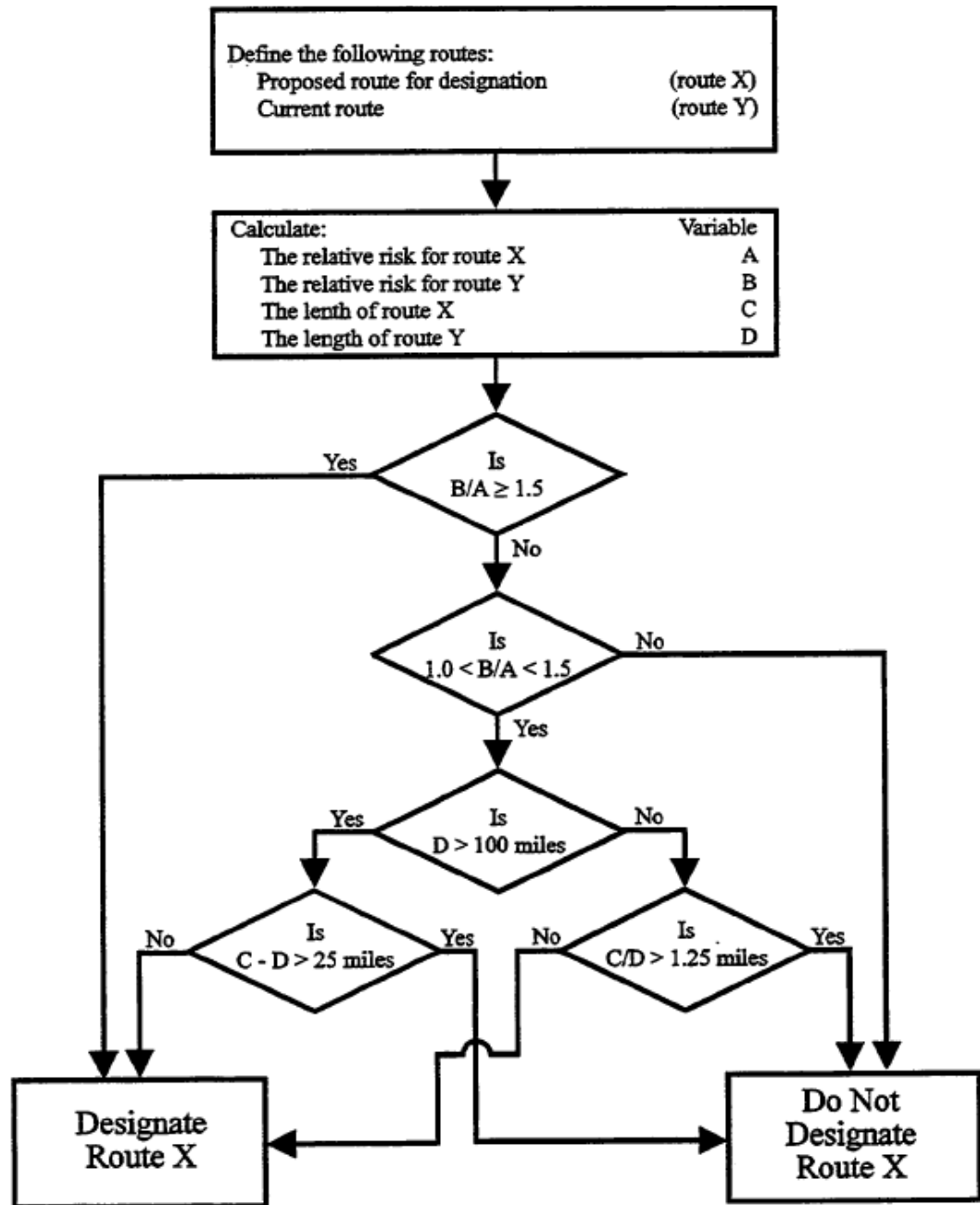
According to the FHWA’s guidelines, one of the criteria that must be considered in evaluating NRHM routes is the through route criterion, which addresses “continuity of movement of NRHM transportation, so that it is not impeded or unnecessarily delayed by routing designations.” If the ratio of the relative risk of the current routing to that of the proposed alternative is greater than 1.5, then the current route presents 50 percent more risk to the public than the proposed route and the proposed route can be designated without further analysis. If the ratio is between 1.0 and 1.5, then the designation of the proposed route depends on the total length of the current route, and the relative difference in length between the current and proposed routes. If the proposed route does not diminish the risk, then it should not be designated as an alternative route. Figure 5.1 describes the steps involved in the through routing analysis.

5.1 THROUGH ROUTING CRITERION RESULTS

If we assume Alternative Route 1 as the current NRHM designated route, and since only Alternative Route 3 diminishes population risk relative to Alternative Route 1, then only Alternative Route 3 would be subject to the through routing criterion. The results on Table 5.1 suggest that Alternative Route 3 does not impose any additional burden in terms of the distance traveled and thus could be assigned as a NRHM truck route. However, if we assume that the City of Laredo does not have any NRHM-designated route, as is currently the case, and we undertake the through routing analysis for the rest of the alternative routes, the results suggest that neither Alternative Route 2 nor Alternative Route 2A impose any additional burden in the distance traveled, and thus they could be considered as potential NRHM-designated routes.

Through routing analysis worksheets per alternative route as requested by the FHWA’s guidelines are presented in Appendix A.

Figure 5.1 Through Routing Analysis Process



Source: FHWA Highway Routing of Hazardous Materials, Guidelines for Applying Criteria.

Table 5.1 Through Routing Analysis Route Comparison

Routes	Risk Ratio Route 1/ Route n	Length (miles)	Is Alternative N distance >100 miles?	Is Distance of RN-R1>25 miles?
Alternative Route 1	1.00	161.51	Yes	NA
Alternative Route 2	0.99	162.14	Yes	No
Alternative Route 2.A	0.99	120.03	Yes	No
Alternative Route 3	1.09	156.26	Yes	No

Source: Cambridge Systematics, Inc.; and Alliance Transportation Group, Inc.

6.0 Additional Analysis

The FHWA guidelines on NRHM routes provide additional factors to be considered as input to the risk estimation of alternative NRHM routes, such as special populations, sensitive environments, emergency response capabilities, burden on commerce, and congestion and transportation delays.

Sensitive Environments

Two different sensitive environments were considered in the analysis; historic preservation buildings; and environmentally-vulnerable sites, such as major aquifers, floodplains, and water areas.

Regarding historic preservation areas, a letter was sent to Texas Historical Commission on April 5, 2006, requesting any comments or concerns about the potential risk of exposure to hazardous materials of historical sites located near the current and alternative truck routes. On May 1, 2006, Texas Historical Commission responded that no historic properties are or would be affected by any of the routes.

Environmentally-vulnerable sites data on major aquifers, floodplain, and water areas were obtained from U.S. Environmental Protection Agency (EPA). The area of each type of sensitive environment in the impact area was measured at the segment and route level to determine total area by type. This total sensitive environment area was multiplied by the appropriate accident rate and summed to determine the relative route sensitive environmental risk.

The presence of pipelines and high-tension power lines were also noted along each route for future analysis and are included in the attached spreadsheet.

Emergency Response Capabilities

Emergency response capabilities of the Laredo Fire Department were obtained from Laredo Fire Department spokesman Eloy Vega. At present, the City has one designated primary hazardous material unit that is properly trained and equipped in Laredo located at Station 7. Additional stations that have hazardous materials training, but not the equipment, are Stations 9, 10, and 13, and these are called out to assist in the occurrence of a major spill. Mr. Vega also indicated that other stations would act in a support role in the event of a hazardous materials emergency, and that all firefighters have the minimal training for facing hazardous materials spills.

Based on a 10-minute travel time buffer from the fire station to the spill location, all analysis segments within a 10-minute response window from any point along the route alternatives have been determined via the TransCAD Travel Time Band function. After arriving at the scene, it takes approximately 2 hours for all of the necessary equipment to be taken off the truck and between 2 and 4 hours for

clean up, depending on the size of the release, according to Laredo's Fire Department. For this analysis, a total time of 5.167 hours was used (5-hour response time plus 10-minute travel time). The methodology for determining the emergency response capability diverges from the Federal guidelines due to the more sophisticated nature of the route system under consideration. Instead of looking at the number of trained and equipped units, this analysis examined the percentage of each route's length that was within a 10-minute emergency response time. The resulting figure gives a clearer concept of the actual emergency response capabilities.

Burden on Commerce

As required in the Federal guidelines, the burden on commerce of the proposed alternatives was also evaluated. The rational basis for the ordinance limiting the transport of hazardous materials to certain routes is the reduction of risk to the health and safety of Laredo. The ordinance would achieve its goals by restricting the hazardous materials route to the alternative deemed safest in the analysis.

If we assume the current truck route as the designated NRHM route, then Alternative Route 1 poses no burden on commerce through cost or impairment of efficiency as it is composed of the existing route that transporters of hazardous materials have been using. However, in a strict sense, since currently there is no designated NRHM route, Alternative Route 1 does impose additional travel time costs to carriers compared with Alternative Routes 2, 2A, and 3, given that most of hazardous material warehouses are located south of the World Trade Bridge and thus crossing the border only via the Colombia Solidarity Bridge is more circuitous than via the World Trade Bridge.

Alternative Routes 2 and 3 both include the additional option of the World Trade Bridge, allowing for additional efficiency in hazardous materials routing for the transportation companies. The limitations in the routing for Alternative 3 should not represent a substantial burden to commerce based on the addition of Houston Street and Matamoros Street west of IH 35.

Congestion Delays

The evaluation of congestion was performed using the first method indicated in the Federal guidelines, requiring the maximum queue length for each segment. The maximum queue length is the longest distance that cars would stack up at an intersection due to a traffic obstruction. This analysis assumes that traffic would be blocked in both directions, and therefore is designated the number of lanes running in one direction for the full length of the segment. The analysis looked at the individual segments of the proposed NRHM routing as the lowest level of detail on the system. This means that the presence of intersections with local streets was ignored in the process of determining queue lengths on the system. This decision was made so that the option of routing traffic (including trucks) through the local neighborhoods would not be interpreted as a benefit to the route by giving a shorter maximum queue length. Counting local streets as

potential egress points for queued traffic would reduce the maximum queue length in areas where such streets are adjacent to the truck route and therefore lower the risk assessment value. This would prejudice the risk assessment towards areas with a dense network of local streets, which is counterintuitive to this analysis. Local streets have additional risk factors such as narrower widths, unsignalized intersections, and a higher level of pedestrian activity. This decision is justified by the health and safety risks involved in having a substantially higher volume of car and truck traffic on streets not designed for or accustomed to such volumes.

The distance between analysis segments was therefore determined by the maximum queue lengths for each route segment regardless of where an accident would occur on the segment. This is based on two assumptions: 1) all vehicles downstream of the accident clear the roadway; and 2) traffic in both directions is impacted. Incident duration was based on an assumed 10-minute Laredo Fire Department response time to arrive at the accident site and the cleanup time of 5 hours for oxidizers, as cited by the Laredo Fire Department representative. The average length of queued vehicles, including headway, was estimated at 40 feet to account for a mix of cars and trucks; this value was derived from the Federal guidelines. The delay calculation was estimated by multiplying the distance in feet by the response time in hours by the number of lanes, divided by the average vehicle length. This yields a delay measurement in vehicle hours.

6.1 ADDITIONAL ANALYSIS RESULTS

Table 6.1 compares the results of the additional analysis among the proposed alternative routes with the current truck designated route, Alternative Route 1.

Table 6.1 Additional Analysis Route Comparison

	Congestion Delay	Difference with R1 Congestion	Environmental Risk	Difference with R1 Environmental	Emergency Response
Alternative Route 1	84,058,310,803	NA	980,046,751	NA	41%
Alternative Route 2	84,524,849,916	0.6%	982,078,672	0.2%	41%
Alternative Route 2.A	78,120,099,622	-7.1%	959,839,334	-2.1%	55%
Alternative Route 3	83,963,713,904	-0.1%	963,098,235	-1.7%	42%

Source: Cambridge Systematics, Inc.; and Alliance Transportation Group; Inc.

Additional risk analysis per route segment is presented in Appendix 2.

6.1.1 Congestion Delay

As the table shows, when comparing congestion delay of the proposed routes with Alternative Route 1, if a hazardous material spill occurred, Alternative Route 2A would present the lowest congestion delay followed by Alternative Route 3; the former would present around 7 percent lower delay, while the later a 0.1 percent lower delay, while alternative Route 2 would present a 6 percent higher delay than Alternative Route 1.

6.1.2 Environmental Risk

When comparing environmental risk of the proposed routes with environmental risk of Alternative Route 1, Alternative Routes 2A and 3 have the lowest environmental risk, since they decrease it by 2.1 and 1.7 percent, respectively; whereas, Alternative Route 2 increases it slightly by 0.2 percent.

6.1.3 Emergency Response Capabilities

Emergency response capabilities do not differ significantly among the proposed routes. Alternative Route 2A has the highest length coverage within 10-minute emergency response time, 55 percent of the route is within that response time, while Alternative Routes 2 and 3 have coverage of 41 and 42 percent of the route, respectively.

7.0 Comparison of Alternative Routes

This task compares the alternatives according to their lengths, travel times, potential population risk, and additional factors considered.

As Table 7.1 shows, if we assume Alternative Route 1 as the current designated truck route and compare it to the other alternatives, Alternative Route 3 reduces the risk exposure to population, does not impose any additional mileage, has lower congestion delay, lower environmental risk and lower travel time than Alternative Route 1. Alternative Routes 2 and 2A do not differ considerably from Alternative Route 1, both alternatives slightly increase population risk by 0.20 and 0.17 percent respectively compared to Alternative Route 1, none impose any additional burden on commerce, nor have significantly different environmental risk than Alternative Route 1.

Table 7.1 Comparison of Alternative Routes

	Population Risk	Length (Miles)	Congestion Delay	Environmental Risk	Travel Time (Minutes)
Alternative Route 1	28,558,989,086	161.5	84,058,310,803	980,046,751	84.3
Alternative Route 2	28,615,233,654	162.1	84,524,849,916	982,078,672	84.5
Alternative Route 2.A	28,607,588,826	120.0	78,120,099,622	959,839,334	72.6
Alternative Route 3	26,064,666,896	156.3	83,963,713,904	963,098,235	77.4

Source: Cambridge Systematics, Inc.; and Alliance Transportation Group, Inc.

8.0 Public Involvement

The FHWA’s guidelines require that input is being solicited to the potentially-affected parties and by holding a public meeting. Cambridge Systematics contacted several Federal, state, and local agencies to request their comments or concerns regarding the alternative routes selected for risk assessment. Additionally, a Public Hearing was held on October 26, 2006 at the Laredo Public Center to present the results of the study.

8.1 CORRESPONDENCE WITH STAKEHOLDERS

Table 8.1 below presents the stakeholders that were contacted by correspondence.

Table 8.1 Stakeholders Contacted by Correspondence, Telephone, or E-mail

Stakeholder	Letter Sent (Date)	Letters/Comments/Documents Received	Date
Federal level			
U.S. Department of Housing and Urban Development	4-Apr-06	No response	–
Natural Resources Conservation Service	5-Apr-06		
U.S. Army Corps of Engineers	4-Apr-06	No response	–
U.S. Fish and Wildlife Service	4-Apr-06	No response	–
U.S. Department of Homeland Security, Customs and Border protection	14-Mar-06	Hazardous material vehicles entering the country	–
State Level			
Texas Parks and Wildlife Department	5-Apr-06	Webb County list of rare species	
Endangered Resources Branch		Map of species that could potentially be in the project area	07-Apr-06
Texas Commission on Environmental Quality	5-Apr-06	Strategic Plan Report of State of the Rio Grande and the Environment of the Border Region (June 2002)	11-Apr-06

Stakeholder	Letter Sent (Date)	Letters/Comments/Documents Received	Date
Texas Historical Commission	5-Apr-06	Inputs from Steve Niemeyer, Policy Analyst, TCEQ Letter from Texas Historical Commission stating that no historic properties would be affected	1-May-06
Local Level			
Laredo Fire Department	6-Apr-06	Comments by e-mail from Eloy Vega regarding emergency response capabilities	22-May-06
Caesar Kleberg Wildlife Research Institute	5-Apr-06	Not in the position to contribute	11-Apr-06
City of Laredo, Floodplain Administrator	5-Apr-06	E-mail from the Federal Emergency Management Agency including a map showing "points of interest" (schools, hospitals, library, traffic generators, etc.)	11-Apr-06
Laredo Housing Authority	4-Apr-06	Map of future developments	24-Apr-06
Laredo Health Department	4-Apr-06	No response	–
Webb County Economic Development Department	4-Apr-06	No response	–
Laredo Freight Forwarders Association	5-May-06	No response	–
Laredo Independent School District	5-May-06	Telephone conversation with Victor G. Mora; no comments were provided	May-20-06

Source: Cambridge Systematics, Inc.

See Appendix B for correspondence or e-mails received.

8.2 INPUTS FROM STAKEHOLDERS

Among the stakeholders who provided some comments on the subject are shown below.

Texas Commission on Environmental Quality

In a telephone conversation on April 11, 2006 with Steve Niemeyer, Policy Analyst, he stated that: "Opening the World Trade Bridge to NRHM cargo may increase the population and environmental risks since the WTB is very close to a drinking water plant and the Colombia-Solidarity Bridge was designed to contain spills, while the World Trade Bridge was not."

Laredo Fire Department

In a telephone conversation and e-mails, Eloy Vega, from the Laredo Fire Department, described the emergency response capabilities of LFD and stating that:

- Fire Station 7 is considered the primary hazardous material station due to the equipment and number of trained personnel. It is the location of the hazardous material response unit. Such unit contains equipment and supplies that will allow for mitigation.
- Additional stations that have hazardous materials training, but not the equipment are Stations 9, 10, and 13, and these are called out to assist in the occurrence of a major spill. Mr. Vega also indicated that other stations would act in a support role in the event of a hazardous materials emergency, and that all firefighters have the minimum training for facing hazardous materials spills.

8.3 PUBLIC HEARING

In order to get input from the general public regarding the route alternatives, a Public Hearing was held at 4:00 p.m. on October 26, 2006 at the Laredo Civic Center located at 2400 San Bernardo Avenue, Laredo Texas. A Public Notice announcing the Public Hearing was published in the Laredo Morning Times on Monday October 23, 2006. The purpose of the meeting was to present the findings of the study. Representatives of the City and Cambridge Systematics/Alliance Transportation Group attended the meeting to answer questions pertaining to this project. Both verbal and written input was received during this meeting.

Simultaneous translation from English to Spanish and vice versa was available during the meeting.

Approximately 75 people attended the meeting, with representatives of Nuevo Laredo, Tamaulipas, and the border control/inspection agents from the Mexican side.

During the public hearing the counterpart in Mexico of the Association of Laredo Forwarding Agents, “Asociación de Agentes Aduanales de Nuevo Laredo,” submitted a letter requesting the opening of the World Trade Bridge as a NRHM route claiming the following:

- When the restriction to NRHM carriers to cross the border only through the Colombia Solidarity Bridge was imposed, the World Trade Bridge was not operating;
- Crossing over the Colombia Solidarity Bridge involves traveling approximately 50 additional kilometers than crossing over the World Trade Bridge, which increases travel times and operating costs; and
- Emergency response services in Mexico are located farther from the Colombia Solidarity Bridge than from the World Trade Bridge.

Regarding the routes alternatives, some people were concerned about Alternative Route 3, and specifically about the roadway segment on Saunders due to the presence of a school and other sensitive sites adjacent to the street.

A separate memorandum presents public hearing sign-in sheets, public comments, and a transcription of the public hearing.

9.0 Conclusions

In a strict sense, the City of Laredo does not have an officially-designated NRHM route. However, it does have a designated truck route, Alternative Route 1 that functions as de facto NRHM route system. Based on this definition and a strict application of the FHWA guidelines, only Alternative Route 3 can be designated as an alternative NRHM route, since it is the only route that reduces population risk relative to Alternative Route 1, besides not imposing any burden on commerce, and having lower environmental risk, lower congestion delay, and lower travel times than Alternative Route 1. However, since Alternative Routes 2 and 2A do not differ significantly in population risk from Alternative Route 1 and since they satisfy the Federal guidelines in other respects, neither impose any additional burden on commerce relative to Alternative Route 1, nor have significantly different environmental risk than Alternative Route 1, they could be considered as designated NRHM routes subject to TxDOT approval.

10.0 Next Steps

Based on Texas Department of Transportation Traffic Operations Manual, Section 7, Non Radioactive Hazardous Materials Routing, to designate a Non Radioactive Hazardous Material Route a political subdivision must undertake the following steps:

- **Step 1 - Initial Contact.** Contact the local TxDOT district office and any other political subdivision during the process of determining the best NRHM route.
- **Step 2 - Route Analysis and Proposal.** The political subdivision must develop a route proposal. The written proposal must address all of the Federal standards and factors listed in 49 CFR Section 397.71 (b). Use the most current version of the U.S. DOT publication, entitled *Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials*.
- **Step 3 - Local Public Hearing.** The political subdivision must hold at least one public meeting on the proposed NRHM routing designation.
- **Step 4 - Proposal Submission.** Submit eight copies of the NRHM route and one original color map of the proposed NRHM route designation proposal to TxDOT Traffic Operation Division (TRF).
- **Step 5 - Proposal Review.** TRF will provide the public with notice through the publication in the *Texas Register* and a 30-day period in which to comment. TRF will also conduct a public hearing to receive additional comments on the proposed NRHM routing designation.
- **Step 6 - Consultation with Other States and Indian Tribes.** TRF will provide written notice to the officials responsible for NRHM highway routing in all other affected states and Indian tribes.
- **Step 7 - Authorization and Approval.** If TxDOT determines that a route has met all criteria for approval, TRF will submit the proposed NRHM routing designation to TxDOT executive director for approval.
- **Step 8 - Route Designation and Signing.**
 - **Designation.** Upon receipt of a letter of approval from TxDOT, the political subdivision must designate the NRHM route by ordinance, resolution, rule, regulation, or other official order. The political subdivision must forward a copy of the order to TRF within 30 days of receipt of the letter of approval.
 - **Signing.** The political subdivision must submit the proposed sign and installation locations of the NRHM route designation to the local TxDOT district office for approval. All signs must conform to the latest version of the *Texas Manual on Uniform Traffic Control Devices*.

The City of Laredo has already undertaken Steps 1 to 3, and needs to proceed with Steps 4 to 8, which implies submitting a formal proposal to TxDOT of the preferred route based on the alternatives routes analyzed in this report.