

**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION
FY2025-26 CONSOLIDATED RAIL INFRASTRUCTURE AND SAFETY
IMPROVEMENTS “CRISI”
GRANT APPLICATION**

**Northern Aroostook Rail Gateway Modernization and
Safety Project**

Maine Department of Transportation

**APPENDIX D:
BCA Technical Memorandum**

MaineDOT CRISI – BCA Technical Memorandum

1. Introduction

This Technical Memorandum documents the methodology, assumptions, data sources, and results of the Benefit-Cost Analysis (BCA) prepared in support of the Maine Department of Transportation's (MaineDOT) FY 2026 Consolidated Rail Infrastructure and Safety Improvements (CRISI) grant application. The project involves rehabilitation of approximately 94 miles of track across the Maine Northern Railway (MNR) Madawaska Subdivision and Eastern Maine Railway (EMR) Van Buren Subdivision, operated by NBM Railways subsidiaries, plus replacement of the St. Croix River bridge deck on MNR.

The BCA was prepared in accordance with USDOT's Benefit-Cost Analysis Guidance for Discretionary Grant Programs (December 2025 update) and uses the USDOT BCA Spreadsheet Template (December 23, 2025, version) as the primary quantitative model. All benefits and costs are discounted at a 7 percent real discount rate over a 30-year analysis period beginning with the first full year of project operations (2031). All monetary values are expressed in constant 2024 dollars.

2. Analysis Framework

2.1 Key Parameters

Parameter	Value
Discount rate	7.0%
Dollar base year	Constant 2024 dollars, per USDOT BCA Guidance.
Construction period	2028–2030
First year of operations	2031
Operational analysis period	30 years (2031–2060).
Total capital investment	\$46,300,000
Inflation rate applied to capital	3.0% annually. Engineering estimate in current dollars; escalated to year-of-expenditure dollars.
Volume growth — Build scenario	Customer-specific rates ranging from 2% to 6% annually, reflecting NBM Railways' operational assessment of each customer segment.
Volume growth — No-Build scenario	Generally held flat at 2026 levels. A modest 2% annual growth floor is applied to Twin Rivers inbound commodities and LP Wooden Siding. Hazmat customer treatment varies by customer; see Section 3.2.

2.2 Project Scope

The project consists of two integrated track rehabilitation components and one bridge element:

- MNR Madawaska Subdivision (70 miles, Ashland MP192 to Madawaska MP262): replacement of 142,560 linear feet of 100-pound jointed rail with 115-pound jointed rail; replacement of 28 mainline turnouts; replacement of 60,000 deteriorated wooden crossties; addition of 40,000 metric tons of ballast; resurfacing of 364,320 linear feet of track.
- EMR Van Buren Subdivision (24 miles, Madawaska V00 to Van Buren V24): replacement of 24 miles of 80-pound jointed rail with 115-pound continuous welded rail; replacement of 6 mainline turnouts; replacement of 12,000 wooden crossties; addition of 29,000 metric tons of ballast; resurfacing of 126,720 linear feet of track.
- St. Croix River bridge deck replacement (MNR MP167.74).

Total corridor length is 94 miles. The project upgrades the track class of both subdivisions from FRA Class 1 (10 mph authorized speed) to FRA Class 2 (25 mph), a 150 percent increase in operating speed across the full project corridor.

2.3 Build and No-Build Scenarios

Build Scenario. Construction commences in 2028 and is substantially completed by November 2030. For BCA purposes, 2031 is the first full year of Build operations. The Build scenario enables: (1) continued movement of hazardous materials on a corridor authorized for such traffic; (2) volume growth across all customer segments at customer-specific rates; and (3) the ramp-up in Irving Woodlands fiber movements driven by the new St. John, New Brunswick wood processing facility currently under construction.

No-Build Scenario. The No-Build baseline reflects continued track deterioration under current funding constraints, with no equivalent rehabilitation project assumed. The corridor degrades from its current FRA Class 1 condition toward Excepted Track status within approximately 2 to 4 years. Excepted Track status limits hazmat movement under federal regulation, reducing or eliminating corridor volumes for several existing hazmat customers. Volume growth is generally foregone across all customer segments. The No-Build baseline is described in detail in Section 3.

3. No-Build Scenario

3.1 Track Deterioration Framework

The No-Build deterioration trajectory reflects NBM Railways' operational assessment of the corridor's condition absent federal investment. Without rehabilitation, the corridor is projected to reach Excepted Track status within 2 to 4 years of the grant award period, based on the current condition of rail, ties, and ballast and the absence of capital available for rehabilitation under existing operating constraints.

FRA Class 1 track allows freight operations at up to 10 mph. Excepted Track, the classification below Class 1, also permits freight operations at up to 10 mph but imposes significant regulatory restrictions on the movement of hazardous materials, with the practical effect of limiting or precluding such movements for many commodity types. The implications for individual shippers depend on the specific commodity, available routing alternatives, and regulatory applicability, and are addressed in the customer-level volume assumptions in Section 3.2.

3.2 No-Build Volume Assumptions

The No-Build scenario applies distinct volume treatments by customer and commodity classification, reflecting the different ways each shipper would respond to Excepted Track designation and corridor deterioration.

Hazardous materials customers. Hazmat customer treatment varies by commodity. Twin Rivers titanium dioxide volumes decline to zero in the No-Build upon Excepted Track designation, as this movement is prohibited by federal regulation and the shipper has no viable alternative on the corridor. Dead River LPG and fuel oil volumes are frozen at 2026 baseline levels in the No-Build: Excepted Track would preclude these movements on this corridor, but Dead River is assumed to maintain current supply volumes by rerouting to alternative Class I gateways. The corridor loses the incremental Dead River growth that the Build scenario would support, but base volumes are not modeled as a truck diversion. LP MDI and LP Other Hazmat are excluded from the truck-diversion calculation given the mixed nature of these commodity classifications; a modest 2% annual growth is applied to their No-Build volumes as a conservative baseline.

Non-hazmat customers. Most non-hazmat volumes are held flat at their 2026 baseline with zero growth through 2060, reflecting the foreclosure of volume growth under deteriorating service conditions. A 2% annual growth floor is applied to Twin Rivers inbound commodities (wood pulp, corn starch, limestone slurry, kaolin, and talc) and LP Wooden Siding, reflecting baseline demand trends expected to persist even under degraded corridor conditions. The No-Build volume model is conservative in that it holds most non-hazmat volumes flat at 2026 levels rather than modeling the demand suppression that service deterioration would realistically produce, understating total BCA benefits.

Customers excluded from the BCA. McCains (fertilizer and canola oil) is located below Easton, Maine, outside the project limit, and is excluded. Other Lumber Shippers and Twin Rivers legacy lumber rows have no material volumes and are excluded. Two Other Miscellaneous customer rows carry unconfirmed commodity splits.

4. Benefit Quantification

4.1 Travel Time Savings

Methodology

Travel time savings reflect the avoided cost of operating three corridor trains at the No-Build speed of 10 mph rather than the Build speed of 25 mph. The 94-mile corridor spans the MNR Madawaska Subdivision (70 miles) and EMR Van Buren Subdivision (24 miles). Three trains traverse all or part of the project corridor five to six days per week, as follows:

Train	Route	One-Way Miles	Days/Week	Annual Trips	Hrs Saved/Yr
520	Van Buren (V24) to Madawaska (MP262)	24	5 (M–F)	520	~749
530	Fort Kent (MP244) to Nixon Siding (MP212)	32	6 (Su–F)	624	~1,198
900	Fort Kent (MP244) to Madawaska (MP262)	18	6 (Su–F)	624	~674
Total				1,768	~2,621

All three trains operate as turn jobs, departing and returning to the same station the same day. Annual directional trips equal days per week multiplied by 52 weeks multiplied by a round-trip multiplier of 2. Hours saved per trip equal the difference between No-Build travel time (one-way miles ÷ 10 mph) and Build travel time (one-way miles ÷ 25 mph). Total annual hours saved across all three trains is approximately 2,621 hours, constant throughout the 30-year BCA period.

Annual savings are valued at \$655 per train-hour, the USDOT BCA Guidance Appendix A, Table A-5 freight train hauling rate (2024 dollars). The Table A-2 Locomotive Engineer time value (\$54.20 per person-hour) is not applied separately, as it is already embedded in the \$655 hauling rate; applying both would constitute double-counting.

The annual Travel Time benefit is $\$655 \times 2,621 \text{ hours} = \$1,716,624$ in constant 2024 dollars, flat across all 30 years of the BCA period.

Results

Discounted NPV of Travel Time Savings: \$14,194,194 (7%, 30-year period, 2024 dollars)

4.2 Vehicle Operating Cost Savings

Methodology

Vehicle operating cost savings reflect avoided commercial truck operating costs for incremental freight volumes that move by rail under the Build scenario but would divert to highway under the No-Build scenario. The Build-minus-No-Build carload delta in each year represents freight that, absent rail service, would be shipped by truck.

Annual incremental truck-miles are computed by multiplying the Build-minus-No-Build carload delta by customer-specific truck conversion factors and weighted average one-way truck distances. Truck distances represent highway routing from the relevant interchange or origin point to the customer’s delivery destination. For Twin Rivers Paper outbound, a distance of 438 miles (Madawaska to Boston) is applied as a conservative lower-bound assumption, reflecting the nearest major delivery market.

Customer	Commodity / Route	Trucks/Car	Mi/Car
Dead River	LPG and Fuel Oil — alternative gateway to Presque Isle (50/50 split)	4	164
LP Louisiana Pacific	Logs — Fort Kent to New Limerick	4	110
LP Louisiana Pacific	MDI and Other Hazmat — Portland, ME to Holton facility	4	170
Twin Rivers (inbound)	Wood pulp, corn starch, limestone slurry, kaolin, talc, titanium dioxide — Boston to Madawaska	3–4	438
Huber	Panel Products — Easton, ME to Boston	3	330
Irving Woodlands	Hard/Softwood Logs — Fort Kent to Woodland, ME	4	70
Irving Woodlands	Softwood Logs — Fort Kent to Saint John, NB	4	165
Irving Woodlands	Chips — Skerry/Ashland to Saint John, NB	4	200
JD Irving Lumber	Lumber — Van Buren/Ashland to Boston	3	370
LP Wooden Siding	Wooden Siding — Houlton to Boston	3	400
Maibec / Daquaam /JDI	Lumber — Masardis, ME to Boston	3	350
Twin Rivers Paper	Paper rolls — Madawaska to Boston (conservative lower bound)	3	438

The commercial truck vehicle operating cost rate of \$1.23 per truck-mile (2024 dollars) is sourced from USDOT BCA Guidance Appendix A, Table A-4. The rate includes fuel, truck/trailer lease or purchase payments, repair and maintenance, insurance premiums, permits, and tires.

Results

Annual base truck-miles avoided in 2031: Starts at approximately 4.2 million, growing as the Build-minus-No-Build volume delta widens at customer-specific growth rates. Discounted NPV of Vehicle Operating Cost Savings: **\$152,409,599** (7%, 30-year period, 2024 dollars).

Incremental Train Operating Costs

Build scenario volume projections reflect customer-specific growth rates ranging from 2% to 6% annually, resulting in incremental corridor carloads. To handle this volume growth under the Build scenario, NBM Railways would require additional train starts beyond the three turn-job trains currently operating. The analysis conservatively assumes the existing three trains are operating at capacity as of 2025, based on 16,656 observed carloads against a 3-train schedule, implying approximately 5,552 carloads per train per year. For each BCA year, the number of trains required is estimated by dividing projected Build carloads by this per-train capacity and rounding up to the nearest whole number. Incremental trains beyond the existing three are assigned an estimated annual operating cost based on the weighted average train hours of the current corridor schedule (582.4 hours per train per year at 25 mph Build speed), valued at the USDOT BCA Guidance Appendix A, Table A-5 freight train hauling rate of \$655 per train-hour. The resulting incremental operating costs, ranging from approximately \$1.1 million in 2031 to \$5.7 million in 2060, are reflected as Build-scenario costs netted against gross VOC savings. This treatment is conservative in that it assumes full capacity utilization at the 2025 baseline rather than deriving a capacity figure from operational data, which

would likely yield a higher per-train carload threshold and therefore fewer incremental trains. Travel time savings attributable to these incremental trains are excluded from the benefit calculation, as these trains have no No-Build counterpart against which a speed-differential benefit can be measured.

4.3 Emissions Reduction

Methodology

Emissions reduction benefits reflect the avoided social cost of air pollutant emissions generated by the incremental truck-miles eliminated under the Build scenario. The same annual incremental truck-miles used for Vehicle Operating Cost Savings are applied at the USDOT BCA Guidance Appendix A, Table A-14 commercial truck emissions rate of \$0.038 per truck-mile (2024 dollars). This rate represents the monetized damage cost of criteria pollutants, including nitrogen oxides, sulfur oxides, and fine particulate matter (PM_{2.5}), attributable to diesel combustion in commercial truck operations. Greenhouse gas externalities valued at the Social Cost of Carbon are excluded consistent with OMB Memorandum M-25-27.

Results

Discounted NPV of Emissions Reduction: **\$5,286,340** (7%, 30-year period, 2024 dollars).

4.4 Safety Benefits

Methodology

Safety benefits reflect avoided crash costs attributable to the incremental truck-miles eliminated under the Build scenario. The same annual incremental truck-miles used for Vehicle Operating Cost Savings and Emissions Reduction are applied at the USDOT BCA Guidance Appendix A, Table A-14 external highway use cost — safety component — for buses and trucks at all locations: \$0.023 per truck-mile (2024 dollars). This rate represents the external portion of crash costs associated with commercial truck operations, reflecting fatality, injury, and property damage costs borne by parties other than the truck operator.

Results

Discounted NPV of Safety Benefits: \$3,199,627 (7%, 30-year period, 2024 dollars); \$6,265,800 at 3%.

5. Unquantified Benefits

The following benefit categories were identified but excluded from the quantified BCR. Their exclusion understates the total economic value of the Project.

Operations and Maintenance Cost Savings – Under the No-Build scenario, the deteriorating corridor requires increasing corrective maintenance expenditure to sustain minimum operability. Track in FRA Class 1 and deteriorating condition requires more frequent surfacing, tie replacement, and rail repair than track maintained in a state of good repair. The Build scenario rehabilitates the corridor to FRA Class 2 standards, reducing annual maintenance requirements materially over the analysis period. Annual No-Build corrective maintenance cost data was not available at the time of submission; this benefit is excluded from the quantified BCR. Its exclusion is conservative.

Shipper Cargo Value of Time - The speed increase from 10 mph to 25 mph across the 94-mile corridor reduces freight transit times for all corridor traffic. USDOT BCA Guidance does not prescribe a standard shipper value-of-time rate for freight rail. For high-value commodities such as Twin Rivers Paper rolls, transit time reduction has material commercial value to the shipper. This benefit is excluded pending an independently citable rate. Its exclusion is conservative.

Derailment Risk Reduction – Replacement of deteriorated rail, ties, and turnouts across 94 miles materially reduces the risk of track-caused derailments. The corridor serves hazardous materials customers including LPG and fuel oil, meaning the economic consequence of a derailment event includes not only equipment damage and track repair costs but potential hazardous materials response and evacuation costs.

Corridor Reliability and Service Continuity – Rehabilitated track reduces unplanned service interruptions caused by emergency slow orders and track geometry defects. Twin Rivers Paper has historically diverted significant paper volumes to truck in response to rail service degradation on this corridor. This benefit is

excluded because USDOT BCA Guidance does not prescribe a standard reliability valuation methodology for freight rail operations.

Gateway Competition Value – The corridor provides shippers with access to three competing Class I railroads: CPKC, CSX, and CN. Loss of the corridor would eliminate one competitive gateway option and reduce shipper negotiating leverage with the remaining carriers. This benefit is qualitative and is not included in the quantified BCR.

Social Cost of Carbon – The modal shift from truck to rail under the Build scenario reduces greenhouse gas emissions. Greenhouse gas externalities valued at the Social Cost of Carbon are excluded consistent with OMB Memorandum M-25-27. Their inclusion would further increase the BCR.

Regional Economic and Employment Benefits – Northern Maine’s forest products industry depends on reliable rail service to support mill operations, employment, and regional supply chains. The project area lies within Aroostook County, a rural region that includes an Area of Persistent Poverty census tract (EMR Van Buren Subdivision). These regional economic impacts are addressed in the Project Narrative and are excluded from the BCA per USDOT Guidance Section 8.1.

6. Summary of Results

Category	Discounted NPV (7%, 2024\$)
Travel Time Savings	\$14,194,194
Vehicle Operating Cost Savings	\$152,409,599
Emissions Reduction	\$5,286,340
Safety Benefits	\$3,199,627
Total Discounted Benefits	\$175,089,759
Total Discounted Costs (Capital)	\$29,258,760
Net Present Value (NPV)	\$145,830,999
Benefit-Cost Ratio (BCR)	5.98:1

Vehicle Operating Cost Savings is the dominant benefit category, representing 87 percent of total discounted benefits at the primary discount rate, reflecting the high volume and long-haul distances of freight that would divert to highway under the No-Build. The No-Build volume model is conservative in that it applies no negative growth to any customer and holds most non-hazmat volumes flat at 2026 levels. The analysis excludes several material benefit categories as described in Section 5; their exclusion further understates the true economic value of the Project.