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An Audit Report on

The Department of Transportation's Bridge Inspection Program

December 2009

Report No. 10-017



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Overall Conclusion

The Department of Transportation (Department) conducted bridge inspections in a timely manner and substantially in compliance with federal and state laws and Department policies. All 303 routine bridge inspections that auditors tested at 5 district offices were conducted substantially in accordance with federal and state requirements. However, the Department did not ensure that load restrictions were posted within the federally required time limit on bridges that had been identified as no longer being able to support the state legal load.

According to federal requirements, load restrictions should be posted on state-owned bridges within 90 days of a bridge inspection. Based on a review of 41 postings, the Department took an average of 319 days to post load restrictions on state-owned bridges, exceeding the federal time limit by an average of 229 days. Federal regulations and Department policy require non-state-owned bridges to be load posted within 180 days of a bridge inspection. Seventy-two percent of non-state-owned bridges auditors reviewed were load posted by local entities within the federal time limit. The Department works closely with local entities to close bridges that are no longer safe for the traveling public.

Monitoring practices regarding quality control and quality assurance are inconsistent among the five district offices auditors visited because the Department's Bridge Division provides only limited guidance and oversight to district offices. While the Department's district offices monitored the contracted consultant engineers who perform most of the State's bridge inspections, both the district offices' and the Bridge Division's monitoring activities did not fully comply with Department policies and procedures or federal requirements.

The Department has established a process to comply with state law and policies and procedures for procuring bridge inspection services; however, it should improve its procurement and contracting practices to ensure compliance. All

Background Information

The Department of Transportation's (Department) district offices are responsible for performing inspections and for preparing, maintaining, and reporting structure inventory and appraisal data to the Federal Highway Administration for all state-owned and non-state-owned bridges in each office's jurisdiction.

There are a total of 50,572 bridges in Texas. Specifically:

- State-owned: 33,118 bridges.
- Other (including local government-owned): 17,454 bridges.

The Department spent a total of \$845.5 million in state funds in fiscal year 2008 for expenditures related to state-owned bridges. This total included:

- New bridge construction costs - \$488.2 million.
- Replacement or rehabilitation costs - \$309.5 million.
- Maintenance costs - \$47.8 million

In addition, the Department budgeted \$12 million for consultant engineer inspection services in each of fiscal years 2008 and 2009.

During the 2007-2009 inspection cycle, the Department awarded contracts totaling \$25 million for consultant engineer services. These contracts were later amended to \$28 million.

consultant engineers hired in the 2005-2007 and 2007-2009 inspection cycles met minimum requirements to perform bridge inspections. However, the Department did not adequately track and document all elements of the procurement process or compose the consultant engineer selection team in full accordance with the Texas Administrative Code and Department policy.

The district offices that auditors visited did not consistently submit consultant engineer performance evaluations to the Bridge Division as required by Department policy. District offices completed 68 percent and 39 percent of consultant engineer performance evaluations during the 2005-2007 and 2007-2009 contract periods, respectively. In addition, the Bridge Division provided limited guidance to the district offices for applying evaluation criteria to consultant engineers' performance. These evaluations are important because of the large number of bridges inspected by consultant engineers. During the 2007-2009 inspection cycle, the Department awarded contracts totaling \$25 million for consultant engineer services to conduct 92.8 percent of the Department's bridge inspections. The Department later amended these contracts to total \$28 million.

Data tested in the Department's Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) system, which the Department uses to meet federal reporting requirements, was reliable and accurate. However, the Department should improve the effectiveness of the system's edit check related to inspection dates to ensure compliance with time frames established by federal requirements to enter the data. The Department also did not follow a formal system development life cycle methodology when creating a new Web-based system that is scheduled to replace BRINSAP.

The Department used a reasonable methodology to develop budgets for Bridge Division operations and bridge inspection consulting services for the 2009-2011 inspection cycle. Auditors could not assess the reasonableness of the district offices' budgets because the Department does not require district offices to create a separate budget for bridge inspection activities. However, all consultant engineer-submitted invoices tested were accurate and reviewed in compliance with Department policy.

Federal Stimulus Funds

Under the American Recovery and Reinvestment Act (ARRA), the federal government allocated Texas \$2.25 billion for transportation infrastructure projects. According to the Department, a portion of these funds will be used to supplement critical bridge rehabilitation and replacement projects that were not funded from the federal Highway Bridge Program, which is the State's primary source of funding for bridge construction and repairs. The ARRA funds will enable the Department to add 52 bridge

Federal Funding for Bridge Projects in Texas

The federal Highway Bridge Program funded:

- 227 bridge projects valued at \$253 million in 2009.
- 245 bridge projects valued at \$247 million in 2008.

The federal American Recovery and Reinvestment Act provided funding for additional bridge projects for fiscal years 2009 and 2010. Specifically:

- 52 bridge maintenance and rehabilitation projects.
- 7 new bridge construction projects.

maintenance projects and 7 new bridge construction projects, according to the Department. As of October 2009, the Department had approved contracts for 49 of those 59 additional ARRA-funded projects. These projects are identified in Appendix 4 and total approximately \$35.05 million.

Key Points

The Department conducted timely bridge inspections.

All 303 routine bridge inspections that auditors tested at 5 district offices were conducted substantially in accordance with federal and state requirements, except for missing photographs at one district.

The Department should improve the timeliness of its postings of load restrictions on state-owned bridges.

None of the 41 state-owned bridges auditors reviewed were load posted within the federally required 90-day time limit. The Department took an average of 319 days after a bridge's inspection to post load restrictions on the 41 bridges reviewed for calendar years 2005 through 2009. The Department's methodology for calculating the time taken to post load restriction on state-owned bridges does not meet federal requirements.

The Department worked with local entities to ensure that non-state-owned bridges were generally load posted within the federally required 180-day time limit. Local entities posted 72 percent of non-state-owned bridges within federal requirements. The Department's methodology for calculating the time frames for load posting on non-state-owned bridges met federal requirements. The Department has an emergency load posting process in place if it determines that a bridge requires immediate load posting.

Quality control and quality assurance activities at the Bridge Division, as well as at district offices, do not comply with Department policies and procedures.

Neither the Bridge Division nor the five districts auditors visited were fully compliant with Department policy regarding quality control and quality assurance activities. The Bridge Division should provide more guidance and direction to the districts in carrying out quality control and quality assurance practices. Also, the Department should more fully document and clarify its quality control and quality assurance procedures for bridge inspection operations.

The Department has a process for procuring consultant engineer inspection services; however, it should improve key elements of that process to ensure compliance.

The Bridge Division contracted 92.8 percent of its routine bridge inspections and awarded contracts totaling \$25 million (\$28 million including amendments) during the 2007-2009 contracting cycle. Auditors could not determine whether the Bridge

Division complied with Department policies and procedures for selecting the most qualified bridge inspection consultant engineers because the Department lacked sufficient documentation supporting (1) the final evaluation scores for some consultant engineers and (2) changes made to other consultant engineers' evaluation scores.

In addition, the Bridge Division did not fully comply with the Department's requirement for the composition of the consultant engineer selection team. The Bridge Division also should improve its consultant engineer performance evaluation process by (1) ensuring that all districts submit the consultant engineer evaluations as required by Department policy, (2) ensuring that consultant engineer evaluation criteria is objective, and (3) providing more guidance to the districts on how the evaluations should be completed.

All of the consultant engineers the Department hired in the 2005-2007 and 2007-2009 inspection cycles met its minimum requirements to perform bridge inspections. The Department properly advertised public notifications of its intent to solicit inspection services. All inspection service contracts tested contained all of the essential elements required by the *State of Texas Contract Management Guide* to protect the State's interests.

Summary of Management's Response

The Department agrees with most of the recommendations and conclusions in this report, but disagrees with the recommendation to consider formalizing an informal policy that requires consultant selection team members to sign nepotism disclosure forms for all bridge inspection contracts, regardless of the contract amount.

The management responses to the specific recommendations in this report are presented immediately following each set of recommendations in the Detailed Results section of this report.

Summary of Information Technology Review

Auditors reviewed application controls, access security controls, program change controls, and backup processes for BRINSAP. Additionally, the Department is transitioning to a new Web-based system, called Pon-Tex, which is scheduled to replace BRINSAP. Because Pon-Tex is not fully implemented, auditors reviewed only the Department's system development life cycle process for this system. While the Department ensured that data in BRINSAP was accurate and reliable, auditors identified weaknesses in access controls and the Department's system life cycle development methodology for the Pon-Tex system. (See Chapter 3 for more information about the information technology review.)

Summary of Objectives, Scope, and Methodology

The objectives of this audit were to:

- Determine whether the Department ensures that bridge inspections are conducted in accordance with federal and state laws and agency policies and procedures.
- Determine whether the Department appropriately addresses bridge inspection recommendations to ensure the safety of the traveling public.
- Verify the amount of funds budgeted to and expended for bridge inspections.

The scope of the audit included bridge inspection activities at the Department's Bridge Division and district offices. Auditors examined the following:

- Bridge inspections and closures during the 2007-2009 inspection cycle.
- Load posting data from calendar years 2005 through 2009.
- Consultant engineer contractor selection processes for the 2005-2007 and 2007-2009 inspection cycles.
- Bridge Division and district office budgets for fiscal years 2008 and 2009, and the bridge inspection consultant engineers' budget for the 2009-2011 inspection cycle.

The audit methodology included reviewing Department policies and procedures, interviewing key Bridge Division and district office personnel, collecting and analyzing documentation and data, and performing selected tests and other procedures.

Auditors communicated other, less significant issues to the Department's management separately in writing.

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Detailed Results

Chapter 1

The Department Conducted Timely Bridge Inspections and Worked with Local Entities on Bridge Closures; However, It Should Improve the Timeliness of Load Postings and Its Quality Control and Quality Assurance Program

The Department of Transportation (Department) conducted all bridge inspections tested at five district offices in a timely manner and was substantially in compliance with federal and state laws and Department policies and procedures. In addition, bridge inspection folders tested at the five districts auditors visited were in substantial compliance with Department policies and procedures, except for missing photographs at one district. However, during calendar years 2005 through 2009, the Department did not ensure that load restrictions were posted within the federally required time limit on state-owned bridges that had been identified as not being able to support the state legal load of 80,000 pounds.

Necessary bridge closures were completed in all districts visited. However, the Department's *Bridge Inspection Manual* minimally addresses quality control and quality assurance procedures, and the Department provides little oversight or guidance related to quality control and quality assurance to its district offices.

Chapter 1-A

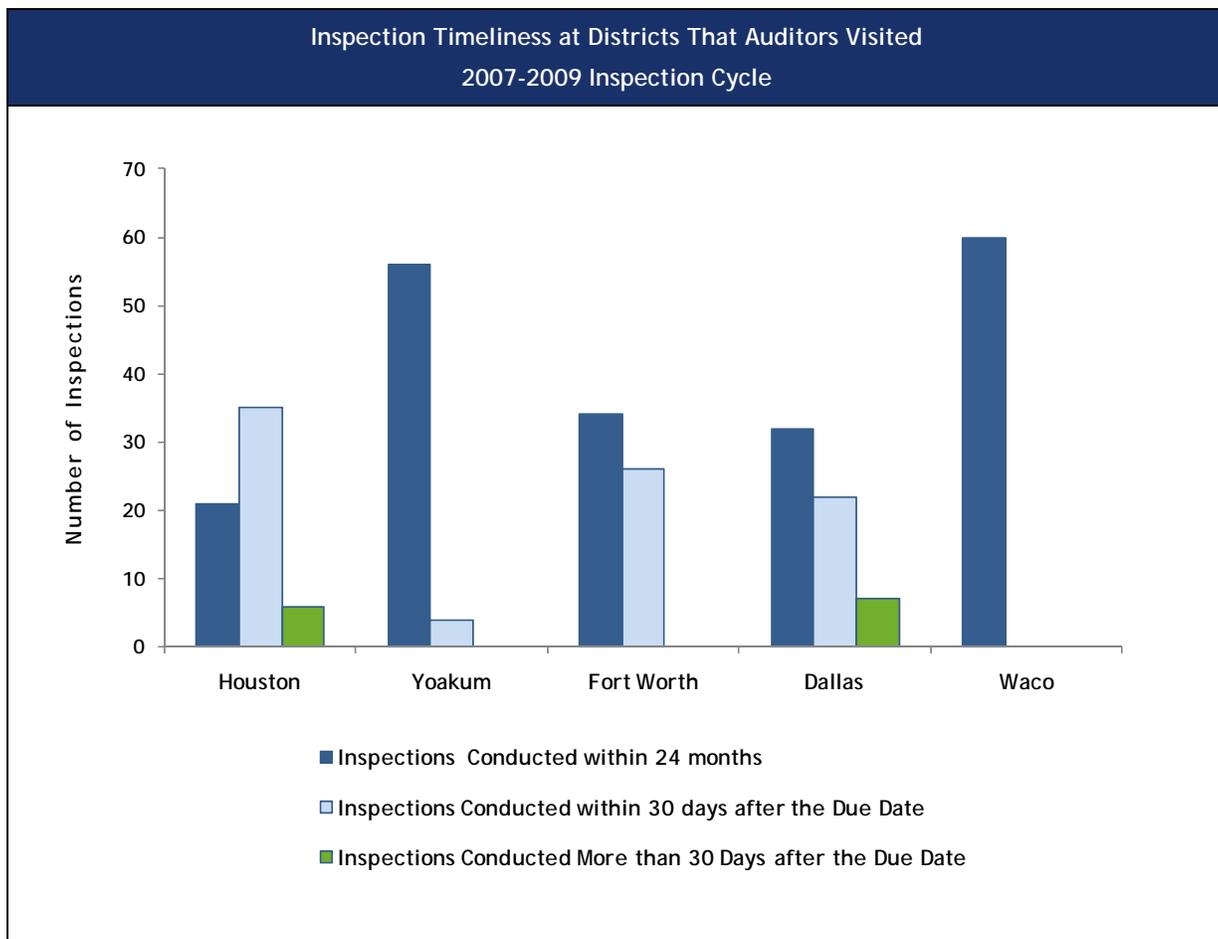
The Department Conducted Timely Bridge Inspections and Maintained Required Documentation Substantially in Compliance with Federal and State Laws and Department Policies

All 303 routine bridge inspections that auditors tested at 5 district offices were conducted substantially in accordance with federal and state requirements. National Bridge Inspection Standards developed by the Federal Highway Administration require the Department to perform routine inspections at least once every 24 months. In the *2004 Federal Register*, the Federal Highway Administration recognized that certain circumstances such as severe weather, safety issues, and scheduling problems may cause routine inspections to be delayed, but it stated that adjusted inspection dates should not extend more than 30 days beyond the due dates.

Auditors tested 303 files for bridges scheduled to be inspected during the 2007-2009 inspection cycle. Of these bridges, 87 (29 percent) were not inspected within the 24-month timeframe; however, only 13 (4 percent) bridges were inspected after the 30-day grace period (see Figure 1). The district offices, which are responsible for determining when bridges need to be

inspected, cited consultant engineer availability issues as the primary reason for delayed bridge inspections.

Figure 1



Source: Auditor analysis of a sample of 303 bridge inspection folders from the 5 districts visited.

The district offices' ability to meet federally required inspection timelines depends substantially on the consultant engineers' availability. The Department had 27 consultant engineers under contract for the 2007-2009 inspection cycle. A consultant engineer may perform as many as 400 inspections in one district under a single work authorization. According to district personnel, some districts require up to eight consultant engineers at a time to complete inspections. If all consultant engineers are conducting inspections in only a few districts, this may cause delays for inspections in other districts. Optimizing consultant engineers' schedules across districts is essential for all inspections to be completed in a timely manner.

District offices maintained most required documentation in all bridge inspection folders tested.

Federal regulations require the Department to collect and maintain structure inventory and inspection data for all bridges in Texas. Of the 303 bridge folders auditors tested, 4 districts had less than a 6.5 percent error rate (one district had no errors). The fifth district¹ had a 25 percent error rate, but all errors except for one were attributed to photographs that were not included in the file, even though Department policy required the photographs be included.

The district offices maintain structure inventory and other bridge-related information in hard copy folders, which consultant engineers and Department employees use to complete inspections. These hard copy folders contained photographs, inspection records, and other information that described the condition of the bridges. These documents also serve as source data for information in the Department's Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) (see Chapter 3 for more information about BRINSAP).

Recommendations

The Department should:

- Take appropriate actions to ensure that all bridges are inspected within federally mandated timeframes.
- Ensure that Department staff, as well as bridge inspection consultant engineers, provide all required documentation in the bridge folders.

Management's Response

The Department should take appropriate actions to ensure that all bridges are inspected within federally mandated timeframes.

Management agrees. The Department will continue to view timely inspections of bridges as a primary method of ensuring the safety of the traveling public. New systems are presently being developed for monitoring and reporting inspection findings that will improve the Department's response to bridge related issues.

David Hohmann, P.E., Director of the Bridge Division, is responsible for ensuring that all bridges are inspected within federally mandated timeframes. This recommendation is currently in practice.

¹ Auditors noted that some photographs were not included in folders reviewed at the Fort Worth district. The Fort Worth district performs bridge inspections in-house and has an informal process to take photographs only if a bridge's condition changes.

The Department should ensure that Department staff, as well as bridge inspection consultant engineers, provide all required documentation in the bridge folders.

Management agrees. The Bridge Division will continue to promote standardization of documentation among all districts, and will ensure that internal and external contributors are kept apprised of changes and developments.

David Hohmann, P.E., Director of the Bridge Division, is responsible for ensuring that bridge folders are complete. This recommendation is currently in practice.

Chapter 1-B

The Department Did Not Meet Federal Time Limits for Posting Load Restrictions on Bridges

The Department did not post load restrictions on any of the 41 state-owned bridges auditors tested within the 90-day time limit required by the Federal Highway Administration (FHWA). The Department's process for posting load restrictions on state-owned bridges that cannot support the state legal load is not designed to meet the federal requirement to post load restrictions within 90 days after a bridge inspection. The Department took an average of 319 days to post load restrictions on the 41 bridges tested.

The Department's methodology for measuring the timeliness of load posting on state-owned bridges does not meet federal requirements. According to guidance provided to state auditors by FHWA, state-owned bridges should be load posted within 90 days from the date of inspection (see Appendix 5 for a copy of the letter from the FHWA). However, the Department's methodology measures load posting timeliness from the date on which the Bridge Division approves the recommended load posting, which can occur significantly after the inspection date. For the 41 bridges tested, an average of 240 days had elapsed between the inspection date and the date that the Division approved the load posting request (see Figure 2 on the next page), and it took the Department an average of 319 days to post the load restrictions from the date of inspection. The Department took from 118 to 1,075 days to post the load restrictions on the 41 state-owned bridges that auditors tested (see Table 1 on the next page).

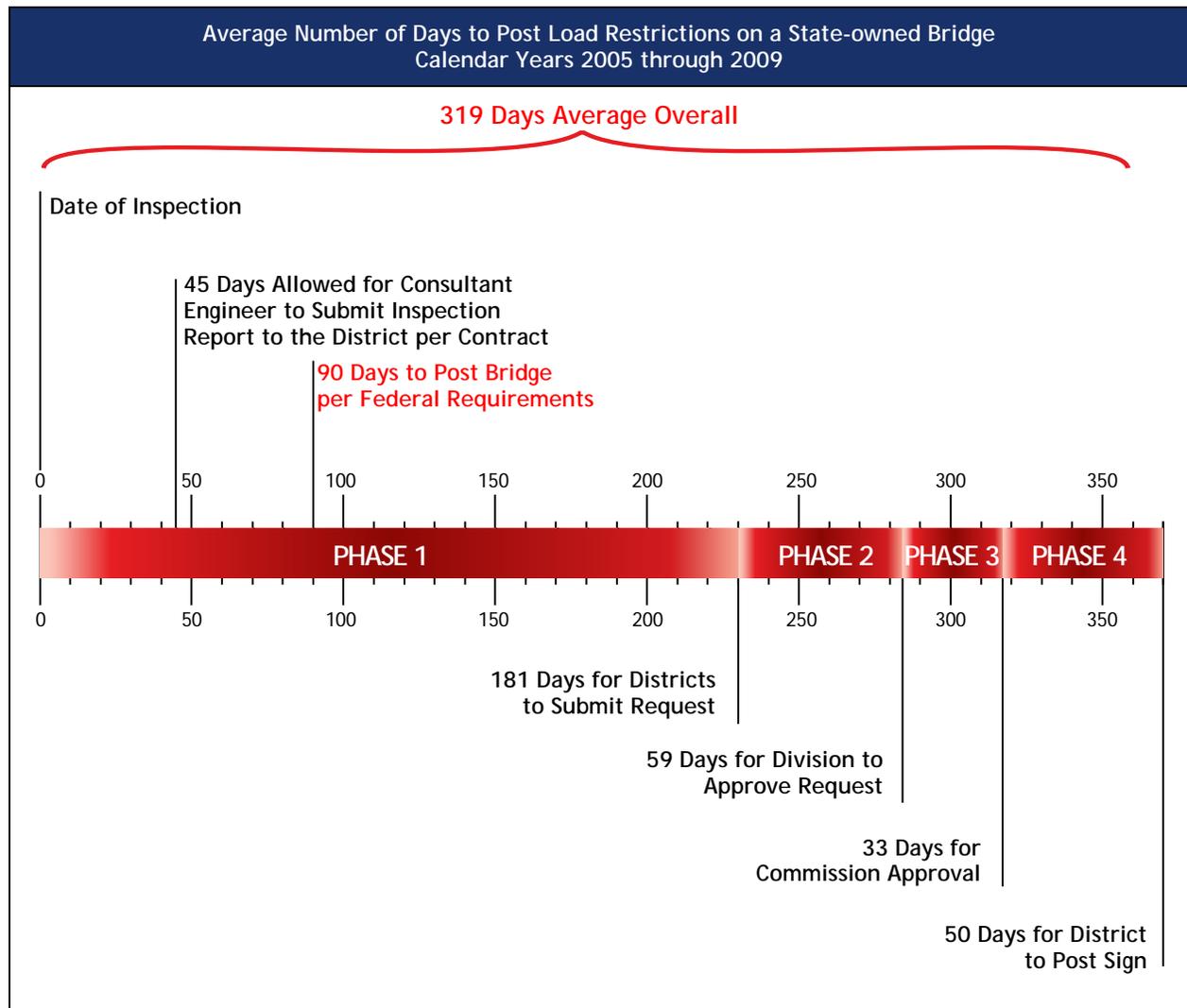
Table 1

Days the Department Took to Post Load Restrictions after Inspection ^a	
Number of Days to Post Load Restrictions	Number of Bridges
118 to 200 Days	15
201 to 400 Days	20
401 to 600 Days	2
More than 600 Days	4
Total Bridges Tested	41
^a Auditors performed this analysis using the Bridge Division’s stand-alone load posting database and identified some dates in the database that were not supported by hard copy documentation. Auditors also identified several inspection dates that were after the date that the Bridge Division received the load posting recommendation; all inspection dates should be before or on the same date as the load posting recommendation. In these cases, the inspection dates listed in BRINSAP were used to complete the analysis.	

Sources: Bridge Division’s stand-alone database and BRINSAP.

Using the Bridge Division’s methodology, however, auditors calculated that it took an average of only 75 days to post load restrictions on these 41 state-owned bridges. In addition to not meeting federal requirements, the Department’s current methodology for measuring the timeliness of load postings provides little incentive for the Department to streamline the process or expedite requests to load post bridges.

Figure 2



Source: Auditor analysis of 41 state-owned bridges sampled from the 84 bridges that were load posted for the first time during calendar years 2005 through 2009. Thirteen of the Department's 25 districts are represented in the sample. Due to data limitations, some items tested resulted in negative time periods during Phase 2 and Phase 4. Auditors did not include these items when calculating the average number of days. Therefore, the average numbers in the chart do not sum to 319 days.

Auditors separated the Department's load posting times for the 41 state-owned bridges tested into four phases. Specifically:

- **Phase 1**—It took an average of 181 days from the date of the consultant engineer's inspection for the district office to submit the recommended change on the bridge load posting form to the Bridge Division for review. Consultant engineers are required by contract to submit their inspection reports to the district offices within 45 days of the inspection. None of the district offices visited had a process to expedite the submission of recommendations for load posting changes to the Bridge Division.

- **Phase 2**—The Bridge Division took an average of 59 days to review the consultant engineer’s load posting calculations and the documentation supporting the inspection results. If the Division agrees with the load posting recommendation, the request is then placed on the agenda for the next Texas Transportation Commission (Commission) meeting. Texas Transportation Code, Section 621.102, requires the Commission to approve changes to the maximum weight that may be moved over a state highway by order entered in its minutes.
- **Phase 3**—The Commission took an average of 33 days to approve the load posting recommendation. According to management, the Commission has never disapproved a recommendation to load post a state-owned bridge.
- **Phase 4**—It took the Bridge Division an average of 50 days to notify the district offices of the Commission’s approval and for the district offices to physically post the load restrictions on the bridge.

During inspection cycles 2005 to 2007 and 2007 to 2009, the Department received 103 (84 new and 19 revised) load posting recommendations, an average of 26 per year.

If a bridge inspector determines that the condition of a bridge warrants an immediate load posting, the Department has procedures in place allowing a bridge to receive an emergency load posting for up to 120 days with Bridge Division approval. Once the structures are repaired or replaced, the load restrictions can be removed. The following are examples of recent emergency load postings based on field inspections:

- In September 2009, two bridges in the Odessa District on U.S. Highway 285 had significant deterioration of the main reinforcing in the top slab of the bridges.
- In May 2009, one bridge’s supporting structure in the Bryan District on FM 488 was affected by recent flooding in the stream it crossed.
- In March 2007, two bridges in the Laredo District had significant deterioration of the concrete beneath the structural beams.

Non-State-owned Bridges

In contrast to the way it calculates load posting times for state-owned bridges, the Department calculates the load posting times for non-state-owned bridges from the date of inspection, which meets federal requirements that state that load restrictions must be posted on non-state-owned bridges within 180 days after a bridge inspection. Eighteen of 25 (72 percent) non-state-owned bridges that auditors tested were load posted within the federally required 180-day time limit.

For non-state-owned bridges, a district bridge engineer reviews the consultant engineer's calculations after a district office receives the recommendation to post load restrictions on a bridge. If the district bridge engineer agrees with the recommendation, the district office orders the load posting signs and notifies the appropriate local entity, which is responsible for posting the signs on the bridge.

Although the Department does follow federal guidelines when calculating the amount of time it took to load post a non-state-owned bridge, the BRINSAP system is not currently programmed to generate reports that would allow the Bridge Division to effectively monitor the load posting status of non-state-owned bridges. BRINSAP currently generates the following two reports related to the status of non-state-owned bridges recommended for posting:

- One report lists all non-state-owned bridges that are recommended for load posting, but the report does not include the inspection date or the federally required deadline for when the bridges should be load posted.
- A second report identifies non-state-owned bridges that have been recommended for load posting for 6 months (180 days) or longer. However, the report uses the date on which the data was entered into BRINSAP to calculate this, rather than the actual inspection date.

Timely load posting of bridges is important to help ensure the safety of the traveling public. In addition, timely load posting and accurate updating of information into BRINSAP is essential for the Department's Motor Carrier Division to safely route oversized and overweight vehicles on state roadways and bridges.

Recommendations

The Department should:

- Expedite implementation of load posting recommendations for state-owned bridges by:
 - ♦ Amending consultant contracts to require consultants to immediately complete and submit to the Division inspection reports in which they recommend bridges for load posting.
 - ♦ Requiring the Division to prioritize and expedite review of consultant recommendations to load post bridges.
 - ♦ Requesting legislative authority to allow the Department to immediately load post state-owned bridges without Commission approval.

- ♦ Requiring the districts to prioritize and expedite load postings of state-owned bridges and immediately report load postings to the Division.
- Ensure that the methodology it uses to calculate the timeliness of load posting state-owned bridges complies with federal requirements.
- Develop or redesign tools to effectively monitor the timeliness of load posting state-owned and non-state-owned bridges.

Management's Response

Expedite implementation of load posting recommendations for state-owned bridges by:

- Amending consultant contracts to require consultants to immediately complete and submit to the Division inspection reports in which they recommend bridges for load posting.

Management agrees. The Bridge Division has evaluated historical time frames for implementing bridge load restrictions and determined that steps can be taken to expedite the process. This review revealed a time-consuming step that could be improved - the time required for a District to submit a written load restriction change request to the Bridge Division for review.

To address this issue, the Bridge Division can require that inspection consultants submit load restriction changes, along with all the supporting documentation, directly to the Bridge Division for review once a recommendation has been made. This would eliminate the time that it takes the District to route the request to the Bridge Division.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the State Audit Office's (SAO) final audit report.

- Requiring the Division to prioritize and expedite review of consultant recommendations to load post bridges.

Management agrees. The Bridge Division has identified the need for additional division resources to help prioritize and expedite the review of consultant bridge load posting recommendations. Two additional engineering positions will be allocated to handle the expedited workload.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

- Requesting legislative authority to allow the Department to immediately load post state-owned bridges without Commission approval.

Management agrees that the implementation of load posting recommendations should be expedited. The Department will request that the Commission investigate proposing legislation to eliminate Commission approval of load restrictions on state-owned bridges. If favorable, the Commission will pursue legislation to eliminate the Commission approval requirement.

David Hohmann, P.E., Director of the Bridge Division, is responsible for the implementation of this recommendation pending legislative approval.

- Requiring the districts to prioritize and expedite load postings of state-owned bridges and immediately report load postings to the Division.

Management agrees. The Bridge Division will develop policies directing districts to immediately report to the Bridge Division when load posting signs are placed. These policies will be included in the Bridge Inspection Manual.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should ensure that the methodology it uses to calculate the timeliness of load posting state-owned bridges complies with federal requirements.

Management agrees that improvements can be made in the timeliness of load postings. As discussed earlier, the Department will institute changes to effect direct submission of postings to the Bridge Division, allocate additional staff for load rating review, explore the Commission seeking legislative changes to eliminate minute order requirements, and develop guidelines for districts to follow to notify the Bridge Division of sign installation. We have opened discussions with the FHWA Texas Division Administrator to evaluate FHWA staff's interpretation.

However, management does not agree with the Federal Highway Administration's interpretation of sections within the Code of Federal Regulations concerning time frames for implementing load restrictions.

The Code of Federal Regulations, Section 650.313 (c) states, "Rate each bridge as to its safe load-carrying capacity in accordance with the AASHTO Manual (incorporated by reference, see Sec. 650.317). Post or restrict the bridge in accordance with the AASHTO Manual or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed that allowed under the operating rating or equivalent rating factor." State law mandates that the Texas Transportation Commission is the only entity that can set maximum weight limits on a state highway. Any changes to

weight limits must be entered into the minutes of the Commission. According to state law a restriction only becomes effective on a highway when the appropriate signs giving notice of the maximum weight have been erected. These provisions are spelled out in the Texas Transportation Code, Section 621.102.

Secondly, the Code of Federal Regulations, Section 650.315 (d) states, “For changes in load restriction or closure status, enter the SI&A data into the State or Federal agency inventory within 90 days after the change in status of the structure for State or Federal agency bridges and within 180 days after the change in status of the structure for all other bridges.” Based on this provision and the state law that provides that a weight restriction does not become effective until signs are erected (Texas Transportation Code, Section 621.102 (d)), the ninety-day clock to update the database should not start until signs are posted. Presently TxDOT starts the ninety-day clock when the Bridge Division approves a change in load restriction for Commission consideration. This policy was developed in conjunction with the FHWA and transmitted to them in 2004.

The Department should develop or redesign tools to effectively monitor the timeliness of load posting state-owned and non state-owned bridges.

Management agrees. The Department is in the process of implementing a new bridge inspection data management system that will help facilitate more effective monitoring of the time required to load post bridges. The new system also makes historical data available for use during the monitoring process.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO’s final audit report.

The Department Works with Local Entities to Ensure That Necessary Bridge Closures Occur

In the 5 districts visited, 14 non-state-owned bridges were recommended for closure in the last 2 years (1 inspection cycle) as a result of a routine inspection.² Eleven of the 14 non-state-owned bridges recommended for closure by inspectors were closed on the same day that they were inspected. For the three non-state-owned bridges that were not closed immediately, the average time to close the bridge was 36 days. Department policy requires districts to notify the appropriate local entity about a valid bridge closure recommendation because the Department does not have statutory authority to close non-state-owned bridges. At the beginning of fiscal year 2009, there were a total of 10 state-owned and 146 non-state-owned bridges that were classified as closed in Texas, according to the *2008 Report on Texas Bridges*.

Bridge Condition Rating

A bridge condition rating is a measure of a bridge's deterioration or damage rated on a scale of 0 (failed condition) to 9 (excellent condition). See Appendix 9 for a glossary of bridge-related terms.

Sources: The Department's *Bridge Inspection Manual* and *Coding Guide*.

Inspection consultant engineers are required by contract to notify the Department of bridges needing special consideration, which are identified by a bridge condition rating of 4 or lower (see text box). For non-state-owned bridges, the districts verify the bridge's condition after a consultant engineer recommends the bridge for closure. The Department asks local entities to provide photographic evidence that the bridge has been closed, which is retained in the Department's bridge inspection folders. Inspectors verify that the bridge is still closed during subsequent inspections.

The Department uses the Participation Waived–Equivalent Match Program (Program) to encourage local entities to comply with closing and posting recommendations. Non-state-owned bridge construction projects are usually funded using 80 percent federal funds, 10 percent state funds, and 10 percent local funds. The Program allows a local entity to waive its 10 percent participation cost for a bridge project if it uses an equivalent amount of funding to improve the condition of other bridges in its jurisdiction. However, a local entity's eligibility and continued participation in the Program is dependent upon its compliance with posting and closing recommendations.

Recommendation

The Department should continue working with local entities to ensure necessary bridge closures occur in a timely manner.

² The monthly BRINSAP reports that auditors reviewed did not list any state-owned bridges that were recommended for closure during this time period as a result of a routine inspection.

Management's Response

Management agrees. TxDOT will continue to work with local entities to ensure that necessary bridge closures occur in a timely manner.

David Hohmann, P.E., Director of the Bridge Division, is responsible for the continued cooperation with local entities and ensuring timely bridge closures. This recommendation is currently in practice.

Chapter 1-D

The Department Lacks Sufficient Quality Control and Quality Assurance Policies and Procedures for Bridge Inspections

The Department's quality control and quality assurance programs do not fully comply with federal requirements or Department policies. Title 23, Code of Federal Regulations, Section 650.313, requires each state to ensure that it develops and implements systematic quality control and quality assurance procedures to maintain a high degree of accuracy and consistency in all bridge inspection programs (see text box). While the Department's *Bridge Inspection Manual* contains minimal policies relating to quality control and quality assurance, the Department does not have any written procedures relating to quality control and quality assurance. The Bridge Division does not monitor districts' implementation of quality control and quality assurance activities. Although districts have informal quality control and quality assurance procedures, there was no consistency in those procedures at the five districts visited.

Quality Control and Quality Assurance

Quality control consists of procedures that are designed to maintain the quality of a bridge inspection program and ensure that bridges maintain load ratings that are at or above a specified level.

Quality assurance consists of procedures and methodologies that include sampling and other measures to assure the adequacy of quality control procedures and to verify or measure the quality level of an entire bridge inspection and load rating program.

Requirements for quality control and quality assurance procedures were added to the federal National Bridge Inspection Standards (NBIS) in 2005.

Source: Title 23, Code of Federal Regulations, Section 650.305.

Effective quality control and quality assurance procedures would help the Department ensure that bridge inspection ratings are uniform and accurate. The Department has informal quality control and quality assurance procedures that are implemented inconsistently among the five districts visited. Specifically, the *Bridge Inspection Manual* includes the following requirement:

Both the Bridge Division and district offices should periodically conduct field team composition reviews to ensure that consultant engineers are using the personnel specified in their contracts with the Department and to observe actual inspections in the field.

In addition, the districts offices have the following responsibilities:

- District offices should review 10 percent of the bridge inspection folders prepared by bridge inspectors for accuracy and completeness.

- District offices should conduct fieldwork reviews of 7 percent of inspections that bridge inspectors completed. This requires district personnel to reinspect a bridge to verify the accuracy of the inspection results.

The Department established these requirements in 1995 after several reviews by the Federal Highway Administration cited the lack of quality control and quality assurance processes in the Department’s bridge inspection program as a weakness.

As shown in Table 2, none of the five districts visited were in full compliance with the Department’s policies regarding bridge inspection folder reviews and fieldwork reviews of completed inspections; two districts were in partial compliance.

Table 2

Five Districts’ Compliance with Bridge Inspection Review Requirements 2007-2009 Inspection Cycle			
District	Did the District Document Its Review of 10 Percent of Inspection Folders?	Did the District Conduct Fieldwork Reviews of 7 Percent of completed Inspections?	Did the District Conduct and Document Periodic, Field Team Composition Reviews?
Dallas	No	No	No
Fort Worth	No	No	Not Applicable ^a
Houston	Yes	No	No
Waco	No	Yes	No ^b
Yoakum	No	No	No
^a The Fort Worth District conducted inspections using primarily in-house staff. ^b The Waco District asserted that it performed field team composition reviews, but it did not keep supporting documentation for those reviews.			

Auditors noted the following quality control/quality assurance issues at the five districts visited:

- The Yoakum, Dallas, and Waco districts asserted that they conducted reviews of inspection folders for the 2007-2009 inspection cycle, but they could not provide any documentation showing that these reviews had occurred. In addition, the Fort Worth District asserted that it performed folder and field reviews, but it did not keep supporting documentation for those reviews.
- The Houston District reviewed 100 percent of bridge inspection folders that consultant engineers submitted for the 2007-2009 inspection cycle,

but it conducted fieldwork reviews only on an event-driven basis, according to district bridge management.

Four of the five district bridge inspection coordinators in the five districts visited indicated in interviews with auditors that they lack the resources to perform all of the quality control and quality assurance requirements in the Department's *Bridge Inspection Manual*.

Recommended Quality Control/Quality Assurance Program Elements

The Federal Highway Administration recommends that a bridge inspection quality control/quality assurance program should do the following:

Documentation:

- Elaborate on the purpose and benefits of the quality control/quality assurance program.
- Provide appropriate definitions.

Quality Control Procedures:

- Include procedures for the review and validation of inspection reports and data.
- Document all required refresher training.

Quality Assurance Procedures:

- Include procedures and sampling parameters for selecting bridges to review and establish required review frequencies.
- Implement disqualification procedures for consultant engineers that have a continued record of poor performance.

Source: Federal Highway Administration's *Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program*.

The bridge inspection coordinators in the five districts visited stated that the Bridge Division does not monitor or provide guidance to the district offices regarding quality control and quality assurance practices. In addition, Bridge Division management indicated that they lack the resources to do field team composition reviews and to observe actual inspections in the field.

With its limited application of quality control and quality assurance practices, the Department lacks assurance that bridge inspection ratings are reasonable and inspections are performed in a uniform manner across the state. Accuracy and consistency of bridge inspections is a key component to ensuring the safety of the traveling public. The Federal Highway Administration has identified best practices related to quality control/quality assurance that state agencies should implement to improve the quality of state bridge inspection programs. (See text box and Appendices 6 and 7 for more information about these best practices.)

Recommendations

The Department should:

- Re-evaluate the resources needed to comply with the current quality control and quality assurance requirements in its *Bridge Inspection Manual* at the Bridge Division and district office levels.
- Develop a quality control/quality assurance section in its *Bridge Inspection Manual* that:
 - ♦ Creates standardized procedures for how to conduct folder reviews, including identifying specific items to review and developing a risk-based sampling methodology for determining which folders should be reviewed.
 - ♦ Specifies how folder reviews should be documented.

- ♦ Creates standardized procedures for how to conduct fieldwork reviews, including a methodology for selecting which bridges to review, specifying which items to review, and documenting the reviews.
- ♦ Considers Federal Highway Administration-identified best practices in *Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program*.
- Ensure that its Bridge Division regularly monitors the districts' compliance with the Department's quality control/quality assurance policies and procedures. The Department could consider linking the district engineer's performance evaluation to compliance with quality control/quality assurance policies and procedures.

Management's Response

The Department should re-evaluate the resources needed to comply with the current quality control and quality assurance requirements in its Bridge Inspection Manual at the Bridge Division and district office levels.

Management agrees. The Bridge Division has identified a lack of division resources available to perform quality assurance reviews of work done in the districts. The Bridge Division will include adequate levels of quality assurance that should be conducted by the districts in the Bridge Inspection Manual. The Bridge Division will also develop a reporting system to document and monitor quality assurance activities within the Bridge Inspection Program.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should develop a quality control/quality assurance section in its Bridge Inspection Manual that creates standardized procedures for how to conduct folder reviews, including identifying specific items to review and developing a risk based sampling methodology for determining which folders should be reviewed.

Management agrees. The Bridge Division will develop procedures to be included in the Bridge Inspection Manual for conducting reviews of data collected during bridge inspections.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should develop a quality control/quality assurance section in its Bridge Inspection Manual that specifies how folder reviews should be documented.

Management agrees. The Bridge Division will develop procedures to be included in the Bridge Inspection Manual for performing document reviews of data collected during bridge inspections.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should develop a quality control/quality assurance section in its Bridge Inspection Manual that creates standardized procedures for how to conduct fieldwork reviews, including a methodology for selecting which bridges to review, specifying which items to review, and documenting the reviews.

Management agrees. The Bridge Division will develop procedures to be included in the Bridge Inspection Manual for conducting field reviews of bridge inspections.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should develop a quality control/quality assurance section in its Bridge Inspection Manual that considers Federal Highway Administration-identified best practices in its Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program.

Management agrees. TxDOT will review the Federal Highway Administration's Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program and incorporate applicable methods in a revised quality control/quality assurance program.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department should ensure that its Bridge Division regularly monitors the districts' compliance with the Department's quality control/quality assurance policies and procedures. The Department could consider linking the district engineer's performance evaluation to compliance with quality control/quality assurance policies and procedures.

Management agrees. The Bridge Division will develop a reporting system to document and monitor quality assurance activities within the Bridge Inspection Program.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO's final audit report.

The Department Has Established a Process for Procuring Consultant Engineer Inspection Services; However, It Should Improve Certain Key Processes to Ensure Compliance

The Department advertised and negotiated proposals for bridge inspection services as required by statute and the Texas Administrative Code; however, it should improve the processes it uses to evaluate consultant engineer proposals.

All consultant engineers that the Department hired in the 2005-2007 and 2007-2009 inspection cycles met the Department's minimum requirements to perform bridge inspections. However, auditors cannot provide complete assurance that the Department selected the most qualified consultant engineers because the Department lacked adequate documentation of proposal evaluations. Also, the Department could provide additional assurance of objectivity in its inspection services procurement process by requiring nepotism disclosure statements from all staff involved in the procurement of bridge inspection services.

In addition, the Bridge Division was not in full compliance with Texas Administrative Code requirements for the composition of the consultant engineer selection team. Also, district offices did not consistently submit to the Department consultant engineer performance evaluations, and the evaluation instrument district offices used lacked sufficiently objective criteria to rate consultant engineer performance.

The Bridge Division contracted 92.8 percent of its routine bridge inspections and awarded contracts totaling \$25 million in the 2007-2009 contracting cycle. These contracts were later amended by supplemental agreements to \$28 million. Costs to inspect bridges vary by bridge type and size. Below are examples of the average negotiated costs per bridge type in the 2007-2009 inspection cycle for state-owned bridges:

- Interchange or roadway crossing – \$509.
- Water crossing – \$551.
- Culvert – \$381.
- Bridge that is more than 500 feet in length – \$1,016 to \$2,554.

The bridge types listed above account for more than 98 percent of the state-owned bridges in the Department's bridge inventory.

The Department Advertised and Negotiated Bridge Inspection Services Proposals as Required by Statute and the Texas Administrative Code; However, It Should Improve Its Processes for Evaluating Consultant Engineer Proposals

The Department advertised its intent to contract for bridge inspection services through public media within the timeframes required by Title 43, Texas

The Department's Consultant Engineer Procurement Process

The Department has established a multi-tiered consultant engineer procurement process. Below is a summary of the process.

- The Department posts a notice of intent to contract for bridge inspection services on its Internet site and on the *Electronic State Business Daily*.
- The Department conducts an initial screening of respondents and identifies the consultant engineers who meet pre-certification requirements.
- The consultant engineer selection team conducts additional evaluations of the consultant engineers who met the pre-certification requirements and develops a short list of potential candidates.
- The consultant engineer selection team notifies the short list respondents and requests written proposals and interviews.
- The consultant engineer selection team evaluates all proposals, conducts interviews, and scores results—which is in the form of points—for each respondent based on specific criteria.
- The consultant engineer selection team recommends all respondents that score a minimum of 2,400 points to the Department's executive director for authorization to begin fee negotiations. These are considered the best qualified.

Administrative Code, Section 9.33. The Department has a multi-tiered procurement process for bridge inspection services that includes a consultant engineer selection team that awards points based on pre-established criteria (see text box). The Department used historical cost information for each type of bridge inspection to assist it in arriving at a final negotiated price. Of the 39 consultant engineers who originally responded to the Department's advertisement for bridge inspection services for the 2007-2009 inspection cycle, the Department negotiated prices and contracted with 27 consultant engineers. Auditors reviewed the Department's consultant engineer procurement process for two inspection cycles and noted the following:

- The Department negotiated a 4.3 percent decrease for state-owned bridges and a 1.7 percent decrease for non-state-owned bridges from the contractors' original submitted costs for the 2005-2007 inspection cycle.
- The Department negotiated a 0.4 percent decrease for state-owned bridges and a 2.2 percent decrease for non-state-owned bridges from the contractors' original submitted costs for the 2007-2009 inspection cycle.
- All 55 inspection service contracts tested for the 2005 -2007 and 2007-2009 inspection cycles contained all of the essential elements required by the *State of Texas Contract Management Guide* to protect the State's interests.

The Department lacked adequate documentation to demonstrate that it selected the most qualified providers of bridge inspection services for the 2007-2009 inspection cycle. Specifically, the Department lacked documentation showing why changes were made to the scores of 7 of 29 (24 percent) evaluations. In addition, auditors could not recalculate the scores for two proposals to arrive at the same point totals given by the Department's consultant engineer selection team to applicants. The Department also lacked evidence that the consultant engineer selection team chair reviewed the evaluation documents or the consultant engineer selection team's overall processes as required by Department policy.

In addition, the consultant engineer selection team that evaluated consultant engineer proposals for the 2005-2007 and 2007-2009 inspection cycles did not fully comply with Department requirements. Specifically, the teams for each cycle did not include a representative from the Bridge Division. Title 43, Texas Administrative Code, Section 9.34, requires the consultant engineer selection team chair to be a member of the Bridge Division's managing staff.

The Department should consider implementing a formal policy to require staff involved in procuring bridge inspection services to sign a nepotism disclosure statement regardless of contract value.

The Department awarded 28 contracts for \$900,000 each during the 2005-2007 procurement cycle, and it awarded 27 contracts for \$930,000 each during the 2007-2009 procurement cycle. The Department authorized supplemental agreements that increased the contract values to more than \$1 million on 9 contracts awarded during the 2005-2007 cycle and 19 contracts awarded during the 2007-2009 cycle. Texas Government Code, Section 2262.004, requires all procurement staff involved in the procurement process of contracts awarded at more than \$1 million to sign nepotism disclosure statements. The Department has a written policy that requires nepotism disclosure forms to be signed by staff involved in procurement of professional services contracts worth \$1 million or more. Although in September 2008 the Division began requiring all staff involved in the procurement of contracted consultant engineers to sign nepotism disclosure forms, even if the contracts were for less than \$1 million, this is not a formal written policy.

Recommendations

The Department should:

- Ensure the Bridge Division includes written justification of changes to consultant engineer scores in its scoring documentation, as well as a documented review by the consultant engineer selection team chair.
- Ensure the Bridge Division's consultant engineer selection team complies with the composition requirements in the Texas Administrative Code.
- Consider requiring the Bridge Division to implement a formal policy to require consultant selection team members to sign nepotism disclosure forms for all bridge inspection contracts.

Management's Response

The Department should ensure the Bridge Division includes written justification of changes to consultant engineer scores in its scoring documentation, as well as a documented review by the consultant engineer selection team chair.

Management agrees. The need to follow procedures has been and will continue to be communicated to involved personnel.

David Hohmann, P.E., Director of the Bridge Division, is responsible for the documentation and justification for consultant engineer scores. This recommendation is currently in practice.

The Department should ensure the Bridge Division's consultant engineer selection team complies with the composition requirements in the Texas Administrative Code.

Management agrees. The Bridge Division has already taken steps to ensure that the chair of the consultant engineer selection team for future bridge inspection contracts is an employee of the Bridge Division.

David Hohmann, P.E., Director of the Bridge Division, is responsible for ensuring these steps are effective. This recommendation is currently in practice.

The Department should consider requiring the Bridge Division to implement a formal policy to require consultant selection team members to sign nepotism disclosure forms for all bridge inspection contracts.

Management disagrees. However, the Bridge Division will comply with current TxDOT policy regarding nepotism.

On February 17, 2009 a new TxDOT policy went into effect that required nepotism forms to be filled out by employees who make decisions or recommendations on work authorizations of \$100,000 or more and contracts worth \$1,000,000 or more. Since that date the Bridge Division has required all members of bridge inspection consultant selection teams, and both division and district personnel overseeing bridge inspection work authorizations, to sign nepotism forms. Members of the consultant selection team for existing bridge inspection contract signed nepotism forms in September of 2008, well in advance of the new TxDOT policy requiring this action.

District Offices Did Not Consistently Submit Consultant Engineer Evaluations to the Bridge Division as Required by the Department's Policies and Procedures

District offices did not consistently submit consultant engineer evaluations to the Bridge Division as required by the Department's contract guidelines for the 2005-2007 and 2007-2009 inspection cycles. The Department's *Bridge Inspection Manual* instructs district offices to evaluate bridge inspection consultant engineers upon the completion of each work authorization. The evaluation criteria used to assess contractors' performance is subjective and may lead to consultant engineers being inconsistently evaluated.

The Districts achieved limited compliance with requirements to submit consultant engineer performance evaluations.

For the 2005-2007 contract period, 91 of 134 (68 percent) work authorizations had a corresponding evaluation on file with the Bridge Division. In addition, only 49 of 126 (39 percent) work authorizations had corresponding evaluations for the 2007-2009 contract period. Without a complete assessment of each consultant engineer's performance on file, the Bridge Division's contract selection team lacks complete information for making their selections for the consultant engineer pool. Not having documented evaluations could prevent the Division from being able to use valuable feedback information in future contract award decisions.

The Department provides limited guidance for how to apply evaluation criteria.

While the Department provides guidance for inputting evaluations into its consultant engineer monitoring system and generating summary reports, it gives only limited guidance on applying evaluation criteria and no instruction on which level of performance constitutes a corresponding rating. The Department uses a standard form to evaluate the performance of all professional providers of engineering, architectural, and surveying services, including those provided for bridge inspections. The Department's guidance on evaluating consultant engineers states that judgment should be used in applying criteria and ratings. Auditors observed that many of the Department's evaluation criteria provide little guidance, are not objectively measurable, and are difficult to quantify. For example, the evaluation forms reviewed included some of the following undefined criteria:

- "Significant errors."
- "Numerous corrections needed."
- "TxDOT standards randomly followed."
- "Unorganized."

- “Missed deadlines significantly [and] affected TxDOT project development schedule.”

As a result, the consultant engineer evaluations can vary based on the preferences and judgments of the individual evaluators. This could lead to inconsistent and incomplete measures of each consultant engineer’s overall performance.

Recommendations

The Department should:

- Ensure that district offices submit consultant engineer evaluations in a timely manner by stressing the evaluations’ importance in the procurement process.
- Develop evaluation criteria that are objective, and provide specific guidance to the district offices on how to apply evaluation criteria.

Management’s Response

The Department should ensure that district offices submit consultant engineer evaluations in a timely manner, by stressing the evaluations’ importance in the procurement process.

Management agrees. The Bridge Division will continue to be proactive in encouraging districts to submit consultant engineer evaluations upon completion of work. The Bridge Division will develop a monitoring system to allow Districts to track the status of submitted evaluations.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing a monitoring system to track evaluations within twelve months from the date of the SAO’s final audit report.

The Department should develop evaluation criteria that are objective, and provide specific guidance to the district offices on how to apply evaluation criteria.

Management agrees. Bridge Division will develop evaluation criteria guidelines to assist the districts in producing consistent and measurable results. These guidelines will be included in the Bridge Inspection Manual.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing this recommendation within twelve months from the date of the SAO’s final audit report.

Information the Department Used to Manage the Program Is Accurate; However, It Should Improve Its Edit Checks and Adherence to the System Development Life Cycle Methodology

Data tested in the Department’s mainframe system for bridge management and inventory information—BRINSAP—were reliable and accurate. However, the Department should improve the effectiveness of the edit check relating to the inspection date. In addition, the Department did not follow a formal system development life cycle methodology when creating a new Web-based system that is scheduled to replace BRINSAP. Not following a documented system development life cycle methodology puts the application and data at risk of not meeting the client’s needs and not performing the required business functions completely and accurately.

All BRINSAP data tested was accurate and supported by required documentation.

All critical data entry controls auditors tested were functioning as intended except for two data entry controls discussed below. The system contains several controls to identify duplicate records or other data with errors and to prevent these errors from being introduced into the system. In addition, the Department limits access to BRINSAP to only those employees with proper authorization. Also, nearly all data tested at the district offices auditors visited matched information in the BRINSAP system. Data error rates ranged up to 1.3 percent. The district offices produce most of the data that is the source of information entered into BRINSAP.

However, BRINSAP lacks an effective edit check to ensure timely entry of the bridge inspection date into BRINSAP. The current control in BRINSAP compares the inspection date entered to the current date and allows the inspection date to be entered up to 51 months after completion of the inspection. The system also allows users to enter a future inspection date. Title 23, Code of Federal Regulations, Section 650.315, requires bridge inspection data to be entered into a state agency’s inventory (which in Texas is currently BRINSAP) within 90 days of the inspection date for state-owned bridges and 180 days for non-state-owned bridges. Without edit checks that ensure that data is entered within 90 days for state-owned bridges or 180 days for non-state-owned bridges, the Department lacks controls to ensure compliance with federal regulations. In addition to compliance with federal regulations, timely inspection data is essential for the Department to ensure the safety of bridges.

In addition, a key staff person who is responsible for making weekly updates to BRINSAP data and for generating the monthly reporting has no trained backup. In the event of an unexpected absence by this staff person, the lack of

Changing Data Systems

The Department is transitioning from one system to another to manage bridge inspection data. These two systems are:

- **BRINSAP** - A mainframe computer system the Department has used as a data repository for high-level bridge inspection data since the 1970s.
- **PonTex** - A Web-based application that will collect detailed bridge inspection data and help the Department manage assignments for individual bridge inspectors. PonTex is projected to be fully implemented in 2011. It is currently being used as a pilot system in the Odessa District.

a backup employee could result in major delays in the critical functions of the weekly and monthly data reporting processes.

The Department did not follow a system development life cycle methodology for its new Web-based bridge management and inventory system.

The Department's System Development Life Cycle (SDLC) Methodology

SDLC is a methodology for small projects that details requirements for a software development project. These include:

- Assigning an issue number for the request.
- Determining resources needed.
- Creating a project plan.
- Maintaining documentation.
- Gathering business and data requirements.
- Preparing a test plan.
- Preparing test scenarios and test data.
- Conducting acceptance tests.

Source: *TxDOT Business Systems Development and Support Software Development Life Cycle Methodology*.

The Department is in the process of transitioning from BRINSAP to an automated Web-based bridge management information system called PonTex. The Department's Technology Services Division (TSD) is assisting the Bridge Division in developing this information system. However, in developing PonTex, TSD did not follow its policies or procedures regarding the use of a system development life cycle methodology and did not adequately involve the Bridge Division. Additionally, TSD programmers are performing multiple duties that should be separated.

The development of PonTex has been informal, and several development phases were not conducted according to the Department's system development life cycle methodology (see text box). For example, user requirements from the Bridge Division were poorly documented and not updated by the application developers as the project changed over time. The original user requirements were from a 2001 effort to develop the predecessor to PonTex. TSD did not revisit these requirements in 2007 when development of PonTex began. The Bridge Division, which is PonTex's user, has not provided adequate formal input to system developers and has not taken adequate ownership of the development of a system designed for its use.

TSD, the PonTex application developers, did not receive specific input on data validation for the system from the Bridge Division. Although the Bridge Division is conducting field testing of the system, it has not conducted any formal user acceptance testing. User acceptance testing is an important step for determining whether an application is functioning properly and meets the required business needs. Department policy states that user requirements should be gathered and documented during the development of a software project. It also requires user acceptance testing be performed at the end of application development. By not following a documented policy for system development, the Department places PonTex and its related data at risk of not fully meeting the Bridge Division's needs. This also increases the risk that possible application problems could go undetected.

Due to a limited number of staff, PonTex application programmers are performing multiple duties that should be separated. For example, auditors noted the following:

- Two programmers can move code they have changed into production, which allows either of them to perform the change process from start to finish without any monitoring.
- All five PonTex programmers have access to production data through the application, as well as direct access to the Oracle database, which contains bridge inspection data. Production data belongs to the Bridge Division and all changes should be made by its staff.

By not separating these duties, the Department places the data and application at risk of unauthorized changes that are not detected. According to federal guidelines on system controls, segregation of duties is often achieved by splitting responsibilities between two or more organizational groups. Properly dividing duties diminishes the likelihood that errors and unauthorized changes will go undetected.

Recommendations

The Department should:

- Change the edit on the inspection date field in BRINSAP to flag for review any inspection date that is entered more than 90 days after the completion of the inspection. Also, this field should not allow for any future dates to be entered.
- Ensure that staff have appropriate segregation of duties and can perform key duties in the event of staff absences.
- Follow its system development life cycle methodology in developing applications and adequately document the development process.
- In the future, require program owners to develop user and data validation requirements prior to application development.
- In the future, require application users to perform a documented user acceptance testing prior to moving an application into production.
- Limit PonTex application programmers' access to the Bridge Division's production data.

Management's Response

The Department should change the edit on the inspection date field in BRINSAP to flag for review any inspection date that is entered more than 90 days after the completion of the inspection. Also, this field should not allow for any future dates to be entered.

Management agrees that the problem should be rectified, but disagrees that changes should be made to BRINSAP, which is an obsolete system. The new PonTex data system will replace BRINSAP by August 2010. This finding will be mitigated once PonTex is in full production.

David Hohmann, P.E., Director of the Bridge Division, is responsible for implementing PonTex statewide by the end of fiscal year 2010.

The Department should ensure that staff have appropriate segregation of duties and can perform key duties in the event of staff absences.

Management agrees. Teams for Texas deploys production code updates. Prior to production, developers are able to deploy code changes. We recently began using the PonTex application in a production capacity. The usual process to deploy updates through Teams for Texas will be effective immediately. Technology Services Division staff is trained to provide backups unless there is a personnel shortage in an area. In these cases, based on the criticality of the function, an interim backup may be assigned.

Judy Skeen, P.E., Director of the Technology Services Division, is responsible for the implementation of this recommendation within twelve months from the date of the SAO's final report.

The Bridge Division does have backup personnel in place to run weekly data updates and produce monthly reporting. David Hohmann, P.E., Director of the Bridge Division, is responsible for ensuring these duties are covered and this is the current practice.

The Department should follow its system development life cycle methodology in developing applications and adequately document the development process.

Management agrees. Application development efforts should follow the development life cycle methodology and applicable processes. Due to the iterative nature by which the PonTex system came into existence, there was confusion over which processes needed to be followed. PonTex development was a close collaborative effort between the Technology Services Division and the Bridge Division. PonTex developers completed the work required by the methodology; however, they failed to produce adequate documentation. For example, requirements were defined for the effort that spawned PonTex. These requirements were subsequently reviewed by the Bridge Division.

However, an updated set of formal requirements for PonTex functionality was not produced. Another example is the Bridge Division provided approval to begin the implementation effort, which was taken as user acceptance. However, a formal user acceptance document was not prepared.

Judy Skeen, P.E., Director of the Technical Services Division, is responsible for stressing the importance of following established procedures and communicating to involved personnel the requirement to do so. This recommendation is currently being implemented.

In the future, the Department should require program owners to develop user and data validation requirements prior to application development.

Management agrees.

Judy Skeen, P.E., Director of the Technical Services Division, is responsible for stressing the importance of following established procedures and communicating to involved personnel the requirement to do so. This recommendation is currently being implemented.

In the future, the Department should require application users to perform documented user acceptance testing prior to moving an application into production.

Management agrees.

Judy Skeen, P.E., Director of the Technical Services Division, is responsible for stressing the importance of following established procedures and communicating to involved personnel the requirement to do so. This recommendation is currently being implemented.

The Department should limit PonTex application programmers' access to the Bridge Division's production data.

Management partially agrees. The access criteria document for PonTex, which was approved by the application owner, allows update access for PonTex developers via a database role. After review, it has been determined that this role is not needed and will be removed from the access criteria document.

PonTex development staff will continue to have access to production data through the PonTex application and read-only access through database roles. Development staff need to be able to update administrative application data. The application security profile used provides this level of update. It also prevents development staff from updating bridge inspection data in the application. Development personnel need to be able to query the database directly to aid troubleshooting efforts.

Judy Skeen, P.E., Director of the Technology Services Division, is responsible for allowing or not allowing access by application programmers to the Bridge Division's production data. This recommendation is currently being implemented.

The Department Used a Reasonable Budget Methodology to Develop Budgets for Bridge Division and Consultant Engineer Inspections; However, It Could Improve Its Budgeting Process for District Offices

Auditors reviewed the Department's methodology for three budget areas: bridge inspection consulting services contracts, the Bridge Division's operational budget, and district offices' operational budgets. The Department used a reasonable methodology to develop budgets for Bridge Division operations and bridge inspection consulting services for the 2009-2011 inspection cycle. However, the Department does not require its district offices to formulate separate budgets for bridge inspection activities. As a result, the Department's ability to identify the resources and costs associated with bridge inspection activities is limited.

The districts auditors visited are performing thorough reviews of all consultant engineer invoices to ensure accuracy and completeness before payments are made. Auditors reviewed payments at the five districts visited for the time period of fiscal year 2008 and fiscal year 2009 through June 1. Auditors identified only minor exceptions for program payments to consultant engineers.

The Division's budget methodology is reasonable for operations and contract consultant engineer inspections.

The Program's total budget for contracted bridge inspections was \$30.2 million for the 2009-2011 inspection cycle. This represents a 10 percent increase from the 2007-2009 inspection cycle. The primary reason for the increase is the additional cost to provide load capacity calculations for all bridge inspections. The Department told auditors that there were new federal requirements to do load calculations for all bridges inspected. The Bridge Division formulated its consultant engineer budget based on the number and type of bridges that needed to be inspected during the 2009-2011 inspection cycle. The Bridge Division's methodology for preparing the budget for the 2009-2011 inspection cycle was reasonable and reflected costs necessary to perform the required routine bridge inspections for that time period.

The Bridge Division's operational budget consists primarily of salaries (82 percent and 80 percent for fiscal years 2008 and 2009, respectively) for the management and staff who are directly involved with the bridge inspection function. The Bridge Division's operations budget was \$918,888 for fiscal year 2008 and \$794,002 for fiscal year 2009. The Bridge Division's budget methodology was reasonable.

The Department does not require its district offices to formulate separate budgets for bridge inspection activities.

Each of the 25 districts offices has a bridge engineer's office, which includes bridge inspection activities. The Department does not require district offices to formulate separate budgets for bridge inspection activities at the district level. Therefore, auditors could not review the reasonableness of the bridge inspection budgets at the five districts visited.

Without a detailed, separate, and complete budget for district bridge inspection operations, the Department's ability to identify the resources and costs associated with the bridge inspection activities is limited.

District offices have thorough invoice review and approval processes.

The district offices are responsible for reviewing and approving consultant engineer invoices for bridge inspections. All five districts visited had thorough review and approval processes in place to ensure the accuracy and completeness of invoices. Auditors observed several instances in which district personnel identified and corrected invoice errors that would have resulted in overpayments. At the 5 districts visited, auditors reviewed 255 invoices totaling \$9.3 million and identified only minor exceptions. Of the invoices reviewed, only 5 (2 percent) were incorrectly coded to a district other than the one where work was actually performed.

Recommendation

The Department should consider requiring its district offices to prepare complete and detailed budgets for bridge inspection operations.

Management's Response

Management agrees.

Department Administration is responsible for the evaluation and possible implementation of detailed budgets for district bridge inspection activities within twenty-four months from the date of the SAO's final audit report.

Appendices

Appendix 1

Objectives, Scope, and Methodology

Objectives

The objectives of this audit were to:

- Determine whether the Department of Transportation (Department) ensures that bridge inspections are conducted in accordance with federal and state laws and agency policies and procedures.
- Determine whether the Department appropriately addresses bridge inspection recommendations to ensure the safety of the traveling public.
- Verify the amount of funds budgeted to and expended for bridge inspections.

Scope

The scope of the audit included bridge inspection activities at the Department's Bridge Division and district offices. Auditors examined the following:

- Bridge inspections during the 2007-2009 inspection cycle.
- Load posting data from calendar years 2005 through 2009.
- Consultant engineer contactor selection processes for the 2005-2007 and 2007-2009 inspection cycles.
- Bridge Division and district office budgets for fiscal years 2008 and 2009, and the bridge inspection consultant engineers' budget for the 2009-2011 inspection cycle.

Methodology

The audit methodology included review of the Department's budget for bridge inspections, consultant engineer selection process, and quality control/quality assurance policies and procedures.

Auditors performed tests to determine the effectiveness of the Department's invoice review and approval process; the accuracy of information in the Department's Bridge Inventory, Inspection, and Appraisal Program (BRINSAP); whether the Department complied with its quality control/quality assurance policies and procedures; and whether the Department complied with

required timeframes for performing inspections, load posting bridges, and updating bridge inspection data.

Auditors conducted interviews and performed testing and other procedures at the following five district offices:

- Dallas.
- Fort Worth.
- Houston.
- Yoakum.
- Waco.

Information collected and reviewed included the following:

- Department policies and procedures.
- The Department's bridge inspection folders.
- Bridge inspection procurement documents for the 2005-2007 and 2007-2009 inspection cycles.
- Bridge inspection contracts, supplemental agreements, and work authorizations.
- Billing statements for bridge inspection services that consultant engineers provided.
- Consultant Engineer Tracking System reports.
- Consultant engineer evaluations.
- Department internal audit reports.
- Federal Highway Administration-published quality control and quality review program recommended framework.
- Department employee salary information.
- Bridge inspection data in BRINSAP.

Procedures and tests conducted included the following:

- Interviews with key personnel from:
 - The Department's Bridge Division.
 - The Department's Finance Division.

- The Department's Motor Carrier Division.
- The Department's district offices.
- Analysis of the accuracy of payments made to consultant engineers from the Financial Information Management System (FIMS) and compliance with Department invoice review and approval requirements.
- Verification of reported performance measures.
- Review of the Department's budget for bridge inspections.
- Review of the Department's consultant engineer selection process.
- Review of general and physical controls over BRINSAP.

Criteria used included the following:

- Code of Federal Regulations, Title 23.
- Texas Administrative Code, Title 43.
- Texas Transportation Code, Titles 6 and 7.
- Texas Government Code, Title 10.
- State of Texas Contract Management Guide.
- The Department's Contracting Management Guide.
- The Department's Bridge Inspection Manual.
- The Department's Maintenance Operations Manual.
- *Guide to Performance Measure Management* (State Auditor's Office Report No. 06-329, August 2006).

Project Information

Audit fieldwork was conducted from April 2009 through August 2009. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The following members of the State Auditor's staff performed the audit:

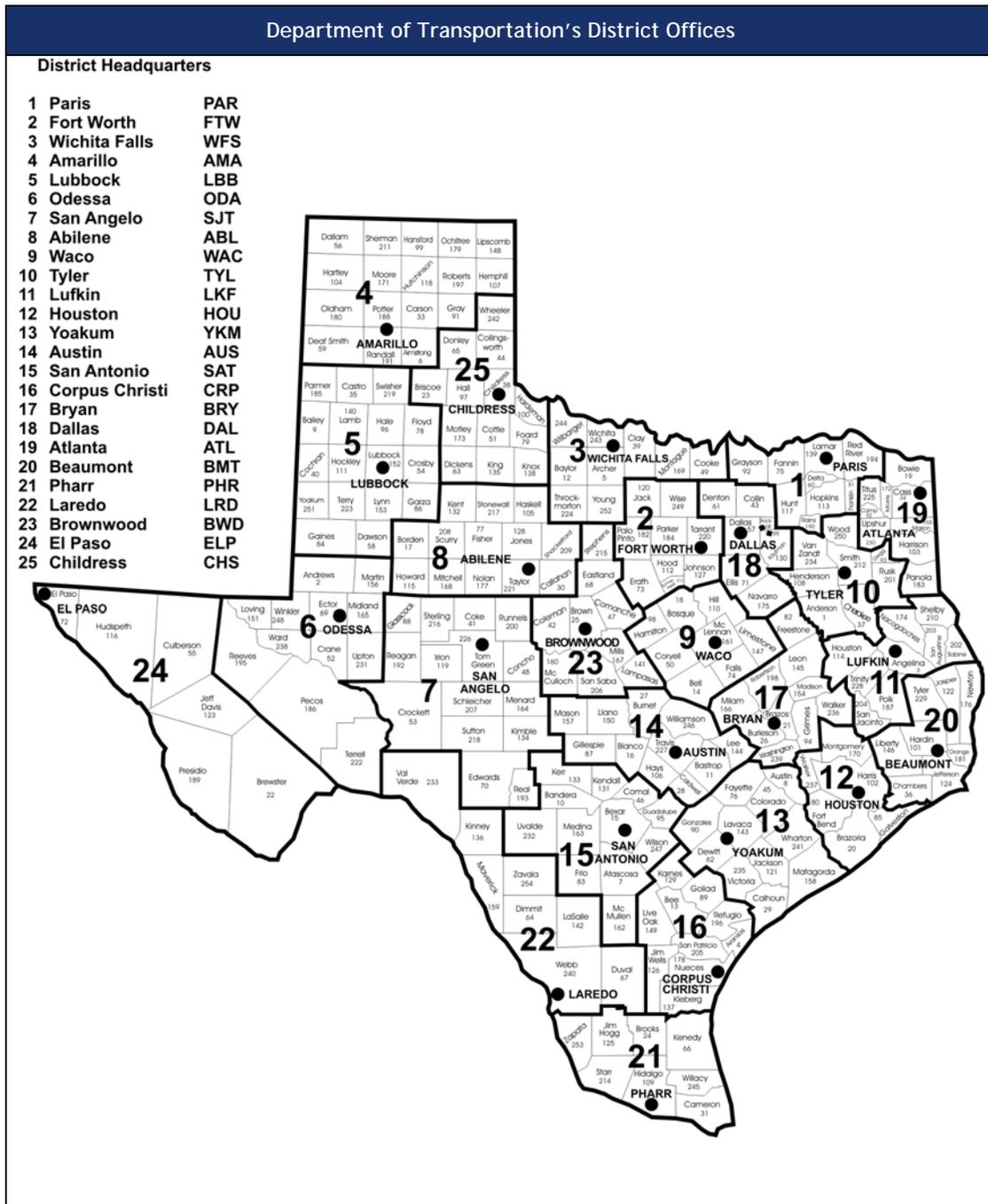
- Lucien Hughes (Project Manager)

- Michael F. Boehme, CIA, PHR (Assistant Project Manager)
- Sarah Flowers
- Tessa Mlynar
- Anca Pinchas, MS, MA, CPA, CIDA
- Brendi Tubbs
- Kemba Valentine
- Charles Wilson, MPAff
- Stephen Randall, MBA (Information Systems Audit Team)
- Serra Tamur, MPAff, CISA, CIA (Information Systems Audit Team)
- Dennis Ray Bushnell, CPA (Quality Control Reviewer)
- John Young, MPAff (Audit Manager)

Department of Transportation District Map

Figure 3 shows the Department of Transportation's 25 district offices that oversee the State's transportation system within their jurisdictions.

Figure 3



Source: Department of Transportation's Bridge Division.

The Department's Performance Target for Texas's Bridges

The Department of Transportation's (Department) Bridge Division has one Legislative Budget Board (LBB) key performance measure: Percent of Bridges Rated in Good Condition or Higher. The Department has set a goal of 80 percent of state-owned and non-state-owned bridges in Texas to be in good or higher condition by the end of fiscal year 2011. The Department reported in 2008 that 78.42 percent of the 50,571 bridges in its bridge inventory were rated in good condition or higher (see Table 3). According to the Department's reported performance measure results, it has been making steady progress toward achieving this goal since it reported in 2001 that 70 percent of the State's bridges were in good or higher condition.

Auditors reviewed the Department's calculations and methodology for this performance measure as reported for 2008 and determined that it is generally following the LBB-approved measure definition. Auditors also determined that the 2008 measure calculation was substantially accurate.

The Department also has an internal goal to have no state-owned bridges classified as structurally deficient. According to the Department's *Report on Texas Bridges*, a bridge is classified by the Federal Highway Administration as structurally deficient if it meets any of the following criteria:

- It has an extreme restriction on its load-carrying capacity.
- It has deterioration severe enough to reduce its load-carrying capacity beneath its original as-built capacity.
- It is closed.
- It is frequently over-topped during flooding, creating severe traffic delays.

Table 3

Reported Bridge Conditions and Total Number of Structurally Deficient Bridges in Texas Fiscal Years 2001 through 2008		
Fiscal Year Reported	Percent of Bridges Reported in Good Condition or Higher (State-owned and Non-state-owned) ^a	Total Number of Structurally Deficient Bridges (State-owned Only) ^b
2001	70 percent	763
2002	71 percent	693
2003	75 percent	645
2004	76 percent	565
2006	77 percent	483
2008	78 percent	354

Reported Bridge Conditions and Total Number of Structurally Deficient Bridges in Texas Fiscal Years 2001 through 2008		
Fiscal Year Reported	Percent of Bridges Reported in Good Condition or Higher (State-owned and Non-state-owned) ^a	Total Number of Structurally Deficient Bridges (State-owned Only) ^b
^a Auditors reviewed the Department's methodology for calculating the performance measure for 2008 only. ^b Auditors did not review the accuracy of these calculations because the measure is not reported to the LBB as a key performance measure.		

Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

American Recovery and Reinvestment Act Funds and Texas Bridges³

The American Recovery and Reinvestment Act of 2009 (ARRA) was signed into law on February 17, 2009. According to the Department of Transportation (Department), ARRA contains \$27.5 billion for transportation infrastructure projects, and Texas was allocated \$2.25 billion (8.2 percent of the overall funds) for highway and bridge projects. The Texas Transportation Commission (Commission) has approved 383 projects under the ARRA program. Of those, 59 are bridge projects (15 percent). According to the Department, it had awarded contracts for 49 (81 percent) of those bridge projects⁴ as of October 2009 (see Table 4).

Table 4

Awarded Bridge Projects That Are Funded with ARRA Funds As of October 2009				
Letting Date ^a	District	Total Awarded Contract Amount	Number of Projects in Contract	Project Descriptions
April 23, 2009	Abilene	\$ 508,786.32	2	Replace Bridge and Approaches
April 23, 2009	Abilene	508,786.32	2	Replace Bridge and Approaches
May 8, 2009	Abilene	622,795.20	1	Replace Bridge and Approaches
August 12, 2009	Austin	9,393,526.59	1	Replace Bridge, Approaches, and Widen Frontage Roads
October 21, 2009	Austin	2,075,715.18	2	Replace Bridge and Approaches
April 23, 2009	Beaumont	1,043,652.40	11	Upgrade Bridge Rails and Approaches
April 22, 2009	Childress	1,237,606.44	6	Replacement of Existing Bridge Facilities
May 8, 2009	Dallas	625,784.60	1	Replace Two Bridges and Approaches
May 8, 2009	Dallas	625,784.60	1	Replace Two Bridges and Approaches
July 7, 2009	Dallas	499,080.30	1	Replace Bridge and Approaches
July 8, 2009	Dallas	1,615,006.34	1	Replace Bridge and Approaches
July 8, 2009	Dallas	1,615,006.34	4	Replace Bridge and Approaches
May 7, 2009	Dallas	1,708,659.32	2	Replace Bridge and Approaches
July 8, 2009	Dallas	2,856,520.65	2	Replace Bridge and Approaches
October 20, 2009	Dallas	856,466.20	1	Replace Bridge
October 20, 2009	Dallas	856,466.20	1	Replace Bridge
September 10, 2009	Houston	1,790,503.39	2	Replace Bridge and Approaches

³ Information in this appendix is from the Department of Transportation and was not audited by the State Auditor's Office.

⁴ The Department of Transportation's Highway Bridge Program addressed the most critical bridge rehabilitation/repair projects. Bridges qualified to receive funding under this program were categorized as structurally deficient and/or functionally obsolete and had a sufficiency rating of less than 80. The Highway Bridge Program received \$253 million in federal funding in fiscal year 2009 for 227 projects. Those projects not receiving funding from the Highway Bridge Program were allocated ARRA funds.

Awarded Bridge Projects That Are Funded with ARRA Funds As of October 2009				
Letting Date ^a	District	Total Awarded Contract Amount	Number of Projects in Contract	Project Descriptions
April 23, 2009	Houston	313,362.02	1	Replace Bridge
September 10, 2009	Houston	1,348,545.00	1	Bridge Maintenance
April 23, 2009	San Angelo	2,489,936.82	2	Construct Bridges and Approaches
April 22, 2009	San Antonio	1,048,332.35	1	Replace Bridge and Approaches
April 22, 2009	San Antonio	518,704.16	1	Replace Bridge and Approaches
April 23, 2009	San Antonio	827,437.36	1	Remove and Replace Guadalupe River Bridge and Reconstruct Approach
April 22, 2009	Tyler	61,344.00	1	Riprap and Concrete Structure Repair
Totals		\$35,047,808.10	49	
^a The letting date is the date on which bids were advertised to be received.				

Source: The Department.

Texas's allocation of \$2.25 billion includes approximately \$500 million to be sub-allocated to metropolitan planning organizations⁵ throughout the state and \$1.7 billion to the Commission for project selection. This includes:

- \$1.5 billion for discretionary projects of statewide significance and importance.
- \$174.4 million for projects in rural areas.
- Approximately \$67.5 million for enhancement projects or non-traditional transportation projects, such as hike and bike trails.

The Department of Transportation (Department) asserts that it has a documented methodology for the selection of ARRA projects to ensure compliance with ARRA. According to the Department, its methodology includes gathering local input for project prioritization, and ensuring that projects selected meet one or more of the following criteria:

- Projects that improve the safety of the transportation system.
- Projects on corridors of statewide significance or regional priority.
- Projects that leverage or pool resources.

⁵ Federal law requires that a metropolitan planning organization be designated for each urban area with a population of 50,000 or more; there are 25 metropolitan planning organizations in Texas, which coordinate efforts with the Texas Department of Transportation to create comprehensive transportation plans that support metropolitan community development and social goals.

- Projects that create long-term economic benefit to the communities and region they serve.
- Projects that are in economically distressed areas.

Federal Highway Administration's Guidance on Federally Required Timeframes for Load Posting Bridges

A letter to the State Auditor's Office from the Federal Highway Administration providing guidance on federal requirements for load posting bridges.



U.S. Department
of Transportation
**Federal Highway
Administration**

Texas Division
November 5, 2009

300 E. 8th Street, Room 826
Austin, TX 78701-3255
Tel (512) 536-5900
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texas.fhwa@dot.gov

In Reply Refer To:
HTA-TX

State Auditor's Office
P.O. Box 12067
Austin, TX 78711-2067

Attn: Mr. Lucien Hughes
Project Manager

Subject: State Auditor's Office QUESTIONS FOR FHWA

Dear Mr. Hughes:

Please find below the responses (*previously provided on June 2, 2009*) from the FHWA Texas Division to the Texas State Auditor's Office questions.

SAO Questions and FHWA TX Division Responses:

1. Regarding the 90 day and 180 time frames listed in 650.315, are there any more in-depth or specific requirements than this?

The FHWA considers the 90-day period for on-system and 180-day period for off-system to start on the date of inspection. The respective time periods allow a reasonable amount of time for completion of the inspection, inspection report, any necessary actions and data entry updates.

2. When does FHWA consider that a change in status exists?
 - a. The date the inspector recommends posting?

The FHWA considers a change in status on the date of inspection for the structure. Bridge inspections are performed with at least one registered professional engineer present and would thus have overall responsibility with a revised updated load rating and posting recommendation.



Mr. Hughes
November 5, 2009
Page 2

- b. When the Department performs its own calculations for verification and recommends posting?

The FHWA considers a change in status on the date of inspection for the structure. The 90-day time frame does not start from the date the Department performs its verification calculations. These verification calculations should be completed within the given time period.

- c. Should an on-system bridge have the same start date as an off-system bridge?

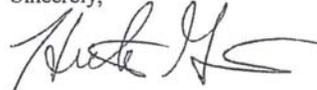
An on-system bridge should have the same start date as an off-system bridge, which is the date of inspection.

- d. What is a reasonable time period from date of inspection and recommendation to post to the date the Department changes the status in BRINSAP?

The State should adhere to a firm 90-day period for on-system and 180-day period for off-system. The respective time periods allow a reasonable amount of time for completion of the inspection, inspection report, load rating calculation and review, any necessary actions and data entry.

The responses provided are consistent with the current regulation; however, if special circumstances arise such that TxDOT cannot meet the specified time periods, then these exceptions should be formally submitted to and approved by the FHWA. If you have any questions, please contact me at (512) 536-5923 or Peter Chang at (512) 536-5920.

Sincerely,



Hector Garcia
Assistant Bridge Engineer

Federal Highway Administration's Recommended Framework for Bridge Inspection Quality Control and Quality Assurance

The Federal Highway Administration has developed national bridge inspection standards that require state transportation departments to develop and implement quality control and quality assurance programs to monitor bridge inspection activities. According to the federal requirements, quality control and quality assurance programs should include periodic field reviews of inspection teams, bridge inspection refresher training for program managers and team leaders, and independent reviews of inspection reports and computations to maintain a high degree of accuracy and consistency in the inspection program.

To assist the states, the Federal Highway Administration developed a recommended framework for bridge inspection quality control and quality assurance program procedures, which are summarized in Table 5.

Table 5

Recommended Framework for Bridge Inspection Quality Control and Quality Assurance Programs	
Element	Procedure
Documentation	<ul style="list-style-type: none"> ▪ Develop, document, and maintain a bridge inspection manual that contains quality control/quality assurance program purpose, benefits, and procedures in accordance with the recommended framework.
Quality Control	<ul style="list-style-type: none"> ▪ Define and document quality control roles and responsibilities. ▪ Document qualifications required for program manager, team leader, inspection team member, and load rater. ▪ Document process for tracking how qualifications are met through experience, certifications, and training; and for the content, frequency, and delivery method of required refresher training. ▪ Document special skills, equipment needs, and training for specific types of inspections. ▪ Document procedures for review and validation of inspection reports and data; and for identification and resolution of data errors, omissions, and changes.
Quality Assurance	<ul style="list-style-type: none"> ▪ Define and document quality assurance roles and responsibilities. ▪ Document procedures for conducting office and field quality assurance reviews that address procedures for: maintaining, documenting, and sharing review results; determining review frequency and sampling parameters; reviewing current inspection reports, files, and ratings; validating team qualifications; and developing checklists to guide review of specific items. ▪ Document disqualification and re-qualification procedures for team leaders and consultant engineers. ▪ Document procedures for validating quality control procedures.

Source: Excerpt from the *Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program as applicable for our objective*, Federal Highway Administrations at <http://www.fhwa.dot.gov/bridge/nbis/nbisframework.cfm>.

The Federal Highway Administration has also identified several states with commendable quality control and quality assurance practices that incorporate elements of its recommended framework. These are listed in Table 6.

Table 6

Quality Control and Quality Assurance Practices in Other States That Incorporate Elements of the Federal Highway Administration's Framework					
Quality Control/ Quality Assurance Practice	Wisconsin	Oregon	Massachusetts	Washington	Oklahoma
Documentation					
Bridge inspection manual contain quality control/quality assurance procedures incorporating recommended Federal Highway Administration framework.				X	
Details purpose and benefits of quality control/quality assurance program.		X			
Provide appropriate definitions.			X		
Quality Control (QC) Procedures					
Defines quality control roles and responsibilities.			X		
Documents qualifications for inspection team.				X	
Has a process for tracking inspection team qualifications.				X	
Documents required refresher training.					
Documents special skills, training, and equipment needs for specific types of inspections.				X	
Has procedures for review of inspection reports and data.					
Has procedures for identifying and fixing data issues.				X	
Quality Assurance (QA) Procedures					
Defines quality assurance roles and responsibilities.	X		X	X	
Has procedures for maintaining, documenting, and sharing review results.					
Establishes review frequency parameters	X			X	
Has procedures and sampling parameters for selecting bridges to review.	X	X			
Has procedures for reviewing inspection reports, bridge files, and load ratings.					
Has procedures to validate qualifications of inspector and load rater.	X				

Quality Control and Quality Assurance Practices in Other States That Incorporate Elements of the Federal Highway Administration's Framework

Quality Control/ Quality Assurance Practice	Wisconsin	Oregon	Massachusetts	Washington	Oklahoma
Defines "out-of-tolerance" for condition rating and load rating.					
Has checklists covering typical items to review as part of quality assurance procedures.	x	x		x	
Has disqualification procedures for inspectors that have a record of poor performance.					x
Has re-qualification procedures for inspectors that demonstrate acceptable performance.					x
Has procedures for conducting inspections on a "control" bridge.					x
Has procedures to validate quality control procedures.					

Source: Excerpt from the *Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program*, Federal Highway Administrations at <http://www.fhwa.dot.gov/bridge/nbis/nbisframework.cfm>.

Quality Control and Quality Assurance Best Practices

The Federal Highway Administration has highlighted several states that have developed commendable quality control and quality assurance practices. Those practices are listed in Table 7.

Table 7

Recommended Procedures from Other States	
State	Procedures
Oregon	<p>Offer guidance for bridges to be included in field reviews, including:</p> <ul style="list-style-type: none"> ▪ Bridges with urgent or critical maintenance recommendations. ▪ Bridges with load rating or load posting issues. ▪ Bridges in need of rehabilitation or replacement. ▪ New structures recently opened to traffic. <p>Outline the composition of the quality assurance review team and how it will perform field reviews, which includes:</p> <ul style="list-style-type: none"> ▪ Annually conducting a quality assurance review for each region. ▪ Independently inspecting bridges and reconciling the inspection results to the most recent inspection report of record and openly discussing any differences that might exist between the two.
Wisconsin	<p>Describe how an on-site office review of Wisconsin Department of Transportation districts and local government entities will be conducted, including:</p> <ul style="list-style-type: none"> ▪ Verification of inspector qualifications. ▪ Review of bridge inspection records for legibility, accuracy, and accessibility. ▪ Bridge inspection planning, including inspection schedules, average inspection time, and inspection preparation. ▪ Review of routine inspection reports to ensure that recommended repairs are recorded, inspection notes are legible, and forms are signed and dated.
Oklahoma	<p>Quality control/quality assurance program contains continuing education requirements, including:</p> <ul style="list-style-type: none"> ▪ Attendance at training sessions once every two years for inspection personnel. ▪ Training attendees conduct an independent inspection of a test bridge to be discussed at training session. <p>Details grounds for the disqualification of bridge consultant personnel and firms, including:</p> <ul style="list-style-type: none"> ▪ Failure to correct findings from quality control or quality assurance reviews. ▪ Recurring miscoded critical National Bridge Inventory items. ▪ Failure to attend required continuing education sessions. ▪ Failure to submit completed inspection data and/or corrections in a timely manner.

Source: Excerpt from the *Recommended Framework for a Bridge Inspection Quality Control/Quality Assurance Program*, National Highway Administration at <http://www.fhwa.dot.gov/bridge/nbis/nbisframework.cfm>.

Texas Bridges by the Numbers

The Department of Transportation's (Department) district offices are responsible for performing inspections and for preparing and maintaining structure inventory and appraisal data that is reported to the Federal Highway Administration for all state-owned and non-state-owned bridges in each office's jurisdiction. The district offices also are responsible for planning, designing, constructing, operating, and maintaining state-owned bridges, and local jurisdictions are responsible for these activities for non-state-owned bridges. Table 8 lists the total number of state-owned and non-state-owned bridges in each district.

Table 8

State-owned and Non-state-owned Bridges in Each District As of September 2008				
District	Number of State-owned Bridges in District	Number of Non-state-owned Bridges in District	Total Number of Bridges in District	Percent of Total Bridges Statewide
Abilene	1,349	390	1,739	3.4 %
Amarillo	682	109	791	1.6 %
Atlanta	1,060	221	1,281	2.5 %
Austin	1,841	1,249	3,090	6.1 %
Beaumont	1,077	448	1,525	3.0 %
Brownwood	885	410	1,295	2.6 %
Bryan	1,143	593	1,736	3.4 %
Childress	699	195	894	1.8 %
Corpus Christi	1,271	379	1,650	3.3 %
Dallas	3,244	2,498	5,742	11.4 %
El Paso	987	227	1,214	2.4 %
Fort Worth	1,992	1,578	3,570	7.1 %
Houston	2,731	2,756	5,487	10.8 %
Laredo	810	148	958	1.9 %
Lubbock	428	24	452	0.9 %
Lufkin	789	530	1,319	2.6 %
Odessa	1,054	54	1,108	2.2 %
Paris	1,325	858	2,183	4.3 %
Pharr	657	309	966	1.9 %
San Angelo	1,196	125	1,321	2.6 %
San Antonio	2,419	1,158	3,577	7.1 %
Tyler	1,164	570	1,734	3.4 %
Waco	1,629	1,031	2,660	5.3 %

State-owned and Non-state-owned Bridges in Each District As of September 2008				
District	Number of State-owned Bridges in District	Number of Non-state-owned Bridges in District	Total Number of Bridges in District	Percent of Total Bridges Statewide
Wichita Falls	1,036	479	1,515	3.0 %
Yoakum	1,650	1,115	2,765	5.5 %
Totals	33,118	17,454	50,572	100.1%^a

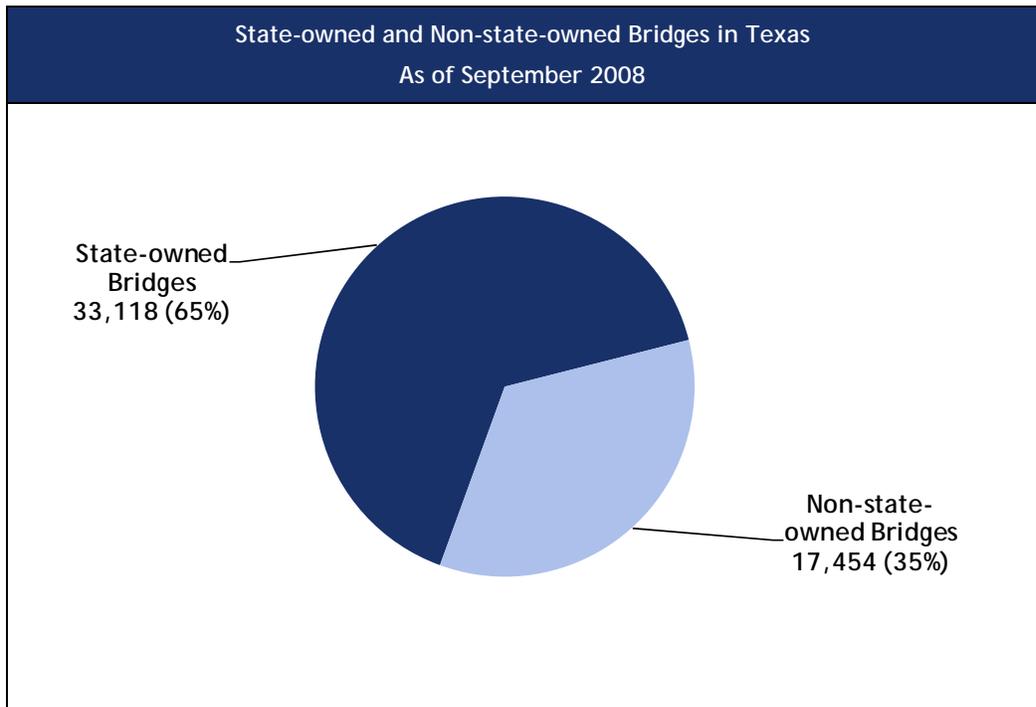
^a Percentages do not sum exactly to 100 percent due to rounding.

Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

Percent of State-Owned and Non-state-owned Bridges

Figure 4 shows the number of state-owned and non-state-owned bridges as of September 2008.

Figure 4

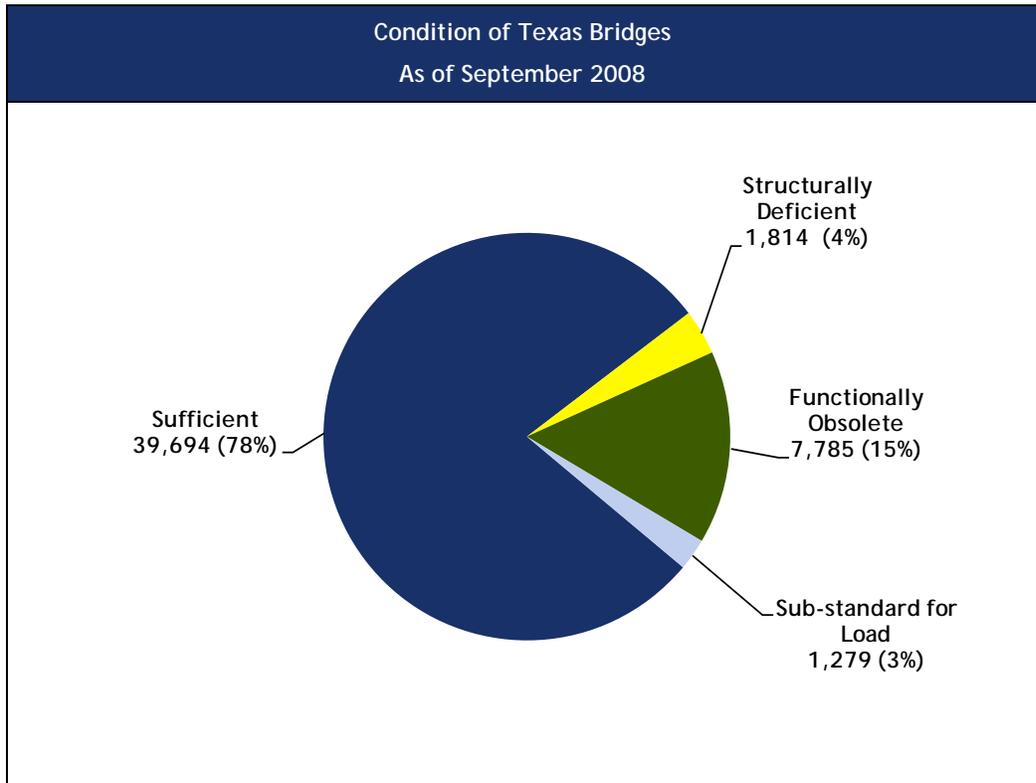


Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

Condition of Texas Bridges

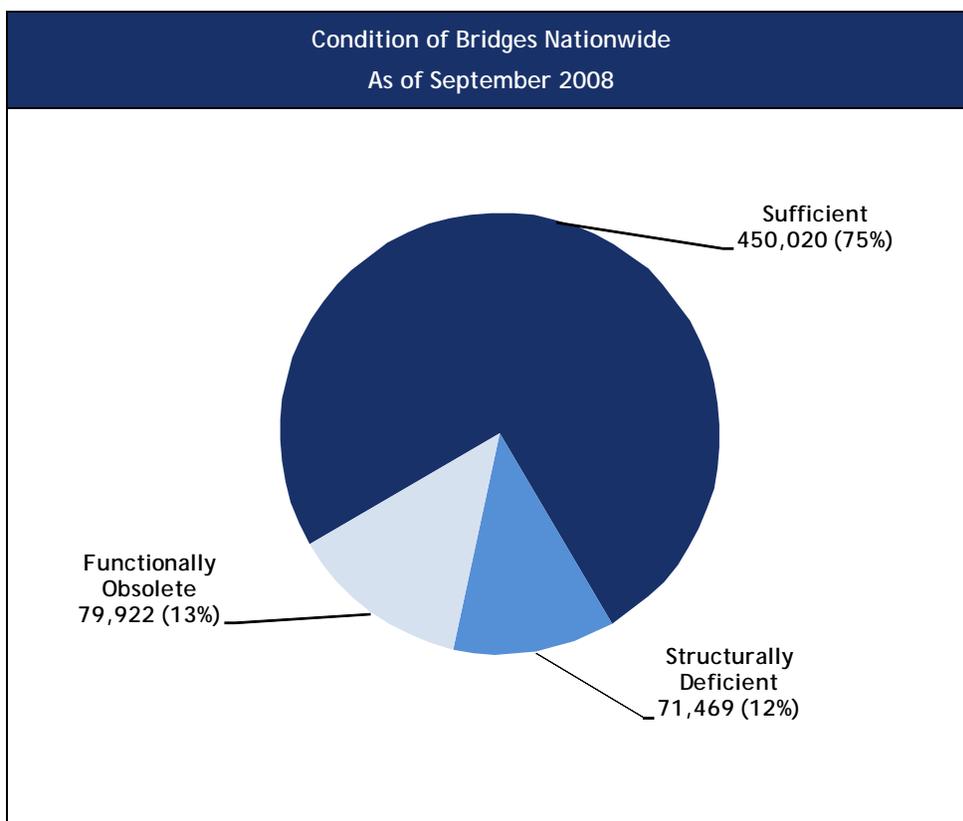
To increase safety for the traveling public, the Department indicated it has been working to achieve its 10-year goal of having 80 percent of Texas bridges rated in good or higher condition (sufficient) by the end of fiscal year 2011. According to the Department's 2008 *Report on Texas Bridges*, since fiscal year 2001, the Department has steadily reduced the number of structurally deficient bridges in Texas. As of September 2008, 19 percent of bridges in Texas were classified as structurally deficient or functionally obsolete (see Figure 5). Nationwide, 25 percent of all bridges are classified as structurally deficient or functionally obsolete (see Figure 6).

Figure 5



Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

Figure 6

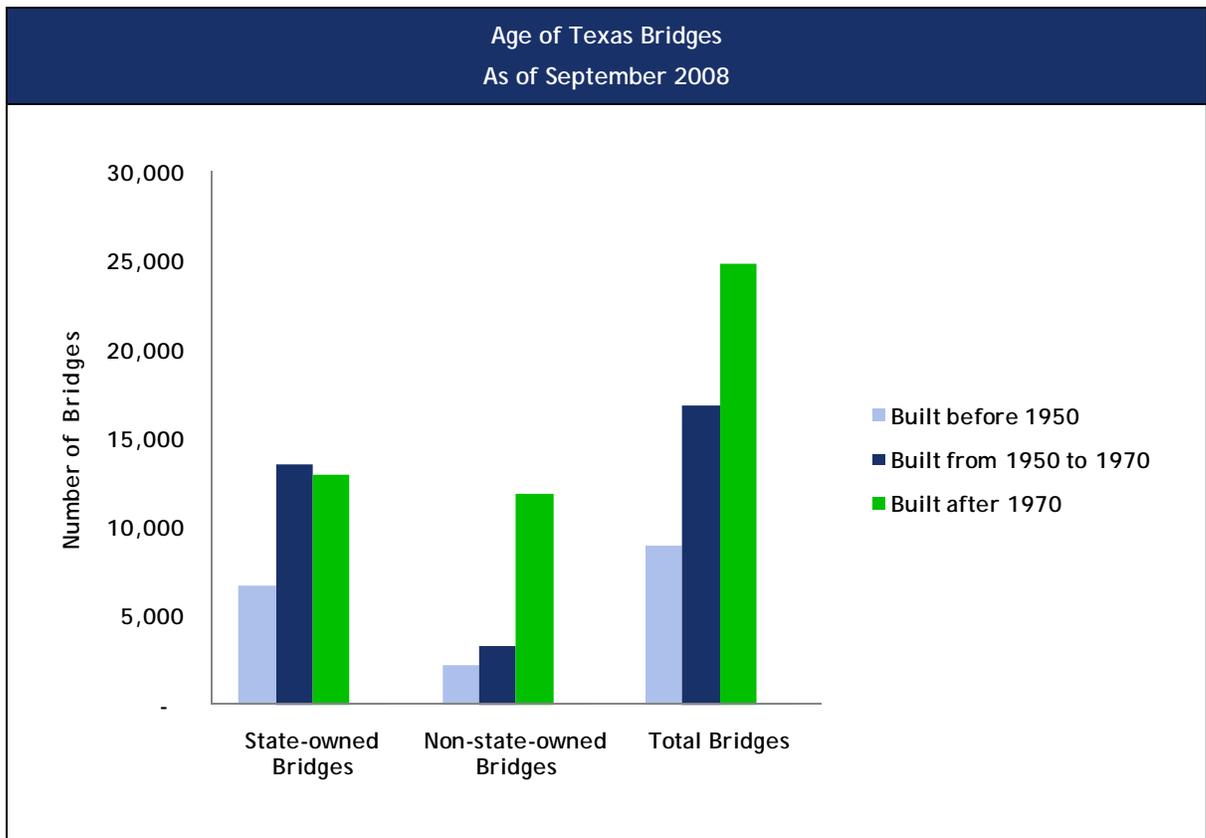


Source: Federal Highway Administration.

The Age of Texas Bridges

According to the Department's 2008 *Report on Texas Bridges*, design criteria for the construction of bridges have evolved as the volume of traffic and weight of vehicles traveling on the Texas transportation system increased. The 2008 *Report on Texas Bridges* also states that some of the state's older bridges do not meet current Department or American Association of State Highway and Transportation Officials standards. Bridges built before 1950 were generally designed to carry less than the current state legal load; and bridges built between 1950 and 1970 do not all meet current roadway approach width requirements. The Department anticipates an increased need for funding and resources to maintain, rehabilitate, and replace the aging bridges. Figure 7 on the next page shows the number of bridges built before 1950, between 1950 and 1970, and after 1970.

Figure 7

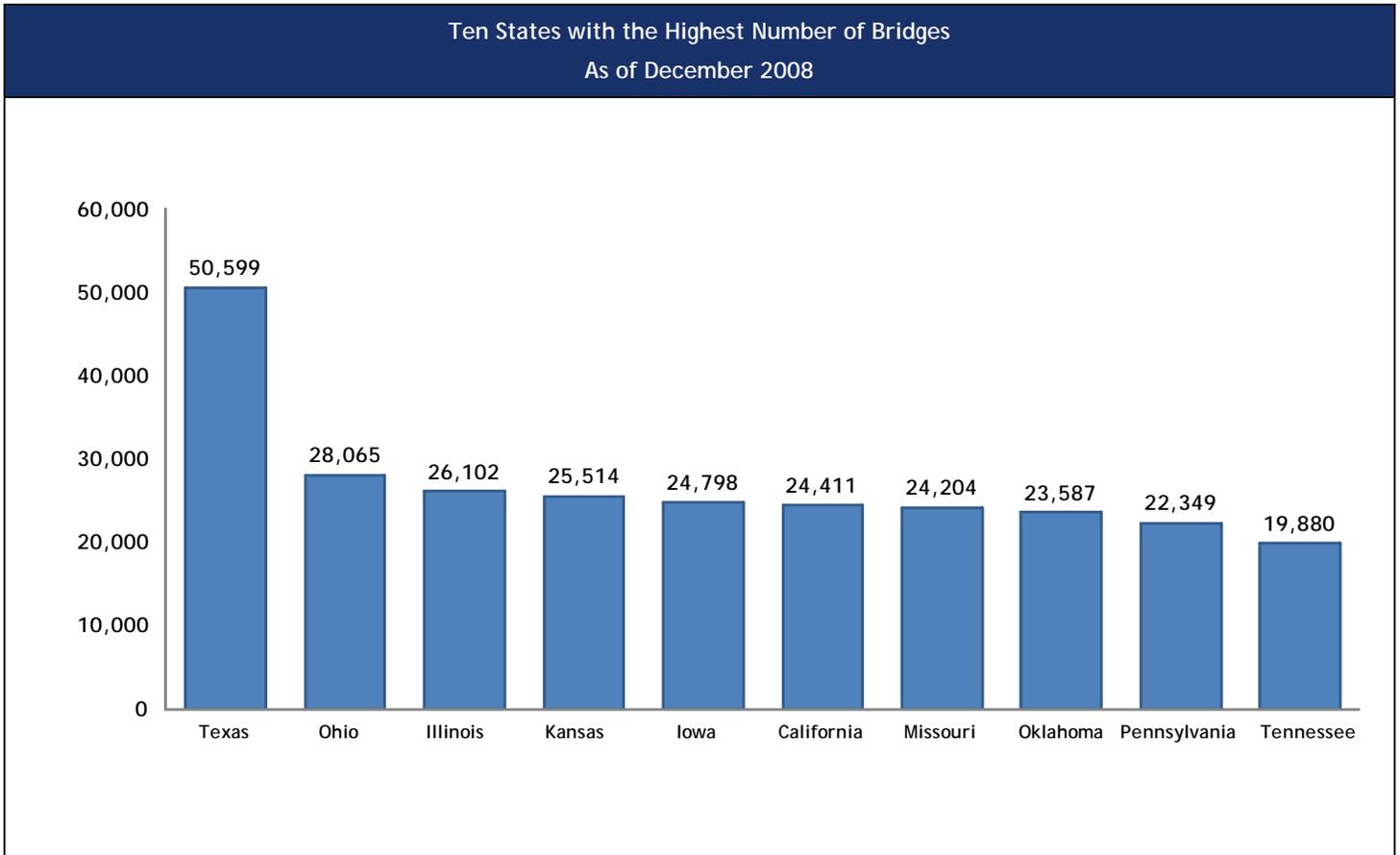


Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

National Statistics

The Federal Highway Administration collects structure inventory and appraisal data for all 50 states, the District of Columbia, and Puerto Rico for its National Bridge Inventory database. Based on this data, Texas has more bridges than any other state, accounting for approximately 8 percent of the nation's total bridge inventory. As of December 2008, there were 601,411 bridges nationwide. Figure 8 lists the 10 states with the highest number of bridges.

Figure 8



Source: Federal Highway Administration.

Basic Bridge Terms

Table 9 provides definitions of common terms used in the Department of Transportation's (Department) bridge inspection process.

Table 9

Bridge Inspection-related Terminology	
Term	Definition
Bridge	A structure that (1) includes supports erected over a depression or an obstruction, such as water, a highway, or a railway; (2) has a roadway or track for carrying traffic or other moving loads; and (3) has an opening measured along the center of the roadway of more than 20 feet between faces of abutments, spring lines of arches, or extreme ends of the openings for multiple box culverts; or multiple pipes that are 60 inches or more in diameter and have a clear distance between openings of less than half of the smallest pipe diameter.
On-system Bridge (referred to as state-owned in this audit report)	A bridge located on the designated state highway system, administered by the Department of Transportation, and funded with state funds or a combination of federal and state funds.
Off-system Bridge (referred to as non-state-owned in this audit report)	A bridge that is not a part of the designated state highway system and is under the direct jurisdiction of a local government, such as a county, city, other political subdivision of the state, or special district with authority to finance a highway improvement project.
Structurally Deficient	This is a bridge that (1) has an extreme restriction on its load-carrying capacity, (2) shows deterioration that is severe enough to reduce the bridge's load-carrying capacity beneath its original as-built capacity, (3) is closed, or (4) is frequently over-topped during flooding.
Functionally Obsolete	A bridge that fails to meet its design criteria in any one of the following areas: deck geometry, load-carrying capacity, vertical or horizontal clearances, or approach roadway alignment.
Sufficiency Rating	A numerical evaluation that measures a bridge's structural adequacy, safety, serviceability, functional obsolescence, and essentiality for traffic service. Sufficiency ratings are used to determine a bridge's eligibility for rehabilitation or replacement through the Federal Highway Bridge Program.
State Legal Load	The maximum legal load for each vehicle configuration. Texas Transportation Code, Section 621.101, establishes that, in general, any vehicle load cannot exceed 80,000 pounds gross weight, 34,000 pounds on any tandem axles, or 20,000 pounds on a single axle.
Design Load	The live load a structure was designed to carry; a bridge's original as-built capacity.
Load Rating	A measure of the amount of weight (live load) that can safely cross a bridge considering bridge plans and supplemented by information from a field inspection.
Load Posted Bridge	A bridge that is restricted to a weight limit that is less than the state legal load. The load capacity is communicated by signs at the bridge site.
Sub-standard for Load Only	A bridge that is not structurally deficient or functionally obsolete, but it is load-restricted because its original as-built capacity was not designed to carry the current state legal load.
Land-locking Bridge	A bridge that restricts traffic into an area because of load limitations or closures. These bridges are load posted.

Sources: Title 23, Code of Federal Regulations, Section 650.305; *Report on Texas Bridges*, Department of Transportation, September 2008; and Texas Transportation Code, Sections 620.101 and 620.102.

Motor Carrier Division

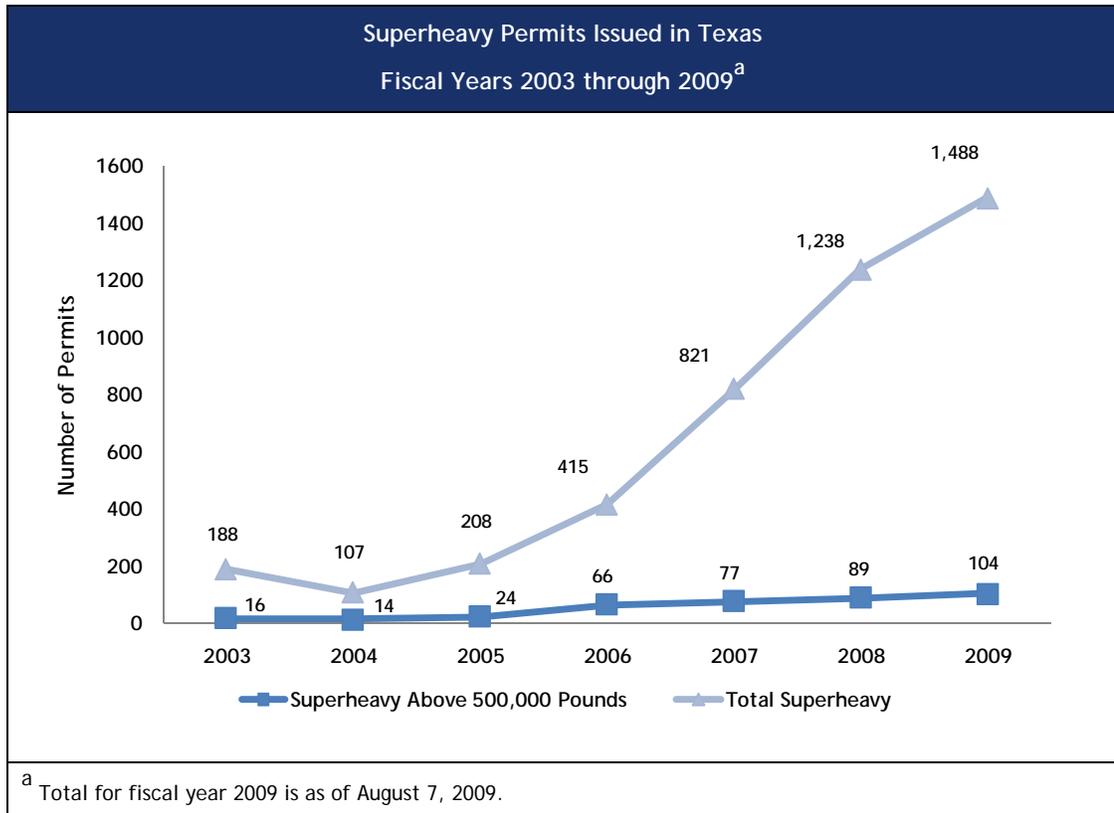
According to the Texas Transportation Code, the Texas Transportation Commission is responsible for establishing the state legal load, which is the maximum permitted weight for each vehicle configuration that may safely use a bridge. As of September 2009, any vehicle load cannot exceed 80,000 pounds gross weight, 34,000 pounds on any tandem axles, or 20,000 pounds on a single axle. Structural damage, excessive road wear, and road hazards may result from vehicles with loads that exceed the legal size and weight limitations traveling on state roadways and bridges. However, some heavy machinery and equipment that support the State's infrastructure cannot be reasonably dismantled for transportation. Therefore, permits may be purchased to legally transport loads that exceed the State's legal size and weight limitations.

The Department of Transportation's Motor Carrier Division (MCD) is responsible for planning routes and issuing permits to facilitate the movement of loads that exceed the State's maximum width, height, length, overhang, and/or weight limits. These loads may consist of a single vehicle or a combination of vehicles. The MCD relies on accurate and up-to-date information from the Department of Transportation's (Department) Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) database to route overweight vehicles around load-restricted bridges, unless those bridges provide the only vehicular access to the destination.

The MCD issues superheavy permits for loads that exceed 254,300 pounds. Of 580,415 overweight permits the MCD issued during fiscal year 2008, 1,281 were for superheavy loads. For all superheavy permits, the Department's Bridge Division is required to approve a detailed structural analysis of bridges on the planned permit route.

As Figure 9 on the next page shows, the number of superheavy permits issued annually has increased 691 percent since 2003. This is due in part to increased transportation of generators, transformers, wind turbines, and oil refinery equipment. During the same time period, the overweight vehicles also became heavier: the number of superheavy permits issued to transporters weighing more than 500,000 pounds increased by 550 percent.

Figure 9



Source: Department of Transportation's Motor Carrier Division.

It should be noted that the Department does not provide assurance that the bridges on the permitted route will accommodate the overweight loads. Therefore, in addition to permit fees, transporters are financially liable for damages caused to bridges on the permit route. By supervising permitted loads during passage, or inspecting bridges before and after passage, the Department can identify damages and ensure the safety of the traveling public. The MCD also has an enforcement program that penalizes permit holders and non-permit holders for violating the size and weight restrictions of the Texas Transportation Code.

Bridge Rehabilitation and Replacement

According to the Department of Transportation's (Department) 2007 Statewide Preservation Program, the Department has processes in place to categorize and rank bridges in need of rehabilitation and replacement. Recommendations for these bridges are submitted to the Texas Transportation Commission for approval as part of the Department's 10-year plan.

Federal Highway Bridge Program

The Federal Highway Bridge Program provides funding for rehabilitation and replacement projects to assist the states in improving the condition of state-owned and non-state-owned bridges. Cost participation ratios for eligible projects are structured as an 80 percent federal funds–20 percent state funds ratio for state-owned bridges, and an 80 percent federal funds–10 percent state funds–10 percent local funds ratio for non-state-owned bridges. To meet Federal Highway Administration eligibility criteria, bridges must have a certain sufficiency rating and/or be classified as either structurally deficient or functionally obsolete.

Texas Eligible Bridge Selection System

The Department indicated that it uses a scoring system to prioritize the rehabilitation and replacement of eligible bridges statewide. Based on the bridges' overall condition, the Texas Eligible Bridge Selection System (TEBSS) places bridges into six project prioritization categories, which are listed in Table 10. Structurally deficient and functionally obsolete bridges with the lowest sufficiency ratings are considered the highest priority.

Table 10

Project Prioritization Categories	
Priority	Category
1	Critically deficient, structurally deficient landlocking bridges.
2	Non-landlocking, critically deficient, structurally deficient bridges.
3	Structurally deficient, landlocking bridges.
4	Non-landlocking, structurally deficient bridges.
5	Functionally obsolete, landlocking bridges.
6	Non-landlocking, functionally obsolete bridges.

Sources: The Department's *Report on Texas Bridges*, September 2008; and the Department's 2007 Statewide Preservation Program.

Unified Transportation Program

After bridge rehabilitation and replacement projects have been ranked and prioritized, the Department makes project selection recommendations to the

Texas Transportation Commission (Commission). The Commission approves state funding for rehabilitation and replacement projects through the Department's Unified Transportation Program (Program), which is a 10-year plan that guides transportation project development and construction. The Program consists of 12 budget strategies that are distributed among the Statewide Mobility Fund and the Statewide Preservation Program. After the Commission approves a list of projects, bridges are rehabilitated and replaced based on their priority rankings until available funding is exhausted. Table 11 lists the number of state-owned and non-state-owned bridges that the Department indicated were replaced or rehabilitated through the Federal Highway Bridge Program and through non-Federal Highway Bridge Program funding during fiscal year 2008.

Table 11

Texas Bridges Replaced or Rehabilitated in Fiscal Year 2008					
Condition	Federal Highway Bridge Program		Non-Federal Highway Bridge Program		Total projects completed
	State-Owned	Non-state-Owned	State-Owned	Non-state-Owned	
Structurally Deficient	62	87	4	0	153
Functionally Obsolete	74	12	14	0	100
Not Structurally Deficient or Functionally Obsolete	4	6	99	3	112
Totals	140	105	117	3	365

Source: *Report on Texas Bridges*, Department of Transportation, September 2008.

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