APPENDIX D:
Literature Review for the Central Corridor Supplemental EIS

Literature Review for the Central Corridor Supplemental EIS

This literature review examines papers, reports, studies and other documents on

- The impacts from the construction of major transportation projects on area business revenues; and/or,
- Best practices employed to mitigate adverse construction-related impacts to businesses.

Studies that undertook quantitative analyses of impacts to **storefront businesses** were particularly sought out. Although growing as a field of research, literature on the impacts of transportation construction to area businesses is relatively scarce. The "Technical Report on the Potential Impacts on Business Revenues during Construction of the Central Corridor Light Rail Project" completed by the US Department of Transportation Volpe Center (2011) reviewed four academic and government-published studies as well as two additional studies. In addition to highlighting studies with quantitative analyses of business impacts as the Volpe report did, this literature review includes additional published reports that present qualitative findings on the topic.

Peer-Reviewed, Government or Academically Published Works

Analyzing the Effects of Highway Rehabilitation on Businesses[i]

This 1993 study by de Solminihac and Harrison on construction phase impacts to businesses from urban highway rehabilitation projects examined an 11.6-mile highway reconstruction project along the Southwest Freeway (US-59) in Houston, TX. Construction activities were broken into four segments and took place from August 1989 to December 1992.

The researchers examined sales data for businesses along the corridor and compared actual sales data during construction to predictions of sales based on pre-construction sales data. Businesses were broken down into ten categories to determine which sectors were most impacted by construction. Based on this quantitative analysis, the researchers found that negative impacts from construction were most severely felt by businesses in four retail categories: food stores (37 percent drop), automotive outlets (32 percent drop), general merchandise (28 percent drop) and home furnishings (17 percent drop).

The authors also conducted a business survey to ask managers to quantify impacts to their businesses. About 49 percent reported being considerably affected by construction and an additional 32 percent said they were somewhat affected. Of the 66 respondents, 22.7 percent said their sales either improved or did not change during construction. Another 22.7 percent reported sales dropping between 10 to 20 percent. Only 12 percent of businesses surveyed reported experiencing a sales drop of 40 percent or more during construction.

Estimated Construction Period Impact of Widening State Highway 21 in Caldwell, Texas[i]

Wildenthal and Buffington's 1996 study examined the widening of a 2.3-mile stretch of State Highway 21 in Texas. Construction on the project occurred between 1991 and 1993 in Caldwell, TX, a town of 3,000. The transportation construction project differs greatly from the CCLRT project in its location and project type. The authors surveyed managers of abutting businesses to obtain information on sales figures, number of employees and number of available parking spaces before and during construction. Survey data on sales were cross-checked with actual sales data, where available. Of the 54 survey respondents, 34 (63 percent) reported a decline in sales and 20 reported a decline of 25 percent or more. Twenty-three businesses reported actual sales data for 1990 (before construction) and 1991 (less than one year into construction). Of those 23 businesses, slightly over half experienced a decline. The aggregate sales data from these 23 businesses showed a five percent decrease in sales between 1990 and 1991. Meanwhile, gross sales data for all businesses in Caldwell (obtained from the state comptroller's office) showed a five percent increase in sales during this period. Approximately 80 percent of business managers reported no change in the number of employees during construction.

Mitigating the Adverse Impacts of the Dallas North Central Expressway Construction on Businesses

In a 1998 study, Harrison and Waldman examined the impacts to business associated with the reconstruction of an 18-mile stretch of the North Central Expressway (NCE) and the construction of an adjacent Dallas Area Rapid Transit (DART) light rail transit (LRT) in Dallas, TX. The researchers surveyed businesses along two sections of the corridor where construction had already been completed as well as businesses abutting two sections that were under construction at the time of the survey. Harrison and Waldman supplemented the business owner perceptions gained through the surveys with an analysis of more objective sales data reported to the Texas state comptroller. The research team further examined business openings and closings during construction and trends in multi-tenant real-estate market.

Based on two previous reports (WisDOT, 1989; de Solminihac and Harrison, 1993) and correlation with NCE surveys, the researchers identified the four most sensitive sectors to transportation construction work: retail, other; retail, food; retail, auto; and services. Harrison and Waldman collected sales data for the businesses within these sectors along the NCE project corridor. They then compared the data from before construction began to sales data from the construction period. They further compared sales data for businesses along the NCE construction corridor to sales data for these sectors in Dallas as a whole. Both of these comparisons yielded no significant difference in business sales. Surveys of business openings and closings along the four sections showed 60 business openings and 36 business closings occurred during construction. Finally, analysis of quarterly absorption, occupancy and rental rates for multi-tenant office buildings showed a low point from 1991 to 1992, when occupancy rates in the project area were 10 percent below the city average. However, the statistics showed a steady rise from 1992 to 1996, when occupancy in buildings of this type was 87 percent along the NCE project corridor – four percent above the city average.

Survey responses from businesses in the two completed sections primarily highlighted negative impacts to sales and driving patterns. Some also noted communication issues between the Texas Department of Transportation (TxDOT), the construction contractor and businesses. Surveys that were administered to businesses as they were experiencing frontage road reconstruction activities yielded similar results to

those in the completed sections. However, these business owners noted less adverse impacts from construction than those surveyed in the completed sections. Harrison and Waldman hypothesized that this could mean that TxDOT, the contractor and businesses had learned from the experiences from the already completed sections.

The authors highlighted five recommendations for mitigating impacts to business during the construction of large, urban transportation projects:

1. A dedicated person or group tasked with mitigating adverse impacts to area residents and businesses.
2. Expedited construction of frontage roads to minimize access issues for area businesses.
3. A survey of businesses before construction begins to identify those businesses most vulnerable to construction and to establish contacts between the businesses and the project outreach person or team.
4. Targeted outreach and mitigation measures for those types of businesses that have been determined to be more sensitive to construction activities.
5. Flexibility in communication techniques to take advantage of the best available and most effective media.

Highway Construction Impacts on Wyoming Business[i]

In a 2005 study, Young, Wolffing and Tomasini analyzed twelve highway construction projects, which were all completed in Wyoming between 1998 and 2001. One of the largest projects examined was located in Cody (population 49,644). It affected 50 businesses and cost over $8 million. Projects ranged in size and location down to an $87,000 project in Moorcroft (population 807), which affected three businesses.

The researchers used a survey to identify business managers' perceived impacts to revenue from construction. A total of 98 surveys were returned. Responses were then compared to actual tax data from the Wyoming Department of Revenue for projects with a large enough number of businesses to complete a statistical analysis. Forty-two percent of the survey responses about perceived impacts during construction were found to be more pessimistic than actual impacts to revenue. The authors found that most businesses experienced reduced positive growth as opposed to negative growth in sales during construction. The authors further classified businesses by Standard Industrial Classification (SIC) codes and examined impacts to businesses by business category. Some business categories were particularly susceptible to negative impacts during construction, namely the food-related retail, gas service and hotel service categories.

Young, Wolffing and Tomasini also sent out a survey to all fifty state Departments of Transportation (DOTs) to assemble a list of common practices implemented to address business owner concerns and to mitigate impacts to businesses during construction of transportation projects. All fifty DOTs responded. The results showed that DOTs emphasized communications to businesses through television, radio, newspapers and websites as a way of disseminating information about construction schedules, closures and other related information. State DOTs tended to emphasize maintaining access to businesses as the

primary mitigation measure employed. Special signage to denote business access was highlighted, though states were split on whether or not individual business names should be used on signs. Contractor incentives or penalties were also common measures implemented by DOTs to encourage efficient construction practices.

Development of Improved Procedures for Business Accommodation on Transportation Construction Projects

A 2005 report by Ellis and Washburn for the Florida Department of Transportation (FDOT) surveyed and interviewed businesses along four reconstruction corridors to determine their perceptions of impacts to their businesses during construction. The four projects were

- A 2-year major reconstruction of San Jose Boulevard (Jacksonville).
- A 13-month (400-day) major reconstruction of 1.6 miles of SR 121 (MacClenny).
- A 20-month major reconstruction of 1.16-mile stretch of Mahan Drive (Tallahassee).
- A major reconstruction of 3 miles of US 192 (Kissimmee).

Using information gathered from interviews and focus groups with business managers along the four corridors, Ellis and Washburn rated the construction impacts of highest concern to businesses. The highest rated concerns were related to customer access/parking and delivery access followed by business visibility and signage concerns. The prevailing perception of the business managers was that customers had a difficult time accessing their businesses. The next impacts of highest concern, according to the FDOT report, were utility outages and disruptions during construction. Construction-associated congestion and changes in traffic patterns were determined to be another set of impacts that concerned business managers. Based on information gathered from businesses on their perceptions, the report concluded that destination businesses (e.g. banks, specialty retailers, insurance agencies) were less likely to feel negative impacts on business due to traffic pattern changes than other businesses such as fast-food retailers.

The 2005 report by Ellis and Washburn for FDOT further expounded a number of accommodation strategies to address the business concerns that were identified. The authors broke down these recommendations into three areas:

1. Strategies to Improve Communication with Businesses
    - Hold a public meeting to introduce mitigation efforts and project personnel before construction starts.
    - Install a project sign that includes basic information about the project and contact information.
    - Regularly distribute information to businesses via flyers.
    - Provide project information and updates on a project website.
2. Business Signage
    - Mount signs on posts to increase visibility.
3. Business Access, Parking and Traffic Congestion

- Develop traffic control plans which take into account construction impacts to automobile traffic; other traffic including pedestrian, bicycle and bus; business access; and parking availability. The development of the plan should also include accident analysis and level of service analysis of the existing corridor, pre-construction.
- Base part of contractor incentive pay on the successful implementation of business accommodation efforts.

Improved Procedures for Business Accommodation on Transportation Construction Projects

Ellis and Agdas published an updated report in 2010. The authors noted that three-quarters of business managers surveyed along the San Jose Boulevard project and two-thirds of businesses along the Mahan Drive project reported that construction of the projects had negatively impacted their businesses. The authors further stated that reported declines in revenue were in the 5 percent to 25 percent range.

Ellis and Agdas's 2010 article further highlighted the benefits of developing a pre-construction business inventory and establishing early contact with businesses abutting the construction project, routinely visiting businesses to foster communication and coordinate utility outages with all relevant actors.

Highway Construction Related Business Impacts[i]

In a 2008 study, Buddemeyer and Young study looked at the impacts to businesses in Dubois, Wyoming, during a major reconstruction of US 26/287 over Togwotee Pass. The reconstruction was scheduled in five phases and broken into four projects to be completed over seven years. Business owners and residents in Dubois, a small rural town with a population of 926, were concerned that construction activities would cause a loss of tourism traffic to the town, as US 26/287 runs through the center of Dubois and connects it to the tourist destinations of Jackson Hole and Yellowstone National Park.

The authors compiled a list of businesses operating in the town of Dubois at the start of construction. Most of the 174 businesses on the list were highly dependent on tourist traffic; 60 percent of the businesses reported that 75 percent or more of their customers were from out of town. The authors classified the businesses by business type according to Standard Industrial Classification (SIC) codes and then used sales tax revenue data and sales tax rates for the different types of businesses to calculate revenues for each business. The researchers plotted revenue data for 110 of the 174 businesses (only those that were operating in Dubois from January 2001 to October 2007). Aggregate yearly sales figures were compared to predicted sales figures, which were calculated based on pre-construction data. The authors found that the Dubois businesses, overall, were performing close to the level expected by the predicted sales figures, with some minor declines in 2007. Tourist-based businesses, overall, also experienced growth, though it was lower than other businesses.

The researchers also conducted a survey of business owners. Only 13 of the 63 survey respondents reported that they felt their business was negatively impacted by construction activities.

Report on Mitigation of Transportation Construction Impacts. Minnesota Department of Transportation[i]

A 2009 report published by the Minnesota Department of Transportation (MnDOT) examined impacts to businesses during the construction of transportation projects. As part of its broader study, MnDOT

conducted a survey of businesses along seven transportation construction projects in the state of Minnesota to glean information about the types and extents of impacts to businesses and the effectiveness of various mitigation measures.

Three projects were located in the Twin Cities Metro:

- Major reconstruction of Highway 36 between White Bear Ave. and Hwy 120/Century Ave;
- Major reconstruction of I-35W & 54th Street/Diamond Lake Road (Minneapolis);
- Major reconstruction of Lake Street (Minneapolis).

Four projects were located outside of the metropolitan area:

- Major reconstruction of Highways 16/61 (La Crescent);
- Mill and overlay of Highway 2 West of Highway 38 intersection (Grand Rapids);
- Major reconstruction of Highway 2 East of Highway 38 (Grand Rapids);
- Major reconstruction of Highway 10 (Detroit Lakes).

In total, MnDOT sent out over 400 surveys and received responses from 95 businesses. Of the respondents, 76 percent said their business had been impacted by construction and 62 percent reported having lost business.

The 2009 MnDOT report presented a list of best practices and recommendations for implementing mitigation activities.

1. Include business outreach in a broader, more holistic public involvement program to connect different stakeholder groups in the community. Mitigation of business impacts necessarily involves communications not just to business owners but also to customers, employees and suppliers.
2. Map out key decision makers and project managers early in the project to reduce confusion when rules and policies change under new management. The benefit of the construction contractor as a direct point of contact for businesses should not be overlooked.
3. Tailor outreach and communication strategies to each specific project and allow for natural changes. The greater the impact on business impacts, the longer the lead-time a project should have in starting outreach. Corridor construction projects have the greatest impact and should have significant outreach along the corridor at least one year ahead of construction.
4. Provide businesses with an information packet that includes construction information, agency contact information, and a list of resources that can provide financing, marketing and/or technical support. A project description that lays out the reasoning behind the project may increase buy-in to the project.
5. In addition to providing project information, demonstrate responsiveness to questions and requests for further information.
6. Identify business issues early in project planning through consultations with local government units and business representatives.

7. Identify partnership opportunities with community and business organizations and with other government entities.

Mitigating Traffic Impacts During the Marquette Interchange Reconstruction Project

The Wisconsin Department of Transportation (WisDOT) developed and implemented a traffic mitigation program to manage business and community needs during the reconstruction of the Marquette Interchange in the heart of downtown Milwaukee. The Marquette Interchange, where Interstates 43, 94 and 794 intersect, is a gateway to downtown Milwaukee, which is a large population and job center with approximately 4,300 businesses. WisDOT solicited ideas for mitigation measures from local business organizations and other local agencies in four areas: public information, freeway traffic operations and safety, transit and demand management, and local road traffic operations. Based on an evaluation of the measures that were ultimately implemented as part of the traffic mitigation program, the authors identified three key success factors:

1. Good partnerships with local agencies.
2. Early identification of mitigation measures during the design and budgeting processes.
3. Strong lines of communication with the public, local agencies and construction contractors.

Assessing Neighborhood and Social Influences of Transit Corridors

Fan and Guthrie authored a 2012 study on neighborhood change during and after transit corridor development. The researchers surveyed residents and business owners along two existing Twin Cities transit corridors – the Hiawatha LRT and the Northstar commuter rail line – and two planned corridors – the Cedar Avenue Bus Rapid Transit line and the Central Corridor LRT. The authors sought to identify which businesses saw themselves as "winners" and which as "losers" in transitway development. Though the study overall was focused on longer-term impacts of transitway development, part of the survey instrument was designed to probe business owner perceptions of impacts from transitway construction. Construction on the Central Corridor and Cedar Avenue transitways had not yet begun at the time of data collection, so all construction impacts measured were actually business owner expectations of impacts.

Around 40 percent of businesses surveyed along the Central Corridor LRT perceived that transitway development had had and would continue to have somewhat negative or strongly negative impacts. Comparatively, perceptions of negative impacts from the Cedar Avenue transitway development were held by around 20 percent of the survey population. Forty percent of Central Corridor business survey respondents were very concerned by construction impacts. Only about 20 percent reported no concern. These figures compare to approximately 30 percent of businesses along Cedar Avenue that reported being very concerned and an approximately equal number of businesses that reported not being concerned at all.

The authors asked business about their level of concern over several specific impacts including customers not knowing how to reach businesses, fewer people passing by, trucks not being able to reach businesses, noise and dust impacts, and loss of parking. Along the Central Corridor, a majority of businesses noted concern about each of these potential impacts. Central Corridor business owners were

slightly more likely to be concerned about customers not knowing how to reach businesses and fewer people passing by, and a slightly less likely to be concerned about customers not knowing that businesses are open. Along the Cedar Avenue transitway corridor, business owners were primarily concerned with customers not knowing how to reach their businesses and fewer people passing. Other concerns, especially trucks not being able to reach, noise and dust, and lack of parking were not as commonly listed as concerns.

Other Published Works

The Impact of Light Rail on Local Businesses[i]

In 2006, Houston Tomorrow (formerly the Gulf Coast Institute) published a case study report on the impact of light rail projects on businesses in six cities that had recently constructed projects. As a non-profit organization, Houston Tomorrow sought to provide information to Houston residents about experiences with light rail construction in other cities. Houston Tomorrow gathered data by interviewing transit agency staff, local government officials, and representatives of the business community in Los Angeles, San Diego, Dallas, Portland, Minneapolis and Salt Lake City.

Portland's TriMet was the only agency to collect data on small businesses during construction, and several of the other cities noted how beneficial such data collection would have been in measuring the impacts of construction to businesses. The extension of Portland's LRT system along Interstate Avenue mirrored many of the characteristics of the CCLRT, running along an urban corridor with storefront businesses, about 70 percent of which were possibly dependent on impulse customers. Portland's data showed seven business closures during construction, but only one was determined to be directly related to construction. Thirteen of the original 106 businesses along the corridor moved and four changed names and ownership; two of these changes were determined to be attributable to LRT construction.

Some of the representatives from other cities surveyed provided anecdotal estimates of impacts to businesses during LRT construction, but most did not attempt to quantify overall impacts. A transit agency official estimated that no more than 10-15 percent of businesses along recent LRT construction corridors in Dallas shut down during construction; he further noted that not all closures were due to construction.

Light Rail Construction: Mitigation of Business Interruption

In another 2006 report, Houston Tomorrow surveyed methods used by six cities to mitigate business interruption during LRT construction projects to present "a toolkit of tested mitigation practices" for future projects, particularly those in the City of Houston. Data on methods used in these cities, along with mostly anecdotal appraisals of success levels, were collected via interviews with City officials, rail project officials, business community members and others involved (e.g. officials from banks or non-profit lending institutions involved). Effective methods employed in Dallas, Los Angeles, Minneapolis, Portland, Salt Lake City, and San Diego were broken down into five key areas for successful mitigation. These areas, along with the various strategies highlighted by Houston Tomorrow, are listed below.

1. Financial assistance programs:
    - Small loan programs that offer low-interest or interest-free loans
    - Loans administered by a third-party, non-profit institution
2. Community relations:
    - A single point of contact for businesses and the broader community
    - 24-hour construction hotline
3. Construction guidelines and project management:
    - Meeting with utility companies to coordinate construction schedule
    - Flexibility in design
    - Early communications with businesses about construction plans
    - Completing construction in sections
    - Maintaining vehicle access to parking and pedestrian access to business entrances
4. Contractor incentives:
    - Incentive pay determined based on appraisal of calls into the complaints hotline and on the votes of community representatives
5. Marketing:
    - Distribution of coupon books
    - Promotional mail alerting neighbors that shops are open
    - Special signage along corridor
    - Placing of ads on buses
    - Placing of full-page ads for specific geographic clusters of businesses as they were experiencing construction on their doorstep
    - Establishment of Lunch Bus program to bring project-related employees to eat at restaurants along the construction corridor

Little Mekong CCLRT Impact Study

In a 2012 study, the Asian Economic Development Association (AEDA) surveyed business owners along University Avenue between MacKubin Street and Galtier Street in Saint Paul about the impacts of light rail construction. This five-block study area contains 80 businesses, with a high percentage of Asian-owned (70 percent) and non-Asian minority-owned (13.8 percent) businesses. The majority of businesses can be classified under the restaurant, retail or service-related sectors (61.25 percent). The study gathered qualitative data through semi-structured, in-person interviews with business owners, managers or other staff at 64 of the 80 businesses in the study area. Data collection occurred from late March to July 2012.

The study includes a number of estimates provided by the survey respondents of percent loss of customers or percent loss of revenue from construction. These estimates are presented anecdotally and vary significantly, with some businesses reporting losses of 25-30 percent and others reporting losses of 70-80 percent.

One of the questions survey respondents were asked was what the "greatest challenge" posed by construction to their business was. Twenty-four said customer access, 14 said traffic and navigation, 12

said parking access and 11 said nothing. According to case study summaries of 31 of the businesses surveyed, service-based businesses were the most likely *not* to report significant negative impacts from construction. Meanwhile, all six case study restaurants reported loss of customers and business. The study concluded that businesses that rely on the physical presence of customers at their University Avenue location were more affected than businesses that do not rely on customers coming in.

Student Papers

Light Rail Transit Construction Impact Mitigation Strategies[i]

As a student at the University of Minnesota's Humphrey Institute, Reuben Collins prepared a report on mitigation of construction impacts to businesses. In this 2007 study, Collins analyzed case studies from seven US cities that had recently completed construction of LRT projects. The cities included Portland, Seattle, Salt Lake City, Phoenix, Denver, Houston and San Jose, and were selected because they had one or more key characteristics in common with the Central Corridor LRT project, namely a mid-size metropolitan area context and/or a center-running alignment on an arterial street. The author focused on mitigation strategies employed in the seven cities, but made mention of impacts to businesses in a few of the case studies. The report cited the same figures for business closures during the construction of Portland's Interstate Avenue LRT as the 2006 Houston Tomorrow report on impacts. Collins looked at business impacts from the first LRT line in Salt Lake City, which was completed in 1999 (an earlier project than the one analyzed in the Houston Tomorrow report). The report cites an anecdotal estimate that thirty percent of businesses along the corridor closed curing construction, although no formal tracking of closures was completed. In a case study of the construction of 4.3-mile at-grade stretch of Seattle's Central Link LRT, the author cited a Seattle Times news article from February 2006 that reported that 44 of 274 businesses along the corridor had closed since construction began in July 2004.

Based on the data collected in the case studies, Collins developed a table of mitigation measures implemented in the seven cities and rated each measure's effectiveness and popularity among businesses and residents. Some of the most commonly employed measures included regular communication channels such as websites, mailers, and meeting; 24-hour hotlines for complaints; "Open for Business" signage; and extra advertising for businesses. The effectiveness of these measures did not always correlate with their broad implementation. Open for business signage, advertising campaigns, business advice and counseling, contractor incentive programs, door to door canvassing, multi-lingual outreach coordinators and travel demand management were determined to be the most popular measures in the cities in which they were implemented. The programs with the highest effectiveness rankings included contractor incentive programs, the hiring of multi-lingual outreach coordinators, door to door canvassing, and the provision of business advice and counseling free of charge.

Alive! Survive! Thrive!: Outreach, Construction Mitigation and Assistance Strategies for Small Businesses Along University Avenue from Lexington to Rice

In 2007, Larry Fasching, Mary Guerra, John McCarthy and Susan Sloper completed a pre-construction study of businesses along a two-mile stretch of University Avenue as part of their course work at the University of Minnesota's Humphrey Institute. The authors' study involved a survey of 19 businesses

between Lexington Parkway and Rice Street. The purpose of the survey was to extract business manager perceptions on their existing business conditions, the potential impacts of LRT construction to their businesses and mitigation measures that might be useful. Most respondents said their businesses are destination businesses. The primary mode of customer access for most businesses was via personal vehicle and most provided off-street parking. The most prominent concerns regarding LRT construction were related to decreased customer access and a shrinking customer base due to traffic flow changes and customer avoidance of the construction zone.

Based on their survey of businesses and a literature review on business impact mitigation measures employed during other transitway construction projects, Fasching et al. identified twelve strategies to mitigate business interruption during construction of the Central Corridor LRT. The proposed medium-term strategies (to be completed before construction started) are listed below, along with the recommended agency to serve as a lead on the undertaking.

1. Designate a Mitigation Specialist to serve as a single point of contact for business owners and contractors about mitigation of impacts to local businesses. (Metropolitan Council)
2. Establish business mentoring programs to offer courses and training to area businesses, for example on how to develop a business plan. (City of St. Paul)
3. Establish construction guidelines to keep business interruption to a minimum, for instance by completing construction in segments to reduce the amount of time that construction activities are taking place in front any given business. (Metropolitan Council)
4. Disseminate a list of business resources that includes existing organizations that offer technical support, loans, etc. (City of St. Paul)

Longer-term strategies (2010-2014) to be implemented during construction include

1. Hold weekly meetings to allow business owners, project managers, contractors and city officials to have a regular forum for exchange. (City of St. Paul)
2. Create a Community Development Fund to provide grants and low-interest loans to businesses impacted by LRT construction. (City of St. Paul and non-profit organization)
3. Leverage other available private and non-profit lending resources. (Metropolitan Council)
4. Establish a parking management program to identify off-street parking availability and a plan to share these resources. (Metropolitan Council)
5. Launch an “Open for Business” campaign to encourage patronage to the area during construction. Activities may include distributing coupons for area businesses and placing advertising on local bus routes serving the area. (Metropolitan Council)
6. Provide additional signage to notify customers that businesses are open and provide specific information on alternate access to businesses. (Metropolitan Council)
7. Implement a lunch bus campaign to bring customers to a given restaurant along the corridor and/or a food court that brings University Avenue restaurants to customers somewhere off of the corridor (e.g. at State Capitol). (City of St. Paul)
8. Use contractor incentives to allow the community to control quarterly contractor bonuses. (Metropolitan Council Business Advisory Council)

Economic Indicators of the Lake Street Corridor

A 2009 report prepared by Jose Diaz, a doctoral candidate at the University of Minnesota's Applied Economics department, appraised and analyzed the changes in the economic performance of businesses along a 5-mile stretch of Lake Street, a commercial corridor in Minneapolis, MN, during major reconstruction of the street. As measures of economic performance, the study collected and used data on the number of open businesses per section of street and the sales tax revenue from each section from 2004 to 2006. Diaz then compared these figures to construction timelines, and particularly looked at the two sections which were under construction in 2005 and 2006 as well as one section in which construction was scheduled to begin in 2007. The correlative results showed negative growth in the number of businesses in the year in which those two sections experienced construction, but positive growth in years without construction. The sales tax data showed no discernible correlation with construction periods.

Impact of Light Rail Construction on Neighborhood Business Activity in the Rainier Valley, Seattle, Washington

In a 2009 master's thesis, Alexandre Krieg investigated the impacts of Central Link LRT construction on neighborhood business activity along a commercial corridor in the Rainier Valley neighborhood of Seattle, WA. This section of the Central Link LRT involved the construction of a center-aligned, at-grade track along 4.5 miles of Martin Luther King Jr. Way South, a main commercial corridor in the ethnically diverse neighborhood.

Though this analysis focused on data collected before LRT and after construction, a few of the findings presented speak to impacts on business activity during construction. According the study, 268 businesses were open a year before construction began and 57 businesses were forced to relocate due to construction. Despite these 57 relocations, 234 businesses were open in 2009, when Central Link operation began. While business turnovers did occur during the six-year study period (from 2003, a year before construction began, until 2009, when Central Link operation began), the total number of open businesses peaked during the middle of the construction period in 2006. Total revenue reported by businesses along the corridor that paid business taxes grew by 30 percent between 2001 and 2008 (adjusted for inflation). However, businesses with gross annual revenues below $50,000 during this period were tax exempt, and are thus excluded from this figure. The number of businesses above the threshold was relatively stable during construction, but the number of businesses below the threshold fluctuated and many of these businesses demonstrated losses.

Business impact mitigation measures included a Supplemental Mitigation Assistance (SMA) program, which disbursed $15.1 million in business re-establishment payments, business interruption payments and loans for business improvements. The business re-establishment payments were geared towards businesses forced to relocate off of the corridor. The business interruption payments were targeted at small businesses staying on the corridor, which were required to demonstrate losses to be eligible. One hundred sixty-eight businesses out of a universe of 310 businesses received business interruption payments.

Results of the Supplemental Mitigation Assistance Program on Businesses Impacted by Light Rail Construction in the Rainier Valley

In a second report submitted in 2009, Krieg evaluated the effects of the SMA products used during the construction of the Central Link LRT through Seattle's Rainier Valley. Based on this evaluation of success factors and obstacles, Krieg distilled three best practices and six further recommendations for future projects utilizing mitigation funding programs:

1. Ability to adapt mitigation products based on changes in construction schedule or other changes.
2. Ongoing and active engagement and follow-up with businesses by the organization managing the fund.
3. Clear goals set to establish a framework for the funding activities.
4. Collaboration and communication between various actors, including all transit agencies, construction contractors, counties, cities, funding agencies, residents and businesses involved.
5. Linkage of financial and technical assistance to help businesses receiving financial assistance also improve their business practices.
6. A single provider of technical and financial assistance to provide a one-stop-shop for businesses.
7. Long-term business outreach that begins before construction, continues during construction and is sustained after construction.
8. Preparation for the end of construction and end of the financial assistance program.
9. On-going reporting and monitoring to document program impacts in a standardized, objective manner.

The Potential Impact of Central Corridor LRT on Existing University Avenue Businesses

Agnew et al. reviewed business impacts of LRT construction and mitigation strategies employed in four US cities: Seattle, Portland, Phoenix and East Los Angeles. The student researchers also completed an inventory of University Avenue businesses between Lexington Parkway and Rice Street and classified businesses by sector. Based on a literature review, the authors identified eight factors that influence the extent of LRT construction impacts to a given business. These included, in order of importance, the financial state of the business (at the start of construction), mitigation measures taken, parking and accessibility, marketing, type of customer base, property value changes, proximity to new developments or vacancies (possible future sites for new development), and whether a business owned or leased their space. The authors then completed a sectoral analysis of businesses in this study area based on the eight factors outlined above. The researchers found that businesses in the personal care services sector, the largest sector in the study area, were not expected not to be particularly affected during construction due to their regular clientele. Full-service restaurants were expected to see impacts due to loss of walk-in business during construction. Businesses in the automotive repair and maintenance sector were expected to have relatively low survivability as compared to other sectors due to loss of accessibility during construction.

Light Rail Construction Mitigation Strategies: National Examples for the Central Corridor

In 2007, Arbit et al., students at the University of Minnesota's Humphrey Institute of Public Affairs, conducted case study research to determine recommendations for business impact mitigation during Central Corridor LRT construction. The authors examined business impact mitigation strategies employed during LRT construction in Portland, Salt Lake City, San Diego and Houston, due to the similar contexts of these LRT projects, which generally ran along median alignments in urban commercial corridors. Based on the findings from these case studies, the authors developed a number of recommendations for the agencies involved in the Central Corridor LRT project as well as recommendations for construction contractors.

Summary of recommendations to the City of Saint Paul, the Metropolitan Council and other agencies:

- Begin mitigation efforts as early as possible.
- Keep pedestrian and vehicle access to businesses open.
- Create a business directory and help promote those businesses during construction.
- Include mitigation funds in project budget.
- Hire outreach staff who have connections to the local area and do not just give out information but listen to business owners' concerns.
- Use construction incentive pay to stimulate efficient construction practices.

Summary of recommendations for construction contractors:

- Work with businesses and municipal agencies to arrange alternate access when necessary.
- Find off-street parking locations that do not compete with customer or delivery van parking for area businesses.
- Organize lunch visits to area restaurants.
- Put up detour signs that are easily seen by both vehicular and pedestrian traffic.

Summary

Apart from the studies previously reviewed in the Volpe Center's 2011 Technical Report, most of the studies that outlined impacts to businesses during the construction of transportation projects used surveys of business owners' and managers' perceptions. Very few of the studies employed other methods, such as comparative analysis of sales tax data or an assessment of business openings and closings during construction. Most studies showed at least some impact to businesses, although several of the studies utilizing survey instruments noted businesses impacts were not as bad as expected, according to subjective survey responses.

A number of the recommendations or best practices in business impact mitigation were outlined in various studies summarized above. These recommendations or best practices were by and large derived from case study reviews, which generally included subjective and anecdotal responses from interview partners involved with the various construction projects. Recommendations can be organized into five broad categories: access, communications/outreach, marketing, construction practices and the provision of technical and financial resources to businesses.

Recommendations for access included putting up clearly visible signs to direct vehicle and pedestrian traffic to alternate access routes to businesses and creating a parking plan to make best use of available parking.

Best practices for communications included starting project communications and public outreach significantly before construction; maintaining strong communication lines between agencies, local governments, businesses, residents and all other relevant actors; having a stable, single point of contact for businesses; and, being responsive and flexible in communication strategies.

Common marketing recommendations included launching an "Open for Business" campaign; sending out coupon books for area businesses; placing ads in buses and other media; and, establishing a lunch bus program.

Best practices in construction included completing construction in segments; working with businesses to maintain vehicular and pedestrian access; and, utilizing contractor incentive pay that is tied to contractor's success in accommodating businesses.

Finally, common recommendations for the provision of resources to affected businesses included developing and disseminating a list of existing technical and financial resources for businesses; providing low-interest small business loans during construction through a third-party; and, folding financial and technical support into a one-stop-shop for businesses along the corridor.

References

Agnew, S., P. Baum, M. Croaston, A. Janzen, E. Jerabek, B. Jorgenson, A. Senn, J. Yang. (2010). *The Potential Impact of Central Corridor LRT on Existing University Avenue Businesses.* Humphrey Institute of Public Affairs, University of Minnesota. Retrieved from http://conservancy.umn.edu/bitstream/90555/1/The%20Potential%20Impact%20of%20Central%20Corridor%20LRT.pdf.

Arbit, D., W. Delaney, D. Ronzani, and T. Sweetland. (2007). *Light Rail Construction Mitigation Strategies: National Examples for the Central Corridor.* Humphrey Institute of Public Affairs, University of Minnesota. Retrieved from http://universityavenuebiz.com/documents/ConstructionMitigationSurvey-finaldraft.pdf.

Asian Economic Development Association (AEDA). (2012). *Little Mekong CCLRT Impact Study*.

Buddemeyer, J., R. Young, and S. Vander Giessen. (2008). *Highway Construction Related Business Impacts: Phase 3 Effort for the Town of Dubois.* Department of Civil and Architectural Engineering, University of Wyoming.

CH2M Hill. (2009). *Report on Mitigation of Transportation Construction Impacts.* Minnesota Department of Transportation. Retrieved from http://www.dot.state.mn.us/businessimpacts/pdfs/businessimpacts-report-feb2009.pdf.

Collins, R. (2007). *The Impact of Light Rail on Local Businesses.* Masters thesis. Hubert H. Humphrey Institute of Public Affairs, University of Minnesota.

Crossley, D., J. Blazek Crossley, R. Cagney, and G. Wells. (2006). *Light Rail Construction: Mitigation of Business Interruption.* Houston, TX: Houston Tomorrow. Retrieved from http://www.gulfcoastinstitute.org/university/LightRail_Mitigation.pdf.

Crossley, D., J. Blazek Crossley, R. Cagney, and G. Wells. (2006). *The Impact of Light Rail on Local Businesses.* Houston, TX: Houston Tomorrow. Retrieved from http://www.gulfcoastinstitute.org/university/LightRail_BusinessImpact.pdf.

de Solminihac, H. and R. Harrison. (1993). *Analyzing Effects of Highway Rehabilitation on Businesses*. Washington, DC: Transportation Research Record (1395).

Diaz, J. (2009). *Economic Indicators of the Lake Street Corridor.* Center for Urban and Regional Affairs, University of Minnesota.

Ellis, R. and D. Agdas. (2010). *Improved Procedures for Business Accommodation on Transportation Construction Projects.* Construction Research Congress 2010. Reston, VA: ASCE.

Ellis, R. and S. Washburn. (2005). *Development of Improved Procedures for Business Accommodation on Transportation Construction Projects.* Department of Civil and Coastal Engineering, University of Florida.

Fasching, L., M. Guerra, J. McCarthy, and S. Sloper. (2007). *Alive! Survive! Thrive!: Outreach, Construction Mitigation and Assistance Strategies for Small Businesses Along University Avenue from Lexington to Rice.* Humphrey Institute of Public Affairs, University of Minnesota.

Harrison, R. and B. Waldman. (1998). *Mitigating the Adverse Impacts of the Dallas North Central Expressway Construction on Businesses*. Washington, DC: Transportation Research Record (1632).

Hustad, M. W., M. Nag, and A. Kowske. (2006). *Mitigating Traffic Impacts During the Marquette Interchange Reconstruction Project.* ITE Journal (2006, April).

Krieg, A. (2009). *Impact of Light Rail Construction on Neighborhood Business Activity in the Rainier Valley, Seattle, Washington*. Masters thesis. Department of Urban and Regional Planning. University of Florida.

Krieg, A. (2009). *Results of the Supplemental Mitigation Assistance Program on Businesses Impacted by Light Rail Construction in the Rainier Valley*. Department of Urban and Regional Planning. University of Florida.

Wildenthal, M. and J. Buffington. *Estimated Construction Period Impacts of Widening State Highway 21 in Caldwell, Texas*. Washington, DC: Transportation Research Record (1559).

Young, R. K., C. Wolffing, and M. Tomasini. (2005). *Highway Construction Impacts to Wyoming Businesses.* Washington, DC: Transportation Research Record (1924).

[i] Reviewed in Volpe Center's 2011 Technical Report.