

2019 Sustainability Report

Progress and Headwinds

July 2020

m DEPARTMENT OF
TRANSPORTATION

July 2020



At MnDOT, as we address the urgent needs of today, we also must continue building for the future.

We will recover from the catastrophic impacts of COVID-19 and we will confront the systemic racism that has been a stain on our state for far too long. As we recover and rebuild, we have the opportunity to position Minnesota as a leader.

As we transition to a new climate economy, we have an unique opportunity to promote economic and environmental resilience and sustainability. The MnDOT 2019 Sustainability Report, our fourth installment, highlights some of the ways that MnDOT is supporting this transition.

In many ways, 2019 was marked by new partnerships to support sustainability and public health at MnDOT, highlighted by the Pathways to Decarbonizing Transportation project. Pathways was a multi-agency effort to engage Minnesotans on how they wanted the transportation sector to evolve in the future, improve mobility and transportation options, and reduce carbon pollution to meet state emission reduction goals. The process led to a series of agency actions, including new incentives for electric vehicles and the creation of an advisory council made up of business and community leaders, and elected officials, to advise the agency on how to reduce carbon pollution from transportation in the future.

MnDOT also created a number of new internal partnerships, many of which are shared in the “District in the Spotlight” sections of the report. These stories are some just of the terrific examples of the ingenuity and commitment to the agency vision that exists throughout the agency and across the state.

Other progress that MnDOT achieved in 2019 includes:

- Reducing energy consumption per square foot by 17 percent between 2008 and 2019

- Leading a competitive request for proposal for community solar garden subscriptions that will save MnDOT more than \$1.5 million and account for almost 25 percent of total agency electricity use
- Increasing the number of agency electric vehicles from four to 29
- Exceeding our goal in the 2018-2019 winter season for reducing salt usage

As much ground that we gained in 2019, we also experienced some setbacks:

- Carbon pollution from transportation in Minnesota continued to increase between 2018 and 2019. This is attributed to low gas prices, increased freight traffic, people driving more miles, and more purchases of low-fuel efficiency pick-up trucks and SUVs.
- MnDOT used more fuel in our fleet vehicles in 2019, mostly in plow trucks to manage snow and ice. Compounding the problem, the state experienced more multi-day snow and ice events than in recent years.
- The agency is seeing a trend towards using less native seeding on projects in recent years.

As you will see as you read this report, we have made important progress but we have substantial work ahead. I am thankful for our team and many partners as we build a MnDOT that keeps Minnesotans moving and does our part to turn the tide on climate change for future generations.

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Transportation and climate change

Transportation is the #1 emitter of greenhouse gas (GHG) emissions in Minnesota. In 2016, Minnesota generated 154.2 million tons of CO₂e with 40.3 million tons of CO₂e (26%) coming from the transportation sector. Carbon dioxide equivalent (CO₂e) is a single unit that combines the impact of each different greenhouse gas in terms of their global warming potential. While transportation emissions declined by 8% between 2005 and 2016, transportation sector emissions declined less than other sectors and became the leading source of GHG emissions in Minnesota starting in 2016 (Figure 1)¹. 2019 data is not yet available, but preliminary estimates show the transportation sector continued to be the leading emitter through 2018².

MnDOT is committed to reducing GHG emissions from the transportation sector. Minnesota Statute 174.01 includes the following transportation sector goals that MnDOT is responsible for achieving:

- 10) ensure the planning and implementation of all modes of transportation are consistent with the environmental and energy goals of the state
- 11) promote and increase the use of high-occupancy vehicles and low-emission vehicles
- 13) increase use of transit as a percentage of all trips statewide by giving highest priority to the transportation modes with the greatest people-moving capacity and lowest long-term economic and environmental cost
- 15) reduce GHG emissions from the state's transportation sector
- 16) accomplish these goals with minimal impact on the environment

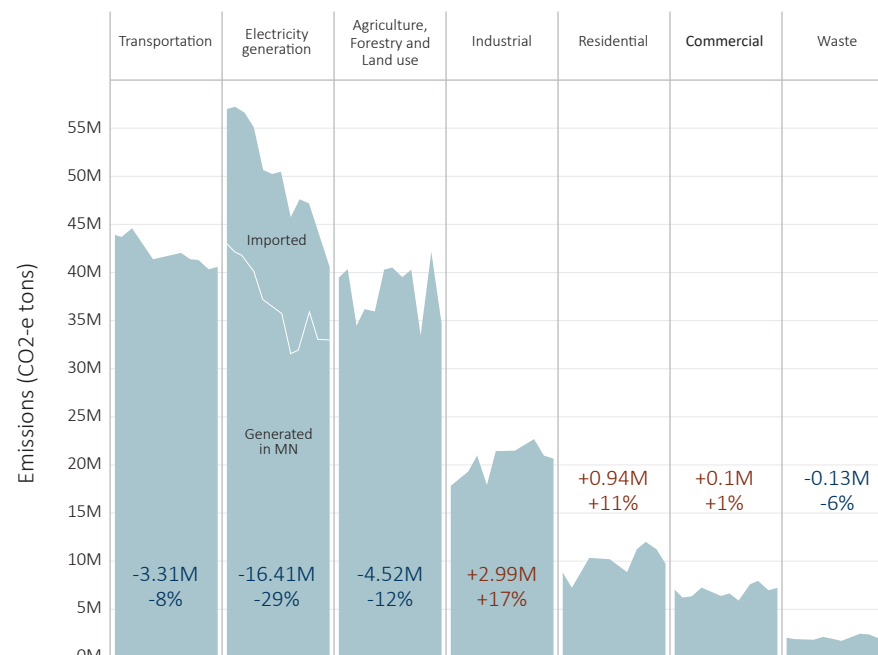
In addition to generating GHG emissions, the transportation sector is already being impacted by climate change and those impacts are expected to increase as Minnesota is predicted to see more extreme weather as it gets warmer and wetter.

¹ MPCA, *Greenhouse Gas Emissions in Minnesota, January 2019*

² Rhodium, 2018 State Comparison

In 2017, MnDOT set a goal to reduce greenhouse gas emissions from the transportation sector to 29.5 million tons CO₂e by 2025.

Figure 1. GHG emissions by sector in Minnesota (2005-2016)



Sustainability reporting history & purpose

The annual MnDOT Sustainability Report is developed by the agency's Office of Sustainability and Public Health (OSPH). OSPH has four key focus areas:

1. Reduce transportation sector GHG emissions,
2. Promote agency sustainability,
3. Improve resilience of the transportation system, and
4. Promote public health.

The first [MnDOT Sustainability Report \(2016\)](#) created measures and targets that agency leaders used to track progress towards achieving sustainability goals in the Governor's Executive Orders, the Next Generation Energy Act (NGEA), and MN Statute 174.01. Subsequent reports expanded on the original reporting and have been used to inform strategic direction towards state and agency sustainability goals.

The 2019 Report is entitled "Progress and Headwinds" because a number of our sustainability efforts demonstrated leadership and made progress towards agency goals. There were also measures where MnDOT did not make progress and, in some cases, measures moved in the wrong direction. Where we understand the reasons for our "progress and headwinds," they are shared in the report. For measures where the cause of progress or headway is less clear, we will investigate and include more explanation in future reports.

In addition to highlighting our annual progress, the report also includes the following new sections:

- Describes early work to promote connections between transportation, sustainability, and public health
- Outlines the MnDOT-led effort: Pathways to Decarbonizing Transportation
- Provides a planning process to help staff develop action steps to make progress on sustainability goals

What is public health and how does it relate to transportation?

In 2019, OSPH met with 33 groups and more than 300 people to identify strategies to advance public health and transportation. Staff facilitated group discussions with 33 groups and coded the results to understand broad themes and patterns that emerged. Participants included MnDOT staff and external stakeholders from other state departments, municipal governments, transit providers, hospitals, and the University of Minnesota. OSPH used the stakeholder feedback to create a workplan for 2020 that includes the following:

- Increase staff resources for public health and transportation
- Evaluate implementation of complete streets policy on MnDOT projects and identify opportunities to improve or expand use
- Develop narratives to describe the connection between public health and transportation
- Strengthen partnerships with the Minnesota Department of Health and other public, private, and nonprofit partners to support public health and transportation

MnDOT is leading by example

Agency sustainability targets are driven by state statutes and policies. In addition to Minnesota State Statute 174.01, Executive Orders 19-27 and 19-25 establish goals for MnDOT to reduce internal agency emissions. Executive Order 19-27 requires MnDOT to report and make progress on six sustainability goals:

- **Reduced Fleet Fossil Fuel Consumption:** 30% reduction of state fleet consumption of fossil fuels by 2027 relative to a 2017 adjusted baseline
- **Reduced Water Consumption:** 15% reduction of water use by 2025 relative to a 2017 adjusted baseline
- **Sustainable Procurement:** 25% of total spend on priority contracts are sustainable purchases by 2025
- **GHG Emissions:** 30% reduction of GHG emissions by 2025 relative to a 2005 calculated baseline
- **Energy Consumption:** 30% reduction in consumption of energy per square foot by 2027 relative to a 2017 adjusted baseline
- **Reduce Solid Waste:** 75% combined recycling and composting rate of solid waste by 2030

Executive Order 19-25 provides requirements for energy and water reduction at agency facilities. For example, it requires MnDOT to develop a schedule to systematically improve the operational efficiency of existing agency facilities.

In 2016, MnDOT voluntarily set ambitious GHG emissions reduction targets. The targets and 2019 results are summarized in Table 1.

Table 1. MnDOT GHG Emissions Reduction Targets

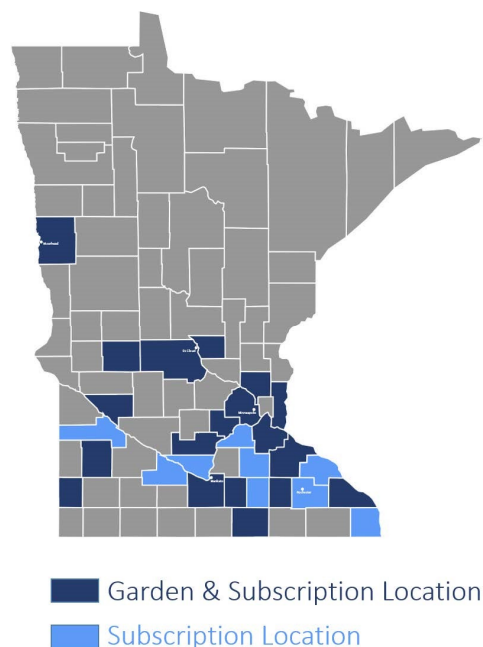
Metric	Target (2025)	Results
Facilities Total annual GHG emissions generated from energy used by MnDOT owned and/or occupied facilities	27,778 metric tons CO ₂ e	28,388 metric tons CO ₂ e
Fleet Total annual GHG emissions generated from fuel used by the MnDOT-owned fleet	26,500 metric tons CO ₂ e	49,918 metric tons CO ₂ e

The following activities are examples of MnDOT sustainability work in 2019 to make progress toward GHG emissions targets for agency operations:

Solar Community Solar Garden Subscription

In October 2019, MnDOT entered into two 25-year agreements with local solar companies to purchase a total of 7.4 million kilowatt-hours annually from community solar gardens (CSG) located throughout Minnesota. This is equivalent to approximately 24% of agency total annual electricity use. The agency subscribed to 23 community solar gardens developed and owned by the solar vendors. The solar gardens will generate clean, renewable energy and provide energy savings to MnDOT in 18 counties (Figure 2). Six of the solar gardens should be online by early 2020. MnDOT did not purchase the renewable energy credits (RECs), so the subscriptions do not count towards reported GHG emission reduction goals. However, they will save money and support the health of people, the environment, and our economy in Minnesota.

Figure 2. Map of community solar garden locations and MnDOT facilities



Light Duty Fleet Selector Tool

In 2019, MnDOT developed a tool that helps staff select electric options when replacing cars, SUVs, and mini-vans in the MnDOT fleet. The tool recommends plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) with equivalent or lower total cost of ownership than comparable internal combustion engine vehicles. While PHEVs/EVs have higher upfront costs, they offer lower operating and maintenance costs than internal combustion engine vehicles because electricity is much less expensive than gasoline and EVs need very little maintenance.

Electric Vehicles and EV Chargers

In 2019, MnDOT purchased Level 2 EV chargers at facilities in 7 of the 8 MnDOT District around the state and purchased 20 Mitsubishi Outlander PHEVs and 4 Chevy Bolt BEVs. The investment helps MnDOT make progress towards agency goals and realize additional outcomes:

- Support travel by EV for MnDOT staff to make progress towards state and agency goals to reduce emissions and fossil fuel use
- Reduce fleet operating costs since many EVs have a lower total cost of ownership than gasoline-powered equivalent vehicles
- Promote Minnesota as an employer of choice by highlighting and using new technologies in ways that are visible to visitors and employees

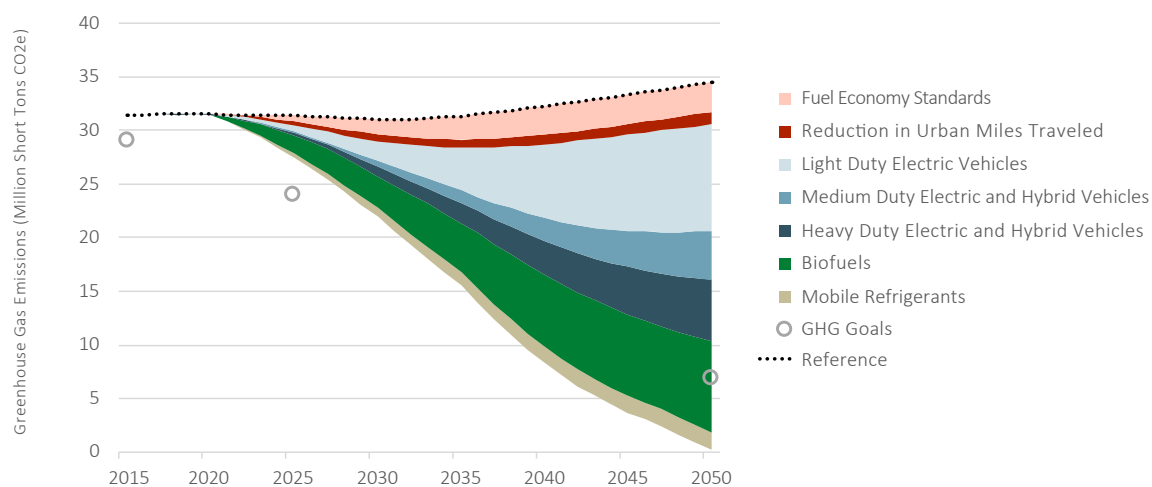
MnDOT has a role to play in Decarbonizing Transportation

In 2007, Minnesota passed the bi-partisan Next Generation Energy Act that established goals for the state to reduce GHG emissions by 15% below 2005 levels by 2015, 30% by 2025, and 80% by 2050. The state did not meet our 2015 goal and we are not on track to meet our future goals. Transportation is now the largest emitter of GHGs in the state. To achieve our GHG reduction goals, state-level action is needed and there are many opportunities for immediate action in the transportation sector.

Pathways was a collaboration between MnDOT, the Environmental Quality Board, Minnesota Pollution Control Agency, Minnesota Department of Agriculture, and the Minnesota Department Commerce. Pathways explored opportunities to reduce GHG emissions from passenger cars and trucks, medium-duty and heavy-duty trucks, buses, motorcycles, and mobile air conditioning (Figure 3). The goal was to identify a series of strategies to get us on track to meet the state GHG emission reduction goals.

The Pathways project generated a set of recommendations and actions. Efforts to decarbonize transportation must go beyond a single policy, effort, or agency and will impact other sectors as well, particularly agriculture and electricity generation. Participants were also clear that solutions must focus on equity and environmental justice.

Figure 3. Emission reductions by measure, 80 x 50 scenario



Build EV Market and provide more EV options: The public and Minnesota's largest employers viewed the lack of EV options available for purchase in Minnesota as a major barrier to EV adoption. There was also dismay about weakening fuel economy standards by the federal government.

- Recommendation: Adopt low-emission vehicle (LEV) and zero-emissions vehicle (ZEV) standards that requires car companies to offer more EVs for sale in Minnesota

Promote biofuels to reduce GHG emissions and support rural Minnesota:

Biofuels are important for Minnesota and increased use of biofuels is needed to achieve the state's NGEA GHG goals.

- Recommendation 1: Strengthen the state's existing petroleum replacement goals
- Recommendation 2: Expand biofuel infrastructure to allow more biofuel use and higher biofuel blends

Fund EV infrastructure: There was lots of support for state policies to fund more EV infrastructure around the state.

- Recommendation: pilot funding to support investment in clean transportation around the state

Starting November 1, 2019, residents who purchase or lease a new or used EV will receive a one-time credit of up to \$250 for MnPASS, allowing them to drive in the express lane when traffic is heavy. The three-year pilot program is aimed at people who may be on the fence about choosing an EV or a plug-in hybrid as their next car and gives them yet another reason to make the switch to cleaner transportation.

Fund EV infrastructure: There was lots of support for state policies to fund more EV infrastructure around the state.

- Recommendation: Create a funding pilot program to support Clean Transportation investment

Provide EV incentives: Participants supported financial and nonfinancial incentives to increase EV adoption in Minnesota, especially for passenger vehicles. Incentives help offset the higher cost of an EV compared to a conventional internal combustion vehicle.

- Action: Create a MnPass incentive to encourage people to purchase EVs

Provide more transportation options: Public comments supported actions that reduce vehicle miles traveled to reduce GHG emissions and increase health, equity, and safety benefits that come from more walkable and bikeable communities.

- Action: Analyze GHG emissions in transportation projects

Sustainable Transportation Advisory Council

The Sustainable Transportation Advisory Council (STAC) will make recommendations to the MnDOT Commissioner to reduce carbon pollution from transportation, consistent with the statutory goals and prioritize recommendations that value equity and environmental justice. The STAC includes 22 leaders from the public, private, and nonprofit sectors, and legislators, and is co-chaired by MnDOT Commissioner Margaret Anderson Kelliher and Xcel President for Minnesota and the Dakotas Chris Clark. Members were appointed in January 2020 and will submit an annual report of recommendations by December each year.

Metric	Target	Results	Trend	Analysis
Greenhouse Gas Emissions Annual total CO ₂ e emissions generated by the Minnesota transportation system	29.5 million tons CO ₂ e 2025	42.1 million tons CO ₂ e 2018		In 2018, transportation GHG emissions continued to increase in Minnesota. This is attributed to low gas prices, increased freight, people driving more miles, and increased purchases of low-fuel efficiency pick-up trucks and SUVs.
Vehicle Miles Traveled (VMT) Total number of vehicle miles traveled in Minnesota each year	TBD - decrease	60.4 billion miles 2018		VMT continued to increase in Minnesota over the last three years, which contributes to more GHG emissions. Higher use of single occupancy vehicles, higher housing costs, and a disconnect between jobs and transit access are likely contributors.
Per Capita Vehicle Miles Traveled Total number of vehicle miles that the average Minnesotan travels per year	TBD - decrease	10,780 2018		Two key factors affect VMT: the number of drivers and the distance people drive. Between 2016 and 2018, the population in Minnesota increased by 1.7% and per capita VMT rose by 1.1%.
Electric Vehicles Cumulative number of EV registrations in Minnesota	20% of all light duty vehicles by 2030	<1% 12,750		EV registrations increased by 37% between 2018 and 2019. At the end of 2019, there were 12,750 registered in Minnesota. More than 1 million additional EVs are needed in the next 10 years to achieve the state goal.
Ethanol Use Estimated annual ethanol consumption in Minnesota	TBD - increase	27,580 billion BTUs		Ethanol has the potential to reduce carbon emissions in liquid transportation fuels and use increased by 7% between 2013 and 2017. Data from the federal Energy Information Agency are provided for illustrative purposes only. Future reporting will align with data from the Governor's Council on Biofuels.

Transportation Options

Progress

MnDOT is committed to supporting multimodal transportation options, including active transportation, transit, and high-occupancy vehicles.

The Sustainable Transportation Advisory Council will develop recommendations which are expected to include actions that reduce VMT. By December 2020, the agency expects to have new metrics and key goals for measuring success in this area.

Ongoing Activities

- **Demonstration projects:** MnDOT and partners implement and evaluate demonstration projects to improve walking and biking in communities statewide.
- **Education and encouragement:** MnDOT provides education and encouragement to students on safe walking and bicycling through the Safe Routes to School program.
- **Counting people walking and bicycling:** The MnDOT walking and bicycling count program collects data and information to inform state, regional, and local planning and engineering.
- **Market and promote Greater Minnesota transit:** Promotes transit in Greater Minnesota by identifying and funding specific marketing needs of seven transit system providers in southwest Minnesota.
- **Bikeable community workshops:** MnDOT partners with the Minnesota Department of Health and Bicycle Alliance of Minnesota to host Bikeable Community Workshops with communities interested to advance safe active transportation networks.
- **Bicycle facility design training:** MnDOT will develop and implement training for staff to help implement bicycle facility design on state roadways.

District in the Spotlight

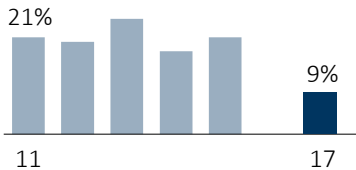
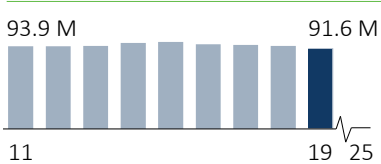
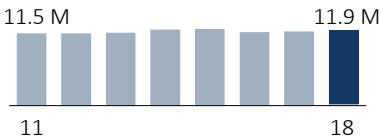
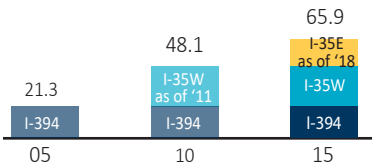
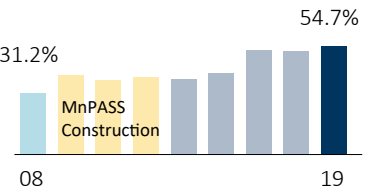
District 1 Advances Complete Streets

The Complete Streets approach is one tool MnDOT uses to provide multimodal transportation options. Project management teams assess the context of each highway project to address the needs of all transportation users, including people walking, biking, and using transit.

MnDOT District 1 used a Complete Streets approach to the Hwy 135 reconstruction project in Biwabik. The City of Biwabik created a Main Street Project Task Force comprised of citizens, city councilors, and city staff. MnDOT worked with the task force to support their vision: to create a welcoming downtown with a sidewalk and amenities that encourage visitors to explore. Project Manager, Brian Larson, included narrower highway and parking lanes in the new design to calm traffic, increase the safety of people walking and biking, and provide space for lighting, landscaping, benches, and bike racks.



Rendering of the reconstruction along Hwy 135 in Biwabik, MN

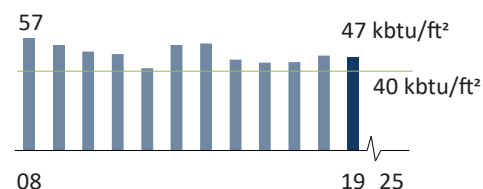
Metric	Target	Results	Trend	Analysis
Frequency of Bicycling Percentage of survey respondents who biked at least once a week	No target	9% 2017		The big decrease in 2017 is due to a change in the survey question from at least once a week between April and October to daily/few times per week year round.
Transit Ridership in the Twin Cities Boardings reported by public transit providers serving metro-area counties	145-150 million 2030	91.6 million		Twin Cities transit ridership was down again in 2019 due in part to more auto usage, lower gas prices, and the impact of emerging travel options like ride-hail services, bike share, and scooters. In downtown Minneapolis, where many riders transfer, construction in 2019 created detours and delays for several of the region's busier transit lines.
Transit Ridership in Greater Minnesota Annual boardings reported by public transit providers serving Greater Minnesota counties	17 million 2025	11.9 million 2018		Greater Minnesota transit rides have been relatively stable for the past five years. At the current pace, Greater Minnesota transit providers are not likely to meet the 2025 ridership goal.
Miles of MnPASS Total miles of High Occupancy Vehicle (HOV)/managed lanes	22.5 new miles Fall 2021	65.9 direct miles		Construction for MnPASS extensions on I-35W (downtown Mpls and County Road C to Lexington Ave) should be complete by Fall 2021.
MnPass Person Throughput Person throughput on northbound HOV/MnPASS Express Lane as share of total person throughput during morning peak	No target	54.7%		Compared to northbound I-35W general purpose lanes, the northbound I-35W MnPASS lane carried 32% more people at Black Dog Road and 58% more people at Lake Street during the morning peak. Increased throughput may be short-term due to construction impacting these locations in 2019.

Progress

Key Goal: Reduce energy consumption per square foot at MnDOT-owned and/or occupied buildings by 30% from 2008 levels by 2025

More Progress
Needed

-7
KBTU/sq. ft.



Trend: MnDOT is making progress toward the 2025 target for energy intensity. Between 2008 and 2019, the agency reduced energy consumption per square foot by 17%. Planned building improvements over the next 5 years are estimated to bring the energy intensity of MnDOT facilities very close to the 2025 target.

2019 Progress

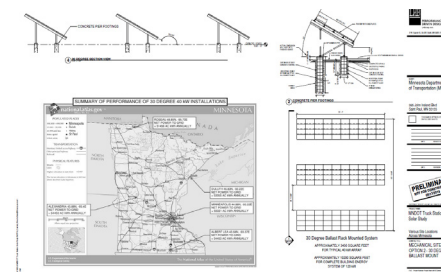
- Promoted agency-wide standards for facility temperatures
- Developed a retro-commissioning schedule for all MnDOT facilities
- Completed the truck station solarization study that determined solar is cost-effective at MnDOT truck stations
- Subscribed to 23 community solar gardens to offset electricity bills for 7.4 million kWh or 24% of MnDOT electricity use
- Completed building automation, HVAC, and lighting upgrades at MnDOT facilities throughout the state

District in the Spotlight

District 6 Solicits Bids for Solar

A 2018 MnDOT analysis found that agency-owned truck stations could benefit from solar energy. The study found that installing a 40 kW solar array could save the agency about \$40,000 over the life cycle of the array and offset all electricity use at the building.

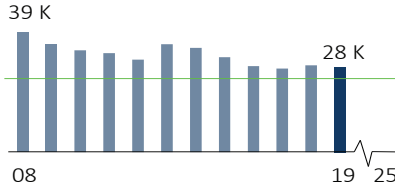
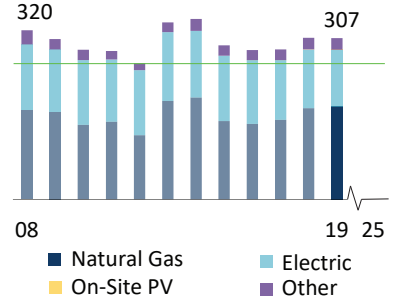
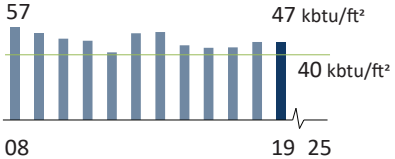
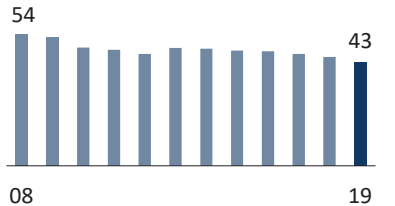
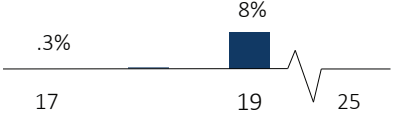
Based on the research, District 6 worked with the MnDOT Building Services Section to solicit bids for an energy efficient design for a new truck station in Northfield. Preliminary designs that include solar will be reviewed for cost effectiveness. Construction is scheduled to be complete in 2021.



Summary of anticipated performance from a 40 kW solar array at a MnDOT truck station

2020 Actions

- Support improved compliance with agency-wide temperature set points
- Continue energy efficiency projects such as building automation, equipment upgrades, and lighting upgrades
- Identify energy planning needs for two districts to achieve 20% energy use reduction target by 2025
- Solicit additional solar bids in District 6 and Metro District
- Develop a new dashboard to visualize MnDOT facility energy use

Metric	2025 Target	Results	Trend	Analysis
Greenhouse Gas Emissions Annual total carbon dioxide equivalent emissions generated by MnDOT owned and/or occupied facilities	27,778 metric tons CO ₂ e -30% from 2008	28,388 metric tons CO ₂ e		MnDOT is making progress toward the 2025 target for GHG emissions from facilities. Between 2008 and 2019, the agency reduced facility-related greenhouse gas emissions by 28%. Facility improvements, a cleaner electricity grid, and renewable energy led to the decrease.
Total Energy Use Annual total electricity, natural gas, on-site solar, chilled water, steam, fuel oil, and propane consumption at MnDOT-owned and/or occupied facilities	256 BBTU -20% from 2008	307 BBTU		Between 2008 and 2019, total agency energy use decreased by 4%. During this time, the MnDOT facility square footage increased by 835,402 square feet or 15%. A reduction in electricity use was offset by an increase in chilled water use at the Transportation Building and natural gas use statewide.
Energy Intensity Annual total electricity, natural gas, and propane consumption at MnDOT-owned and/or occupied facilities per square foot	40 KBTU/sq. ft. -30% from 2008	47 KBTU/sq. ft.		Between 2008 and 2019, the agency reduced energy consumption per square foot by 17%. Planned building improvements over the next 5 years are estimated to bring the energy intensity of MnDOT facilities very close to the 2025 target.
Weather Normalized Energy Intensity Annual total electricity, natural gas, and propane consumption at MnDOT-owned and/or occupied facilities per square foot normalized to a 2008 baseline	No target	43 KBTU/sq. ft..		Between 2008 and 2019, the agency reduced weather normalized energy consumption per square foot by 21%. Weather normalizing the data removes the additional energy use required in extreme weather conditions and demonstrates the energy performance improvements in MnDOT facilities over time.
Renewable Energy Amount of renewable energy subscribed to or used by MnDOT as share of total agency energy use	25%	8%		Renewable energy use or subscriptions as a share of total energy use increased by nearly 8 percentage points between 2018 and 2019. Two community solar garden subscriptions for 6.6 million kWh of electricity annually drove the significant increase.

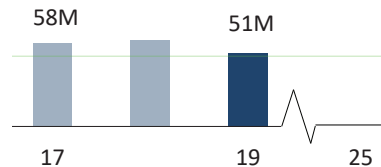
Facilities: Water and Waste

Water

Key Goal: Reduce water consumption at MnDOT owned and/or occupied facilities by 15% from 2017 levels by 2025

More Progress
Needed

-2
million gallons



Trend: Water consumption declined by nearly 17% between 2018 and 2019. Not enough data is available to determine if this decrease is a downward trend or a natural variation in our water use pattern.

2019 Progress

- Installed additional water meters to allow MnDOT to track and manage use
- Sealed artesian flowing wells

2020 Actions

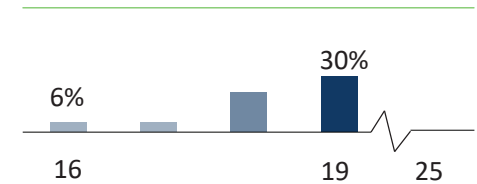
- Minimize landscape irrigation
- Re-use stormwater and waste water
- Include additional water conservation measures into new building construction and existing building renovation

Waste

Key Goal: 75% recycling rate by 2030

More Progress
Needed

+45
percentage points



Trend: The MSW recycling rate increased by 6 percentage points between 2018 and 2019. The change was partially a result of better data tracking.

2019 Progress

- Identified recycling captains to promote recycling and support compliance in MnDOT Districts
- Provided staff training for reporting through the Sustainability Reporting Tool
- Established quarterly reporting schedule for waste data

2020 Actions

- Develop and release a plan for implementing best practices, for signage, new employee training, training at annual waste coordinator workshops, and periodic waste audits
- Review options for providing organics recycling in areas of the state where organics programs are established
- Identify a method for tracking paper use and develop a communications plan to reduce paper use

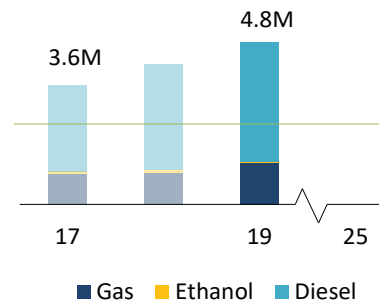
Metric	2025 Target	Results	Trend	Analysis												
Water Consumption Annual total water consumed at MnDOT owned and/or occupied facilities	49 million gallons	51 million gallons	<table><thead><tr><th>Year</th><th>Consumption (M gallons)</th></tr></thead><tbody><tr><td>16</td><td>58</td></tr><tr><td>17</td><td>58</td></tr><tr><td>18</td><td>58</td></tr><tr><td>19</td><td>51</td></tr><tr><td>25</td><td>-</td></tr></tbody></table>	Year	Consumption (M gallons)	16	58	17	58	18	58	19	51	25	-	Water consumption declined by nearly 17% between 2018 and 2019. Not enough data is available to determine if this decrease is a downward trend or a natural variation in our water use pattern.
Year	Consumption (M gallons)															
16	58															
17	58															
18	58															
19	51															
25	-															
Waste Generated Annual total waste generated by MnDOT owned facilities	No Target	7,501 tons	<table><thead><tr><th>Year</th><th>Trash (tons)</th><th>Recycling (tons)</th><th>Total (tons)</th></tr></thead><tbody><tr><td>16</td><td>~1,500</td><td>5,068</td><td>6,568</td></tr><tr><td>19</td><td>~2,500</td><td>5,001</td><td>7,501</td></tr></tbody></table>	Year	Trash (tons)	Recycling (tons)	Total (tons)	16	~1,500	5,068	6,568	19	~2,500	5,001	7,501	Reported waste increased by 33%. The increase was partially a result of adding additional buildings to the dataset. Specifically, rest areas in all Districts were included in the CY19 data for the first time.
Year	Trash (tons)	Recycling (tons)	Total (tons)													
16	~1,500	5,068	6,568													
19	~2,500	5,001	7,501													
Total Waste Recycled Annual total recycling rate at MnDOT owned facilities (includes specialty waste)	60%	46%	<table><thead><tr><th>Year</th><th>Recycling Rate (%)</th></tr></thead><tbody><tr><td>16</td><td>40</td></tr><tr><td>17</td><td>40</td></tr><tr><td>18</td><td>40</td></tr><tr><td>19</td><td>46</td></tr><tr><td>25</td><td>-</td></tr></tbody></table>	Year	Recycling Rate (%)	16	40	17	40	18	40	19	46	25	-	The recycling rate increased by 3 percentage points between 2018 and 2019. The change was partially a result of better data tracking.
Year	Recycling Rate (%)															
16	40															
17	40															
18	40															
19	46															
25	-															
MSW Waste Recycled Annual total municipal solid waste recycling rate at MnDOT owned and/or occupied facilities (does not include specialty waste)	75%	30%	<table><thead><tr><th>Year</th><th>Recycling Rate (%)</th></tr></thead><tbody><tr><td>16</td><td>6</td></tr><tr><td>17</td><td>6</td></tr><tr><td>18</td><td>6</td></tr><tr><td>19</td><td>30</td></tr><tr><td>25</td><td>-</td></tr></tbody></table>	Year	Recycling Rate (%)	16	6	17	6	18	6	19	30	25	-	MSW recycling rate increased by 6 percentage points between 2018 and 2019. The change was partially a result of better data tracking.
Year	Recycling Rate (%)															
16	6															
17	6															
18	6															
19	30															
25	-															

Progress

Key Goal: Reduce fossil fuel use by MnDOT vehicles by 30% from 2017 levels by 2025

More Progress
Needed

-2.5 million
gallons



Trend: MnDOT used 36% more fossil fuel in 2019 than in 2017. The increase was driven by diesel fuel use, which accounted for 72% of total fossil fuel used in 2019. The plow trucks MnDOT uses to manage snow and ice use diesel fuel. Over the last three years, Minnesota has experienced more multi-day snow events statewide, requiring snowfighters to drive more miles. More progress is needed to reach the goal.

2019 Action Plan Progress

Action	Progress
Implement Idle Reduction Standards	Complete
Purchase 5 BEVs and 16 PHEVs	Complete
Implement decision-making tool to right-size fleet and use more fuel efficient vehicles	Complete
Purchase 41 EV chargers to install at MnDOT facilities statewide	Complete
Review differences in fuel efficiency between vehicles of the same model	Not started
Replace 14 Class 1 trucks schedule for replacement with EVs or PHEVs	Not started

District in the Spotlight

Metro District Encourages Idle Reduction

In July 2019, MnDOT released Operating Standards for Idle Reduction and Fuel Savings that limit idling in MnDOT fleet vehicles to 3-minutes or less, except when necessary for critical work or extreme weather.

553 MnDOT Metro District vehicles with telematics showed that between July 2017 and July 2018, idling vehicles used over 29,000 gallons of fuel at a cost of more than \$85,000. In 2019, Metro District implemented the idle reduction standards to reduce unnecessary idling. Supervisors receive daily reports when Maintenance vehicles idle for 30 minutes or more and when Construction vehicles idle for 15 minutes or more at MnDOT facilities. This encourages teams to reduce unnecessary idling and could become a model for the rest of the agency. MnDOT will install telematics throughout the agency fleet in 2020.



MnDOT owns over 800 snow plow trucks

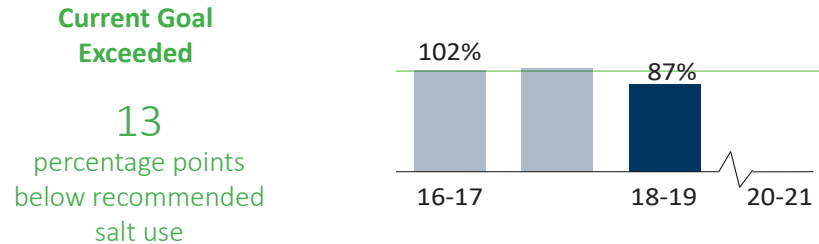
2020 Actions

- Perform a needs analysis for electric vehicle chargers for the MnDOT fleet
- Develop educational materials for MnDOT staff use of EVs and chargers
- Research the fuel efficiency of existing EVs in the MnDOT fleet, especially in Greater Minnesota for cost effectiveness, emissions reductions, and progress toward sustainability goals
- Explore piloting a higher level biofuel blend or renewable natural gas in a small sample of MnDOT heavy duty vehicles
- Continue research on snow plow engine performance and route design to identify opportunities to reduce fuel consumption
- Continue implementing standards for idle reduction and fuel savings

Metric	2025 Target	Results	Trend	Analysis
Greenhouse Gas Emissions Annual total GHG emissions from fuel used by MnDOT vehicles	26,500 metric tons CO ₂ e	49,412 metric tons CO ₂ e		MnDOT generated 16% more fleet GHG emissions in 2019 compared than 2018 driven largely by diesel use for snow fighting.
Total Fossil Fuel Use Annual total fossil fuel use by MnDOT vehicles	2.4 million fossil fuel gallons -30% from 2017	4.8 million fossil fuel gallons		MnDOT used 16% more fossil fuel in 2019 than 2018. MnDOT used more diesel in plows to manage snow and ice in winter 18-19 compared to the previous winter. The diesel MnDOT used had a lower percentage of plant-based fuel compared to the previous year, resulting in increased fossil fuel use.
Diesel Fuel Use Annual total fossil fuel use from diesel by MnDOT vehicles	1.8 million fossil fuel gallons -30% from 2017	3.6 million fossil fuel gallons		
Light Duty Vehicles Annual average miles per gallon achieved by MnDOT Class 1 vehicles	>30 mpg	17 mpg		Light duty fuel efficiency remained constant between 2018 and 2019, despite a slight increase in the number of electric vehicles.
Electric Vehicles Total number of plug-in hybrid electric and battery electric lighty duty MnDOT vehicles	100% of sedans and SUVs are Zero Emission Vehicles by 2030	29		MnDOT purchased 4 BEVs and 20 PHEVs in 2019 in addition to the 5 EVs in the fleet in 2018. EVs account for 10.5% of the agency's 274 sedans and SUVs.
Employee-owned auto mileage Annual total number of cost reimburseable miles traveled by MnDOT employees in personal vehicles for work purposes	No target	3 million miles		MnDOT has no target for reducing employee owned auto mileage and does not currently track employee fuel consistency. MnDOT encourages employees to use the right mode for the right job, including Skype.

Progress

Key Goal: Total salt used by MnDOT each winter is 100% of the amount recommended by the MDSS decision model



Trend: Modeled salt use declined from the 17-18 season. Variability in the data is due to adjustments and improvements to the maintenance decision support system (MDSS). The trend in salt use appears to be decreasing.

Ongoing Activities

MnDOT is actively pursuing the following ways to maintain safety and reduce the negative environmental effects of road salt:

- Use technology, like anti-icing and pre-wetting, to optimize the treatment and use of salt on roads
- Use equipment, like ice breakers, to enhance the removal of ice and snow
- Use liquid chemical deicers instead of salt or sand
- Use underbody plows to reduce the amount of salt needed
- Train drivers on new snow plowing techniques
- Research chemical and equipment innovations not currently used at MnDOT
- Install blowing snow control measures such as living snow fences, standing corn rows, strategically placed bales, native tall grass wildflower prairie plantings, and road design elements to increase snow storage or facilitate the wind blowing the snow off the surface

District in the Spotlight

District 2 Reduces Salt Use

MnDOT looks for opportunities to reduce salt use while maintaining safe driving conditions in winter operations. In District 2, salt use decreased over the last two years. Communication, education, and staff training on best practices and salt sustainability were the key to their success.

District 2 Maintenance Superintendent, Donald Nosbisch led efforts to increase the use of salt brine and alternative liquids and directed staff to install storage tanks in locations throughout the District. District 2 is exploring new technologies like v-box slide for salt slurry generators to achieve further reductions. Tony Bowe, Shop Supervisor, and Teri Bahr, Subarea Supervisor continuously evaluate the functionality and performance of new equipment.



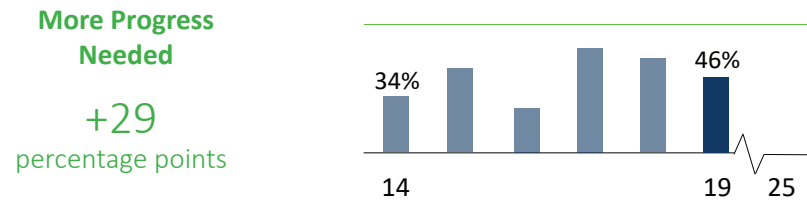
District 2 storage tank for salt slurry

Metric	Target	Results	Trend	Analysis														
LED Bulb Replacement % Total count of LED lighting installed on MnDOT roadways	100% 2020	94%	<table><tr><th>Year</th><th>Percentage</th></tr><tr><td>15</td><td>58%</td></tr><tr><td>16</td><td>~65%</td></tr><tr><td>17</td><td>~70%</td></tr><tr><td>18</td><td>~80%</td></tr><tr><td>19</td><td>94%</td></tr><tr><td>20</td><td>100%</td></tr></table>	Year	Percentage	15	58%	16	~65%	17	~70%	18	~80%	19	94%	20	100%	MnDOT is on track to convert all roadway lighting from high-pressure sodium (HPS) to light-emitted diodes (LED) by 2020. The goal is to convert all remaining lights, mostly in rural areas, by December 2020.
Year	Percentage																	
15	58%																	
16	~65%																	
17	~70%																	
18	~80%																	
19	94%																	
20	100%																	
Lighting GHG Emissions Reductions Total GHG emissions reduced by converting to LEDs	16,811 metric tons CO ₂ e 2020	16,266 metric tons CO ₂ e	<table><tr><th>Year</th><th>Reductions (metric tons CO₂e)</th></tr><tr><td>15</td><td>10,266</td></tr><tr><td>16</td><td>~12,000</td></tr><tr><td>17</td><td>~13,000</td></tr><tr><td>18</td><td>~14,000</td></tr><tr><td>19</td><td>16,266</td></tr><tr><td>20</td><td>16,811</td></tr></table>	Year	Reductions (metric tons CO ₂ e)	15	10,266	16	~12,000	17	~13,000	18	~14,000	19	16,266	20	16,811	The estimated GHG reduction for each light converted from HPS to LED is 1,433 lbs CO ₂ e (or 65%).
Year	Reductions (metric tons CO ₂ e)																	
15	10,266																	
16	~12,000																	
17	~13,000																	
18	~14,000																	
19	16,266																	
20	16,811																	
Salt Use Total salt applied to MnDOT roadways each winter	No target	247 tons Winter 18-19	<table><tr><th>Winter</th><th>Salt Use (tons)</th></tr><tr><td>13-14</td><td>276</td></tr><tr><td>14-15</td><td>~180</td></tr><tr><td>15-16</td><td>~170</td></tr><tr><td>16-17</td><td>~190</td></tr><tr><td>17-18</td><td>~220</td></tr><tr><td>18-19</td><td>247</td></tr></table>	Winter	Salt Use (tons)	13-14	276	14-15	~180	15-16	~170	16-17	~190	17-18	~220	18-19	247	Salt use decreased by 2% in 2018-2019 compared to the previous year. Salt use is driven by winter severity. MnDOT tracks salt use and provides reports from MDSS to ensure the agency can responsibly balance mobility, safety, and the environment.
Winter	Salt Use (tons)																	
13-14	276																	
14-15	~180																	
15-16	~170																	
16-17	~190																	
17-18	~220																	
18-19	247																	
Winter Severity Index Statewide measure that incorporates factors* affecting the severity of the winter season	No target	154 tons Winter 18-19	<table><tr><th>Winter</th><th>Severity Index</th></tr><tr><td>13-14</td><td>128</td></tr><tr><td>14-15</td><td>~100</td></tr><tr><td>15-16</td><td>~110</td></tr><tr><td>16-17</td><td>~120</td></tr><tr><td>17-18</td><td>~130</td></tr><tr><td>18-19</td><td>154</td></tr></table>	Winter	Severity Index	13-14	128	14-15	~100	15-16	~110	16-17	~120	17-18	~130	18-19	154	The statewide average winter severity index increased from 115 to 154 between the winter of 2017-2018 and 2018-2019. The 2018-2019 winter season was more intense for a majority of the Districts, especially during cold temperatures and powerful blizzards in January and February.
Winter	Severity Index																	
13-14	128																	
14-15	~100																	
15-16	~110																	
16-17	~120																	
17-18	~130																	
18-19	154																	
Adjusted % of MDSS Recommendation Annual total salt used by MnDOT compared to the amount recommended by the decision model	100%	87% Winter 18-19	<table><tr><th>Winter</th><th>Adjusted %</th></tr><tr><td>16-17</td><td>102%</td></tr><tr><td>17-18</td><td>~95%</td></tr><tr><td>18-19</td><td>87%</td></tr><tr><td>20-21</td><td>100%</td></tr></table>	Winter	Adjusted %	16-17	102%	17-18	~95%	18-19	87%	20-21	100%	Modeled salt use declined from the 17-18 season. The variability in the data is due in part to a model that is being adjusted and improved. The trend in salt use is believed to be decreasing.				
Winter	Adjusted %																	
16-17	102%																	
17-18	~95%																	
18-19	87%																	
20-21	100%																	

*Winter severity index factors include dew point/relative humidity, wind speed, gusts and direction, frost/ black ice, precipitation type, duration and amounts, air temperature, road temperature, cloud cover, blowing snow, and surface pressure

Native Plantings

Key Goal: Plant 75% of acres with native seeds as part of larger MnDOT projects



Trend: In 2019, 46% of right-of-way adjacent to large MnDOT projects were planted using native seeds. Native seed use has increased compared to the 10-year average of 36%. Design guidance changes in 2014 contributed to this increase but the reasons for the recent decreases will be explored in 2020.

Ongoing Activities

- Clarify guidance for design and construction
- Improve vegetation establishment by addressing obstacles during construction
- Improve establishment speed of native mixes
- Monitor long-term vegetation outcomes
- Eliminate plastics in netting, mulch, sediment control logs and silt fencing used on MnDOT construction projects

Snowfencing

District 4 Installs 16 Miles of Snow Fence in 2018-2019

MnDOT District 4 installed the most snow fencing of any MnDOT District over the past two years. A team approach led to their success. District 4 Snow Fence Coordinator, Kohl Skalin, helped install nearly 14 miles of standing corn rows by engaging farmers through a social and local media campaign and face-to-face meetings with area farmers.

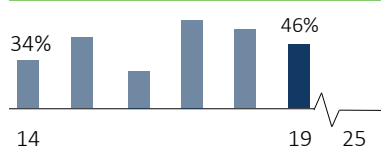
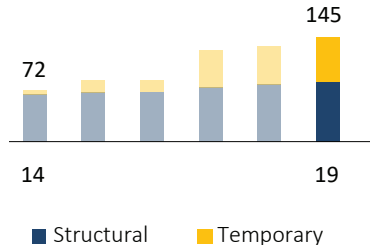
MnDOT District 4 also installed over 2 miles of long-term snow fences using Negotiated Maintenance Contracts and a statewide snow-fence contract. David Keranen, Northwest Regional Blowing Snow Control, prepared plans, worked with external and internal stakeholders, and supported new snow fence construction.



Living snow fence along highway 210 in Wilkin County

Ongoing Activities

In 2017, MnDOT formally created a Blowing and Drifting Snow Control program to further integrate these cost-effective control measures into agency business practices.

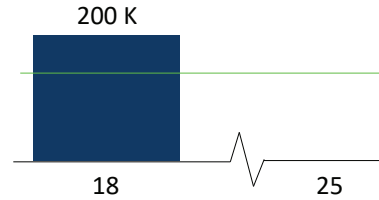
Metric	2025 Target	Results	Trend	Analysis
Native Plantings Total percentage of acres planted with native seeds as part of larger MnDOT projects	75%	46%	 <p>34% 14 19 25</p>	In 2019, 46% of right-of-way adjacent to large MnDOT projects were planted using native seeds. Native seed use has increased compared to the 10-year average of 36%. Design guidance changes in 2014 contributed to this increase.
Snow Fences Total miles of structural snow fences, living plants, and corn rows installed to manage blowing and drifting snow	No target	145 miles	 <p>72 14 19</p> <p>■ Structural ■ Temporary</p>	Between 2018 and 2019 total miles of snow fence increased 9%. Permanent snow fencing increased by nearly 4 miles and temporary snow fence miles increased by almost 9 miles.

Progress

Key Goal: Reduce total annual GHG emissions generated by MnDOT state highway construction projects by 30% from 2018 levels by 2025

More Progress
Needed

- 60,000
metric tons CO₂e



Trend: MnDOT projects were analyzed for CY18 using the Federal Highway Administration (FHWA) ICE 2.0 tool. ICE was updated and improved in 2019 so the CY18 results will become the new baseline from which future performance will be measured.

Ongoing Activities

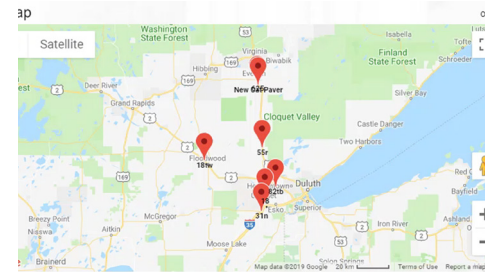
A number of cost-competitive pavement construction techniques have the potential to reduce lifecycle GHG emissions and extend pavement life. For example, increasing pavement recycling reduces the need for material extraction. Extending the life of pavements also reduces emissions that typically increase as a result of congestion and detours during construction. MnDOT continues to investigate these practices to understand their durability, performance and emissions benefits. Some Minnesota counties are almost exclusively using the following asphalt preservation techniques.

- Cold In-Place Recycling (CIR)
- Full Depth Reclamation (FDR)
- Warm Mix Asphalt (WMA)

Statewide Strategy in the Spotlight

E-Ticketing

MnDOT is using an e-ticketing concept to more efficiently document the material quantities delivered to a project in real-time. E-ticketing uses an app to track every delivery truck throughout the load cycle, which includes travel to a project site, unload, and return to the plant. This technology can increase the efficiency of trucking operation by reducing the congestion from trucks bunching up and idling at a plant or project site. That congestion wastes time, fuel, and generates unnecessary emissions, especially for paver and roller equipment.



Delivery truck locations (Summer, 2019)

Metric	2025 Target	Results	Trend	Analysis
Construction Greenhouse Gas Emissions Total annual GHG emissions from fuel and materials used to construct MnDOT projects	140,835 metric tons CO ₂ e -30% from 2018	200,835 metric tons CO ₂ e		The FHWA ICE2 tool used to evaluate emissions was updated and improved in 2019 so the CY18 results are the new baseline. Analysis of construction emissions is an emerging area, so tools and assumptions may change again in the future. CY19 emissions should be included in the 2020 report.
Sustainable Pavement Total annual number of MnDOT projects using warm mix asphalt (WMA), cold-in-place recycling (CR), or full depth reclamation (FDR)	TBD	12		For asphalt pavement, WMA, CIR, and FDR reduce lifecycle GHG emissions compared to conventional pavement preservation techniques. MnDOT constructed 3 CIR and 9 FDR projects for a total of nearly 1,400 roadway miles in 2019.
Recycled Materials Annual total quantity of recycled materials used in MnDOT projects (e.g. recycled asphalt pavement and concrete fly ash)	TBD	TBD	Not currently tracked	MnDOT has a permissive specification that allows up to 20% recycled content in asphalt pavements. MnDOT does not track actual use, but plans to explore this in the future

Progress

In Minnesota, climate change is already having major impacts, and our winters are warming faster than any other state in the continental USA¹. MnDOT assets will become increasingly stressed by climate change and extreme weather, particularly from projected precipitation increases and larger and more frequent storm events. MnDOT is committed to providing a resilient transportation system that serves Minnesota as our climate changes.

The agency is conducting an analysis of projected climate change impacts on bridges, pipes, and culverts (via projected extreme flooding) for each district to inform decision making and outreach for MnDOT projects. One way to mitigate the increased risks that climate change brings is to develop a suite of resilience tools and guidance on how and when to apply them. Use of resilience tools will be balanced with other critical factors such as cost, safety, capacity, and environmental impact to select the best adaptation response (e.g. enhance, defend, accommodate, or retreat).

2019 Accomplishments

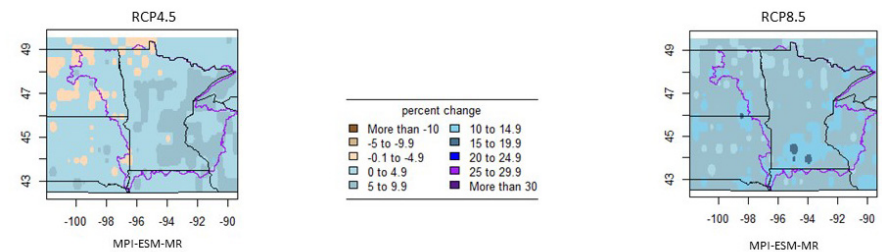
- Launched research projects to study urban stormwater resilience and the impact of climate change on freeze/thaw cycles and pavement
- Developed the MnDOT Transportation Resilience Report to summarize transportation resilience activities taking place in other states, current MnDOT transportation resilience practices, and future opportunities
- Created internal resilience working group to coordinate and advance transportation resilience at MnDOT

¹ [Climate Central, 2013](#)

Statewide Strategy in the Spotlight

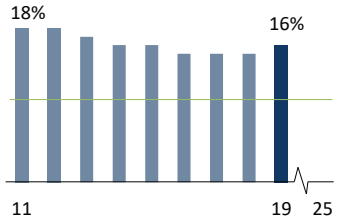
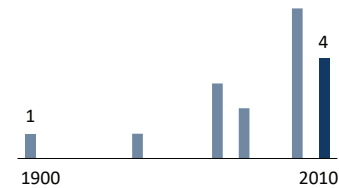
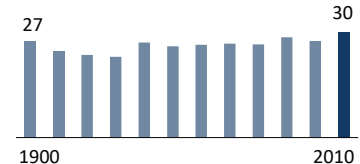
Statewide Extreme Flood Vulnerability Assessment

The Extreme Flood Vulnerability Assessment is an ongoing research project that builds on a previous pilot project, utilizing an updated approach that will be applied to MnDOT assets statewide. The project uses cutting edge, non-stationary climate modeling analysis to select future precipitation interval outputs (similar to today's NOAA Atlas 14) (example below). In 2020 the agency will continue the research with WSP to develop a process for applying these projection scenarios to three MnDOT asset types to assess their vulnerability.



2020 Actions

- Continue statewide extreme flood vulnerability assessment
- Pilot study in MnDOT District 2 to collect qualitative data from district staff about areas of known climate risk and vulnerabilities
- Create guidance to justify design changes to a facility following a disaster (e.g. "betterments")
- Invite peer state DOTs to Minnesota to learn from their experience identifying climate vulnerability and resilient responses in corridor planning

Metric	2025 Target	Results	Trend	Analysis
Culvert Inspections and Condition Total percent of highway culverts in poor condition (Condition 3 or 4)	<10%	16%		From 2011 to 2019, the percentage of culverts in poor condition slightly declined. More progress is needed to achieve the goal.
Contextual Metrics				
Mega-rain Events Events in which six inches of rain covers more than 1000 square miles and the core of the event topped eight inches by decade	No target	4 2010-2019		Minnesota has seen at least 14 mega-rains, with a sharp uptick since 2000. Of these 14 events, two were in the 1970s, two were in the 1980s, none were in the 1990s, but six occurred in the 2000s, with four more in the 2010s. The 20 years from 2000-2019 have seen 2.5 times as many mega-rains as the 27 years spanning 1973-99.
Historic Change in Precipitation Minnesota annual precipitation by decade	No target	30 inches 2010-2019		Precipitation in Minnesota steadily increased between 1900 and 2019.