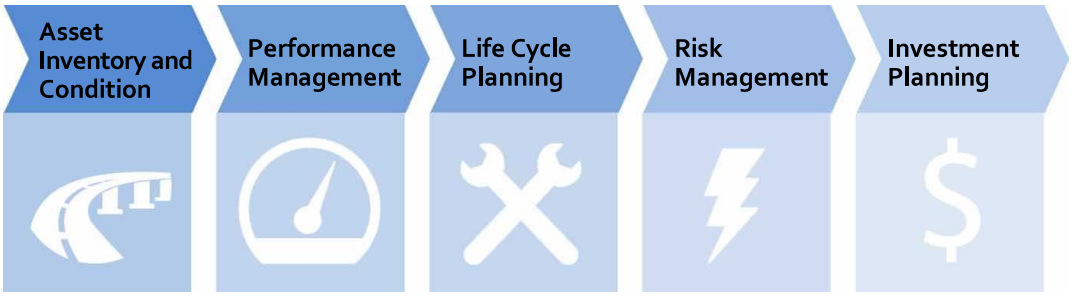
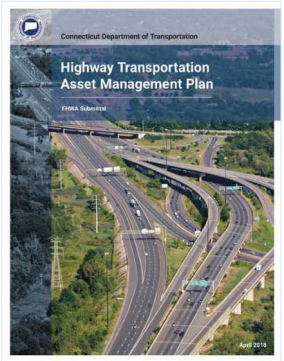
CTDOT's Asset Management Program



Asset management at CTDOT is a risk-based, data-driven process to maximize transportation performance and user experience, to prioritize resources, and to optimize treatments and costs over the life cycle of an asset for the state's multimodal transportation system. In Connecticut, the implementation of transportation asset management (TAM) is needed to address the condition of infrastructure as many assets have aged beyond their intended life expectancy while demands on the transportation network have increased.

The Connecticut Transportation Asset Management Plans

CTDOT has created its Transportation Asset Management Plans (TAMPs) in accordance with federal mandates to establish and document the agency's strategic and systematic process of managing its transportation assets.



Asset Inventory and Condition. CTDOT owns, operates and maintains a multimodal transportation network comprised of highway and transit assets. In terms of their cost and extent, the most significant assets on the system are bridges and pavement. CTDOT owns and maintains the entire Interstate Highway System in Connecticut and approximately 95% of the non-Interstate National Highway System (NHS). CTDOT also owns and maintains all bridges, pavements, traffic signals, signs, sign supports, pavement markings, highway buildings, roadway illumination, retaining walls, drainage culverts, and intelligent transportation systems on the State Highway System. CTDOT also owns or subsidizes nearly all of Connecticut's public transportation services, including commuter rail, bus, bus rapid transit, paratransit, and ferry service.

Performance Management. Monitoring and measuring transportation asset condition enables CTDOT to assess the performance of the transportation system, predict future needs, allocate funding, and schedule projects in an effort to achieve a state of good repair. Asset condition is also an important public-facing measure. Users of the transportation network experience asset condition every day.

Life Cycle Planning. Life cycle planning (LCP) is used to determine what actions to perform on an asset over its life cycle considering these costs. The basic principle underlying LCP is fundamental to asset management: Timely investments by CTDOT in an asset results in improved condition over a longer time period and lower long-term costs. Application of preventive maintenance early in an asset's life when it is still in relatively good condition can delay the need for more costly rehabilitation, replacement, or reconstruction and result in an overall lower life cycle cost.

Risk Management. Managing transportation assets also entails managing risk. CTDOT must balance a wide variety of risks on an ongoing basis and take prudent mitigation actions given funding constraints. Risks range from daily operational concerns to potentially catastrophic risk of asset failures. Being proactive in managing risk helps CTDOT to better utilize capital funding towards maximizing the condition of transportation assets.

Investment Planning. Asset management investment strategies reflect CTDOT's TAM priorities and communicate CTDOT's investment approach to achieve asset performance targets given available funding levels. A TAM financial plan connects the TAM objectives and targets to investment strategies, revenues, and project delivery programs.

Asset management is the process of balancing performance, cost, and risk. Achieving this balance involves a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively through their lifecycle with better decision-making based on quality information and well-defined objectives. It requires business processes, data, information systems, financial commitment and an agency culture capable of implementing asset management.

Asset Management Process Improvements

TAM is a series of processes intended to help preserve asset condition over the life of the asset at minimal cost. Practicing TAM means continuous improvement.

These TAM principles shape the vision that CTDOT has for delivering added value to Connecticut travelers. In recent years, CTDOT created an asset management office and has advanced TAM practices. These advancements include improved understanding of assets and their condition; the relationship between financial investment and longer term performance; implications of risk; and integrating all of these factors into CTDOT's funding allocation process.

The improvements in business practices of better data, better processes, and better tools are leading to CTDOT's ability to answer the following questions:

- What are CTDOT's physical assets; where are these assets; what condition are they in; how well are they performing?
- What work has been performed on the assets and when, how much did it cost, and what was the outcome?
- How much will it cost to reach and maintain performance targets?
- What work should be performed with the money available; what work is already funded and scheduled?
- Where are the biggest risks?

CTDOT continues to make progress in implementing an overall asset management program that results in getting the most performance for the resources available. This includes striving for efficient collection of data, timely updates of business-critical information, improved life cycle planning, and analysis of asset performance in projects and programs to enable CTDOT to deliver programs and projects that improves the assets.

CTDOT's asset management program will :

- **Reduce life cycle costs of asset maintenance** by better tracking asset costs and performance, and making decisions that minimize costs over time to deliver the best value for every public tax dollar;
- **Focus staff resources on tasks that will add the greatest value** through business processes and tools that deliver efficiency and effectiveness;
- **Enhance CTDOT's credibility and accountability** to the Governor, legislature, and customers with investment decisions based on understanding CTDOT's asset needs, priorities, and available funds.

To complement the Connecticut TAMP, CTDOT developed a series of quick reference Fact Sheets providing at-a-glance summaries of asset inventory and condition, State of Good Repair, performance projections and targets. The Fact Sheets use simplified graphs and other information displays with supporting contextual detail to document CTDOT's TAM approach.

Connecticut Transportation Asset Management Plan

Bridge

Data Confidence High

Description

- CTDOT inspects 5,433 roadway bridges, 1,822 of which are National Bridge Inventory (NBI) structures on the National Highway System (NHS).
- 4,058 of these bridges are state maintained; the remaining 1,375 are maintained locally or under another jurisdiction
- CTDOT defines a bridge as a crossing of at least six feet in length, including culverts. The Federal Highway Administration (FHWA) defines an NBI bridge as a structure measuring more than 20 feet in length.
- CTDOT has a distinct Major Bridge Program for large or expensive-to-replace bridges. 60 structures are currently categorized as Major Bridges.

State of Good Repair (SOGR)

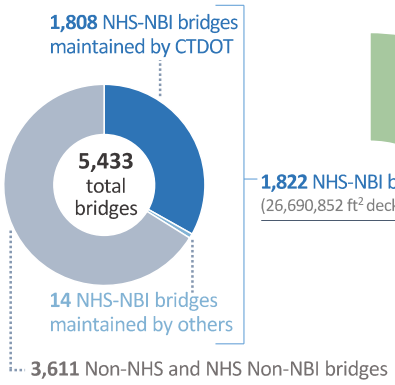
A bridge for which the condition rating for each of the three major components for a span bridge (Substructure, Deck, and Superstructure) or the structural condition of a culvert is rated at least a 5 on a 0-9 condition scale is classified as being in a SOGR.

Bridge Age

The average NHS-NBI bridge in Connecticut is 55 years old, which is 7 years older than the national average of 48 years. The state has a higher percentage of Poor bridges (by deck area) compared to the national average.

NHS-NBI Inventory and Condition

Federal Requirements



Good **3,781,424 ft²**
14.2% of deck area on NHS-NBI bridges is in good condition (378 bridges).
[NBI condition ratings of 7,8, or 9]

Fair **20,737,588 ft²**
77.7% of deck area on NHS-NBI bridges is in fair condition (1,391 bridges).
[NBI condition ratings of 5 or 6]

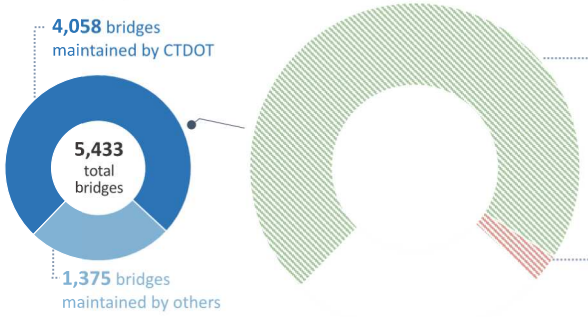
Poor **2,171,840 ft²**
8.1% of deck area on NHS-NBI bridges is in poor condition (53 bridges).
[NBI condition ratings of 0, 1, 2, 3, or 4]

Good-Fair-Poor defined by MAP-21/FAST Act

Based on CTDOT 3/15/21 NBI Submittal

CTDOT-Maintained Inventory and Condition

State Goals



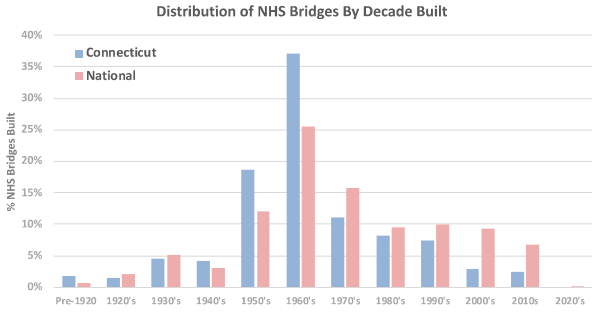
State of Good Repair **3,903 bridges**
96.2% of CTDOT-maintained state bridges are in good or fair condition
[NBI condition ratings of 5 or higher]

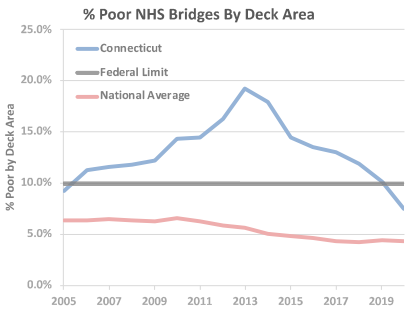
Poor **155 bridges**
3.8% of CTDOT-maintained state bridges are in poor condition
[NBI condition ratings of 4 or lower]

SOGR defined by CTDOT

Based on CTDOT 3/15/21 Snapshot

History





Based on National Data available from FHWA LTBP InfoBridge

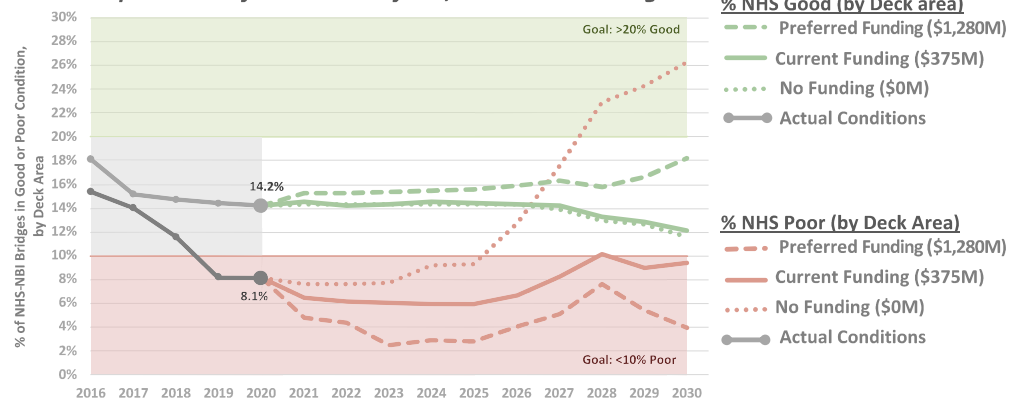
Connecticut Transportation Asset Management Plan

Bridge



NHS-NBI Bridge Performance Projections

Federal Requirements for deck area for 1,822 NHS-NBI bridges



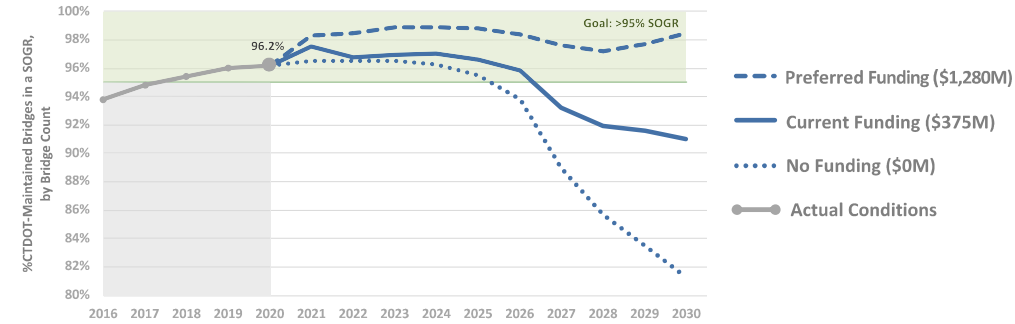
'No Funding' scenario assumes routine bridge maintenance continues, but all capital work is canceled

Performance Projections at Current Funding Level ($375M Budget)

End of Year	2021	2022	2023	2024	2025	Goal
NHS Good (by deck area)	14.5%	14.2%	14.4%	14.5%	14.4%	>20.0%
NHS Poor (by deck area)	6.5%	6.2%	6.1%	6.0%	6.0%	<10.0%

CTDOT-Maintained Bridge Performance Projections

State Goals by number of bridges for 4,058 CTDOT-maintained bridges



'No Funding' scenario assumes routine bridge maintenance continues, but all capital work is canceled

Performance Projections at Current Funding Level ($375M Budget)

End of Year	2021	2022	2023	2024	2025	Goal
SOGR	97.5%	96.8%	96.9%	97.0%	96.6%	95.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

The chart on the left depicts bridge condition for various funding scenarios. These were developed through an analysis program using CTDOT bridge condition data, as of February 2021.

Asset Valuation

$17,065,712,000

Asset value is estimated using the replacement value. For bridges, replacement value is the product of deck area and unit construction cost. For 4,058 bridges: 34,827,984 sqft * $490/sqft = $17.1 billion.

Measures and Goals

CTDOT has set the following bridge condition goals:

Federal Requirements:

- 10% or less Poor by deck area on NHS-NBI bridges (Federal minimum is less than 10% Poor)
- 20% or more Good by deck area on NHS-NBI bridges. (Percent Good is established by each state; no Federal minimum for this goal)

State Goal:

- 95% or more of State-Maintained bridges in a SOGR (State target)

Connecticut Transportation Asset Management Plan

Pavement

Data Confidence High

Description

- There are 3,715 centerline miles of state-maintained routes and roads in Connecticut, 1,406 of which are on the National Highway System (NHS), including 346 Interstate miles.
- There are another 17,454 centerline miles of town maintained roads, 56 of which are on the NHS.
- 70.7% of CTDOT maintained centerline miles are flexible (asphalt) pavements, 29.0% are composite pavements (asphalt over concrete), and 0.3% are rigid (concrete) pavements.

State of Good Repair (SOGR)

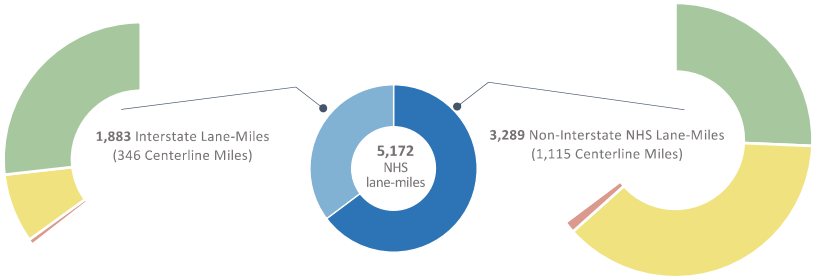
A pavement section for which the Pavement Condition Index (PCI) is 6 or greater is classified as being in a State of Good Repair (SOGR). The PCI is based on cracking, rutting, drainage disintegration, and ride. FHWA uses different condition measures for NHS pavements.

Pavement Age

The average Connecticut NHS pavement structure was constructed 47.6 years ago, and the average surface age is 7.3 years old, based on lane miles.

NHS Roadways Inventory and Condition

Federal Requirements



Good-Fair-Poor defined by MAP-21/FAST Act

Interstate Pavements

Good	Fair	Poor
1,313 Lane-Miles	**399 Lane-Miles**	**3 Lane-Miles**
76.5% are in Good condition	23.3% are in Fair condition	0.2% are in Poor condition

Non-Interstate NHS Pavements

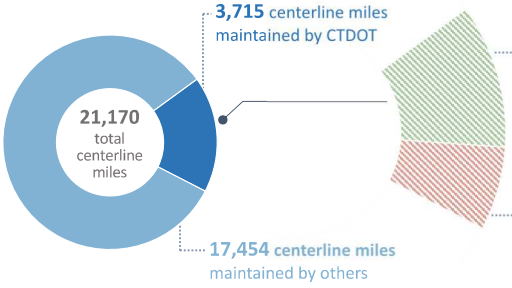
Good	Fair	Poor
1,250 Lane-Miles	**1,836 Lane-Miles**	**67 Lane-Miles**
39.6% are in Good condition	58.3% are in Fair condition	2.1% are in Poor condition

Note on Interstate: Total condition lane miles of 1,715 excludes 131 lane miles coded as bridge and 37 lane miles missing/invalid.
Note on Non-Interstate NHS: Total condition lane miles of 3,153 excludes 81 lane miles coded as bridge and 55 lane mile missing/invalid. Totals include 127 NHS lane miles which are locally maintained, 3.5% in good condition, 91.7% in fair condition and 4.8% in poor condition.

Based on 2020 HPMS pavement condition data submitted to FHWA June 14, 2021

CTDOT-Maintained Roadways Inventory and Condition

State Goals



State of Good Repair **2,551 centerline miles**
69.4% of CTDOT-maintained centerline miles have a PCI of 6 or greater

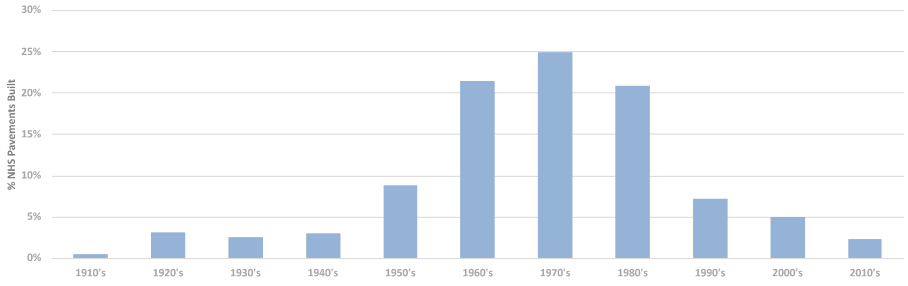
PCI Poor **1,123 centerline miles**
30.6% of CTDOT-maintained centerline miles have a poor condition PCI rating lower than 6

SOGR defined by CTDOT

Based on CTDOT 1/11/22 Snapshot

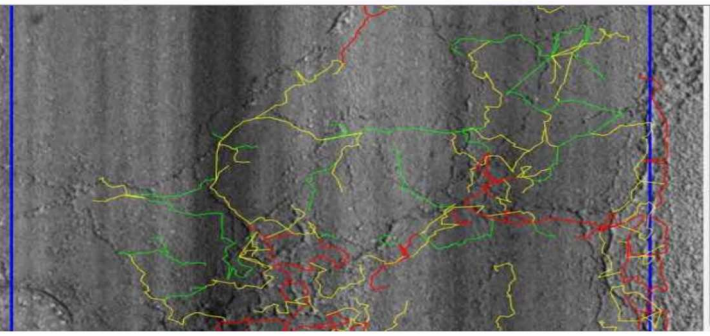
History

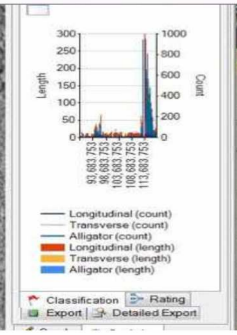
Distribution of CT NHS Roadway Pavements By Decade Built (lane miles)



Connecticut Transportation Asset Management Plan

Pavement

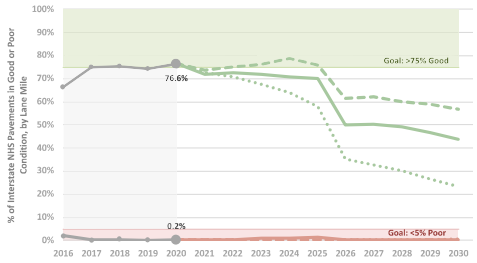




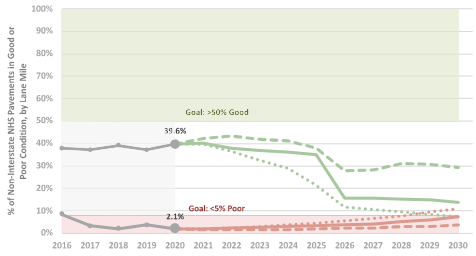
NHS Pavement Performance Projections

Federal Requirements by lane miles for 4,868 lane miles of NHS pavement

Interstate Roadways



Non-Interstate NHS Roadways



% Good (by lane miles)
Preferred Funding ($375M) — Current Funding ($119M) — No Funding ($0M) — Actual Conditions

% Poor (by lane miles)
Preferred Funding ($375M) — Current Funding ($119M) — No Funding ($0M) — Actual Conditions

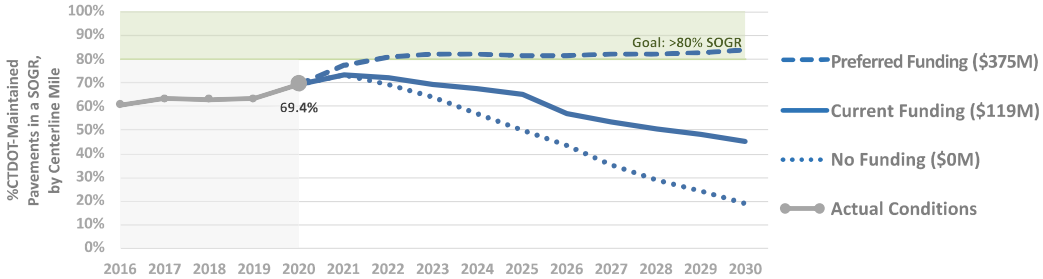
Based on funding as of 12/31/21

Performance Projections at Current Funding Level ($119M Budget)

End of Year	2021	2022	2023	2024	2025	Goal
Interstate Good	71.8%	72.5%	72.0%	71.0%	70.0%	75.0%
Interstate Poor	0.2%	0.2%	1.0%	1.1%	1.3%	<5.0%
Non-Int NHS Good	40.2%	38.1%	37.0%	36.0%	35.0%	50.0%
Non-Int NHS Poor	2.0%	2.2%	2.7%	3.1%	3.5%	<8.0%

CTDOT-Maintained Pavement Performance Projections

State Goals by centerline miles for 3,715 centerline miles



Based on funding as of 12/31/21

Performance Projections at Current Funding Level ($119M Budget)

End of Year	2021	2022	2023	2024	2025	Goal
SOGR	73.5%	72.0%	69.5%	67.3%	65.0%	80.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

The charts on the left depicts pavement condition for various funding scenarios developed through an analysis program using CTDOT pavement deterioration curves projected from 2020 pavement condition data.

Asset Valuation

$10,838,143,000

Asset value is estimated using the replacement value. For pavements, replacement value is the product of pavement area (SY) and unit construction cost. For 3,715 centerline miles of pavement: 99.1 million SY
* $109/SY = $10.84 Billion

Measures and Goals

CTDOT has set the following pavement condition goals:

Federal Requirements:

- Interstate: 75% good condition and less than 5% poor condition (Federal minimum is less than 5% poor)
- Non-Interstate: 50% good condition and less than 8% poor condition

State Goal:

- 80% or more of State-maintained pavements in a SOGR (State)

Connecticut Transportation Asset Management Plan

Traffic Signals

Data Confidence: Medium

Description

- CTDOT is currently responsible for maintaining 2,786 State owned traffic signals:
  - 2,560 Traditional Traffic signals
  - 226 Overhead flashing beacons
- Of the 2,560 traditional traffic signals, 966 are part of 111 computerized traffic signal systems
- CTDOT defines a traffic signal unit as all traffic control equipment at a given intersection or location
- There are an additional 279 independent signs with flashers that are managed as part of the sign asset

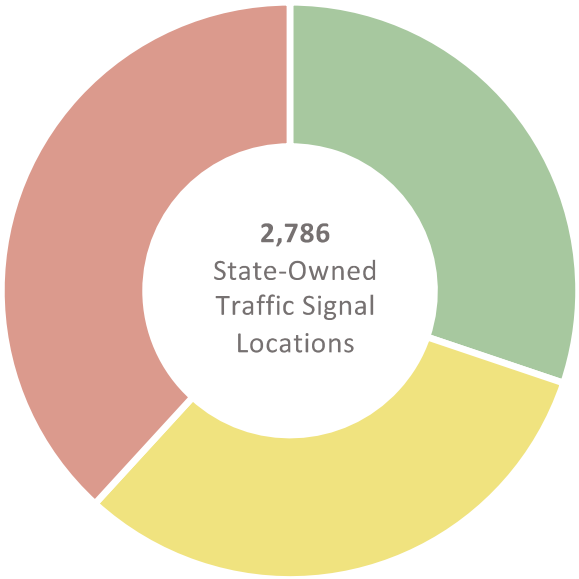
State of Good Repair (SOGR)

The State of Good Repair for traffic signals is determined to be 25 years of life based on expectations of controller and signal head life. Major component upgrades improve operation and safety of traffic signals but are not reflected in SOGR calculations.

Traffic Signal Age

- 38.2% of traffic signals are older than 25 years
- 1.7% of traffic signals are older than 50 years

Traffic Signal Inventory and Condition



Good

841 Locations

30.2% are in Good condition (0-15 years old)

Fair

881 Locations

31.6% are in Fair condition (16-25 years old)

Poor

1064 Locations

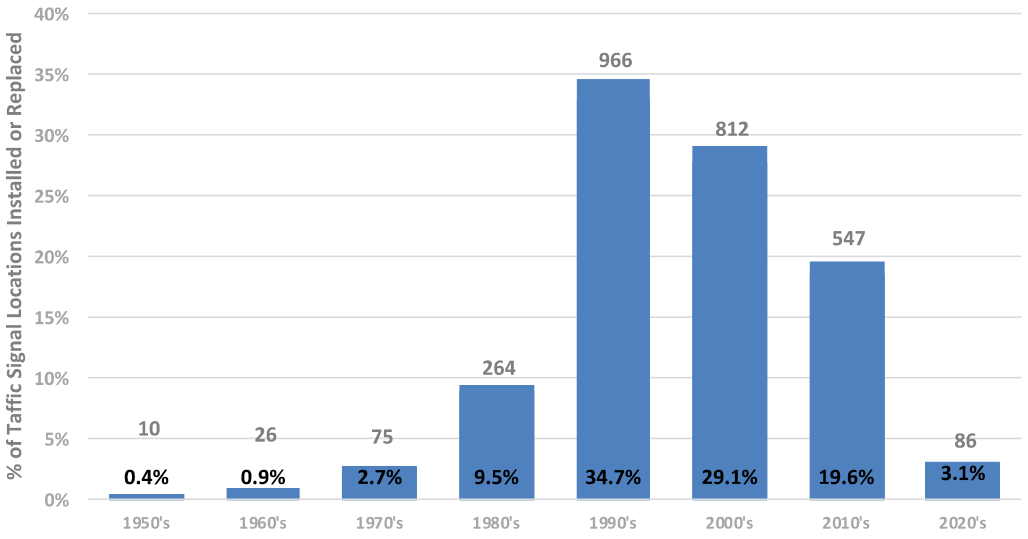
38.2% are in Poor condition (26+ years old)

Good-Fair-Poor and SOGR defined by CTDOT

Based on CTDOT 1/3/22 Snapshot

History

Distribution of Traffic Signal Locations by Year Installed or Replaced



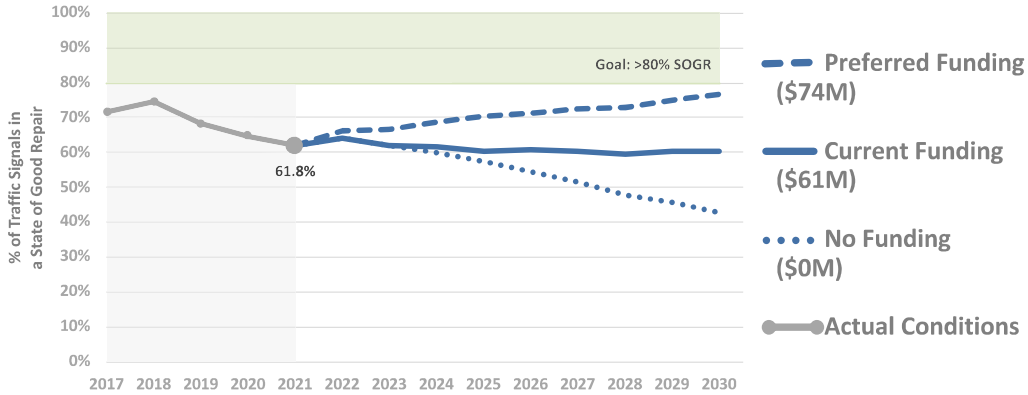
Based on CTDOT 1/3/22 Snapshot

Connecticut Transportation Asset Management Plan

Traffic Signals

Traffic Signals Performance Projections

State Goals by traffic signal for 2,786 traffic signals



Based on funding as of 1/3/22

Projected Performance at Current Funding Level ($61M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	64.1%	62.2%	61.8%	60.4%	60.8%	80.0%

Note: Current funding level includes $29 million for TAM Traffic Signals Preservation projects, $20 million for Computerized Traffic Signal System (CTSS) replacement projects, and $12 million for Traffic Signal Safety & Technology projects. The CTSS projects will affect SOGR rating; Traffic Engineering is taking on the prime designer role starting FY2024. The Traffic Signal Safety & Technology projects are funded through FY2026 and will not affect SOGR rating.

Note: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

In order to maintain a State of Good Repair, roughly 120 traffic signals need replacement each year. Currently, approximately 50-60 traffic signals are replaced each year. Of those, 45-55 signals are programmed under the signal replacement program and 5-10 signals are replaced under other state projects annually.

Asset Valuation

$830,500,000

Asset value is estimated using the replacement value. For traffic signals, replacement value is the product of traffic signal and unit construction cost.
For 2,560 traffic signals : 2,560 * $320,000 = $819,300,000
For 226 Overhead flashing beacons: 226 * $50,000 = $11,300,000

Measures and Goals

There are no Federal requirements at this time. CTDOT has set the following traffic signal condition goal:

State Goal:

- 80% or more of state owned traffic signals in a SOGR

Connecticut Transportation Asset Management Plan

Signs

Data Confidence Low

Description

- CTDOT is responsible for maintaining approximately 247,000 signs (regulatory, warning, and guide) that are located on State owned and maintained roadways. Sign inventory is also represented as 2,354,178 square feet of sign area.
- CTDOT defines a sign as a panel attached to a post(s) or sign structure and a sign assembly as the combination of sign panel(s) and their post(s), support, or sign structure at a single location.
- Overhead sign supports and foundations are managed as a separate asset

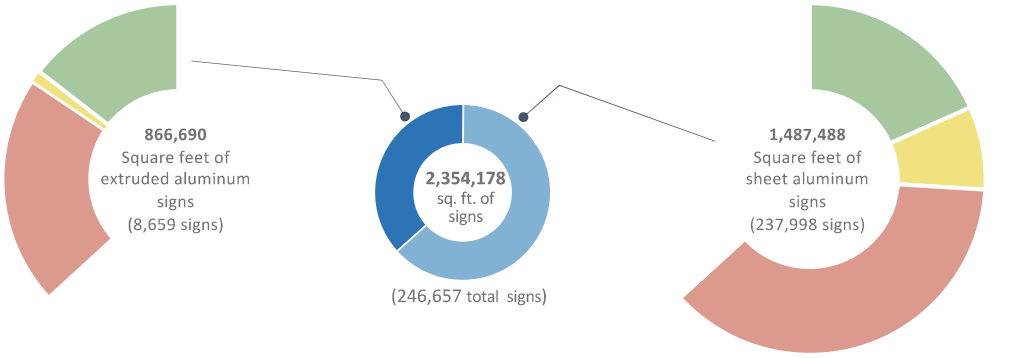
State of Good Repair (SOGR)

A sign installed within 17 years is classified as being in a State of Good Repair. This is based on expectations of retroreflectivity life. Retroreflectivity is a measure of the amount of light reflected by a surface back to the source of the light.

Sign Age

- More than 38% of all signs have are within their expected sign life or effective service life
- Nearly 58% of extruded aluminum signs are less than 25 years old.

Sign Inventory and Condition



Good-Fair-Poor and SOGR defined by CTDOT

Extruded Aluminum Signs

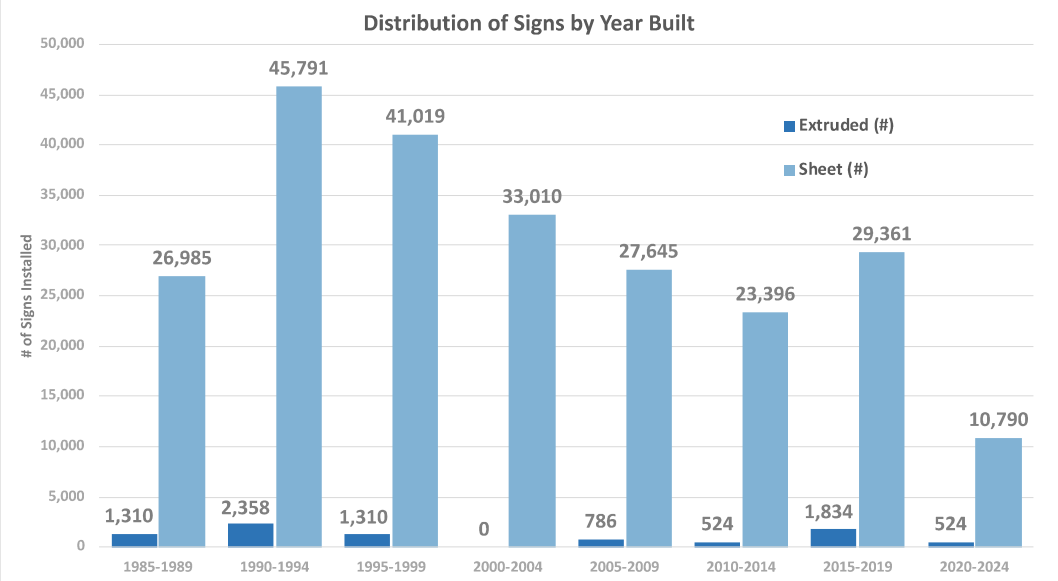
Good	Fair	Poor
3,412 Signs	**260 Signs**	**4,987 Signs**
39.4% are in Good condition (0-12 years old)	3.0% are in Fair condition (13-17 years old)	57.6% are in Poor condition (18+ years old)

Sheet Aluminum Signs

Good	Fair	Poor
69,077 Signs	**28,718 Signs**	**140,203 Signs**
29.0% are in Good condition (0-12 years old)	12.1% are in Fair condition (13-17 years old)	58.9% are in Poor condition (18+ years old)

Based on CTDOT 1/12/22 snapshot

History



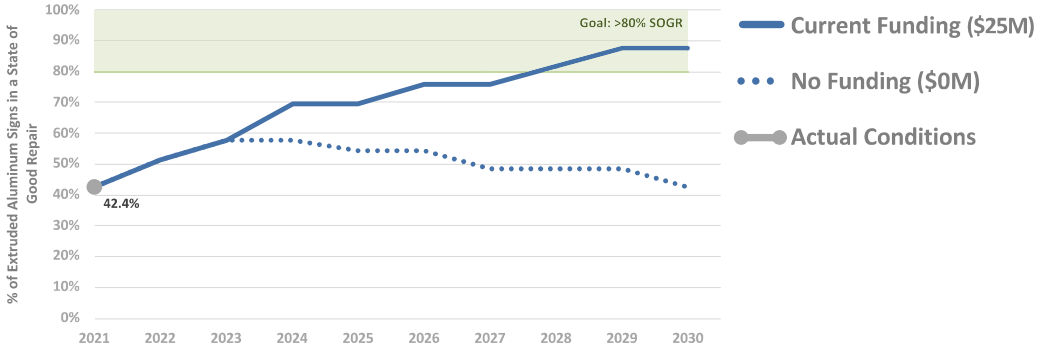
Based on CTDOT 1/12/22 snapshot

Connecticut Transportation Asset Management Plan

Signs

Extruded Aluminum Signs Performance Projections

State Goals by extruded aluminum sign for 8,659 signs



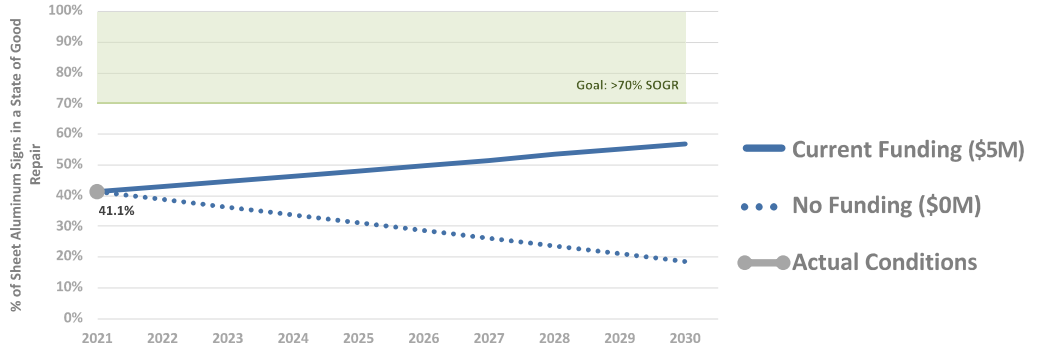
Based on funding as of 12/31/21

Projected Performance at Current Funding Level ($25M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	51.5%	57.6%	69.7%	69.7%	75.8%	80.0%

Sheet Aluminum Signs Performance Projections

State Goals by sheet aluminum sign for 237,998 signs



Based on funding as of 12/31/21

Projected Performance at Current Funding Level ($5M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	42.9%	44.6%	46.4%	48.1%	49.9%	70.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

In order to maintain a State of Good Repair, nearly 500 extruded and 14,000 sheet signs need replacement each year. Currently, approximately 5,000 signs are replaced each year.

Asset Valuation

$182,373,168

Asset value is estimated using the replacement value. For signs, replacement value is the product of square footage and unit construction cost.

Note: This value does not include the cost of overhead sign supports and foundations.

Measures and Goals

There are no Federal requirements at this time. CTDOT has set the following sign condition goals:

State Goals:

- 80% or more of extruded aluminum signs in a SOGR
- 70% or more of sheet aluminum signs in a SOGR

Connecticut Transportation Asset Management Plan

Sign Supports

Data Confidence: Medium

Description

- CTDOT is responsible for maintaining approximately 1,653 overhead sign supports on state maintained roadways
- Sign supports are made up of three categories:
  - 679 Cantilevers
  - 618 Full-Span
  - 356 Bridge Mounted
- CTDOT defines a sign support as the structure (horizontal member(s), post(s) and foundation) carrying sign panels or variable message boards at a single location
- Sign panels attached to the sign support are managed as a separate asset

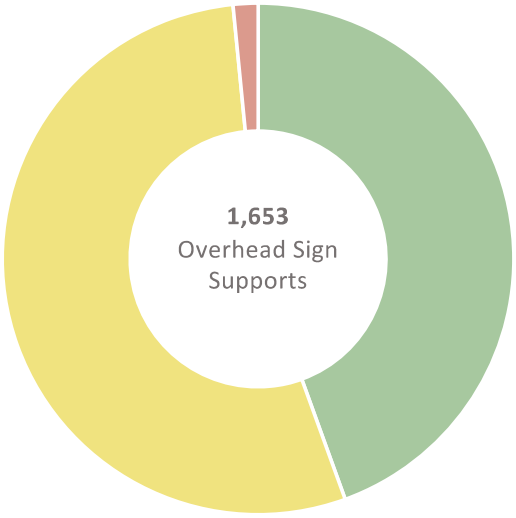
State of Good Repair (SOGR)

Condition ratings are determined via inspection of sign supports on a predetermined cycle. Sign supports with an overall rating of at least a 5 on a 0-9 condition scale are classified as being in a State of Good Repair.

Support Age

- Overhead sign supports are assigned a 34-year service life based on a 17-year sign replacement cycle
- 26.0% (431) of sign supports are 34 years or older.
- 229 sign supports with unknown age were assigned to 1980's based on available imagery from DigitalHIWAY or Google Earth.

Sign Support Inventory and Condition



Good

735 Sign Supports

44.5% are in Good condition

[Condition ratings of 7,8, or 9]

Fair

892 Sign Supports

53.9% are in Fair condition

[Condition ratings of 5 or 6]

Poor

26 Sign Supports

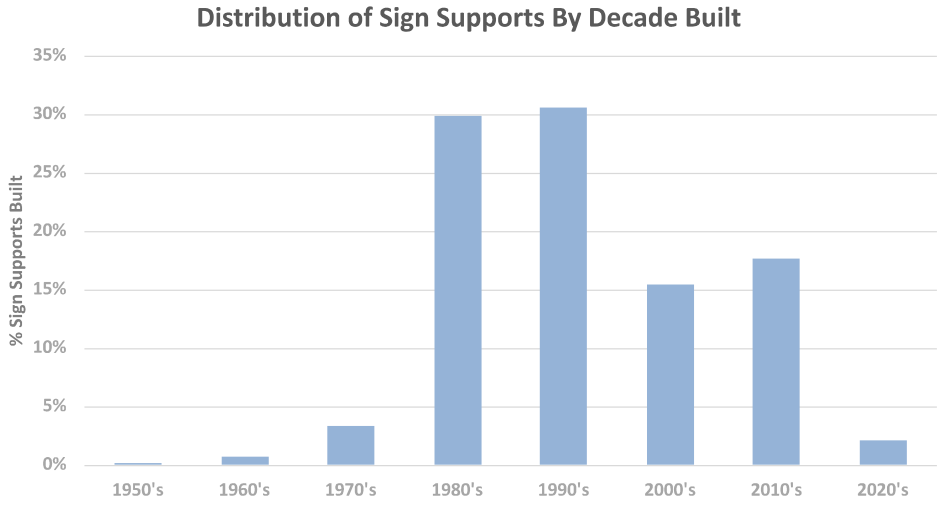
1.6% are in Poor condition

[Condition ratings of 0,1,2,3, or 4]

Good-Fair-Poor and SOGR defined by CTDOT

Based on CTDOT 2/4/22 Snapshot

History



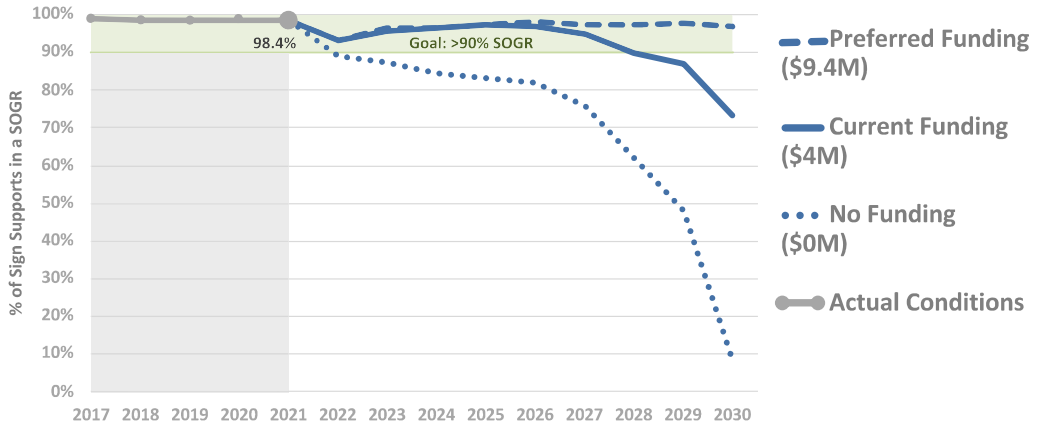
Based on CTDOT 2/4/22 Snapshot

Connecticut Transportation Asset Management Plan

Sign Supports

Sign Support Performance Projections

State Goals by sign support for 1,653 sign supports



Projected Performance at Current Funding Level ($4M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	93.1%	95.7%	96.4%	97.4%	97.1%	90.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

Sign support projections use deterioration curves for the overall structure condition rating. These curves are based on the assigned 34-year service life of sign supports.

Asset Valuation

$294,000,000

Asset value is estimated using the replacement value. For sign supports, replacement value is based on the average unit construction cost by type:
Cantilever $150,000 * 679 = $101,850,000
Full Span $285,000 * 618 = $176,130,000
Bridge Mount $45,000 * 356 = $16,020,000

Note: This value does not include the cost of the sign panels.

Measures and Goals

There are no Federal requirements at this time. CTDOT has set the following sign support condition goal:

State Goal:
- 90% or more of sign supports in a SOGR

Connecticut Transportation Asset Management Plan

Pavement Markings

Data Confidence
Very Low

Description

- CTDOT is responsible for maintaining pavement markings on approximately 3,715 centerline miles of on State maintained roadways
- Pavement Markings include:
  - Line Striping
  - Symbols & Legends (arrows, crosswalks, etc.)
- CTDOT pavement marking applications are either water-based by State forces and Epoxy by Contractor

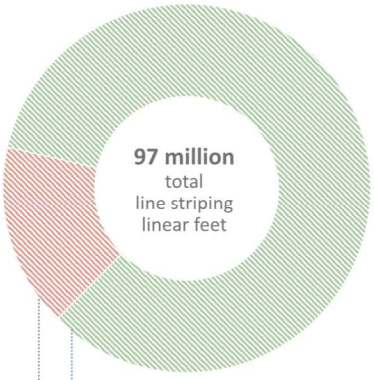
State of Good Repair (SOGR)

In-laid epoxy pavement markings installed within 6 years, epoxy pavement markings installed within the past 3 years and water-based pavement markings installed within 1 year are classified as being in a SOGR. This is based on expectations of retroreflectivity life and wear. Retroreflectivity is a measure of the amount of light reflected by a surface back to the source of the light.

Marking Age

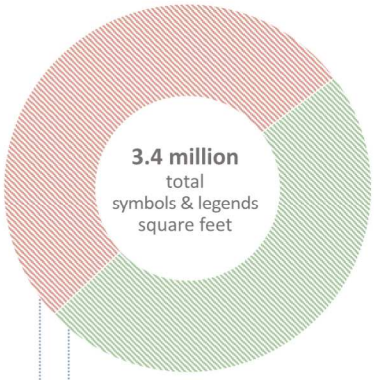
- More than 16% of all line striping and nearly 52% of all symbol and legend pavement markings have exceeded their expected service life.

Pavement Markings Inventory and Condition:
Line Striping and Symbols & Legends



State of Good Repair **81.3 million linear feet**
83.8% of line striping is in a state of good repair

Poor **15.7 million linear feet**
16.2% of line striping is in poor condition



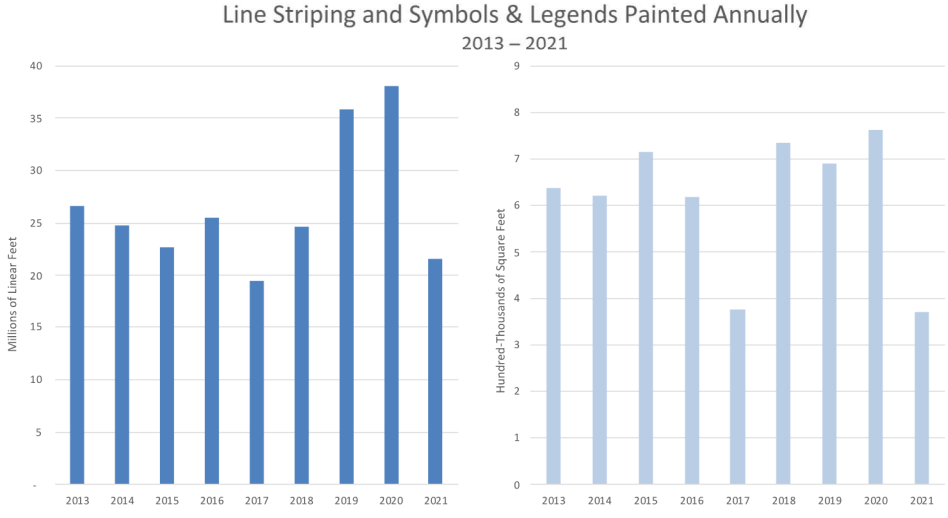
State of Good Repair **1.6 million square feet**
48.2% of symbols & legends are in a state of good repair

Poor **1.8 million square feet**
51.8% of symbols & legends are in poor condition

SOGR defined by CTDOT

Based on CTDOT 12/31/21 Snapshot

History



Line Striping

Symbols & Legends

Based on CTDOT 12/31/21 Snapshot

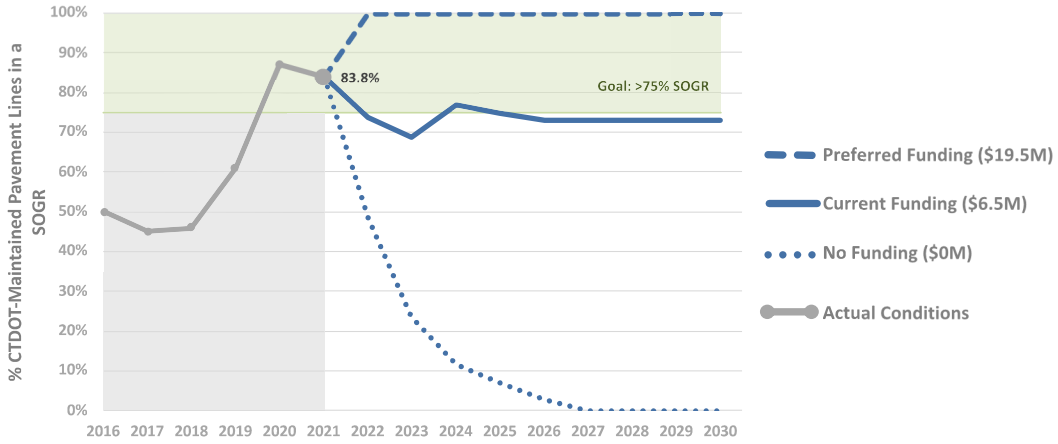
Connecticut Transportation Asset Management Plan

Pavement Markings



Pavement Markings Performance Projections

State Goals by pavement lines for 97 million linear feet of line striping

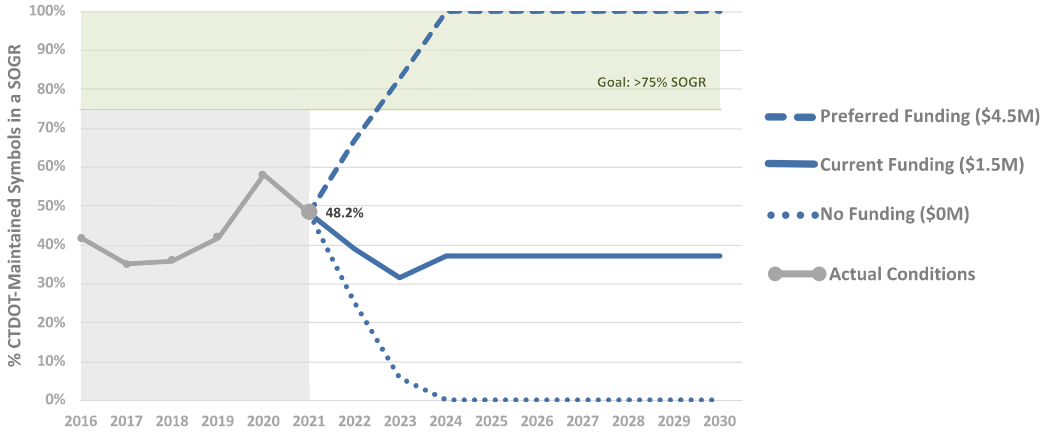


Based on funding as of 12/31/21

Performance Projections at Current Funding Level ($6.5M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	73.7%	68.7%	76.7%	74.8%	73.0%	75.0%

State Goals by pavement symbols for 3.4 million square feet of symbols & legends



Based on funding as of 12/31/21

Performance Projections at Current Funding Level ($1.5M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	39.0%	31.4%	37.3%	37.3%	37.3%	75.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

In order to maintain a State of Good Repair, about 32 million linear feet of line striping and 1.1 million square feet of symbols & legends epoxy pavement markings need to be remarked each year. Currently, approximately 30 million linear feet and 640,000 square feet are remarked each year.

Asset Valuation

$62,916,000

Asset value is estimated using the replacement value method. For pavement markings, replacement value is the product of square footage and unit construction cost considering epoxy only.
Line striping: 97 million LF * $0.50/LF = $48,500,000
Symbols: 3.4 million SF * $4.24/SF = $14,416,000

Measures and Goals

There are no Federal requirements at this time. CTDOT has set the following pavement marking condition goals:

State Goals:

- 75% or more of line striping pavement markings in a SOGR
- 75% or more of symbols & legends pavement markings in a SOGR

Connecticut Transportation Asset Management Plan

Highway Buildings

Data Confidence Medium

Description

- CTDOT defines a highway building as a relatively permanent structure to house persons or property
- CTDOT owns 508 highway buildings classified into four Tiers:
  - Tier 1: significant structures normally occupied by employees or the public
  - Tier 2: salt sheds
  - Tier 3: specialty, storage, and portable office type structures
  - Tier 4: no asset management plan; portable storage containers, buildings managed by other entities or programmed for demolition or sale

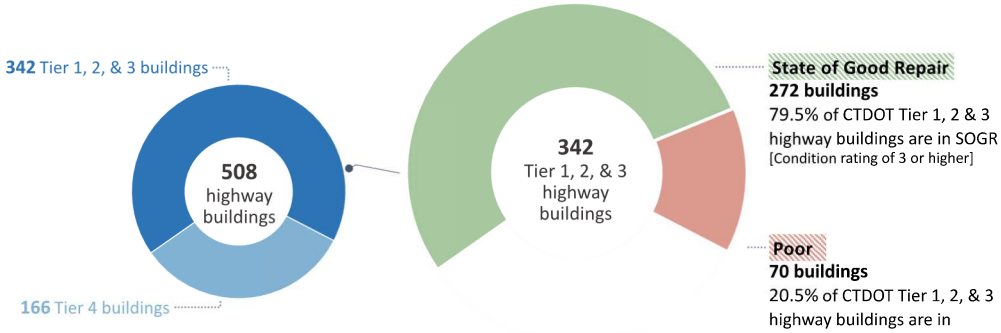
State of Good Repair (SOGR)

- Buildings with an overall rating of 3 or better on a scale of 1-5 are classified as being in a SOGR
- Building ratings are a combination of age-based and condition-based component ratings

Building Age

- Building age is based on the date CTDOT acquired the asset or the date of the last (like new) renovation
- Tier 1 buildings have a 60-year life cycle with a 30-year mid-life SOGR upgrade
- Life cycles and the need for mid-life SOGR upgrades vary for Tier 2 & 3 buildings

CTDOT-Maintained Inventory and Condition



103 Tier I buildings
State of Good Repair : 87.4%
- 73 Maintenance & Repair Facilities
- 17 Rest Area / Weigh Station Facilities
- 13 Administrative Facilities

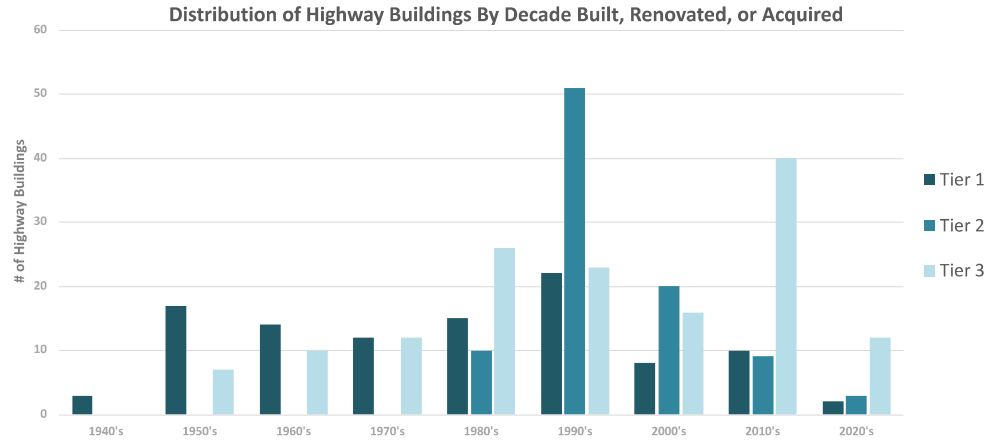
93 Tier 2 buildings
State of Good Repair : 100.0%
- 93 Salt Sheds

146 Tier 3 buildings
State of Good Repair : 61.0%
- 93 Storage Structures
- 51 Portable Office Structures
- 2 Specialty Facilities

166 Tier 4 buildings
State of Good Repair : *Not tracked*
- 90 Portable Storage Containers
- 59 Buildings Managed by Others
- 17 Vacant Buildings Programmed for Demolition or Sale

Based on CTDOT 12/31/21 Snapshot

History



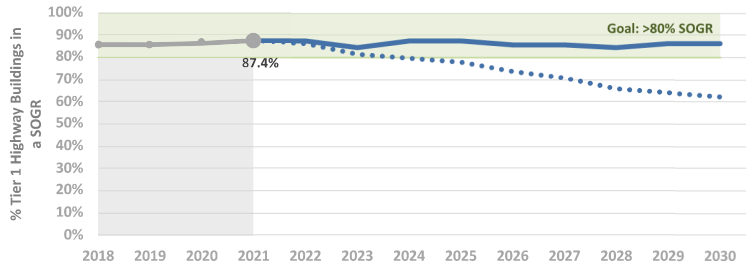
Based on CTDOT 12/31/21 Snapshot

Connecticut Transportation Asset Management Plan

Highway Buildings

Highway Buildings Performance Projections

State Goals by Tier 1 highway building for 103 highway buildings

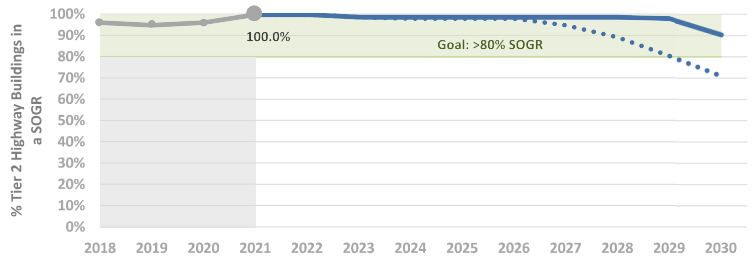


Tanks must be replaced by DEEP Regulation so "No Funding" scenario is not possible for Tier 1.

Tier 1 Performance Projections at Current Funding Level ($56M Average Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	87.4%	84.5%	87.4%	87.4%	85.4%	80.0%

State Goals by Tier 2 highway building for 93 highway buildings

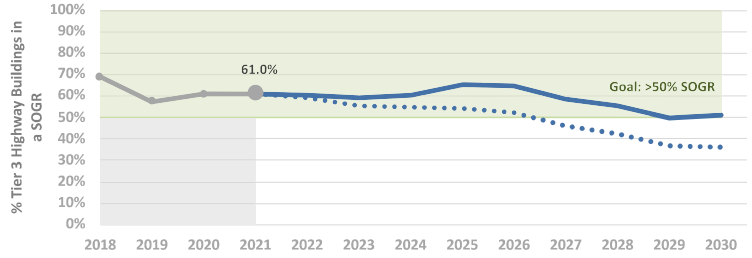


Tanks must be replaced by DEEP Regulation so "No Funding" scenario is not possible for Tier 2.

Tier 2 Performance Projections at Current Funding Level ($550K Average Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	100.0%	98.9%	98.9%	98.9%	98.9%	80.0%

State Goals by Tier 3 highway building for 146 highway buildings



Tier 3 Performance Projections at Current Funding Level ($250K Average Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	60.6%	59.1%	60.2%	65.3%	65.0%	50.0%

Tier 1, 2, and 3 projections based on funding as of 12/31/21

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

Performance projection funding levels are based on the replacement value and include a 1.6 factor to account for non-building related project administration costs for engineering, rights-of-way, and construction incidentals and contingencies.

Asset Valuation

$890,000,000

- Tier 1 buildings: $710M
- Tier 2 buildings: $167M
- Tier 3 buildings: $13M

Asset valuation is the replacement cost of the asset in current year dollars. For buildings, the replacement costs includes any site work necessary for the building to function such as water and sewer systems, generators, and fuel stations as applicable.

Measures and Goals

Federal targets for buildings have not yet been established. The following State Goals have been set:

- Tier 1 buildings: maintain 80% in a SOGR
- Tier 2 buildings: maintain 80% in a SOGR
- Tier 3 buildings: maintain 50% in a SOGR

Connecticut Transportation Asset Management Plan

Illumination

Data Confidence: Medium

Description

- CTDOT owns and maintains a total of 207 lighting systems that include 23,472 light fixtures.
- The majority of lighting systems are located along the roadway network.
- A typical lighting system includes a control cabinet, conduit, conductors, cabinet and light pole foundations, handholes, transformer bases, light poles, light fixture brackets and light fixtures.
- Specialized lighting systems exist for underpasses, tunnels, commuter lots and decorative lighting.

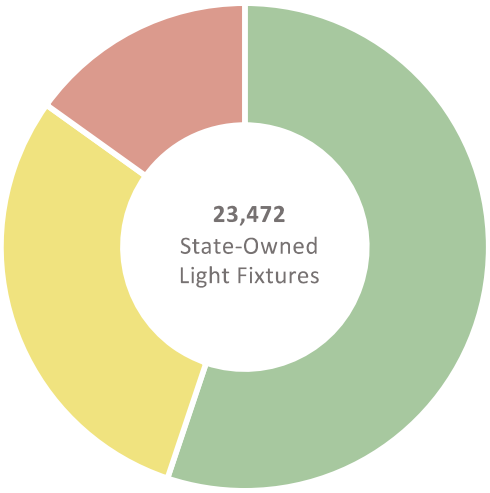
State of Good Repair (SOGR)

- Lighting systems installed within the last 40 years are classified as being in a SOGR.

Asset Age

- Lighting systems and components have an average projected useful life (PUL) of 40 years.
- 15% of light fixtures are beyond the end of their PUL.

CTDOT-Maintained Inventory and Condition



Good

12,942 Light Fixtures

55.1% are in Good condition
(0-30 years old)

Fair

6,985 Light Fixtures

29.8% are in Fair condition
(31-40 years old)

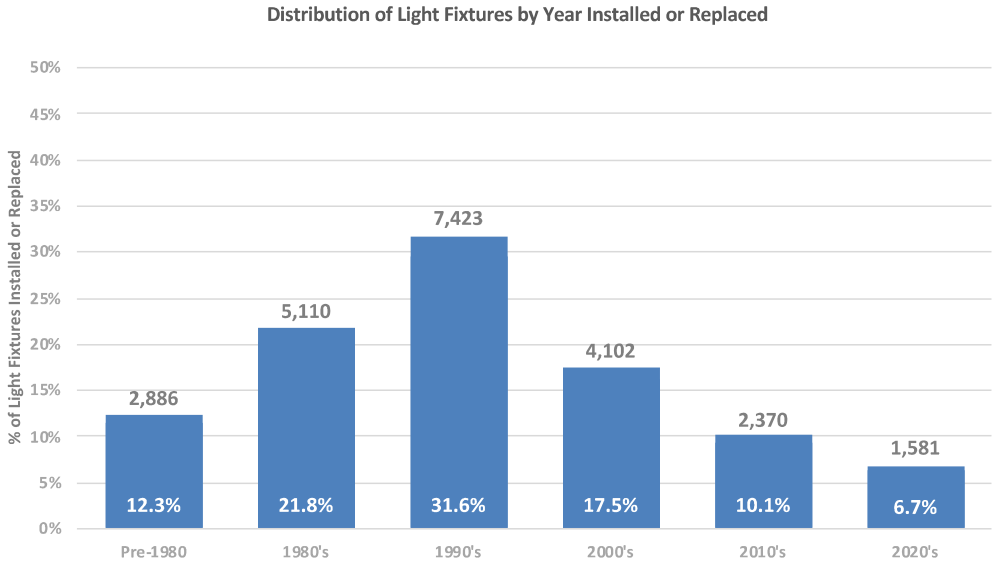
Poor

3,545 Light Fixtures

15.1% are in Poor condition
(41+ years old)

Based on CTDOT 12/31/21 Snapshot

History



Based on CTDOT 12/31/21 Snapshot

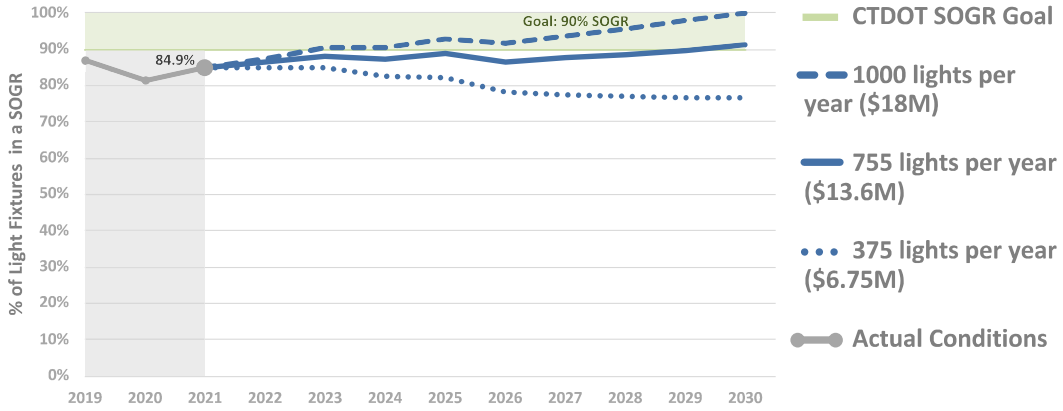
Connecticut Transportation Asset Management Plan

Illumination




Light Fixture Performance Projections

State Goals by Light Fixture for 23,472 Light Fixtures



Performance Projections at Current Funding Level ($13.6M Average Budget)

Year	2022	2023	2024	2025	2026	Goal
SOGR	86.5%	88.3%	87.4%	88.7%	86.4%	90.0%

Projections based on funding as of 12/31/21

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

In order to achieve a SOGR an average of 755 light fixtures need to be replaced each year for approximately 10 years; replacements then drop to an average of 400 lighting fixtures per year to maintain a SOGR. Highway Safety Improvement Projects currently replace an average of 250 light fixtures per year, leaving the remainder to be installed by roadway lighting replacement projects.
The preferred scenario includes approximately 755 signals replaced through illumination specific projects and 250 signals replaced through safety improvement projects.

Asset Valuation

$447,120,000

Asset value is estimated using an average replacement value per lighting system.

207 lighting systems * $2.16M each = $447.1million

Measures and Goals

There are no Federal requirements for illumination at this time. CTDOT has set the following State goal:

- 90% of lighting systems in a SOGR

Connecticut Transportation Asset Management Plan

Retaining Walls

Data Confidence: Low

Description

- CTDOT defines a retaining wall as a structure that provides a grade separation by retaining earth and/or rock.
- CTDOT has currently identified and incorporated 891 retaining walls into its asset database. Plans to capture and rate the remaining wall population are ongoing.
- There are 12 different retaining wall categories.
- Bridge abutments, wingwalls, culvert headwalls and barrier curbs with minor grade differential are considered separate assets.

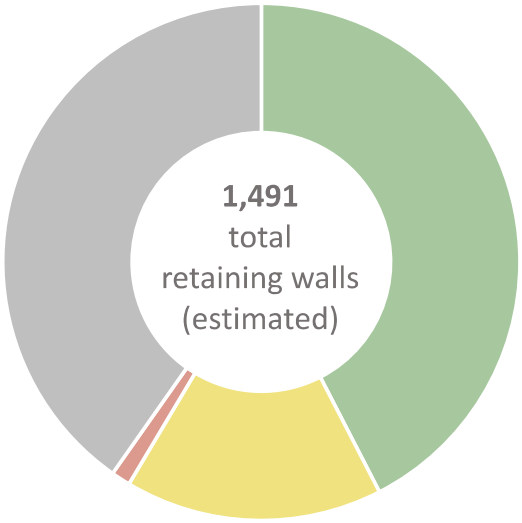
State of Good Repair (SOGR)

Retaining walls with an overall rating of at least a 3 on a 0-6 condition scale are classified as being in a State of Good Repair.

Retaining Wall Age

While there is limited data available on life expectancy of retaining walls, empirical evidence indicate life expectancy ranging from 50 years (for Metal Bin walls or Concrete Crib walls) to well over 100 years (for Masonry walls).

CTDOT-Maintained Inventory and Condition



Good

633 Retaining walls

71.0% are in Good condition

[Condition ratings of 5 or 6]

Fair

240 Retaining walls

27.0% are in Fair condition

[Condition ratings of 3 or 4]

Poor

18 Retaining walls

2.0% are in Poor condition

[Condition ratings of 0, 1, or 2]

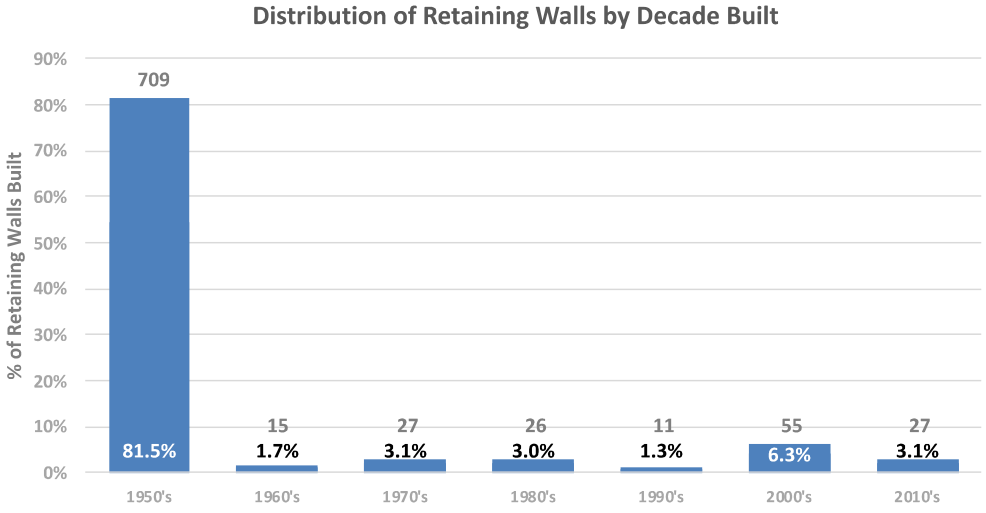
Unknown

600+ Retaining walls

Good-Fair-Poor and SOGR defined by CTDOT

Based on CTDOT 2010 inventory, with 2021 updates

History



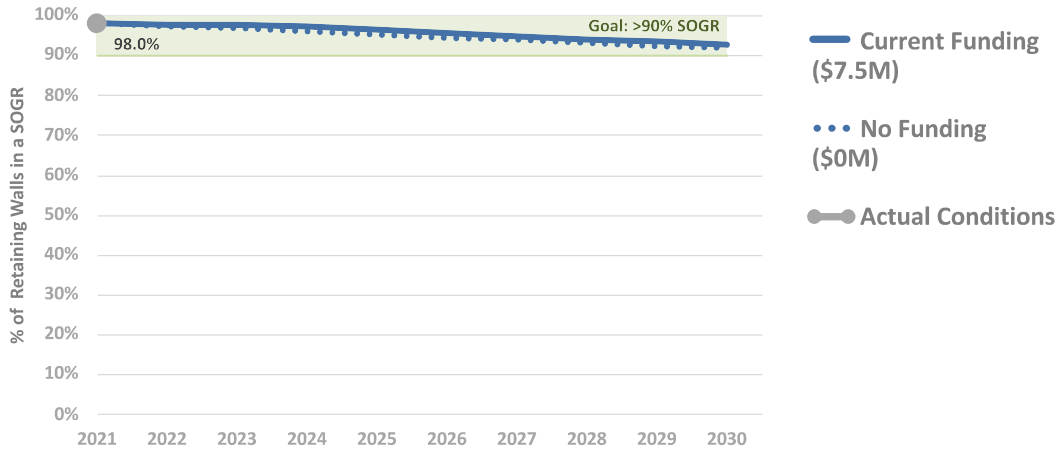
Based on CTDOT 2010 inventory

Connecticut Transportation Asset Management Plan

Retaining Walls

Retaining Walls Performance Projections

State Goals by retaining wall for 891 retaining walls



Based on CTDOT 2010 inventory, with 2021 updates

Projected Performance at Current Funding Level ($7.5M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	97.8%	97.6%	97.3%	96.4%	95.6%	90.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

The projections assume the CTDOT retaining wall fund invests in improvements to walls 60+ yrs old. Current data shows that concrete (cantilever, gravity) and masonry walls (50% of inventory) are in better condition compared to concrete crib and metal bin walls (3% of inventory). This inventory ratio is expected to change once the full retaining wall inventory is completed.

Asset Valuation

$249,819,000

Asset value is estimated using an average replacement cost per retaining wall unit area. For retaining walls, the average unit cost to replace a wall is estimated to be $110/sf. For 891 retaining walls with 2,271,076 sq ft (total average area) x $110/sq ft = $249,818,580

Measures and Goals

There are no Federal requirements at this time. CTDOT has set the following retaining wall condition goal:

State Goal:

- 90% or more of retaining walls in a SOGR

Connecticut Transportation Asset Management Plan

Drainage Culverts

Data Confidence Low

Description

- CTDOT is responsible for a complex drainage system including storm drains, manholes, closed conveyance pipes, culverts, headwalls, and endwalls.
- Culverts convey watercourses or stormwater runoff underneath state roads. In Connecticut, the majority of culverts are reinforced concrete pipes (RCPs) or corrugated metal pipes (CMPs). CMPs can have asphalt coating.
- Culverts over 6' in diameter are considered bridge structures and are inspected and tracked as bridges. Culverts smaller than 6' in diameter (<72" horizontal dimension for box culverts) are considered drainage culverts.

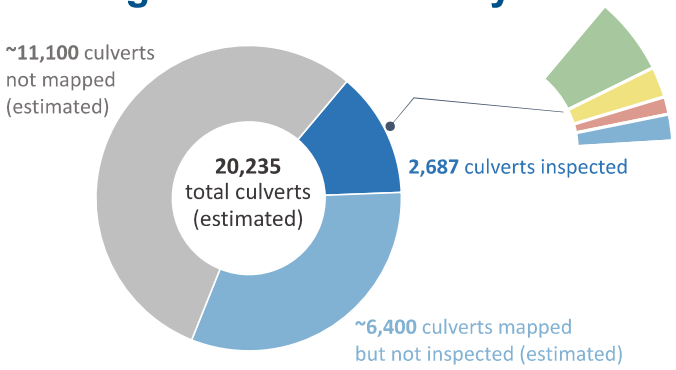
State of Good Repair (SOGR)

A culvert which has been rated Fair or Good is classified as being in a State of Good Repair (SOGR). This rating is based on the Culvert Condition Rating Assessment developed by the CTDOT Office of Environmental Planning.

Drainage Culvert Age

The average drainage culvert in the CTDOT network is 62 years old. The average drainage CMP in the CTDOT network is 59 years old.

Drainage Culvert Inventory and Condition



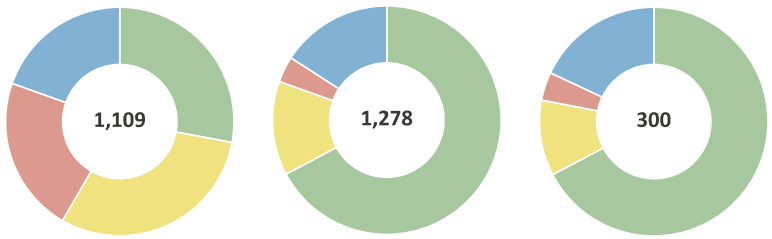
Good
1,370 Culverts
61.9% are in Good condition

Fair
540 Culverts
24.4% are in Fair condition

Poor
304 Culverts
13.7% are in Poor condition

Unable to Assess
473 Culverts

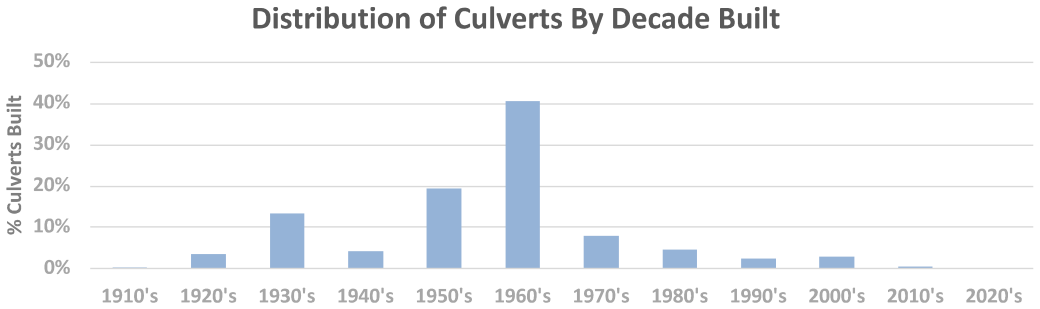
Inspected Culvert Inventory and Condition by Material



	Corrugated Metal Pipe	Reinforced Concrete Pipe	Other Materials
Good	**310** (34.8%)	**858** (79.7%)	**202** (82.1%)
Fair	**337** (37.7%)	**171** (15.9%)	**32** (13.0%)
Poor	**245** (27.5%)	**47** (4.4%)	**12** (4.9%)
Unable to Assess	217	202	54

Based on CTDOT 12/31/21 Snapshot

History



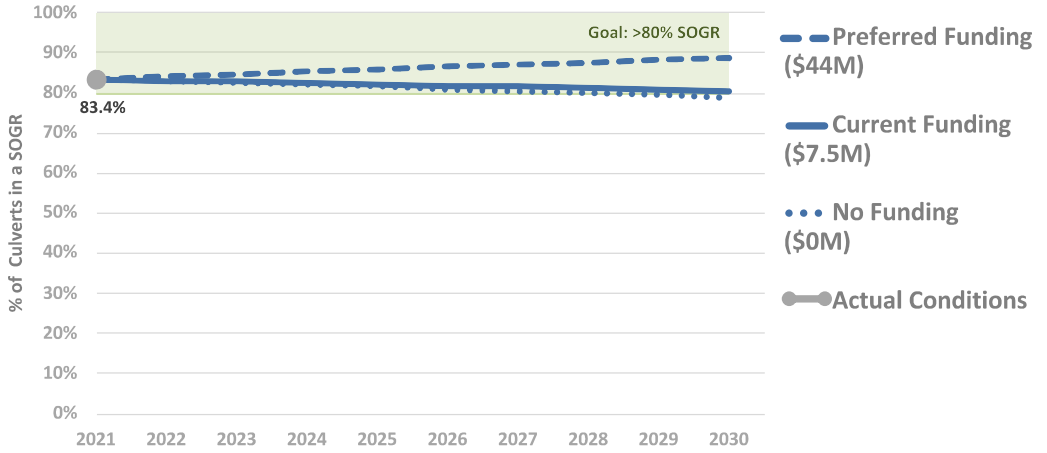
Based on CTDOT 12/31/21 Snapshot

Connecticut Transportation Asset Management Plan

Drainage Culverts

Drainage Culvert Performance Projections

State Goals by drainage culvert for 2,687 culverts



Based on funding as of 12/31/21

Projected Performance at Current Funding Level ($7.5M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	83.1%	82.8%	82.5%	82.2%	81.8%	80.0%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

Culvert performance projections were created using very limited data from culverts that had both age and condition data associated with them.

Asset Valuation

$2,708,657,000

Asset value is estimated using the replacement value. For 20,235 estimated culverts, replacement value is 20,235 * 276 sq ft of pipe * $485 per sq ft of pipe = $2,708,657,100

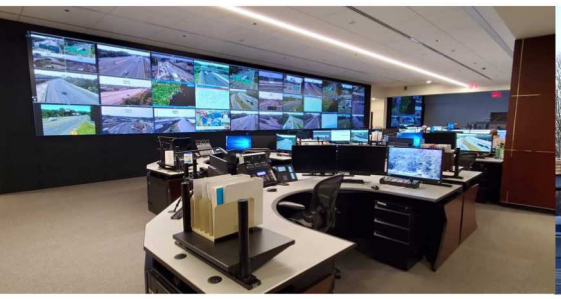
Measures and Goals

CTDOT has not determined measures and targets for culverts at this point.

Connecticut Transportation Asset Management Plan

Intelligent Transportation Systems: ATMS

Data Confidence High



Description

- CTDOT currently owns and maintains a total of 545 Advanced Traffic Management System (ATMS) field devices.
- ATMS field devices are comprised of 362 Closed Circuit Television Cameras (CCTV), 143 Variable Message Signs (VMS), and 40 Roadway Weather Information Systems (RWIS)
- ATMS field devices relies on Operation Centers, Fiber Hubs, and Video Data Transport that are tracked as part of the Highways Buildings Asset.
- ATMS field devices also relies on servers, software, central equipment, and 244 miles of fiber optic cable trunkline to communicate to ATMS field devices. These assets are being evaluated and will be considered for future updates.

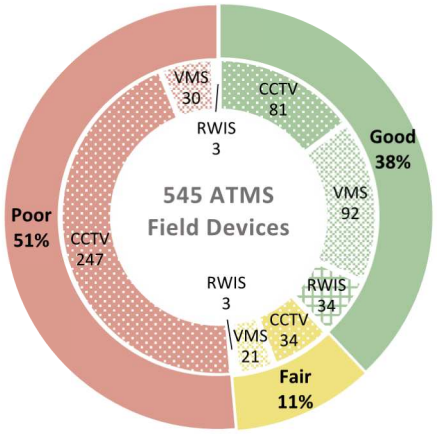
State of Good Repair (SOGR)

- ATMS field devices installed within the last 10 years are classified as being in a SOGR.

Asset Age

- ATMS field devices have an average projected useful life (PUL) of 15 years.
- 51% of ATMS field devices have aged beyond their PUL.

CTDOT-Maintained Inventory and Condition



Good

207 ATMS Field Devices

38.0% are in Good condition (0-10 years old)

CCTV VMS RWIS

Fair

58 ATMS Field Devices

10.6% are in Fair condition (11-15 years old)

CCTV VMS RWIS

Poor

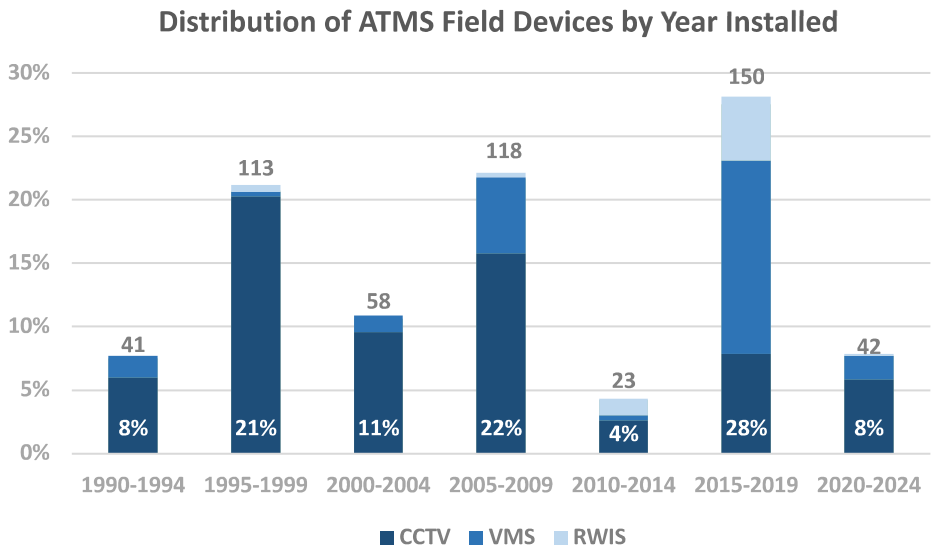
280 ATMS Field Devices

51.4% are in Poor condition (16+ years old)

CCTV VMS RWIS

Based on CTDOT 1/8/22 Snapshot

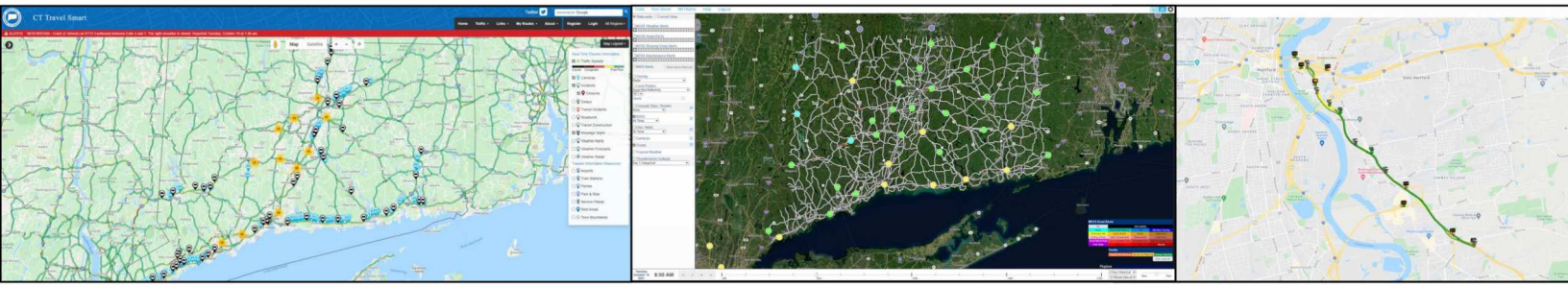
History



Based on CTDOT 1/8/22 Snapshot

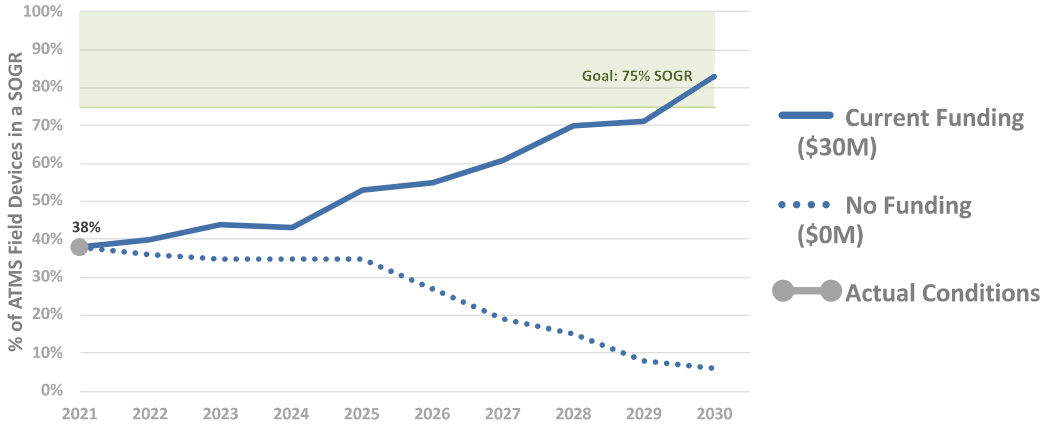
Connecticut Transportation Asset Management Plan

Intelligent Transportation Systems: ATMS



ITS: ATMS Performance Projections

State Goals by ATMS field device for 545 ATMS field devices



Based on funding as of 1/3/22

Projected Performance at Current Funding Level ($30M Budget)

End of Year	2022	2023	2024	2025	2026	Goal
SOGR	40.0%	44.0%	43.0%	53.0%	55.0%	75%

NOTE: "Current Funding" shown in the graphs is limited to funding programed to address State of Good Repair. Projected performance is expected to be greater due to asset improvements funded through CTDOT's Capital Program which are not captured. The Department will soon be able to capture this funding through a project asset data system in development.

Performance Projections

In order to achieve a SOGR of above 75% within 10 years, Highway Operations has been approved for 9 projects that will replace an average of 25 ATMS field devices per project and install new 12 ATMS field devices per project.
Highway Operations projects currently replace an average of 20 ATMS field devices per year, leaving the remainder to be installed by other various projects.

Asset Valuation

$168,000,000

Asset value is estimated using an average replacement value per ATMS field device. Asset value does not include the cost for communication network, hardware, software, or portable ATMS field devices.

362 CCTV* $0.25M each
143 VMS* $0.5M each
40 RWIS* $0.15M each
Total = $168 M

Measures and Goals

There are no Federal requirements for ATMS field devices at this time. CTDOT has set the following state goal:

- 75% of ATMS in a SOGR