Texas Department of Transportation

TxTag

FY2022

CENTRAL TEXAS TURNPIKE SYSTEM

ANNUAL INSPECTION REPORT

SH 130 | SH 45SE | SH 45N | SL1

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May 2, 2022

Ms. Tracey Johnson
Director of Toll Operations
Texas Department of Transportation
125 East 11th Street
Austin, TX 78701

Subject: FY 2022 Inspection of the Central Texas Turnpike System

Dear Ms. Johnson,

As General Engineering Consultant to the Central Texas Turnpike System (CTTS) and in accordance with Section 707 of the Indenture of Trust, Atkins North America, Inc. is pleased to submit the FY 2022 Central Texas Turnpike System Annual Inspection Report.

The condition of the CTTS continues to be maintained in good repair, working order and condition, achieving an overall score of 83 (out of 100). This is a weighted rating that combines the four components of the CTTS: SL1, SH 45N, SH 130 (Segments 1 through 4), and SH 45SE. The results of this year's inspection are indicative of the age of the system and the proactive manner in which the system is maintained.

The Austin District and Toll Operations Division have comprehensive maintenance contracts in place and are funded for routine maintenance sufficient to address deficiencies that were identified this year. There is reserve maintenance funding in place to make any necessary periodic repairs and improvements that may be required.

This report contains a comprehensive summary of inspection results in tabular form. The Introduction, Inspection Results, and Recommendations are included in the body of the report.

If you have any questions, please feel free to call.

Sincerely,

Tammy B. Sims, P.E.
Project Director

Cc: Marcy Saenz, PE
LaTasha Brookins, P.E.
Omar DeLeon, P.E.
Brenda Guerra, P.E.
Greg Blake, P.E.

CENTRAL TEXAS TURNPIKE SYSTEM

ANNUAL INSPECTION REPORT FOR THE FISCAL YEAR ENDING AUGUST 31, 2022

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Acronyms and Abbreviations

AET	All-Electronic Tolling
AVI	Automatic Vehicle Identification
BRINSAP	Bridge Inventory, Inspection and Appraisal Program
CFR	Code of Federal Regulations
CIP	Cast-In-Place
CSC	Customer Service Center
CTTS	Central Texas Turnpike System
DVAS	Digital Video Audit System
FHWA	Federal Highway Administration
FM	Farm-to-Market Road
FY	Fiscal Year
GEC	General Engineering Consultant
GIS	Geographic Information System
HMLT	High-Mast Light Tower
HVAC	Heating, Ventilation, and Air Conditioning
IH	Interstate Highway
IVIS	Intelligent Vehicle Identification System
MSE	Mechanically Stabilized Earth
NBIS	National Bridge Inspection Standards
OSB	Overhead Sign Bridge
PBMC	Performance-Based Maintenance Contract
PMIS	Pavement Management Information System
SH	State Highway
SL	State Loop
TMS	Toll Management System
TOD	Toll Operations Division
TRM	Texas Reference Marker
TTC	Texas Transportation Commission
TxCAP	Texas Condition Assessment Program
TxDOT	Texas Department of Transportation
TxMAP	Texas Maintenance Assessment Program
TxTAP	Texas Traffic Assessment Program
UPS	Uninterruptible Power Supply
US	United States Highway

Executive Summary

As General Engineering Consultant (GEC) to the Central Texas Turnpike System (CTTS), and in accordance with Section 707 of the Indenture of Trust (dated July 15, 2002), Atkins North America, Inc. (Atkins) is pleased to submit the CTTS Annual Inspection Report for the fiscal year ending August 31, 2022. The findings contained in this report are based on the assessment of inspection data compiled for roadways, building facilities, toll elements and structures within the system in coordination with the Texas Department of Transportation (TxDOT) Toll Operations Division (TOD), Austin District Maintenance Office, and Project Finance, Debt, and Strategic Contracts Division; and Atkins' general knowledge of the condition of the CTTS.

This is the fifteenth annual inspection of the CTTS since it opened to traffic. The CTTS comprises State Loop 1 (SL 1) from State Highway 45N (SH 45N) to Farm-to-Market Road 734 (FM 734); SH 130 Segments 1 through 4, SH 45N; and SH 45SE for a total of 72.8 centerline miles. The annual inspection covers Pavement, Traffic Operations and Appurtenances, Roadside, Building Facilities, Toll Elements and Structures (bridges, overhead sign bridges, high-mast light towers, traffic signals) along tolled mainlanes, ramps, and frontage roads within the system. The CTTS became an All-Electronic Tolling (AET) roadway in January 2013, with the removal of the cash collection option.

Fiscal year 2022 (FY 2022) inspections show that the condition of the CTTS continues to be maintained in good repair, working order, and condition, achieving an overall rating of 83 (out of 100). The Pavement category, which makes up 55% of the overall score, achieved an overall rating of 84.1, a decrease from last year's rating of 85.4. This decrease was primarily due to pavement cracking observed on SH 130 and SL 1, as well as increased edge drop-offs on SH 130 and SH 45SE. The Traffic Operations & Safety Appurtenances category, which makes up 25% of the overall score, decreased from 81.6 to 75.4, primarily due to striping and signs that have reached the end of their service life on SH 130, SH 45SE, and SH 45N. In addition, delineation on SH 130 and 45N received a lower score this year due to missing delineation and dirty reflective material, which results in decreased visibility. The category making up the remaining 20%, Roadside, decreased from 91.9 to 90 primarily due to litter and debris observed on SL 1 and SH 45SE. It is anticipated that a majority of the deficiencies identified will be addressed within the upcoming fiscal year through one of the following: existing Performance-Based Routine Mainte-

nance Contract (PBMC); ongoing projects let in FY 2021 and FY 2022, including a large sign replacement project on SH 45N, SL 1, SH 130, and SH 45 SE; restriping on SL 1, SH 45N, and SH 45SE; and overlays on SH 130 Segment 4 and SL 1 frontage roads.

A visual inspection of 57 building facilities was conducted, which included architectural elements, mechanical components, electrical components, and toll booth structures. This year's findings revealed that 94.8% of the elements were rated Good to Excellent, indicating that a majority of inspected elements do not need immediate maintenance or repairs. This year's findings are an increase of 1.9% from last year's 92.9% of elements rated Good to Excellent. Deficiencies noted include non-illuminated area lighting, damaged curb and concrete pavement, and damaged attenuators at the toll booths.

The Toll Management System (TMS) is visually inspected during monthly lane audits and any cosmetic or performance related deficiencies identified are submitted to the Toll System Integrator for resolution and/or repair. To supplement the monthly lane audit, Atkins performed a visual inspection of toll elements, which included in-lane and roadside tolling equipment and appurtenances not covered under the facilities category. Items included in the toll elements inspection are Automatic Vehicle Identification (AVI) readers, antennas, violation enforcement cameras, Digital Video Audit System (DVAS) cameras, lane server equipment, host server equipment, and the Intelligent Vehicle Identification System (IVIS) through pavement loop sensors. This year's findings show that 100% of the elements inspected were rated Good to Excellent.

All bridges and bridge-class culverts within the CTTS are inspected biennially as part of TxDOT's Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) to implement the National Bridge Inspection Standards (NBIS). These standards are issued by the Federal Highway Administration (FHWA) and are discussed in detail in the *Code of Federal Regulations* (CFR), 23 CFR 650C. Results from the latest inspection (FY 2022) indicate that 84.1% of the inspected components were rated Good to Excellent.

Inspections of 37.46 miles of retaining walls within the CTTS were conducted this year. Findings for this year's inspections indicate that 83% of wall elements inspected were rated Good to Excellent.

Inspections for Overhead Sign Bridges (OSBs), High-Mast Light Towers (HMLT), and Traffic Signals occur biennially, with half of the roadway inspections in one year, and the other half conducted in the alternate year. This year, SL 1 and SH 130 were inspected, and the findings based on FHWA's rating system indicate that 99.5% of the OSB components inspected, 99.4% of the HMLT components inspected and 98.6% of the traffic signals inspected were rated Satisfactory to Good.

TxDOT Austin District's mechanism for routine maintenance of CTTS roadways is through a comprehensive PBMC, which requires the contractor to maintain the roadway at a specific level

of service and quality. Atkins has reviewed the contract and determined that all established performance measures are consistent with industry standards and TxDOT maintenance policies required to preserve the quality of the CTTS.

The FY 2022 CTTS annual operating, maintenance, and capital budgets approved by the TTC in August 2021, via Minute Order 116090, included maintenance budgets of approximately $7.3M for routine roadway maintenance; $4.9M for toll system routine maintenance; and $39.9M for non-routine major maintenance of roadways and building facilities. The FY 2022 approved non-routine major maintenance budget consists of frontage road overlay work on SH 130 Segments 2 and 3, slab injection at SH 45SE, drainage improvements on SH 130 at Von Quintus, and a continuation of the large sign replacement across the system. The building facilities non-routine maintenance budget includes SH 130 electrical ground repair, uninterruptible power supply (UPS) building replacement, toll booth glass replacement, generator turbo replacement, chiller coil replacement, and stucco repair.

In January 2017 the TTC approved using the CTTS capital contribution account to fund expansion projects for SH 130 Segments 2 and 3 (from SH 45N to SH 71) via Minute Order 114813; Minute Order 116090 (approved on August 31, 2021) allocates $13.1M for this project in FY 2022. In June 2017, the TTC also approved using available CTTS revenues for an east-south direct connector from U.S. Highway 290 (US 290) to SH 130 via Minute Order 114958; Minute Order 116090 (approved on August 31, 2021) allocates $7.4M for this project in FY 2022.

Based on the condition of the system, TxDOT demonstrates a commitment to system preservation and improvement. By continually monitoring system conditions and ensuring that its system is maintained in good repair, working order, and condition, TxDOT is able to provide a safe and convenient system for its patrons while maintaining a stable investment for bond holders.

SECTION 1
INTRODUCTION

SH 130 SH 45SE SH 45N SL1

1.0 INTRODUCTION

1.1. GENERAL DESCRIPTION AND PROCEDURE OF INSPECTION

The CTTS annual inspection is based on six major categories of the system: Roadways, Retaining Walls, Bridges, Building Facilities, Toll Elements, and Structures. For roadway inspections, elements fall within three general categories: Pavement, Traffic Operations & Safety Appurtenances, and Roadside. The Pavement category includes assessment of rutting, cracking, failures, ride rating, and edges. The Traffic Operations & Safety Appurtenances category consists of assessing large and small signs, raised pavement markers, striping and graphics, attenuators, delineators, and object markers. The Roadside category entails inspection of vegetation management, litter, sweeping, trees and brush, drainage, encroachments, safety barriers, and guardrail end treatments.

For Building Facilities inspections, three general building types are assessed: the Customer Service Center (CSC) building, Toll Plaza Administration Buildings (mainlane plazas), and Toll Plaza buildings (ramp plazas). The major elements in each of the three building types are subdivided into four categories: Architectural, Electrical, Mechanical, and Toll Booths. In addition to the buildings, canopy structures are inspected at each mainlane and roadway ramp plaza.

The Toll Element Inspection consists of an annual visual inspection of the in-lane and roadside tolling equipment and appurtenances, including AVI readers, antennas, violation enforcement cameras, DVAS cameras, lane server equipment, host server equipment, and pavement loop sensors (IVIS).

The inspection of certain structures is conducted on a biennial cycle. Bridges within the CTTS were inspected in FY 2022 as part of the TxDOT Federal Bridge Inspection Program. The next inspection is scheduled for FY 2024. The inspection of OSBs, HMLTs, and traffic signals is also conducted every other year but is staggered such that approximately one-half of the structures are inspected each year. This year's structures inspection included OSBs, HMLTs, and traffic signals on SL 1 and SH 130.

An inspection of retaining walls on the system was conducted this year, which included a visual condition assessment of panels, coping, foundations, joints, wall alignment, slopes, backfill, and drainage.

An inventory of large guide signs was conducted, and a condition assessment is included in the traffic operations score within the roadway inspection results. In addition, a nighttime illumination inspection was conducted.

The assessment of roadways within the CTTS was combined utilizing percentage breakdowns from the former Texas Condition Assessment Program (TxCAP) scoring system, which combined data from three inspection sources: the Texas Maintenance Assessment Program (TxMAP), the Pavement Management Information System (PMIS), and the Texas Traffic Assessment Program (TxTAP), thus providing simplified and concise scoring for each roadway category, component, corridor, and overall system score.

Atkins performs visual condition assessments based on criteria aligning with a 5-point rating scale for the components described in subsection 2.2, Roadways. The results of the inspections are scored and weighted in accordance with the former TxCAP system, allowing for continued comparison of the CTTS roadway conditions with past performance as the system ages. The ratings assigned to the CTTS can be used to make general recommendations on system components needing improvement. A summary of the rating system is described in more detail and the scores are included in Section 2, subsection 2.2.

Inspections are conducted in accordance with standard procedures developed by the FHWA and TxDOT and involve an extensive visual examination of all elements relative to the category of inspection. Inspection data is collected and organized in real-time by means of computer tablets pre-loaded with a Geographic Information System (GIS)-based collection application for visualization and analysis. The GIS base maps and output data are checked to verify accuracy and consistency.

Due to the time interval between inspection activities and the publication of this report, some identified deficiencies may have already been addressed through ongoing maintenance or construction activities. These improvements are typically funded through an approved budget and performed through existing routine maintenance contracts, or through separately let periodic maintenance or construction contracts.

1.2. DESCRIPTION OF THE CENTRAL TEXAS TURNPIKE SYSTEM

The CTTS comprises four main roadway corridors. The first corridor, SL 1 Extension, is approximately 4 miles in length and runs south from the SH 45N interchange to FM 734 (Parmer Lane). SH 45N, the second of CTTS's four corridors, begins west of US 183 at Ridgeline Boulevard and extends east approximately 12.8 miles to the SH 130 interchange north of Pflugerville, Texas. The third corridor, SH 130 (Segments 1 through 4) begins north of Georgetown, Texas, at Interstate Highway 35 (IH 35) and extends 49 miles south to US 183 in southeast Travis County. The fourth corridor, SH 45SE, is approximately 7 miles in length and runs west from US 183 to the IH 35 interchange in south Travis County. All four CTTS corridors are multi-lane, access-controlled toll roads. The four corridors combined provide 72.8 centerline miles to the state highway system and include 242 bridges and major culverts, and 57 buildings. The system's main roadway corridors are summarized in Table 1 and illustrated on Figure 1.

Table 1. Central Texas Turnpike System Corridors

Roadway	Centerline Mile Lengths (miles)	Open to Traffic Date
SL 1 (from SH 45N to FM 734)	4.0	October 2006
SH 45N	12.8	October 2006 (Seg. 3– 6); April 2007 (Seg. 7–8)
SH 130 (Segments 1 through 4)	49.0	December 2006 (Seg. 1); October 2006 (Seg 2); September 2007 (Seg. 3); April 2008 (Seg. 4)
SH 45SE	7.0	May 2009
Total	**72.8**	

An additional 41 miles of SH 130 Segments 5 and 6 connect the CTTS portion of SH 130 to IH 10 northeast of Seguin, Texas. Since Segments 5 and 6 are operated and maintained by others, they are outside the CTTS and are not included in the annual inspections.

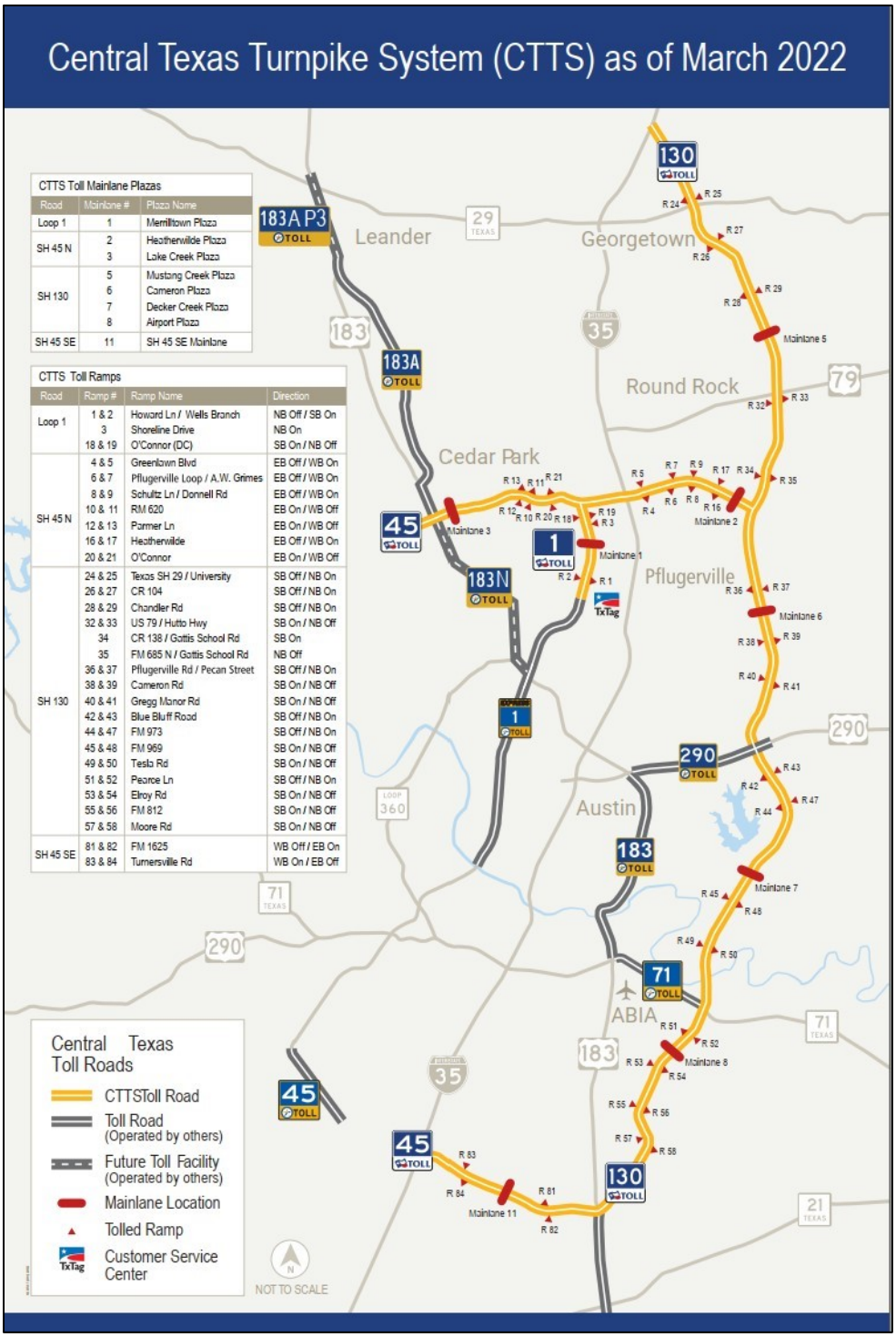

Figure 1. Central Texas Turnpike System (CTTS)

SECTION 2
FY2022 MAINTENANCE INSPECTION RESULTS

SH 130 | SH 45SE | SH 45N | SL1

2.0 FISCAL YEAR 2022 MAINTENANCE INSPECTION RESULTS

2.1. INTRODUCTION

The findings of the FY 2022 Annual Inspection of the CTTS are based on an extensive visual inspection and evaluation of its roadways, bridges, retaining walls, building facilities, toll elements, and structures, and are outlined below. The ratings assigned to the various roadway elements are presented along with a general description of the condition of the roadways, bridges, retaining walls, buildings, toll elements, and structures at the time of inspection.

The CTTS inspection does not consider the criticality of the elements in relation to each other. When reviewing deficiencies, a number of considerations influence the desired level of service. These include safety, protection of private and public investment, comfort, economics, environmental impact, aesthetics, and funding constraints. A pavement failure, for example, would receive priority over a comparably rated deficiency in litter removal because it may have an immediate impact on overall system safety.

2.2. ROADWAYS

The roadway inspection is divided into three general categories of roadway components: Pavement, Traffic Operations & Safety Appurtenances, and Roadside. A sketch identifying the major elements of a typical roadway is included as Figure 2.

Atkins utilized a roadway rating procedure based on the original 25 roadway elements outlined in the former TxCAP system, allowing for continual comparison of the CTTS roadway conditions with past performance as the system ages. Visual condition assessments are based on criteria aligning with a 5-point rating scale as shown in Table 2. Each rated component is converted to a percentage by multiplying each score by 20, and the resulting score weighted by applying the former TxCAP values outlined in Table 3 to determine the overall score for each category. Each category's overall score is then weighted to obtain a total composite score for the entire roadway system.

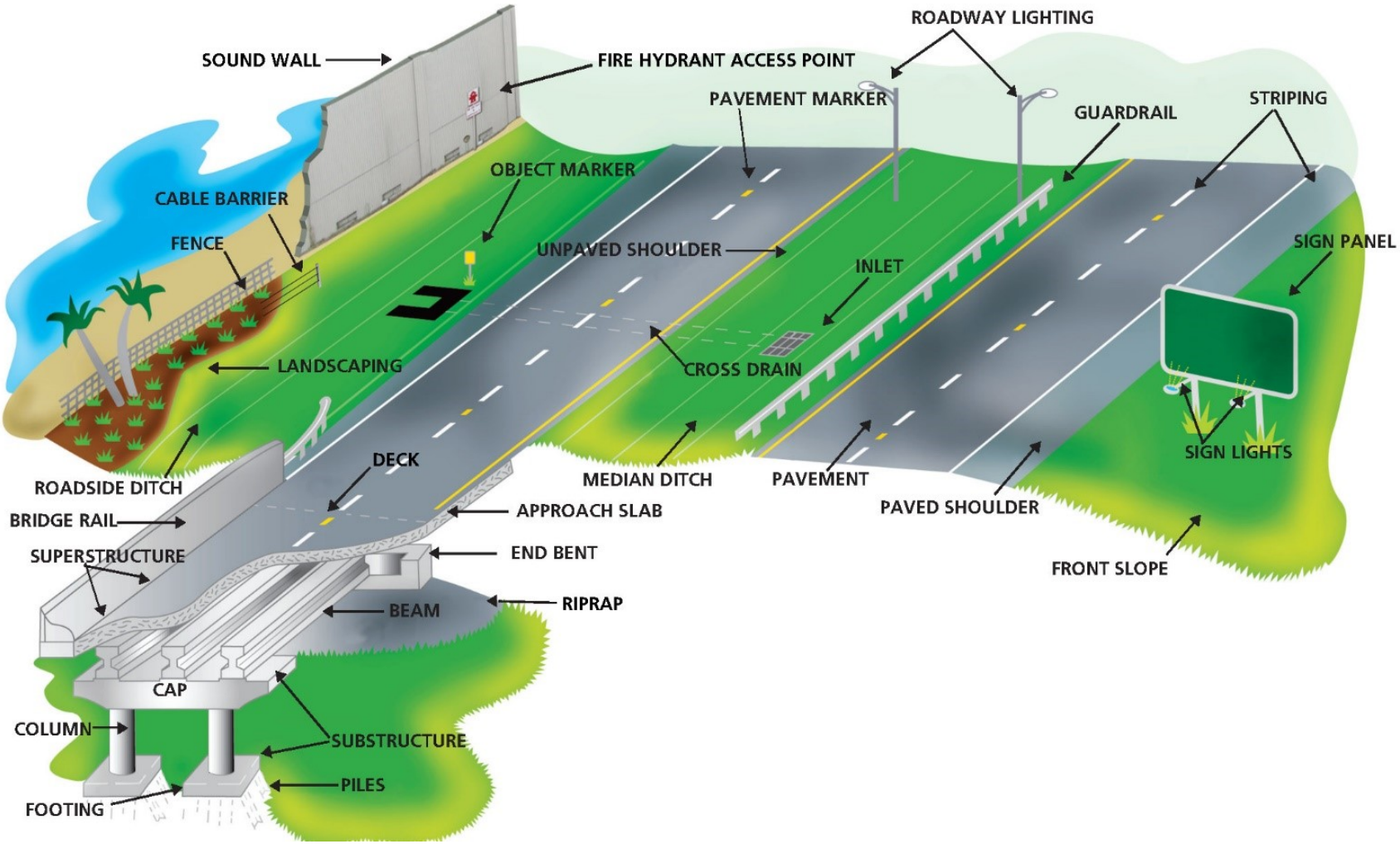

Figure 2. Major System Elements

Table 2. CTTS Roadway Inspection Rating Scale

Grade	Rating	Description
5	Excellent	Feature is in above average condition. No deficiencies noted. No maintenance necessary.
4	Good	Feature appearance and functionality/operability are adequate. No immediate maintenance or repairs necessary.
3	Degraded	Feature appearance or functionality/operability are below average. Maintenance is required but does not require expedited repair to protect the system.
2	Unsatisfactory	Feature appearance or functionality/operability are substandard. Maintenance is required, as soon as practical*, but does not require expedited repair to protect the system.
1	Failing	Feature appearance or functionality/operability are unacceptable. Feature has failed and may require expedited repair to protect the public or system.**

*Timeframe for which repair work would be prioritized and scheduled (under normal circumstances).

**The need for expedited repair to be determined based on response time set forth in TxDOT maintenance protocols for a specific deficiency.

Inspection data is collected and organized in real-time by means of computer tablets pre-loaded with a GIS-based collection application for visualization and analysis. The GIS base maps and output data are spot-checked for accuracy and consistency. Inspection results are organized by facility name, roadway/ramp segment, lane direction, and Texas Reference Marker (TRM), as applicable.

All of the major elements within each category and corresponding scores are shown in Tables 4 through 7 for each roadway in the system. A rating of three (3) or below indicates that the element is degraded and reported as deficient. Inspection scores for all roadways within the CTTS are summarized in Table 8. The inspection results shown include major categories of the following roadway types: mainlane roadways, frontage roads, ramps, and interchanges.

The results of this year's annual inspection indicate that the CTTS roadway elements are maintained in good repair, working order, and condition with an overall roadway score of 83. Figure 3 illustrates how the overall roadway score has historically trended since the initial inspection in 2008.

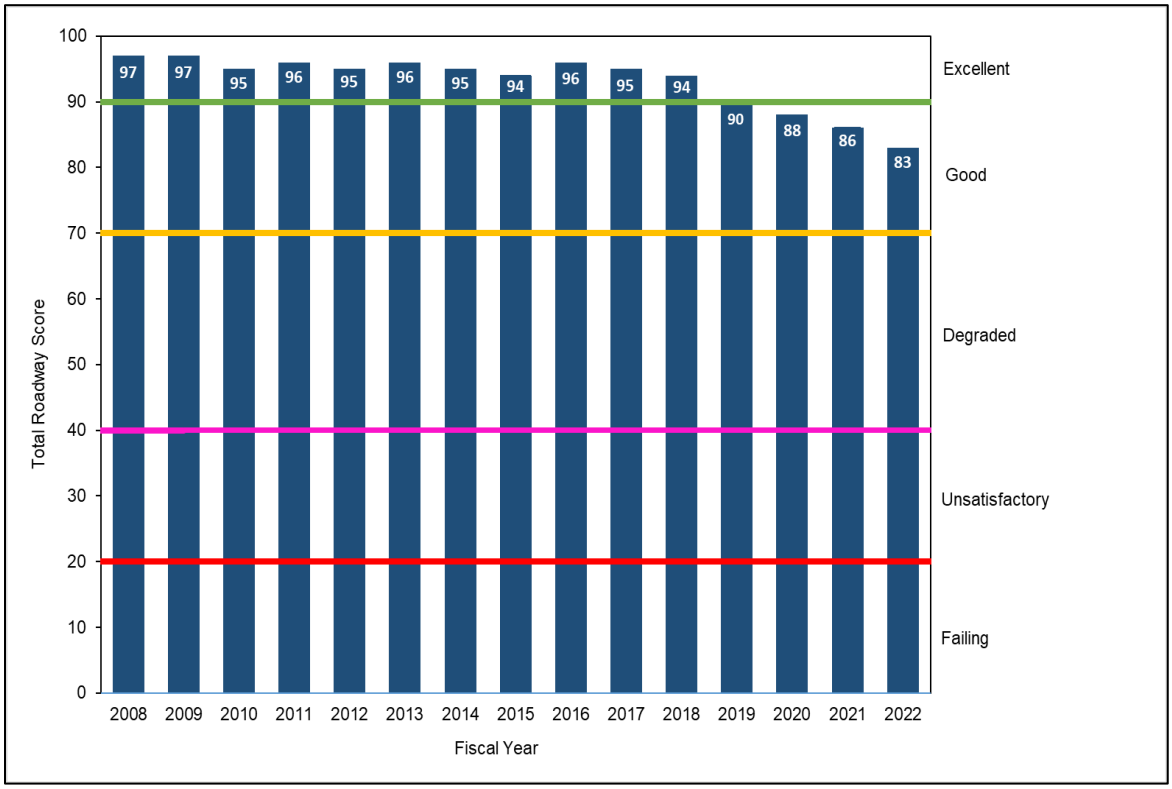

Figure 3. CTTS Historical Roadway Scores – All Roadways

Table 3. TxCAP Roadway Weighted Scoring Values

	Original Percentage	Adjusted Percentage
Pavement Score		
Rutting	18.18	21.28
Cracking	18.18	21.28
Failures	21.82	25.53
Ride	12.73	14.89
Edges	14.55	17.02
Traffic Operations & Safety Appurtenances Score		
Raised Pavement Markers	16.00	17.39
Striping, Pavement Graphics	20.00	21.74
Attenuators	12.00	13.04
Delineators	12.00	13.04
Signs – Small	16.00	17.39
Signs – Large	16.00	17.39
Roadside Score		
Vegetation Management	15.00	16.67
Litter & Debris	10.00	11.11
Sweeping	10.00	11.11
Trees & Brush	10.00	11.11
Drainage	15.00	16.67
Encroachments	5.00	5.56
Safety Barriers	15.00	16.67
Guardrail End Treatments	10.00	11.11
Overall Score		
Pavement	**55.00**	
Traffic Operations & Safety Appurtenances	**25.00**	
Roadside	**20.00**	
Total	**100.00**	

Table 4. Condition of CTTS Roadway Components – SL 1

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	95.9	21.3%	20.4
	Cracking	60.0	21.3%	12.8
	Failures	95.0	25.5%	24.2
	Ride	83.2	14.9%	12.4
	Edges	87.7	17.0%	14.9
	Shoulders	0.0	0.0%	0.0
SL 1 - Pavement Score				**84.7**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	86.4	17.4%	15.0
	Striping, Pavement Graphics	83.2	21.7%	18.1
	Attenuators	92.5	13.0%	10.7
	Delineators	79.4	13.0%	10.3
	Signs – Large	78.0	17.4%	13.6
	Signs – Small	74.4	17.4%	12.9
	Shoulder Texturing	0.0	0.0%	0.0
SL 1 - Traffic Operations & Safety Appurtenance Score				**80.6**
Roadside Score	Vegetation Management	88.7	16.7%	14.8
	Litter & Debris	76.9	11.1%	8.5
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	88.8	11.1%	9.9
	Drainage	82.1	16.7%	13.7
	Encroachments	100.0	5.7%	5.6
	Safety Barriers	87.2	16.7%	14.6
	Guardrail End Treatments	85.0	11.1%	9.4
	Mail Boxes	0.0	0.0%	0.0
SL 1 - Roadside Score				**87.6**
Category Score	Pavement	84.7	55.0%	46.6
	Traffic Operations & Safety Appurtenances	80.6	25.0%	20.2
	Roadside	87.6	20.0%	17.5
SL 1 - Roadway Subscore				**84.3**
SL 1 - Total Roadway Score (2)				**84**

(1) Numbers are rounded to three (3) significant digits.

(2) Value is rounded to the nearest whole number.

Table 5. Condition of CTTS Roadway Components – SH 45N

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	91.5	21.3%	19.5
	Cracking	77.0	21.3%	16.4
	Failures	89.9	25.5%	22.9
	Ride	91.9	14.9%	13.7
	Edges	97.3	17.0%	16.5
	Shoulders	0.0	0.0%	0.0
SH 45N - Pavement Score				**89.6**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	79.0	17.4%	13.7
	Striping, Pavement Graphics	76.9	21.7%	16.7
	Attenuators	89.2	13.0%	11.6
	Delineators	69.8	13.0%	9.1
	Signs – Large	76.1	17.4%	13.2
	Signs – Small	71.3	17.4%	12.4
	Shoulder Texturing	0.0	0.0%	0.0
SH 45N - Traffic Operations & Safety Appurtenance Score				**76.7**
Roadside Score	Vegetation Management	94.4	16.7%	15.8
	Litter & Debris	80.5	11.1%	8.9
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	80.0	11.1%	8.9
	Drainage	87.2	16.7%	14.6
	Encroachments	98.5	5.7%	5.5
	Safety Barriers	94.0	16.7%	15.7
	Guardrail End Treatments	90.9	11.1%	10.1
	Mail Boxes	0.0	0.0%	0.0
SH 45N - Roadside Score				**90.6**
Category Score	Pavement	89.0	55.0%	49.0
	Traffic Operations & Safety Appurtenances	76.7	25.0%	19.2
	Roadside	90.6	20.0%	18.1
SH 45N - Roadway Subscore				**86.3**
SH 45N - Total Roadway Score (2)				**86**

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number

Table 6. Condition of CTTS Roadway Components – SH 130 (Segments 1 through 4)

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	95.6	21.3%	20.4
	Cracking	67.7	21.3%	14.4
	Failures	82.9	25.5%	21.1
	Ride	85.1	14.9%	12.7
	Edges	75.5	17.0%	12.8
	Shoulders	0.0	0.0%	0.0
SH 130 - Pavement Score				**81.4**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	78.7	17.4%	13.7
	Striping, Pavement Graphics	69.3	21.7%	15.0
	Attenuators	92.8	13.0%	12.1
	Delineators	67.3	13.0%	8.7
	Signs – Large	73.7	17.4%	12.8
	Signs – Small	68.1	17.4%	11.8
	Shoulder Texturing	0.0	0.0%	0.0
SH 130 - Traffic Operations & Safety Appurtenance Score				**74.1**
Roadside Score	Vegetation Management	86.3	16.7%	14.4
	Litter & Debris	81.0	11.1%	9.0
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	86.3	11.1%	9.6
	Drainage	90.4	16.7%	15.1
	Encroachments	98.8	5.7%	5.5
	Safety Barriers	87.5	16.7%	14.6
	Guardrail End Treatments	97.1	11.1%	10.8
	Mail Boxes	0.0	0.0%	0.0
SH 130 - Roadside Score				**90.1**
Category Score	Pavement	81.4	55.0%	44.8
	Traffic Operations & Safety Appurtenances	74.1	25.0%	18.5
	Roadside	90.1	20.0%	18.0
SH 130 - Roadway Subscore				**81.3**
SH 130 - Total Roadway Score (2)				**81**

(1) Numbers are rounded to three (3) significant digits.

(2) Value is rounded to the nearest whole number.

Table 7. Condition of CTTS Roadway Components – SH 45SE

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	98.3	21.3%	20.9
	Cracking	80.0	21.3%	17.0
	Failures	97.3	25.5%	24.8
	Ride	92.4	14.9%	13.8
	Edges	74.1	17.0%	12.6
	Shoulders	0.0	0.0%	0.0
SH 45SE - Pavement Score				**89.1**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	75.1	17.4%	13.1
	Striping, Pavement Graphics	61.4	21.7%	13.3
	Attenuators	100.0	13.0%	13.0
	Delineators	74.5	13.0%	9.7
	Signs – Large	74.0	17.4%	12.9
	Signs – Small	68.9	17.4%	12.0
	Shoulder Texturing	0.0	0.0%	0.0
SH 45SE - Traffic Operations & Safety Appurtenances Score				**74.0**
Roadside Score	Vegetation Management	80.2	16.7%	13.4
	Litter & Debris	74.1	11.1%	8.2
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	87.8	11.1%	9.7
	Drainage	89.4	16.7%	14.9
	Encroachments	100.0	5.7%	5.6
	Safety Barriers	94.2	16.7%	15.7
	Guardrail End Treatments	97.5	11.1%	10.8
	Mail Boxes	0.0	0.0%	0.0
SH 45SE - Roadside Score				**89.4**
Category Score	Pavement	89.1	55.0%	49.0
	Traffic Operations & Safety Appurtenances	74.0	25.0%	18.5
	Roadside	89.4	20.0%	17.9
SH 45SE - Roadway Subscore				**85.4**
SH 45SE - Total Roadway Score (2)				**85**

(1) Numbers are rounded to three (3) significant digits.

(2) Value is rounded to the nearest whole number.

Table 8. Condition of CTTS Roadway Components – All Roadways

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	94.6	21.3%	20.1
	Cracking	70.3	21.3%	15.0
	Failures	86.7	25.5%	22.1
	Ride	87.3	14.9%	13.0
	Edges	82.0	17.0%	13.9
	Shoulders	0.0	0.0%	0.0
All Roadways - Pavement Score				**84.1**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	79.2	17.4%	13.8
	Striping, Pavement Graphics	72.3	21.7%	15.7
	Attenuators	91.2	13.0%	11.9
	Delineators	69.5	13.0%	9.0
	Signs – Large	74.4	17.4%	12.9
	Signs – Small	69.6	17.4%	12.1
	Shoulder Texturing	0.0	0.0%	0.0
All Roadways - Traffic Operations & Safety Appurtenances Score				**75.4**
Roadside Score	Vegetation Management	88.0	16.7%	14.7
	Litter & Debris	80.1	11.1%	8.9
	Sweeping	100	11.1%	11.1
	Trees & Brush	85.6	11.1%	9.5
	Drainage	88.8	16.7%	14.8
	Encroachments	98.9	5.7%	5.5
	Safety Barriers	90.0	16.7%	15.0
	Guardrail End Treatments	94.9	11.1%	10.5
	Mail Boxes	0.0	0.0%	0.0
All Roadways - Roadside Score				**90.0**
Category Score	Pavement	84.1	55.0%	46.3
	Traffic Operations & Safety Appurtenances	75.4	25.0%	18.9
	Roadside	90.0	20.0%	18.0
All Roadways - Roadway Subscore				**83.2**
All Roadways - Total Roadway Score (2)				**83**

(1) Numbers are rounded to three (3) significant digits.

(2) Value is rounded to the nearest whole number.

2.2.1. Pavement

The Pavement category includes rutting, cracking, pavement failures, ride rating, and edges. Figure 4 illustrates a typical roadway pavement section within the system. Pavement throughout the CTTS achieved an overall score of 84.1, which is a decrease from last year's score of 85.4, primarily due to pavement cracking observed on SH 130 and SL 1, as well as increased edge drop-offs on SH 130 and SH 45SE. Because of the extensive presence of sulfates in the area of SH 130 and SH 45SE, the soils have a tendency to expand and contract. In addition, portions of SL 1 fall within the mapped outcropping of the Del Rio Clay geologic formation, which is known for its expansive characteristics with changes in moisture content. Over the past few years, there has been significant seasonal rainfall, which could cause movement in the soil subgrade and the pavement structure, leading to increased surface defects.

Figure 4. Typical Roadway Pavement Section

The current roadway PBMC requires the maintenance contractor to address all pavement deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. TxDOT let four maintenance contracts in FY 2021 to address some of the non-routine pavement deficiencies: 1) SH 45N frontage overlay from SH 130 to IH 35; 2) LP 1 frontage overlay from Parmer Lane to SH 45N; 3) SH 45N frontage overlay from Pecan Park Boulevard to IH 35; and 4) SH 130 frontage overlay from Hogeye Road to FM 969. In addition, the SH 130 Segments 2 and 3 expansion projects were completed in the spring of 2022.

As noted in previous Annual Inspection Reports, geotechnical engineers on the GEC team continue to monitor pavement cracking on the northbound SL 1 entrance ramp just north of Shoreline Drive. This year's findings indicate conditions similar to those described in the FY 2021

observation report, which showed minor deformations, minor cracks, and separation at the pavement joints. Atkins recommends that the cracks in the pavement and top of the retaining wall area, such as the coping joints and the exit lane to gore pavement joint, continue to be inspected twice a year and that the degraded seal be repaired.

2.2.2. Traffic Operations & Safety Appurtenances

The Traffic Operations & Safety Appurtenances category ratings are based on the condition of all features that guide, protect, and assist the patron while traveling the CTTS roadways. Figure 5 shows an example of road signs scored in this category.

A Traffic Operations & Safety Appurtenance score rating of 75.4 was achieved across all roadways in the system, a decrease from 81.6 last year. The decrease in score was primarily due to striping and small signs on SH 130, SH 45N and SH 45SE. In addition, delineation on SH 130 and 45N received a lower score this year due to missing delineation and dirty reflective material, which results in decreased visibility.

Figure 5. Large Guide Sign on SH 130

In addition, a complete large guide sign inventory was performed, and both daytime and nighttime assessments were conducted. The findings for this year's inspection indicate that 52.9% of the large signs received a rating of 3 or below, with 15.2% receiving a 1 or 2 rating. The remainder of the signs received a 4 or 5 rating, which is considered Good to Excellent, respectively. The signs receiving ratings of 3 or below were rated down primarily because of degraded retro reflectivity due to age or dirt on the reflective surface.

The former TxCAP rating system did not include an evaluation of lighting systems, but consistent with previous years, a nighttime inspection of the CTTS luminaires was performed to determine whether the bulbs were illuminating. High-mast lights, safety lighting, and continuous lighting were examined as part of this inspection. During the FY 2022 inspection, it was found that 500 high-mast light bulbs out of a total of 1,392, 136 continuous light bulbs out of a total of 348, and 914

safety light bulbs out of a total of 2,020 received ratings that indicate that luminaire (light bulb) replacement is needed.

The current roadway PBMC requires the maintenance contractor to address all Traffic Operations & Safety Appurtenances deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. In addition, with the large guide signs approaching the end of their typical service life, TxDOT let a system-wide large sign replacement project that is currently in process, which will address many of the sign deficiencies identified during this year's inspections.

2.2.3. Roadside

The determination of the Roadside score for roadside features is generally based on the consideration of vegetation management, litter removal, drainage structures, and other elements located outside the paved travel way (Figure 6). The Roadside category achieved an overall score of 90.0, a decrease from 91.9 last year, primarily due to litter and debris observed on SL 1 and SH 45SE.

The current roadway PBMC requires the maintenance contractor to address roadside deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope.

Figure 6. Roadside Conditions

2.3. BUILDING FACILITIES

The building facilities inspection is based on three general building types: the CSC Building, Toll Plaza Administration Buildings (mainlane plazas), and Toll Plaza Buildings (ramp plazas). The CTTS building quantities are detailed in Table 9. In addition to the three building types, canopy

structures are present at all ramp plazas and the old mainlane cash lanes, with the exception of a few locations: SH 45N at O'Connor Drive, SH 45SE, and ramps south of Cameron Road on SH 130. The major characteristics of each building type are subdivided into four categories: architectural, electrical, mechanical, and toll booth components. Currently 57 buildings exist and were in service during the FY 2022 inspection. As part of the inspection process, all relevant structural components and associated mechanical and electrical systems for all building facilities were visually inspected.

The ratings are assigned based on the observed conditions and the descriptions of the numerical grading system are based on the same 5-point system utilized for the roadway system elements. Elements rated deficient are compared to the total number of elements inspected to determine a deficiency percentage for each element.

The inspection findings indicate that 94.8% of the elements were rated Good to Excellent along SL 1, SH 45N and SH 130. There are no facility elements on SH 45SE as it was constructed for all-electronic tolling only. The method of toll collection is accomplished through overhead gantry structures, instead of toll plaza buildings. As a result, overhead gantry structures on the system are covered under subsection 2.5.3 Overhead/Cantilever Sign Structures, below.

This year 6,861 facility asset items were inspected, of which 356 were rated as Unsatisfactory (rating of two or less) condition. The results are summarized in Tables 10 through 12, and a system-wide summary is shown in Table 13. Examples of deficiencies found include non-illuminated area lighting, damaged curb and concrete pavement, and damaged attenuators at the toll booths. Similar to the inspection results from the previous year, the deficiency rating for the CTTS building facilities is Good, with components currently meeting all performance requirements. The current PBMC building facilities maintenance contract requires the maintenance contractor to address all building facilities deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. Some elements such as bollards, attenuators, parking and driveway pavement, roadway gates, and non-sidewalk concrete pavement fall under the purview of the roadway PBMC. A listing of those roadway deficiencies has been forwarded to TxDOT's Austin District.

Table 9. Central Texas Turnpike System Building Quantities – FY 2022

Building Types	SL 1	SH 45N	SH 130	SH 45SE	Totals
Customer Service Center	1	0	0	0	1
Mainlane Plazas	1	2	8	0	11
Ramp Plazas	3	12	30	0	45
Totals	5	14	38	0	57

In 2015, as a result of numerous loop sensor failures on CTTS facilities and per TOD request, Atkins conducted a study to investigate the potential causes of the failures. These in-pavement loop sensors (Figure 7), which are part of the IVIS, detect and classify vehicles traveling through the toll zone. The study found that multiple issues could be attributed to the failures, including damage to the loop sensor wire, improper loop sensor installation, and pavement cracking in the vicinity of the sensors. While pavement cracks were found to be one of the potential causes, the study did not show a direct relationship between the presence of pavement cracks and loop sensor failures. Furthermore, a life-cycle cost analysis determined that it is more economical for TOD to continue to replace loop sensors that fail until the toll zone pavement requires complete replacement. TxDOT continuously monitors these locations and performs supplementary inspections and maintenance to ensure that the toll system's collection capabilities are not affected. From FY 2017 through FY 2021, loop sensors were replaced at 15 locations.

Figure 7. Toll System Pavement Showing IVIS

2.3.1. Customer Service Center

The TxTag CSC, as shown on Figure 8, provides customer service and account management support for TxDOT's toll projects throughout the state. TxTag is one example of a toll transponder, which patrons can use to pay tolls electronically by establishing a prepaid account. The CSC also provides system and accounting services for Pay By Mail customers who are billed monthly for their tolls.

The CSC became operational in July 2006 and operates 5 days a week, Monday through Friday. In 2013, the focus of toll collection moved from manual collection to AET, when the CTTS stopped collecting cash in the lanes. As a result, the CSC's role has become more important in the collection and accounting of toll revenue. The CSC contains TOD's system database, which houses information on daily transactions, the toll revenue due by toll collection type, the inter-operable revenue due from other agencies, and financial reporting information. The facility also houses staff, including general administration, quality assurance, accounting and reconciliation, human resources, and facility administration.

Figure 8. Customer Service Center

2.3.2. Mainlane and Ramp Plaza Building Facilities and Canopies

The toll plaza administration building facilities and canopies are located either as part of a mainlane toll plaza (Figure 9) or ramp toll plaza facility. The canopies typically extend from the administration buildings outward, over the toll booths or toll collection equipment located between the travel lanes. The administration buildings located at mainlane toll plazas are connected to the toll collection booths/equipment by means of an underground tunnel. This facilitates the transport of personnel, toll collection data, and supplies.

Figure 9. Mainlane Toll Plaza Canopy

2.3.3. Architectural

Architectural elements include walls, windows, doors, flooring, canopy, site ground, and parking areas. Of the 4,727 architectural elements inspected, 204 elements received a score lower than a four (4) rating.

2.3.4. Electrical

Electrical elements include building electrical features, wiring, UPS, traffic signals, roadside cabinets, and generators (Figure 10). Of the 1,069 total elements inspected in the electrical category, only 20 elements received a score lower than a four (4) rating.

2.3.5. Mechanical

Mechanical elements include plumbing fixtures, sewer/septic lines, and well and water lines. Of the 193 total elements rated in the mechanical category, only 8 related to plumbing and water well/water lines were rated lower than a four (4) rating.

Figure 10. Facility Generators

2.3.6. Toll Booths

As noted earlier, all toll booths have been closed and decommissioned as part of the AET conversion but were inspected during the FY 2022 inspection efforts since these are still assets within the CTTS. Exceptions include assets considered inactive, such as toll booth heating, ventilation, and air conditioning (HVAC), which were not inspected. Of the 869 total elements inspected in the toll booth category, 123 received a score lower than four (4) rating.

Table 10. Condition of CTTS Building Facilities – SL 1

Category	Element	Number Inspected	Number Rated Less Than 4	Percent Deficient
Architectural	Area lights	165	3	1.8%
	Bollards	25	6	24.0%
	Canopy	17	1	5.9%
	Elevators, Dumbwaiters	2	0	0.0%
	Exterior Doors	14	0	0.0%
	Exterior Walls	28	3	10.7%
	Exterior Windows	75	0	0.0%
	Finishes	136	0	0.0%
	Fire Extinguishers & Cabinets	191	2	1.0%
	Fuel Storage	1	0	0.0%
	Handrail	4	0	0.0%
	HVAC System- Arch	174	0	0.0%
	Interior Doors	139	2	1.4%
	Interior Flooring	140	1	0.7%
	Interior Walls and Ceilings	447	11	2.5%
	Irrigation System/Site Grounds	7	1	14.3%
	Lockers	0	0	0.0%
	Parking Area & Drive Pavement	42	7	16.7%
	Roof Drain	3	0	0.0%
	Systems (Comms/Alarms)	73	0	0.0%
	Interior Signs	30	0	0.0%
Electrical	Building Electrical Fixtures	193	4	2.1%
	Generators	8	0	0.0%
	Traffic Signal	15	0	0.0%
	Uninterrupted Power Supply	2	0	0.0%
	Wiring	43	0	0.0%
	Roadside Cabinet	3	1	33.3%
Mechanical	HVAC System- Mech	1	0	0.0%
	Plumbing Fixtures	29	2	6.9%
	Sewer/Septic Lines	1	0	0.0%
	Well/Water lines	23	0	0.0%
Toll Booths	Area lights-toll	4	0	0.0%
	Attenuator	19	0	0.0%
	Booth Pit	2	0	0.0%
	Concrete Pavement	20	3	15.0%
	Counter/Drawer	18	0	0.0%
	Gates	3	2	66.7%
	Interior Booth	14	0	0.0%
	Nose Flashers	20	0	0.0%
	Signs	7	0	0.0%
	Toll A/C	0	0	0.0%
	Toll Indicator	21	1	4.8%
	Window	13	1	7.7%
	Stairs	8	1	12.5%
Other	Miscellaneous	2	1	50.0%

Table 11. Condition of CTTS Building Facilities – SH 45N

Category	Element	Number Inspected	Number Rated Less Than 4	Percent Deficient
Architectural	Area lights	92	4	4.3%
	Bollards	49	20	40.8%
	Canopy	59	13	22.0%
	Elevators, Dumbwaiters	3	0	0.0%
	Exterior Doors	12	1	8.3%
	Exterior Walls	30	3	10.0%
	Exterior Windows	25	1	4.0%
	Finishes	46	0	0.0%
	Fire Extinguishers & Cabinets	77	1	1.3%
	Fuel Storage	4	0	0.0%
	Handrail	13	2	15.4%
	HVAC System- Arch	111	1	0.9%
	Interior Doors	70	0	0.0%
	Interior Flooring	64	1	1.6%
	Interior Walls and Ceilings	205	7	3.4%
	Irrigation System/Site Grounds	7	1	14.3%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	90	8	8.9%
	Roof Drain	7	2	28.6%
	Systems (Comms/Alarms)	32	0	0.0%
	Interior Signs	23	0	0.0%
Electrical	Building Electrical Fixtures	142	1	0.7%
	Generators	15	0	0.0%
	Traffic Signal	35	1	2.9%
	Uninterrupted Power Supply	5	0	0.0%
	Wiring	61	0	0.0%
	Roadside Cabinet	15	2	13.3%
Mechanical	HVAC System- Mech	0	0	0.0%
	Plumbing Fixtures	24	3	12.5%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water lines	21	0	0.0%
Toll Booths	Area lights-toll	2	0	0.0%
	Attenuator	39	4	10.3%
	Booth Pit	4	1	25.0%
	Concrete Pavement	47	2	4.3%
	Counter/Drawer	25	1	4.0%
	Gates	0	0	0.0%
	Interior Booth	12	1	8.3%
	Nose Flashers	36	0	0.0%
	Signs	21	0	0.0%
	Toll A/C	0	0	0.0%
	Toll Indicator	45	16	35.6%
	Window	13	5	38.5%
	Stairs	7	3	42.9%
Other	Miscellaneous	1	0	0.0%

Table 12. Condition of CTTS Building Facilities – SH 130 (Segments 1 through 4)

Category	Element	Number Inspected	Number Rated Less Than 4	Percent Deficient
Architectural	Area lights	168	1	0.6%
	Bollards	90	39	43.3%
	Canopy	153	14	9.2%
	Elevators, Dumbwaiters	0	0	0.0%
	Exterior Doors	21	0	0.0%
	Exterior Walls	56	2	3.6%
	Exterior Windows	51	0	0.0%
	Finishes	99	0	0.0%
	Fire Extinguishers & Cabinets	148	2	1.4%
	Fuel Storage	27	0	0.0%
	Handrail	13	0	0.0%
	HVAC System- Arch	206	0	0.0%
	Interior Doors	125	3	2.4%
	Interior Flooring	110	2	1.8%
	Interior Walls and Ceilings	376	4	1.1%
	Irrigation System/Site Grounds	32	4	12.5%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	204	31	15.2%
	Roof Drain	13	0	0.0%
	Systems (Comms/Alarms)	52	0	0.0%
	Interior Signs	47	0	0.0%
Electrical	Building Electrical Fixtures	253	4	1.6%
	Generators	27	0	0.0%
	Traffic Signal	74	2	2.7%
	Uninterrupted Power Supply	11	0	0.0%
	Wiring	135	0	0.0%
	Roadside Cabinet	32	5	15.6%
Mechanical	HVAC System- Mech	1	0	0.0%
	Plumbing Fixtures	54	2	3.7%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water lines	39	1	2.6%
Toll Booths	Area lights-toll	38	0	0.0%
	Attenuator	48	6	12.5%
	Booth Pit	12	0	0.0%
	Concrete Pavement	128	21	16.4%
	Counter/Drawer	34	0	0.0%
	Gates	2	1	50.0%
	Interior Booth	20	0	0.0%
	Nose Flashers	50	1	2.0%
	Signs	47	0	0.0%
	Toll A/C	3	0	0.0%
	Toll Indicator	67	52	77.6%
	Window	20	1	5.0%
	Stairs	0	0	0.0%
Other	Miscellaneous	0	0	0.0%

Table 13. Condition of Building Facilities – CTTS (All Roadways)

Category	Element	Number Inspected	Number Rated Less Than 4	Percent Deficient
Architectural	Area lights	425	8	1.9%
	Bollards	164	65	39.6%
	Canopy	229	28	12.2%
	Elevators, Dumbwaiters	5	0	0.0%
	Exterior Doors	47	1	2.1%
	Exterior Walls	114	8	7.0%
	Exterior Windows	151	1	0.7%
	Finishes	281	0	0.0%
	Fire Extinguishers & Cabinets	416	5	1.2%
	Fuel Storage	32	0	0.0%
	Handrail	30	2	6.7%
	HVAC System- Arch	491	1	0.2%
	Interior Doors	334	5	1.5%
	Interior Flooring	314	4	1.3%
	Interior Walls and Ceilings	1028	22	2.1%
	Irrigation System/Site Grounds	46	6	13.0%
	Lockers	4	0	0.0%
	Parking Area & Drive Pavement	336	46	13.7%
	Roof Drain	23	2	8.7%
	Systems (Comms/Alarms)	157	0	0.0%
	Interior Signs	100	0	0.0%
Electrical	Building Electrical Fixtures	588	9	1.5%
	Generators	50	0	0.0%
	Traffic Signal	124	3	2.4%
	Uninterrupted Power Supply	18	0	0.0%
	Wiring	239	0	0.0%
	Roadside Cabinet	50	8	16.0%
Mechanical	HVAC System- Mech	2	0	0.0%
	Plumbing Fixtures	107	7	6.5%
	Sewer/Septic Lines	1	0	0.0%
	Well/Water lines	83	1	1.2%
Toll Booths	Area lights-toll	44	0	0.0%
	Attenuator	106	10	9.4%
	Booth Pit	18	1	5.6%
	Concrete Pavement	195	26	13.3%
	Counter/Drawer	77	1	1.3%
	Gates	5	3	60.0%
	Interior Booth	46	1	2.2%
	Nose Flashers	106	1	0.9%
	Signs	75	0	0.0%
	Toll A/C	3	0	0.0%
	Toll Indicator	133	69	51.9%
	Window	46	7	15.2%
	Stairs	15	4	26.7%
Other	Miscellaneous	3	1	33.3%

2.4. TOLL ELEMENTS

Atkins conducted an inspection of tolling elements and infrastructure for the CTTS TMS. The inspection consists of a visual inspection of the in-lane and roadside tolling equipment and appurtenances not covered under the facilities category. Toll elements included in the inspection are: AVI readers, antennas, violation enforcement cameras, DVAS cameras, lane and host sever equipment, and pavement loop sensors.

Ratings are assigned based on observed conditions, and the descriptions of the numerical grading system are based on a 3-point system as shown in Table 14. Of the 927 total elements inspected in the toll element category, no elements received a score lower than two (2).

Table 14. CTTS Toll Element Inspection Rating Scale

Grade	Rating	Description
3	Excellent	Feature is like new with no deficiencies noted. No maintenance is necessary.
2	Good	Feature appearance has cosmetic damage but is functioning. No immediate maintenance or repairs necessary.
1	Failing	Feature appearance or functionality/operability are unacceptable. Feature has failed and may require expedited repair.

The Toll System Integrator conducts an annual performance audit to verify that system reliability and accuracy has not degraded over time and that the system continues to satisfy the System Integrator's contractual requirements. Based on the annual audit performed in April 2021, all system performance requirements were satisfied. The 2022 annual performance audit is scheduled for April 2022; therefore, results are not yet available. Additionally, the TMS is visually inspected during monthly lane audits and any cosmetic or performance-related deficiencies identified are submitted to the Toll System Integrator for resolution and/or repair.

2.5. STRUCTURES

The structures inspections within the CTTS include the evaluation of various components of the system bridges, retaining walls, OSBs, cantilever sign structures, HMLTs, and traffic signals.

Structures inspections within the CTTS occur on a biennial cycle. The last biennial cycle of bridge inspections was performed during FY 2022. Likewise, inspections for HMLTs, OSBs, and traffic signals occur biennially, with SH 130 and SL 1 inspections conducted in one year and SH 45N and SH 45SE conducted in the alternate year. This year, SH 130 and SL 1 were inspected. Table 15 summarizes the quantity of all major structures of the CTTS, including the structures that were not inspected this year.

Table 15. Quantities of CTTS Major Structures

Category	SL 1	SH 45N	SH 130	SH 45SE	Total
Bridges	18	76	121	27	242
Retaining Walls	54	164	82	26	326
Overhead/Cantilever Signs	26	84	90	24	224
High-Mast Light Towers	2	61	27	29	119
Traffic Signals	12	29	50	4	95
Totals	**112**	**414**	**370**	**110**	**1006**

2.5.1. Bridges

Under BRINSAP, TxDOT developed a statewide inventory and inspection status of all bridges. Figure 11 shows an example of a bridge within the CTTS. The existing bridge conditions are rated and grouped by the following categories: 1) Deck; 2) Substructure; 3) Superstructure; 4) Channel; 5) Culverts; 6) Approaches; 7) Miscellaneous; and 8) Traffic Safety. Typical bridge categories and components inspected are listed in Table 16. The numerical score generated for each component based on a 10-point rating scale is shown in Table 17.

Figure 11. SH 130 at US 290 Bridge

TxDOT inspects all bridges within the CTTS biennially with findings from the previous inspection cycle (FY 2022) indicating that 84.1% of the components were rated Good to Excellent. A total of 1002 components in the categories used to evaluate bridge load ratings were inspected on the 242 structures within the CTTS. Only 159 components (15.9%) had a rating as low as 6 or less, with the remainder of the ratings falling within the 7 to 9 range (Good to Excellent). The components that received a six (6) or less rating had issues such as riprap settlement, metal beam guard fence damage, joint seal degradation, deck drains clogged, missing delineation and approach slab settlement.

Table 16. Bridge Categories and Components Inspected

Category	Components Inspected
Deck	Deck surface and joints, rails, sidewalks, medians, striping, and drainage
Superstructure	Concrete beams, beam connections and bearings
Substructure	Columns, bents, abutments, foundations, riprap
Channel	Condition of stream or creek being crossed
Culverts	Headwalls, wingwalls, slab footing, safety devices
Approaches	Approach slabs, guard fence
Miscellaneous	Vertical underclearance, bridge warning devices
Traffic Safety	Approach rails, impact attenuators

Table 17. Bridge Inspection Rating Scale

Grade	Rating	Description
9	Excellent	All elements are in excellent condition.
8	Very Good	There were no problems noted.
7	Good	Element has some minor problems. Minor maintenance may be needed.
6	Satisfactory	Minor deterioration of structural elements (limited). Maintenance may be needed.
5	Fair	Minor deterioration of structural elements (extensive). Minor rehabilitation may be needed.
4	Poor	Deterioration significantly affects structural capacity. Major rehabilitation may be needed.
3	Serious	Deterioration seriously affects structural capacity. Repair/ rehabilitation is required immediately.
2	Critical	Element shows advanced deterioration. It may be necessary to close the bridge until repaired.
1	Failing	Bridge is closed to traffic, but repairable.
0	Failed	Bridge is closed, but beyond repair.

Review of Bridge Inspection Follow-Up Worksheets for the FY 2022 inspected bridges indicates that most of the components requiring follow-up action received a Routine recommendation type (Level 3), indicating that actions are required within 24 months. Two of the inspected components are considered Critical (Level 1), indicating that action is required within 30 days. However, 16 components were identified as Urgent (Level 2), indicating that action is required within 6 months.

The current roadway PBMC requires the maintenance contractor to address bridge deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. For bridge deficiencies not covered under the PBMC scope or identified as Critical or Urgent, the TxDOT Bridge Division and TxDOT Austin District Maintenance Office collaborate to identify a contract mechanism to repair the deficiency.

2.5.2. Retaining Walls

The CTTS contains 326 retaining wall locations, totaling 37.46 miles in length. Table 18 shows a breakdown of wall count and length for each CTTS roadway.

Table 18. CTTS Retaining Wall Count and Length (By Roadway Corridor)

Corridor	Wall Count	Length (Miles)
SH 130	82	9.901
SH 45N	164	17.536
SL 1	54	7.061
SH 45SE	26	2.962
Total	**326**	**37.460**

Wall inspections consist of visually inspecting the wall face, coping, foundations, joints, panel finishes, top slope, toe slope, backfill, cast-in-place (CIP) sections, and Mechanically Stabilized Earth (MSE) walls. Typical retaining wall categories and components are listed in Table 19.

Table 19. Retaining Wall Categories and Components Inspected

Category	Components Inspected
Wall	Wall face, coping, foundations, joints, panel finishes, and CIP sections
Earth	Top slope, toe slope, backfill, CIP, and MSE wall

The numerical score generated for each component is similar to the scale for roadway and building facilities and is based on a 5-point numerical system, ranging from a five (5) rating, which is considered Excellent, or no maintenance required, to a one (1) rating, which is considered Failing, and may require expedited repair to protect the public or system.

The findings for this year's inspection of retaining walls indicate that 83% of the wall elements inspected were rated Good to Excellent. Deficiencies noted for retaining walls include silt accumulation and vegetation present in flumes, cracks in panel coping, erosion at mow strip, impact damage to wall barriers, and vegetation growth in panels.

The geotechnical engineers on the GEC team continue to monitor not only the pavement cracking on the northbound SL 1 entrance ramp just north of Shoreline Drive, but also the related MSE retaining wall face, which showed evidence of minor but noticeable deformation or bulging wall panels, water stains, and vegetation growth. This year's findings indicate that there are no visually significant changes to the deformation from last year, no evidence of loss of backfill material, and no sign of additional movement or cracks observed at the concrete pad (mow strip) at the toe of the MSE wall.

Also, as previously noted in the FY 2021 report, geotechnical engineers continue to monitor surface run-off that appears to be seeping down behind the retaining wall adjacent to the gore of the southbound exit ramp at SL 1 and FM 734 (Parmer Lane), resulting in some settlement and shifting of the retaining wall. As a short-term solution, sealant was applied to prevent water from infiltrating the construction joints while a concrete buttress berm was placed at the base of the wall to limit the wall's migration. TxDOT Austin District has developed plans for a permanent repair using a tie-back design to remediate the wall distress. As of this printing, the contract was let in March 2022 and work is expected to begin in spring 2022.

2.5.3. Overhead and Cantilever Sign Structures

Overhead and cantilever signs, which provide directional information to patrons throughout the CTTS, are suspended above the travel way by large support structures, such as those pictured on Figure 12. For the inspection process, the condition of these structures is determined based on the visual inspection of two components: 1) sign structure horizontal members; and 2) sign structure vertical members, foundation, and protection system. Inspection of the horizontal member component includes assessment of chord truss members, upper and lower chords, verticals, diagonals, upper bracing, lower bracing, and all connections. Inspection of vertical members, foundations, and the protection system includes assessment of above-ground concrete columns, steel columns, bracing, connections, below-ground foundations (for exposed drilled shafts and vertical movement), and protective railings and/or guard fences.

Figure 12. Overhead Sign Structure

Beginning in FY 2011, inspections for overhead and cantilever sign structures were conducted biennially, with SH 130 and SL 1 inspections conducted in one year, and SH 45N and SH 45SE conducted in the alternate year. During this year's inspection, the overhead and cantilever sign structures on SH 130 and SL 1 were inspected, totaling 116 structures.

At TxDOT's request, the GEC evaluates overhead sign structures using two methodologies. The first methodology is similar to TxDOT bridge inspections, utilizing inspection forms to evaluate elements on a 10-point numerical rating scale (see Table 20), where a grade of a nine (9) indicates that an element is in Excellent condition and a grade of zero (0) indicates that an element has Failed. With this approach, inspectors assign a numerical rating for each element of the superstructure and substructure components, resulting in an overall component rating based on the lowest of the element ratings.

Findings for this year's inspections utilizing this first methodology indicate that 16 of the 116 sign structures received a condition rating of a six (6), which indicates that the structure is in Satisfactory condition, and 2 of the 116 structures received a condition rating of five (5), which indicates that the structure is in Fair condition. Both ratings indicate that the structures have minor deterioration requiring maintenance or minor rehabilitation. No structure received a rating lower than a five (5).

Table 20. Overhead Sign Structures (10-Point Rating Scale)

Grade	Rating	Description
9	Excellent	All elements are in excellent condition.
8	Very Good	Element is in very good condition with no problems noted.
7	Good	Element is in good condition with some minor problems.
6	Satisfactory	Element is in satisfactory condition, with minor deterioration of structural elements. Maintenance may be needed.
5	Fair	Element is in fair condition, with minor deterioration of structural elements. Minor rehabilitation may be needed.
4	Poor	Element is in poor condition, with deterioration significantly affecting structural capacity. Major rehabilitation may be needed.
3	Serious	Element is in serious condition, with deterioration seriously affecting structural capacity. Repair or rehabilitation is required immediately.
2	Critical	Element is in critical condition. Element should be closed or placed out of service until repaired.
1	Failing	Element is failing and is closed/out of service, but repairable.
0	Failed	Element is closed/out of service and beyond repair.

The second inspection methodology is an approach that is based on FHWA guidelines. Inspectors use an element-based inspection form to quantify every element on a 5-point rating scale (Table 21), where a grade of one (1) indicates an element in Good condition and a grade of five (5) indicating an element has Failed. Items assessed include superstructure (truss members and all connections), substructure (chord to tower connections, lateral bracing connections, and base connections), concrete foundations, steel protective coating condition, potential corrosion on steel members, and conditions of protective guard fence and railings. Photographs are taken of the structures' current condition and any distresses. Horizontal clearances are noted for safety.

Findings for this year's inspections utilizing the FHWA's Elements Based methodology indicate that 99.5% of the 73,553 components were rated Satisfactory to Good. This percentage is identical to the SH 130 and SL 1 inspection that was conducted in FY 2020.

Table 21. Overhead Sign Structure FHWA Elements Based (5-Point) Rating Scale

Grade	Rating	Description
1	Good	The elements are new or like new condition with no significant deficiencies.
2	Satisfactory	Minor damage, deterioration, or misalignment to the elements may be observed.
3	Fair	Moderate damage/deterioration that does not significantly affect the element strength or integrity. Repair may be needed.
4	Poor	Major or multiple defects that significantly impact the serviceability or integrity of the structure. Recommend repair or replacement of element within specified time frame.
5	Critical	Any condition where the element has failed, or failure is imminent. Recommend immediate repair or replacement of element.

2.5.4. High-Mast Light Towers

HMLT structures, like the one pictured on Figure 13, provide illumination for improved nighttime visibility at various locations along the CTTS, such as interchanges and toll building facilities.

The condition of HMLTs is based on visual inspection of the following components: 1) high-mast light pole foundation; and 2) high-mast light pole, including assessment of anchor bolts, base plates, column support, compartment doors, vertical alignment, cracks, and protection. Since these structures are usually not as complex as most bridge structures, the 10-point bridge inspection rating scale is not used, as shown in Table 20. Instead, the FHWA's Elements Based rating scale, shown previously in Table 21 for overhead sign structures, is used. This rates every individual element on a 5-point rating scale. It is similar to numerical rating scales used around the country for similar structural elements.

Figure 13. High-Mast Light Tower

Beginning in FY 2011, the HMLTs inspection occurred biennially with inspections being alternated on two roadways per year. During this year's inspection, SH 130 and SL 1 were inspected, which consists of 29 structures. The results indicate that 99.4% of the 6,352 components were rated Satisfactory to Good, which is a 0.3% decline from the SH 130 and SL 1 inspection that was conducted in FY 2020.

2.5.5. Traffic Signals

Figure 14. Traffic Signal

Traffic signals like the one shown on Figure 14 are located at various interchanges within the CTTS system. Traffic signals assist in controlling traffic in a safe, orderly, and efficient manner. They benefit the traveling public by providing orderly movement of vehicles, improved safety, reduced travel times, and an increase in the amount of traffic that an intersection can handle.

The condition of a traffic signal is based on visual inspection of the following components: 1) traffic signal foundation; and 2) signal poles, including assessment of anchor bolts, base plates, column support, arm, chord and cable connections and members, attachments and luminaries. Like HMLTs, these structures are not as complex as most bridge structures and the 10-point bridge inspection rating scale is not used, as shown in Table 20. Instead, the FHWA Elements Based rating scale, shown previously in Table 21 for overhead sign structures, is used. This rates every individual element on a 5-point rating scale. It is similar to numerical rating scales used around the country for similar type structural elements. Starting in FY 2020, inspections for traffic signals were conducted biennially, with SH 130 and SL 1 inspections conducted in one year, and SH 45N and SH 45SE conducted in the alternate year. During this year's inspection, SH 130 and SL 1 were inspected, which consists of 62 traffic signals. The results indicate that 98.6% of the 1,374 components were rated Satisfactory to Good.

SECTION 3
PROGRAM STATUS, COMMITMENTS, AND RECOMMENDATIONS

SH 130 | SH 45SE | SH 45N | SL1

3.0 PROGRAM STATUS, COMMITMENTS, AND RECOMMENDATIONS

3.1. PROGRAM STATUS

The inspection findings this year indicate that the current maintenance program implemented by TxDOT for the roadways, building facilities, toll elements, and structural assets of the CTTS have kept the overall condition of CTTS assets in good repair, working order, and condition. An effective and proactive maintenance policy has contributed to ensuring a safe highway for CTTS users as required by the CTTS Bond Indenture.

3.2. PROGRAMMED COMMITMENTS

As required by the bond indenture, the TTC approved the FY 2022 annual operating, maintenance, and capital budgets prior to the start of the fiscal year via Minute Order 116090. The maintenance budget amounts approved included $7.3M for routine roadway maintenance and utilities; $4.9M for routine toll system maintenance; and $39.9M of the capital maintenance budget for non-routine, major maintenance of roadways and facilities. TxDOT anticipates expending the entire approved amounts for routine roadway maintenance and non-routine, unusual, or extraordinary maintenance.

In FY 2022, TxDOT's Austin District has completed, or is in the process of completing, preventative roadway maintenance activities, which include pavement overlays on SH 130 and SH 45SE. Later this fiscal year, the Austin District is scheduled to perform an overlay on SL 1, structural repairs on a retaining wall on SL 1 and various bridge approach repairs. TOD building facilities expenditures for FY 2022 consist of UPS building replacement, toll booth glass replacement, generator turbo replacement, chiller coil replacement, and stucco repair.

TxDOT has also included funding in the budget for three major infrastructure improvements. In January 2017, the TTC approved using the CTTS capital contribution account to fund expansion projects for SH 130 Segments 2 and 3 from SH 45N to SH 71 via Minute Order 114813; Minute Order 116090, approved on August 31, 2021, allocates $13.1M for this project in FY 2022. In June 2017, the TTC also approved using available CTTS revenues for an east-south direct connector from US 290 to SH 130 via Minute Order 114958; Minute Order 116090, approved on August 31, 2021, allocates $7.4M for this project in FY 2022. At of the time of this report, these projects were complete.

Atkins will work with TxDOT to review and comment on the proposed maintenance and non-routine, unusual, or extraordinary funding levels for FY 2023 prior to the approval of those funding levels at the August 2022 TTC meeting.

3.3. RECOMMENDATIONS

3.3.1. Roadway

Based on FY 2022 visual inspections for the Pavement category, there was pavement cracking and edge drop-offs at various locations throughout the system, with the lowest scores noted on SH 130 and SL 1 (cracking), and SH 130 and SH 45SE (edge drop-offs). In the Traffic Operations & Safety Appurtenances category, pavement markings, signs, and delineation show areas in need of maintenance throughout the system, with the lowest scores noted on SH 130, SH 45N, and SH 45SE (striping); SH 45SE and SH 45N (signs); and SH 45N and SH 130 (delineation). In the Roadside category, litter and debris received the lowest overall rating, with the lowest scores noted on SL 1 and SH 45SE.

Atkins recommends addressing Pavement, Traffic Operations & Safety Appurtenances, and Roadside elements that are identified as Degraded, or a three (3) numerical rating, or lower. A Degraded rating of three (3) indicates that a feature appearance, functionality, or operability is below average, and that maintenance is required, but expedited repair to protect the system is not required.

Based on the review of this year's roadway deficiencies and programmed projects, the majority of the deficiencies identified with the numerical rating of three (3) or lower would fall under the scope of the existing roadway PBMC, and ongoing and future projects including a large sign replacement project on SH 45N, SL 1, SH 130, and SH 45 SE; restriping on SL 1, SH 45N, and SH 45SE; and pavement overlays on SH 130 Segment 4 and SL 1 frontage roads. In addition, Atkins recommends continued maintenance and monitoring (as needed) of the pavement cracks located at the northbound SL 1 entrance ramp north of Shoreline Drive.

3.3.2. Building Facilities

Based on FY 2022 visual inspections, 5.2% of the building facility assets were identified as Degraded or Unsatisfactory, or a three (3) numerical rating or lower. Examples of deficiencies found include non-illuminated area lighting, damaged curb and concrete pavement, and damaged attenuators at the toll booths.

Atkins recommends addressing building facilities elements that are identified as Degraded, or a three (3) numerical rating, or lower. The current building facilities PBMC requires the building facilities maintenance contractor to address all facilities deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. For building facilities items that are not covered under the facilities contract, those deficiencies have been forwarded to TxDOT's Austin District to be addressed by the roadway PBMC.

3.3.3. Toll Elements

Based on the FY 2022 visual inspection, no toll element rated below a two (2) numerical rating, meaning that there is only cosmetic damage, but no loss of functionality, and therefore no immediate maintenance or repairs are necessary. In addition to the annual visual inspection, the Toll System Integrator conducts an annual performance audit to verify that system reliability and accuracy has not degraded over time and that the system continues to satisfy the System Integrator's contractual requirements.

3.3.4. Structures

Based on recent bridge findings contained in the FY 2022 BRINSAP, 84.1% of the bridge components were rated Good to Excellent, with 15.9% of the components receiving a rating as low as a six (6) or less. The components receiving a six (6) rating or less had deficiencies such as riprap settlement, metal beam guard fence damage, joint seal degradation, deck drains clogged, missing delineation and approach slab settlement. If not already completed, it is recommended that items rated Satisfactory or lower be addressed and returned to the proper condition level. It is also recommended that any bridge components that were identified with a Critical, Urgent or a Routine priority level be addressed and returned to the proper condition level within the time frame required by the TxDOT Federal Bridge Inspection Program.

Based on FY 2022 inspection in the retaining wall category, the findings for this year's inspection of retaining walls indicate that 83% of the wall elements inspected were rated Good to Excellent, receiving condition ratings of four (4) or greater. Deficiencies noted for retaining walls included silt accumulation and vegetation present in flumes, cracks in panel coping, erosion at mow strip, impact damage to wall barrier, and vegetation growth in panels. Atkins recommends addressing retaining walls elements that are identified as Degraded, or a three (3) numerical rating, or lower.

In addition, Atkins recommends continued maintenance and annual monitoring of the retaining wall located at the northbound SL 1 entrance ramp north of Shoreline Drive, where wall panels show evidence of deformation, until the permanent repair to address the settlement and shifting of the retaining wall has been completed. In addition, Atkins recommends the continued biannual monitoring of the southbound exit ramp at SL 1 and FM 734 (Parmer Lane).

During the FY 2022 inspection, the overhead and cantilever sign structures on SH 130 and SL 1 were inspected, which total 116 structures. Findings for this year's overhead sign structures inspections indicate that 16 of the 116 sign structures received a condition rating of a six (6), which indicates that the structure is in Satisfactory condition (10-point scale), and two of the 116 structures received a condition rating of five (5), which indicates that the structure is in Fair condition. Both ratings indicate that structures have minor deterioration of structural elements requiring maintenance or minor rehabilitation. No structure received a rating lower than a five (5). Findings for this year's inspections utilizing the FHWA's Elements Based methodology (5-point

rating scale) indicate that 99.5% of the 73,553 components were rated Satisfactory to Good. Atkins recommends addressing sign structures that receive a Satisfactory rating (10-point scale) or lower, or a Fair rating (5-point scale), three (3) numerical rating or lower.

During the FY 2022 inspection, the HMLTs on SH 130 and SL 1 were inspected, which consists of 29 structures. The results indicate that 99.4% of the 6,352 components were rated Satisfactory to Good. Atkins recommends addressing structures that receive a Fair rating (5-point scale), three (3) numerical rating or lower.

Based on the FY 2022 inspection of Traffic Signals on SH 130 and SL 1, 98.6% of the 1,374 components were rated Satisfactory to Good. Atkins recommends addressing signals components receiving a Fair rating (5-point scale), three (3) numerical rating or lower.

Based on the review of this year's structural deficiencies, the majority of items identified would fall under the scope of the routine PBMC.

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