Financial Modernization and Risk Analysis (MARA) Study: Infrastructure

MARA Study Overview

As directed by HB 330, the Financial Modernization and Risk Analysis Committee (MARA) has undertaken a study of the long-term financial needs of the state and the local governments, while considering changes in demographics, technology, and the economy. The MARA committee relies on a data-driven approach to identify potential financial concerns for the state and for local governments. As such, the MARA committee has developed a forecasting model based on econometric data, capable of identifying future financial risks to the state's revenues and expenditures, as well as considering impacts on local governments' revenues and expenditures. This approach has a medium- to long-term time focus, from present to 2040.

Infrastructure Overview

In the overall MARA project to model (out to 2040) all state and local government expenditures and revenues, the Legislative Fiscal Division (LFD) will be modeling infrastructure types owned by state and local governments, such as buildings including schools and universities, water, wastewater, roads, and solid waste; this model will not include infrastructure types owned by non-public entities such as railroads, broadband networks, electrical generation/grid, etc.

Of the infrastructure types LFD will be modeling, the model will be sub-divided into two major categories:

- Buildings, including state-owned, locally owned, and school facilities
- Public works, including state and locally owned water-related infrastructure, state and local streets/highways/bridges, and local landfills

Infrastructure Model Methodology, Data Sources, Anticipated Findings, & Next Steps

Buildings

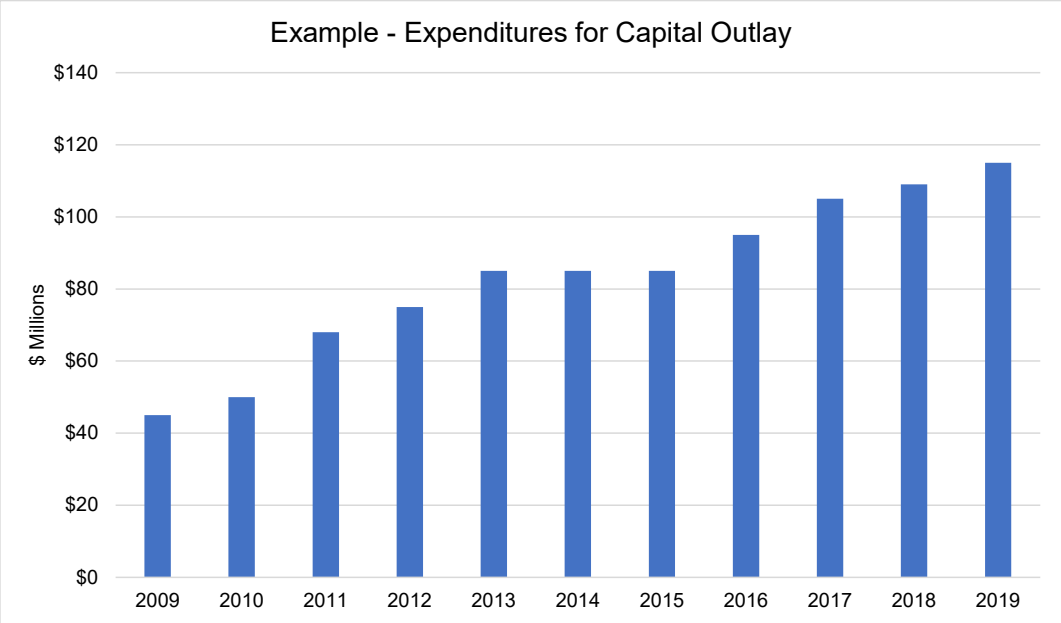
In simple terms, the approach the LFD is taking is to compare actual capital outlay (spending) against industry-recommended guidelines for annual capital maintenance, repair, and life-cycle renewal (budgeting). Comparing where actual spending lands within the range of recommended spending levels will be used to inform whether current spending levels are estimated to maintain facilities for their intended purposes in the long-term.

Actual capital outlay spending will be obtained from the following data sources:

- State-owned facilities – State accounting system data pulls
- Local government facilities – Local government annual financial reports (AFR) submitted to the Department of Administration (DOA)-Local Government Services Bureau
- Montana University System facilities – State accounting system data and data from the Office of the Commissioner of Higher Education (OCHE)
- K-12 facilities – school trustees reports submitted to the Office of Public Instruction (OPI)

LFD will evaluate various models using actual spending history to project similar spending levels into the future and select those methods that work best with the characteristics of the available capital outlay data.

The following chart shows an example of what capital outlay expenditures may look like for an entity over time.



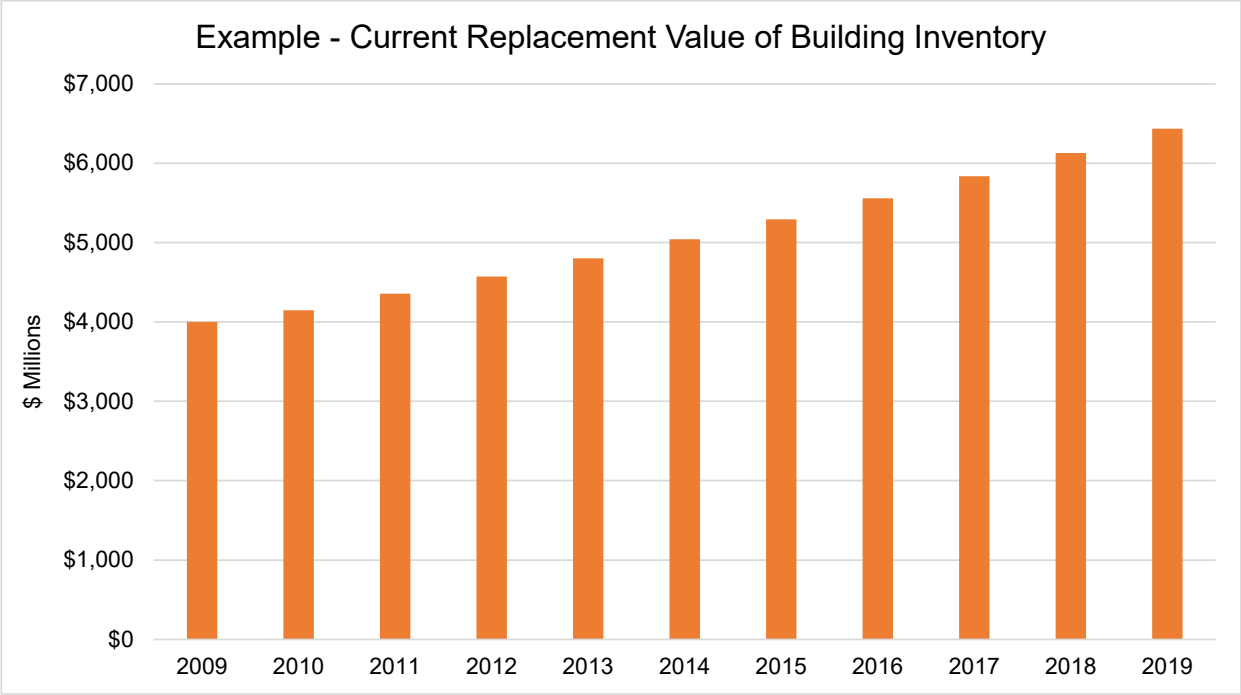
Recommended levels of annual capital outlay spending are based upon the American Physical Plant Administrators (APPA) macro (long-term) budgeting recommendations for maintenance and renewal/upgrade of facilities throughout their life cycles. LFD research has concluded that the APPA recommendations are currently the standard best management practice for K-12, university, and government-owned facilities.

The APPA recommendations set a range for annual spending on capital renewal and deferred maintenance at between 1.5% and 2.5% of current replacement value (APPA BOK Resources, Reference part II, Operations and Maintenance, Capital Renewal and Deferred Maintenance). This range is meant to represent capital outlay spending only and does not include recommended spending levels for ongoing routine maintenance, the systematic day-to-day maintenance to prevent or control the rate of deterioration of facilities that is funded from institution/agency operation budgets (typically recommended at 1-1.5%).

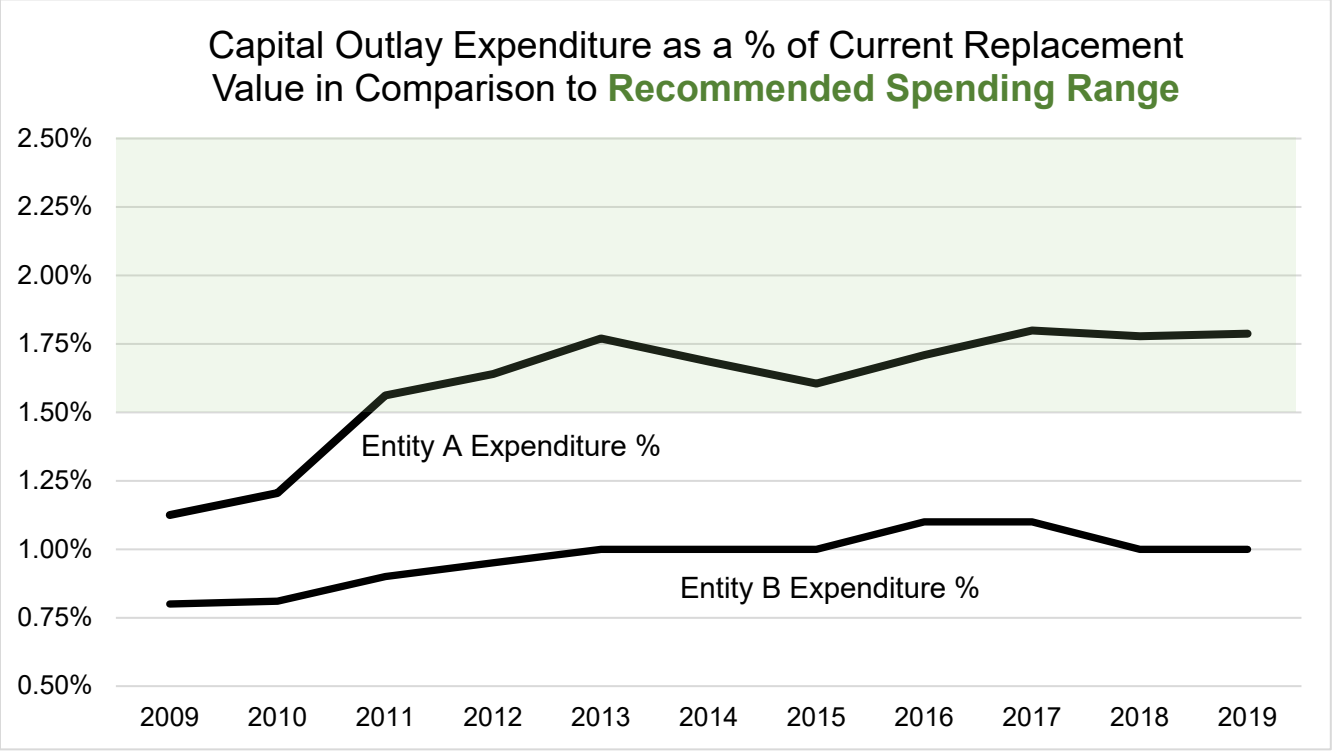
To compare actual spending against recommended levels of spending, a basis of current replacement values (CRV) for facilities within each governmental type is needed. The following data sources will be used for CRV:

- State-owned facilities – State of Montana commercial property valuation schedule compiled by Department of Administration/Risk Management & Tort Division
- Local government facilities/Cities & Towns – Montana Municipal Interlocal Authority (MMIA) property valuation schedules
- Local government facilities/Counties – Montana Association of Counties Joint Powers Insurance Authority (JPIA) property valuation schedules
- Montana University System facilities – State of Montana commercial property valuation schedule compiled by DOA/Risk Management & Tort Division
- K-12 facilities – Montana Schools Group Insurance Authority (MSGIA) property valuation schedules

The following chart shows an example of CRV for an entity's facilities, which would normally show growth over time due to inflation, building renovation, and new construction. LFD will be evaluating how to model CRV growth of each sector into the future considering inflationary impacts, population growth, and other factors.



Initial findings will be based upon an evaluation of projected actual annual spending through 2040 as a percentage of CRV, compared to the recommended annual spending range. The bounds of the recommended funding levels would define the recommended spending range, and the actual or projected actual spending would be plotted to see if it will be within the recommended range or not. The following chart shows an example of this comparison for two hypothetical entities; capital outlay expenditure is shown as a percentage of the CRV, and that percentage is compared to the recommended spending range shown in the shaded area.



Potential follow-up work and items for further consideration in the modeling for buildings may include what to do about identified areas of major capital investments in new facilities (for example, Department of Corrections Master Plan); what other sectors may see a growth in inventory (new construction) due to population growth projections; is inflation causing a lag in CRV data (low valuations).

Public Works

For the model, public works-related infrastructure includes water, wastewater, roads/bridges, and solid waste facilities. The basic modeling approach is to project capital outlay expenditure and estimated revenue or project funding in comparison to projected funding levels needed to bring the various infrastructure types to good condition. This approach varies slightly among the different types of public work infrastructure, based on the data available. This section will be divided by system ownership (local vs. state) and then by type.

Local Public Works Infrastructure

Water and Wastewater

Local water and wastewater infrastructure includes:

- Drinking water and wastewater systems owned and operated by cities, towns, and special districts
- Montana's four regional water systems
- St. Mary's/Milk River project

The modeling approach for local drinking water and wastewater systems is the basic approach described previously for public works in general. The United States Environmental Protection Agency (US EPA) used a similar methodology in their 2002 clean water and drinking water infrastructure gap analysis study, which aimed to identify the existence of a quantifiable gap between investment needs over a 20-year period and current spending, as well as the rate of growth in spending needed to help close that gap.[1]

The regional water systems and the St. Mary's/Milk River project will be included in the model because they are funded, in part, by state and local funding and because they impact, supply, or are integrated with municipal water systems. These projects are somewhat different in nature to the local drinking water and wastewater systems, in that these are large, multi-system, multi-phase projects in various stages of completion or needing replacement/rehabilitation, as in the case of St. Mary's. The modeling approach for these projects is to project spending needed for the cost of completion or replacement/rehabilitation of the system and then compare to current spending and funding levels to determine funding adequacy and the gap between needed spending and available funds.

Actual capital outlay spending will be obtained from the following data sources:

- Local government annual financial reports (AFR) submitted to the DOA-Local Government Services Bureau, including property tax information related to special districts
- State payments, including grant payments (state accounting system)
- Loan payment information from the Department of Natural Resources and Conservation (DNRC)
- State revolving fund loans

[1] https://nepis.epa.gov/Exe/ZyPDF.cgi/901R0200.PDF?Dockey=901R0200.PDF

- Federal funding expenditure and federal cost share estimates; American Rescue Plan Act (ARPA) funding and Bipartisan Infrastructure Law (BIL) estimated expenditure may be included, if relevant to the modeling

Revenue by type (local, state, federal) will be obtained from the following data sources:

- State revolving loan fund project cost and funding source tables from DNRC
- State-funded project grant requests, which include funding sources
- DNRC water and wastewater rate comparison studies, conducted biennially
- Federal cost share percentages for the regional water system projects and St. Mary's

Investment needed will be obtained from the following data sources:

- ARPA water and sewer grant requests from competitive and minimum allocation funding opportunities, particularly unfunded project applications
- Intended use plans submitted to the Montana Department of Environmental Quality (DEQ) for potential projects for the state revolving loan funds
- Cost estimates for the regional water systems, which are updated regularly by the DNRC
- An engineering study and cost estimate for the St. Mary's/Milk River project from the DNRC. This study, which is from 2010, is somewhat dated, however, it covers the complete system and will be indexed to current dollars

LFD will be evaluating how to model growth in spending and growth in investment needs into the future, considering inflationary impacts, population growth, and other factors.

Initial findings will be based on evaluation of projected annual spending through 2040, revenue sources to fund that spending, in comparison to anticipated needs. It is anticipated that the model will show pressure on the various revenue components due to rising costs needed to maintain infrastructure in light of inflation and aging systems, as expressed by investment needs. If, for example, federal and state funding are shown to be relatively flat into the future (not increasing with inflation due to funding constraints), increasing costs will, therefore, put additional pressure on local funding.

Local Roads

Cities and counties are responsible for construction and maintenance of locally owned roads, highways, and bridges in Montana. The modelling approach for local roads is to determine and project capital outlay expenditure and revenues for roads and bridges; this data will be shown in comparison to projected funding needed to maintain roads and bridges. Actual condition data is not available for locally owned and maintained roads; however, the Montana Department of Transportation (MDT) has the number of miles of local roads and both the number and square footage of local bridges. Those numbers will be calculated in relation to costs identified in MDT's transportation asset management plan for pavement maintenance (per lane mile costs) and bridge rehabilitation (costs per square feet) in order to maintain assets, as shown in the following charts. This calculation will show estimated need for local roads.

Table 5-1 Pavement Treatment Cost Effectiveness (2017)

Scope	Treatment	Cost per lane mile	Years Gained per lane mile	Annual Cost per lane mile
Light Preservation	Crack Seal	$4,600	3	$1,500
	Chip Seal	$21,000	7	$3,000
Resurfacing	Microsurface	$56,300	7	$8,000
	Overlay	$116,700	12	$9,700
	Minor Rehab	$140,300	12	$11,700
Structural/ Capacity/ Geometric	Major Rehab	$291,600	15	$19,400
	Reconstruction	$631,800	20	$31,600

Table 5-2 Rehabilitation Versus Preservation Life Cycle Planning Costs

Rehabilitation		
Activity	Year	Cost (ft^2)
New Construction	0	$150
Deck Rehabilitation	20	$20
Joint Replacement		$1
Deck Replacement	40	$60
Deck Rehabilitation (Mill & Thick Overlay)	60	$20
Joint Replacement		$1
Deck Replacement	80	$60
Replace Bridge	100	
Net Present Value		$312

Preservation		
Activity	Year	Cost (ft^2)
New Construction	0	$150
Preservation Treatment	10	$7
Preservation Treatment	20	$7
Joint Replacement		$1
Preservation Treatment	30	$7
Deck Rehabilitation (Mill & Thick Overlay)	40	$20
Joint Replacement		$1
Preservation Treatment	50	$7
Preservation Treatment	60	$7
Joint Replacement		$1
Preservation Treatment	70	$7
Deck Rehabilitation	80	$20
Joint Replacement		$1
Replace Bridge	100	
Net Present Value		$236

Additionally, LFD will be evaluating costs of maintaining gravel roads, as there are a large number of county roads that are gravel. Depending on data availability, sidewalks and alleys in cities and towns may or may not be included in the model.

Actual capital outlay spending will be obtained from the following data sources:

- Local government annual financial reports (AFR) submitted to the DOA-Local Government Services Bureau
- Bridge and Road Safety and Accountability Act (BARSAA) gas tax funding – this data includes specific projects and cost estimates

Revenue by type (local, state, federal) will be obtained from the following data sources:

- Department of Transportation (MDT) data on gas tax distributions to local governments. This includes both the set-aside funding from under 15-70-101, MCA and the BaRSAA funding which is distributed in accordance with 15-70-127, MCA
- Montana Coal Endowment Program bridge grants
- Property tax data related to roads

Investment needed will be calculated as describing using the following data sources:

- MDT data for locally owned and maintained road miles and number and square footage of bridges
- Estimated cost of gravel per mile for county gravel roads
- MDT transportation asset management plan costs of maintaining roads and bridges

LFD will be evaluating how to model growth in spending and growth in investment needs into the future, considering inflationary impacts and other factors.

Initial findings will be based on evaluation of projected annual spending through 2040, revenue sources to fund that spending, in comparison to anticipated needs. Similar to water and wastewater infrastructure, it is anticipated that the model will show pressure on the various revenue components due to rising costs needed to maintain infrastructure in light of inflation and aging assets. If gas tax revenue declines due to increase vehicle fuel efficiency, depending on legislative action, there may be additional pressure on local road funding.

Landfills/Solid Waste

Inclusion of landfills in the model will be dependent on data available. DEQ permits landfills annually, and landfills must provide engineering reports that include estimates of when expansions may be needed. Most landfills in Montana are small enough that expansions and high regulatory costs are unlikely to be necessary. Regular operations and maintenance expense data is available from the local government financial records.

For the larger landfills, LFD will ask DEQ if data is available for when those expansions and additional regulatory costs may occur, and if they have estimates of revenue and expense for those expansions.

State Public Works Infrastructure

State-Owned Dams & Canals

The State Water Projects Bureau (SWPB) of DNRC supports a segment of the agricultural community by providing water from 18 active water storage projects. These projects consist of 22 dams and 250 miles of canals for supply, storage and delivery of irrigation and stock water. SWPB also owns the Broadwater Missouri Toston Hydroelectric facility. SWPB manages contracts with 17 water user associations and markets over 400,000 acre-feet of water to thousands of individual water users.

The modeling approach for state-owned dams and canals will be the same as other public works infrastructure, in terms of identifying investment need in comparison to actual capital outlay expenditure and revenue.

DNRC has provided estimates of **investment need** for infrastructure costs/funding demand based on need for near-term (1-9) at $65.0 million, mid-term (10-19 years) at $60.0 million, and long-term (20-40) at $89.0 million, plus canal rehabilitation needs ($100,000/mile) at $25 million, for a total investment forecast of $239.0 million. These estimates are for specific projects such as dam rehabilitations, storage increase, and major maintenance.

LFD is working with DNRC and will obtain data from the state accounting system on the **revenue** and **capital outlay expenditure** to calculate a projection of future revenue and expenditure.

Initial findings will be based on an evaluation of estimated expenditure and associated funding, in comparison to projected investment need through 2040.

Transportation Overview

The transportation component includes Montana's Department of Transportation's (MDT) highways, engineering, and maintenance program expenditures.

Preliminary Considerations: Transportation

- While federal funding continues to increase, will state gas tax collections be insufficient to cover federal match and maintenance of effort (MOE) before the end of the study period? Additionally, will projections of increases in vehicle fuel economy and adoption of electric vehicles erode revenue streams?
- Inflation of road construction costs materially outpaces the consumer price index (CPI), eroding buying power and decreasing level of service. Will MDT, which is responsible for maintenance of state highways and bridges, be able to deliver the same level of projects as in the past?

Transportation Data Sources

Data for the transportation component is sourced from the Montana Statewide Accounting, Budgeting and Human Resources System (SABHRS), E-REMI, and IHS Markit population projections. In addition, the module will include the Legislative Fiscal Division (LFD) fuel tax revenue estimates, IHS Markit forecasts of price indices, highway construction inflation index, and forecasts of state highway and bridge expenditures based on providing the level of service goals identified by MDT, including estimates of state match.

Transportation Components – Assumptions and Methodology

The transportation module will be broken into the following categories for modeling purposes:

1. Federal aid program, including state match and maintenance of effort
2. General operations and planning
3. Routine highway maintenance
4. Facilities repair & maintenance
5. Facilities replacement
6. Motor carrier services
7. Equipment

Costs are disaggregated based on the financing structure of the following programs: interstate

MARA Transportation Module: Program-level projections and "beige" projections

- Many of the expenditures of state and local government in the MARA forecasting model are projected with a "status quo"-based methodology which assumes "business as normal" or "beige" continues into 2040. An example would be the administrative functions of the Department of Transportation
- In the Transportation module, "non-beige" projections include the highway construction inflation index

system; national highway system; primary system; secondary system; urban system; and bridges.

The Montana Department of Transportation is responsible for nearly 13,000 centerline miles of highways, which are estimated to account for 77.0% of total vehicle miles traveled within the state. The department is funded in large part by federal highway funding with the majority of the balance funded by state fuel taxes. Funding will be allocated with the same share as the funding in FY 2019 for each fund. This will crosswalk the costs developed by fund with the revenue sources for each fund. It will assume the same proportion of funding by source of revenue.

State Highways and Bridges

Highway and Bridge Condition Driven Projections

In 2012 the Moving Ahead for Progress in the 21st Century (MAP-21) legislation was passed by Congress and signed into law. This legislation directs states and the Federal Highway Administration to use a data centric asset management approach to determine state and federal investment in the National Highway System. In response to MAP-21, MDT developed a risk-based transportation asset management plan (TAMP) which includes life cycle planning, performance gaps, non-condition related performance, and risk analysis for recommended investment strategies.[2] The table outlines the 2019 national highway system asset conditions from the MDT 2019 TAMP.

System	Inventory	% Condition**		
		Good	Fair	Poor
Interstate Pavements	4,700 lane miles	56.7%	41.6%	0.0%*
Non-Interstate NHS Pavements	6,505 lane miles	50.9%	48.3%	0.40%
NHS Bridge Deck Area	11,367,900 square feet	17.4%	75.3%	7.3%

*% Poor value lower than range
** Value less than 100% due to missing/under construction segments.

The following graph from the 2020 Montana Department of Transportation Fact Book includes photographs that illustrate the pavement conditions for good, fair, and poor.

Good

Visible traffic wear with low severity cracking and minimal rutting

Fair

Moderate cracking in extent and severity, slight rutting and aggregate loss

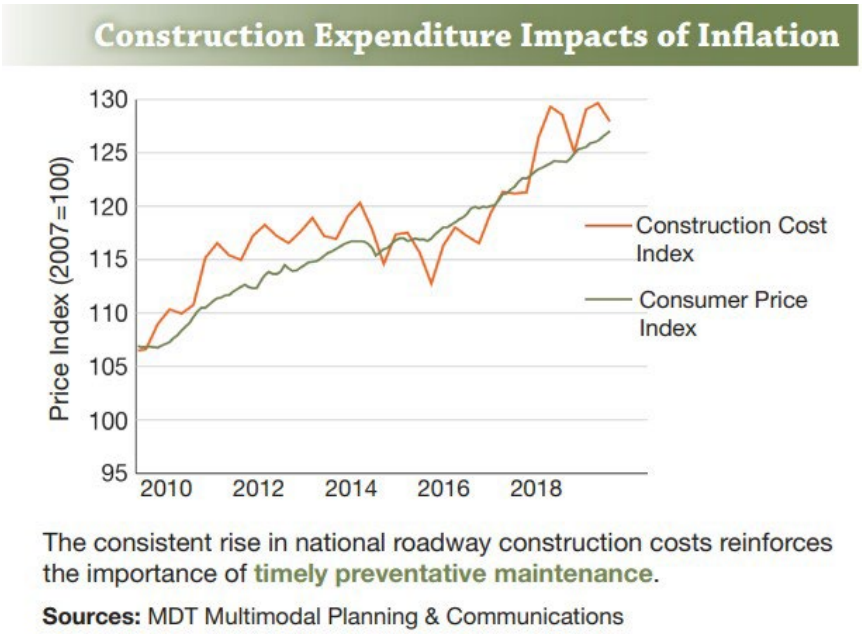
Poor

Prevalent cracking in extent and severity, heavy rutting, patching

[2] Montana Department of Transportation 2019 Transportation Asset Management Plan, page 4.

The MARA transportation module will calculate the need requirements for state highways and bridges to meet 100.0% of "good" pavement conditions. The following outlines data collection and proposed calculations.

- Investment needs to bring all state highways and bridges to 100.0% of "good" condition as identified by MDT
- Revenue forecasts in the LFD fuel tax model will be used to determine the state's ability to meet match requirements of federal funding, and the amount of funding available for facility and non-federal aid highway needs
- Highway construction inflation from the National Highway Construction Cost Index (NHCCI) will be used instead of consumer price index for urban consumers (CPI-U) IHS Markit forecast. NHCCI has varied from negative to nearly 20.0% in the last 20 years, with an average growth of 3.6%. The adjacent graphic from MDT illustrates the volatility of the construction cost index



Transportation Stakeholder Awareness and Participation

Legislative Fiscal Division and Montana Department of Transportation staff met to discuss data and assumptions. Conversations between the department and LFD staff will continue through summer 2022.

Transportation Component Limitations

The majority of the sources like federal transportation packages and fuel tax revenues are forecast in aggregate, and their long-term relationship with the state's population is expected to continue. Due to this modeling methodology, expected deviations from trends in the near term may not be captured by the model.

The federal funding calculated to be needed will be reported and evaluated for the state match. There is a risk that federal funding could diminish or increase over time and the risk would affect funding and services.