



2023–2024 CN Grain Plan





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Message from Tracy Robinson

As the CEO of CN, it is my privilege to provide you our 2023–2024 Grain Plan.

Canada's agricultural industry has always been the cornerstone of our nation's economy, contributing significantly to its growth and stability. CN knows well the pivotal role played by this sector in driving Canada's economic success. As the demand for Canadian agricultural products continues to rise both domestically and internationally, it becomes increasingly important to enhance the supply chain's capacity to meet these challenges head-on.



To address these demands, we at CN will invest to expand the capacity of our piece of the overall supply chain. Through the collaborative efforts of CN and our supply chain partners, we aim to optimize the movement of agricultural goods efficiently and sustainably. However, we are but one link in the supply chain, which is only as strong as its weakest link.

By fostering strong relationships and cooperation amongst supply chain partners, we can streamline the flow of goods and eliminate bottlenecks. This collaborative approach enables us to understand the performance of each supply chain participant and work together to address any challenges, resulting in improved overall efficiency and reliability.

Through open communication and shared data, we can identify areas for improvement, optimize processes, and ensure that every link in the supply chain operates at its peak performance.

At CN, we firmly believe in driving transparency across the entire supply chain. We recognize that transparent operations are vital for managing and assessing performance effectively. Through open communication and shared data, we can identify areas for improvement, optimize processes, and ensure that every link in the supply chain operates at its peak performance.

As we outline in this year's plan, Canadians need a balanced approach to performance measurement that considers **all** parts of the supply chain. To that effect, we look forward to the Canadian Government setting up the Supply Chain Office as we believe it is a step in the right direction. Improved supply chain visibility will help decision-makers better understand what is going on when problems arise and why. We will continue to work with government as they stand up this much needed office.

I extend my gratitude to all our stakeholders who have contributed to the 2023–2024 Grain Plan, including the farmers and industry leaders on our CN Agricultural Advisory Council. With your collaboration, CN stands ready to move the upcoming Canadian grain crop. Together, we can navigate the challenges ahead, capitalize on new opportunities, and ensure the continued success and prosperity of the Canadian agricultural sector.

Sincerely,



Tracy Robinson
President and CEO





Introduction

CN's 2023–24 Grain Plan has been prepared in accordance with Canada's *Transportation Modernization Act* and has two main objectives:

- First, the Grain Plan sets out CN's assessment of how much grain and processed grain products we expect to move during the 2023–24 crop year (August 1, 2023 to July 31, 2024) based on the expected size of the crop and other supply- and demand-related estimates.
- Second, the Grain Plan identifies the steps that CN is taking to move this anticipated volume of grain over the course of the crop year based on demand forecasts and the resources we expect to be available.

During spring and early summer, CN consulted with our grain customers and other stakeholders concerning the 2023–24 Grain Plan. CN also engaged with our **Agricultural Advisory Council**, which involves a cross-section of western Canadian farmers and industry leaders to provide ongoing advice and feedback on grain transportation and CN's interaction with producers. We would like to express our thanks to the stakeholders who provided their input and engagement on CN's 2023–24 Grain Plan.

New Actions and Initiatives for 2023–24

1 Refining the scheduled operating plan.

CN is refining its operating plan to build on last year's successes. Running to plan is the key focus around which all our operations and planning is built. The fundamental changes that CN made to its operational planning and communication last year delivered the best train velocity since 2016 along with strong, consistent grain movement.

2 Rolling stock acquisition. CN will take delivery of 750 new high-efficiency grain hopper cars in 2024.

3 Developing and preparing our people. CN's staff resourcing for 2023–24 will be in line with anticipated customer demand. It will also account for new government regulations related to personal leave days and sick days that are expected to impact labour availability. CN labour priorities for the year ahead focus on employee retention and encourage collaboration across CN teams.

4 Locomotive initiatives. CN will continue process improvements to increase locomotive reliability. This includes our locomotive modernization program (upgrading from direct current [DC] to alternating current [AC]), and outfitting upgraded locomotives with state-of-the-art technology.

5 Supply chain scorecarding initiatives. Canada must expand its measurement systems to consider all parts of the grain supply chain. It is also clear that real-time live information has become critical to maximize the capacity of the supply chain. Government and industry measurement systems should include indicators like grain terminal loading times and customer demand forecasting.

6 Technological innovation. CN expects to implement a new Precision Dispatch System to further optimize train movement across our network.



Davidson, SK

Building on our operational successes

The fundamental changes that CN made to our operational planning and communication in advance of last year's harvest translated into strong, consistent grain movement. Key aspects of these changes were communicated in depth in the 2022–23 CN Winter Plan¹ as follows:

- Improved collaboration and communications with customers on grain movement.
- Focused attention on building and running the core operating plan.
- Renewed emphasis on on-time train departure and car-blocking integrity from major rail yards for scheduled train service.
- Implementation of scheduled slots for bulk unit trains in key corridors.
- Strategic staging of bulk unit trains west of Edmonton, AB, to maximize utilization of network capacity.
- Increased frequency of internal communication among CN teams.
- Matching mainline capacity to feeder line traffic volumes during periods of persistent extreme cold to avoid network congestion.

Besides delivering the strongest network velocity since 2016 and creating additional capacity, running to plan improved overall CN rail network balance, which is critical to ensuring efficient rail operations and ensuring the right resources are in the right place at the right time.

Now that these changes have been implemented and have delivered real results, CN is focused on refining the operating plan based on lessons learned to drive incremental gains in service and efficiency.

¹www.cn.ca/winterplan



Being able to deliver the benefits of the operational improvements that CN has made will rely heavily on demand forecast accuracy. Within CN, that means the Sales and Marketing team and the teams involved in building and running the operational plan must work in an integrated fashion, as well as utilizing precise demand information to make investments in additional network infrastructure and other resources before bringing on incremental business. CN relies heavily on customers to provide accurate and timely forecasts to support our operational planning activities, and that information will become increasingly important to support CN's investment decisions.

Making the most of technology is also part of the path toward operational excellence. Utilization of new technologies help maximize asset use, optimize network capacity and fluidity, and increase safety. The implementation of WABTEC's Precision Dispatch System will enable movement optimization throughout CN's mainline operations. Optimizing train movement means removing unnecessary train meets, delays, or stops, and avoiding train replanning.

The 2022–23 Crop Year in Review

Before turning to our plan for the 2023–24 crop year, it is important to review the factors that affected overall grain traffic movement during the 2022–23 crop year.

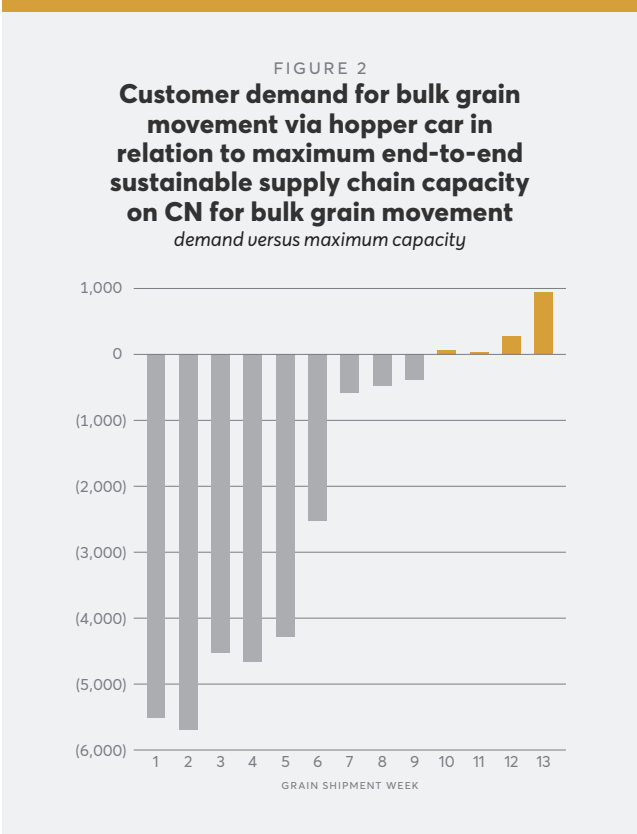
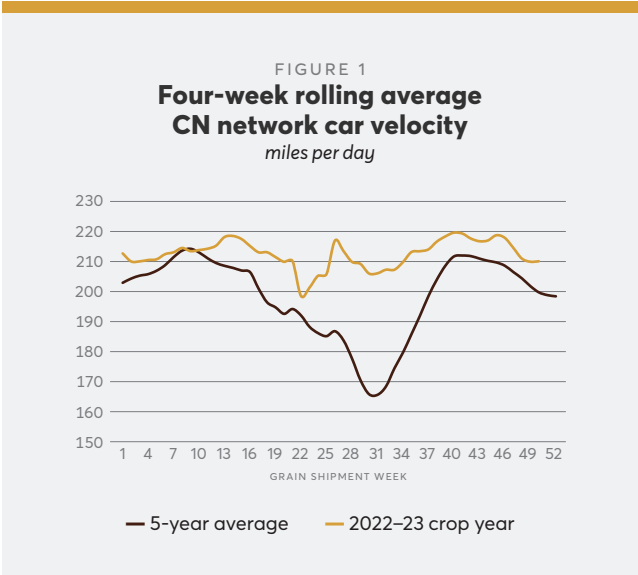
Disciplined adherence to the operating plan

Going into fall 2022, CN was confident we had a comprehensive, strong, and realistic plan in place for grain movement. We intended to deliver the best possible rail service, a key link in the end-to-end grain supply chain. Fundamental changes to CN's rail operating plan, including disciplined adherence to the plan, were implemented in the spring and summer of 2022, laying the base for a successful fall and winter campaign.

Car velocity (how many miles a car moves per day on average) represents an all-encompassing operating metric that accounts for train speed from origination yard to destination yard, as well as the time (in hours) that the railcar spends in a yard. **Velocity during the 2022–23 crop year reached the highest levels recorded since 2016.** In fact, supported by normal winter conditions, CN's winter car velocity was on par with the levels CN achieved in summer and fall 2022.

Limited customer demand for grain movement to start the crop year

Given that stocks of grain reached historically low levels at the end of July 2022 due to the impact of drought on the 2021 grain crop, customer demand for grain movement was well below CN's maximum grain supply chain capacity guidance during the first two months of the crop year. Approximately 27,400 hopper cars' worth (2.6 MMT) of available bulk grain supply capacity on CN went unutilized by customers during this time.



Significant grain loading issues during inclement weather at West Coast ports

The 2022–23 crop year saw a recurring, fixable problem reappear that reduced grain supply chain capacity, namely the lack of grain vessel loading during inclement weather at Canada's West Coast ports. This issue caused acute supply chain capacity problems in grain shipment weeks 13 to 15. At one point in late October 2022, CN had nearly 20 grain trains held back on the Prairies or along the route to Vancouver to avoid overloading the port after rain delays. Those rain delays also meant grain cars weren't getting emptied and cycled back to the Prairies, negatively impacting grain end-to-end supply chain capacity. The impact of the grain vessel rain delays on the grain supply chain also negatively impacts overall rail network fluidity for other commodities. More detail on this topic is presented later in the Grain Plan.

No major rail network disruptions

Unlike the 2021–22 crop year, which saw severe supply chain productivity impacts due to unprecedented rail washouts in southern British Columbia, there were no major disruptions to grain movement during the 2022–23 crop year. Any mainline disruptions that CN encountered were of short duration.

On October 5, 2022, a bridge fire on a CN branch line shut down rail service to the western side of the Peace River region. Just like the company's response to the BC floods in late 2021, CN's Engineering team worked around the clock to get the line back in service. In just eight days, CN mobilized over 60,000 cubic yards of material, the equivalent of 20 Olympic-size pools, to fill in where the bridge once stood and restored service. CN went on to set new records for grain movement in October. Most importantly, this was accomplished safely and without incident. This was an example of CN teamwork at its best. It is also an example of the significant infrastructure investments that CN makes to maintain the safety and fluidity of our network.

Multiple labour agreements completed

The 2022–23 crop year also marked the resolution of multiple labour agreements between CN and unions representing CN workers. On October 11, 2022, we reached a three-year collective agreement with the International Brotherhood of Electrical Workers (IBEW). The agreement runs through December 31, 2024, and covers roughly 750 Signals and Communications employees in CN's Canadian operations.

On December 23, 2022, the Teamsters Canada Rail Conference (TCRC), which represents approximately 160 rail traffic controllers in Canada employed by CN, ratified a new collective agreement that extends through December 31, 2025.

On March 20, 2023, CN and Unifor reached a tentative agreement that was later ratified on May 1, 2023. The agreement will remain in place through December 31, 2024, and covers approximately 3,000 CN employees working in Mechanical, Intermodal, Facility Management, and clerical positions in Canada.

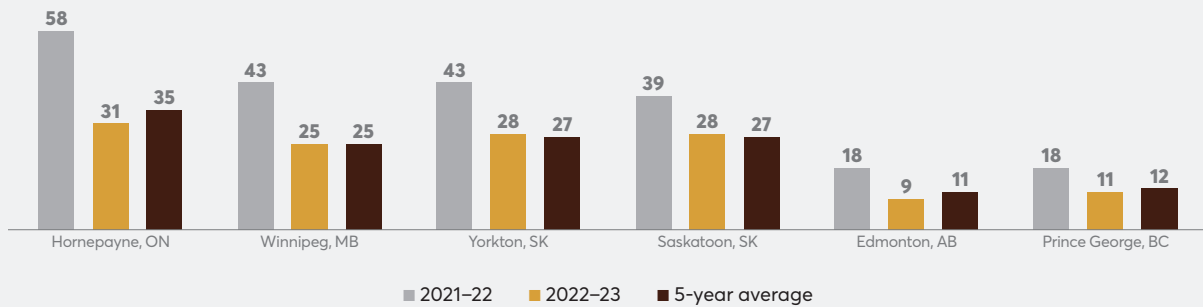
On April 23, 2023, CN announced a tentative agreement with the Teamsters Canada Rail Conference (TCRC). The union represents approximately 6,000 CN locomotive engineers, conductors, yard conductors, and yard coordinators working on CN's mainline, shortlines, and yards, in Canada. The agreement was ratified on May 26, 2023, and will remain in place until December 31, 2023.

Discussions with our employees and their unions will continue through to 2024 as we work to ensure a stable labour environment for both our employees and our customers.

Return to normal winter operating conditions

The frequency of extreme cold during winter 2022–23 was in line with the historical Canadian average. This was in sharp contrast to winter 2021–22 when the frequency of extreme cold nearly doubled normal levels. In our Western Region during the winter of 2021–22, CN had to deal with temperatures below -30°C for over 50 of 65 days between late December and the end of February 2022. For the 2022–23 winter, that figure fell to almost half those levels in some regions. And this year, once extreme cold conditions abated, CN network velocity recovered more quickly, due in large part to the operational changes CN effected in advance of winter 2022–23, including active pipeline management, improved customer collaboration, and improved internal communications to help resolve disruptions when they occurred.

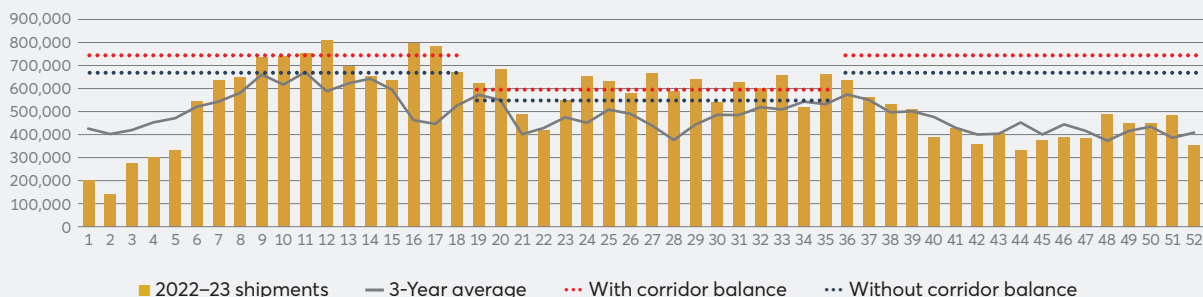
FIGURE 3
Number of days where minimum temperatures were -25°C or colder during December 2022 – March 2023
Select Canadian weather stations across the CN network



Strong, consistent CN grain shipment performance and car order fulfillment

CN achieved **record weekly grain shipment results in 12 of the first 32 weeks of the crop year**, including our two best-ever grain shipment weeks for western Canadian grain — 810,000 metric tonnes in week 12 and 798,000 metric tonnes in week 16. CN also recorded **our best-ever individual month of grain movement** in October 2022, with 3.3 MMT of shipments, and achieved record grain volumes of 2.4 MMT for the month of February.

FIGURE 4
Weekly shipments of grain and processed grain products from Western Canada on CN versus maximum end-to-end sustainable supply chain capacity guidance
tonnage shipped



Port labour disruption

On July 1, 2023, the International Longshore and Warehouse Union (ILWU) initiated a work stoppage that affected ports across the West Coast of Canada. The work stoppage ended on July 13 as a result of a tentative agreement between the ILWU and the British Columbia Maritime Employers Association (BCMEA), only to be resumed by the ILWU for a brief period on July 18. As of the date of the writing of this document, the tentative agreement between ILWU and BCMEA had yet to be ratified, creating uncertainty about operations at Canada's West Coast ports.

Section 87.7 of the Canada Labour Code makes it clear that during a strike or lockout, the services normally provided to ensure the tie-up, let-go and loading of grain vessels at licensed grain terminals, along with the movement of the grain vessels in and out of a port, are not directly affected by the work stoppage. However, grain traffic that moves through non-licensed grain terminals at port (e.g. container stuffing facilities and vegetable oil terminals), along with containerized grain traffic moving directly from Western Canada to port, is not protected by the Canada Labour Code.

A supply chain disruption of this magnitude will take weeks to clear — recovery for the supply chain will be a factor of about five to seven times the length of the labour disruption. CN has implemented an orderly plan to resume carload and intermodal movements to and from the ports of Vancouver and Prince Rupert. This includes actively assessing all traffic to mitigate any further impacts or service disruption and ensure the safety of our people, communities, and customers' goods. Our resumption plan includes maintaining the temporary carload traffic embargoes in place until the labour situation becomes clearer while we work with customers to position traffic destined to the ports.

Environmental impact reduction

CN continued our efforts to decarbonize North America's freight sector by leveraging and stimulating progress in the development of low-carbon fuels and new locomotive technologies. CN also launched a new self-service sustainability tool that provides customers with a detailed report of their estimated greenhouse gas emissions based on all their loaded shipments moved on CN, as well as the emissions avoided by choosing rail over truck. Shipping heavy freight by rail can reduce carbon emissions by up to 75% when compared to trucks. The *My Carbon Emissions* tool empowers customers to make data-driven decisions that support their climate objectives.

Key takeaways from 2022–23

- Canada's western grain supply chain marked major improvements in rail shipment volumes and service in 2022–23, following a return to normal winter conditions, stabilizing trade flows and the implementation of operational changes across the CN network.
- **CN established new weekly records for grain movement in 12 of the first 32 weeks of the crop year, including our two best-ever grain shipment weeks in company history.** CN also recorded our best-ever individual month of grain movement in October 2022 and achieved record movement in February 2023.
- Ongoing challenges loading grain ships on West Coast ports during rain events continued to reduce supply chain capacity and farmers' ability to access markets. These delays drive up costs for all supply chain participants.
- Resolution of multiple labour agreements with CN's valued employees provided stability to company operations.

Factors Affecting Overall Rail Capacity

- › Demand forecast accuracy determines short- and long-term resource planning.
- › Resource planning includes crews, locomotives, rolling stock and infrastructure.
- › Extreme weather events and global politics can impact planning and trade flows.

Forecasting is key

Timely and reliable demand forecasts across all segments of CN's rail traffic is critical to resource and operational planning. In the absence of accurate customer forecasts, CN is required to make assumptions, often relying upon historical data. Significant changes in demand levels or traffic flows that we are not made aware of hinders our ability to respond quickly to new circumstances. Long lead times are required to recruit and train crews (~9 months), acquire locomotives or rolling stock (12+ months), and invest in rail-related infrastructure (18+ months). The result is potential gaps in resource levels that could have been avoided with better forecasting and communication. Improved short- and long-term customer demand forecasts support the supply chain's ability to plan for growth.

Information specific to the grain supply chain that CN requires to support our operational planning activities ranges from daily grain terminal updates to regular updates on customer hopper car demand forecasts by corridor and grain shipment week. When customers assist CN in getting the timing of the ramp-up in demand at harvest time spot on, CN can ensure that we have the hopper car fleet positioned in the most optimal way and meets demand. Thousands of hopper cars need to be pulled from long-term storage due to the cyclical nature of grain movement, making close collaboration between CN and its customers especially key.

Unfortunately, the quality and timeliness of hopper car demand forecasts vary significantly among CN's grain customers. Customers can place hopper car orders with CN up to sixteen weeks forward, but unfortunately, customers elect not to. Lack of forward planning and collaboration negatively impacts the rest of the grain supply chain, as other players, including railways, lose opportunities to more efficiently allocate their resources to meet customer needs and to maximize overall system capacity.

St. Adolphe, MB



Resource planning at CN

Typically, demand planning less than 12 months out is focused heavily on operating crew base and locomotive fleet size. Demand is converted into train counts, which in turn is converted into crew and locomotive demand. Longer-term forecasts focus on rail infrastructure and network capacity. CN monitors traffic levels on individual sections of track and individual traffic corridors to help assess what additional track infrastructure is required. From initial planning to completion, infrastructure investments can take months or years, depending on the scale. In addition, engineering and permitting processes can extend the time required for individual projects.

THE SUPPLY CHAIN IS INTERCONNECTED

The key to success is for supply chain partners to avoid working in isolation and to collaborate across sectors to support long-term demand. In other words, we need to look at the entire system of interconnected supply chains to support economic growth. For example, **locomotives, crew base, and rail infrastructure** are resources shared across all rail traffic moving on CN's network — not just grain. For this reason, **demand for the movement of grain and processed grain products cannot be considered in isolation.** This is also why it is so critical to have accurate demand forecasts across all business segments to ensure effective long-term resource planning. Recognizing that capacity is not infinite, rail traffic increases associated with sudden demand shocks in any one sector due to significant global events or sharp changes in market conditions are not easily absorbed.

While assets such as locomotives can be readily redeployed to other areas of the rail network when demand shifts, resources such as crews cannot. Just like any other employee in Canada's economy, railroaders typically work and make their home within a specific region. Even when employees can take short-term assignments to support a high-demand area, it still takes time to train and familiarize them with their new region. It is better to plan together and build the long-term capacity customers need in advance.

When considering capacity to move traffic, it is also important to note that CN is only one component of the supply chain, with other factors affecting the overall efficiency and capacity of the system. For example, in the end-to-end grain supply chain, activities at the origin, as well as the destination, need to be considered. If an export terminal is congested and lacks space to unload rail cars, trains directed to that terminal must be held back to avoid creating more congestion.

Those delays have a spin-off effect. Considering that most of the hopper car fleet moving grain is a shared asset among customers, fleet efficiency utilization is impacted in this scenario — cars returned more slowly to the interior for the next load mean delays for other players. CN and our customers need to work together and closely coordinate our activities to maximize the efficiency of the end-to-end supply chain.

Watch the video to learn more about the complexity of the grain supply chain:
www.cn.ca/pullingtogether



Impact of weather and other factors on rail operations

External factors, particularly weather-related factors, also have a real impact on supply chain capacity. Winter occurs every year, but the duration and severity of winter conditions are not predictable — every year is different — and all points in the grain supply chain are affected in different ways. For example, extreme cold not only affects rail infrastructure, rolling stock, locomotive power, and people operating the railroad, it also affects operations at Prairie grain handling facilities and export terminals, and grain movement into the primary elevator system from farms.

The extreme cold of a Canadian winter isn't the only thing we can count on. Heavy, persistent rainfall occurs at Canada's West Coast ports every year. And like clockwork, every time it rains, grain movement slows down. However, rain is a solvable problem.

There is no reason that wet weather should impact modern grain terminal operations. Multiple solutions to this problem are in place in the U.S. Pacific Northwest, which is an area with the exact same issue.

Furthermore, the longer and more frequently conditions such as extreme cold or persistent rainfall occur, the more the supply chain's ability to recover is reduced. CN will continue to innovate and find ways to improve our ability to deal with extreme cold and other severe weather events. The development of CN's air distribution braking car fleet, which is now up to roughly 100 cars, is just one example of implementing new technology to mitigate the impact of extremely cold temperatures on rail operations. CN's Winter Plan outlines the ways that CN mitigates the impact of extreme cold on rail operations.



The events of the past few years have served as a reminder that external forces play a large role in determining the overall demand for transportation services. These events include blockades, strikes (such as the recent ILWU/BCMEA dispute), and climate-related network disruptions including floods, fires, and washouts. However, rail capacity is unable to quickly adjust to demand shocks. Train counts cannot simply be doubled overnight to recover from a major mainline disruption or to accommodate a spot market opportunity measured in weeks. There are only so many trains that can move through the mountains at any point in time.

WAR IN UKRAINE

Solutions are harder to find in a shifting environment. The impact of the war in Ukraine remains a wild card in 2023–24 grain markets. With no clear resolution to the conflict in sight, the region's crop production continues to suffer, and political alliances are changing trade flows around the globe. CN will work with our customers to support their business as they adapt to each new development.

Capacity is not infinite, and CN and our customers must plan together and prepare for the future to the best of our respective abilities.



CN's expectations for 2023–24

Based on current demand forecasts and the best economic and market information available, CN expects the total demand for rail service between Edmonton and Jasper, AB, and between Jasper, AB, and Vancouver, BC, to exceed capacity at times during the fall of 2023 and early into 2024. CN expects total demand for rail service to be at or below capacity for the same period on the BC North corridor between Jasper, AB, and Prince Rupert, BC.

The expectation that the railway has capacity available and ready, wherever and whenever required, must be balanced against the fact that there will always be limited capacity to respond to demand shocks driven by sudden changes in market conditions or significant global events. **Capacity is not infinite, and CN and our customers must plan together and prepare for the future to the best of our respective abilities. Customers across all CN business segments have knowledge critical to CN's resource planning. To that end, frequent and open communications ensure customer forecasts and resource updates are shared and CN can better adjust to the uncertainties that impact markets and demand.**

Making the most efficient use of the capacity available in **all** rail corridors throughout the year means more farmers' grain getting to market in a timely fashion. That supports farmers' cash flow and marketing activities. For example, the eastern Canadian transportation system is significantly underutilized and represents an opportunity to increase shipment volumes of grain and other commodities, especially during peak period demand for grain movement through the fall and winter. Corridor balance is required to maximize supply chain capacity and throughput.

Estimating 2023–24 Western Canada Grain Supplies

- › Crop production volumes in Western Canada are generally trending higher.
- › CN relies on feedback from external sources, including grain companies, private market analysts, and government agencies to project yearly grain volumes.
- › Yearly acreage and yield forecasts can change dramatically due to weather and other factors.

Crop production volumes in Western Canada have trended upward over the past 10 years. CN has invested in our network infrastructure, purchased new locomotives and high-capacity hopper cars, and worked with grain customers to extend sidings and build loop tracks that will support continued sector growth. CN's capital investments over the past five years total more than \$15 billion.

However, the past two crop years were a stark reminder that there is significant variability in crop production potential from one year to the next, as well as regionally within Western Canada. Forecasting the volume of grain and processed products to be moved during the crop year requires the consideration of three key items:

- 1 Grain production**, the largest factor affecting the overall volumes to be moved.
- 2 Carry-in** from the previous crop year, which, combined with grain production, represents **total available supplies**.
- 3 Domestic use and exports**, leaving the balance as **carry-out**.

In projecting volumes, CN relies on feedback from external sources, including grain companies, private market analysts, and government agencies such as Agriculture and Agri-Food Canada (AAFC). It is also important to emphasize that crop production forecasts are subject to significant variability given the impact of weather during the growing season on crop development and yield potential.

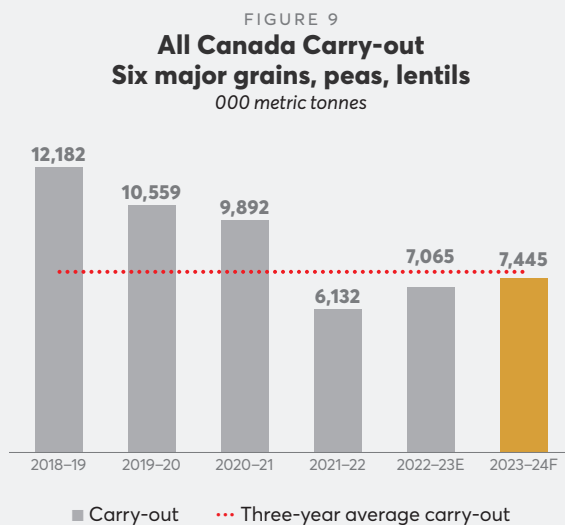
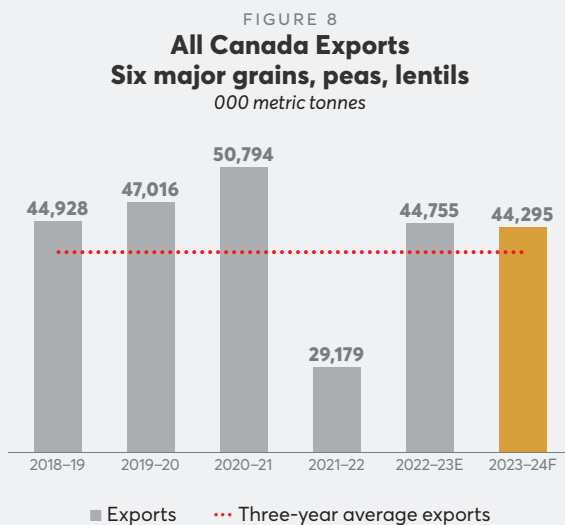
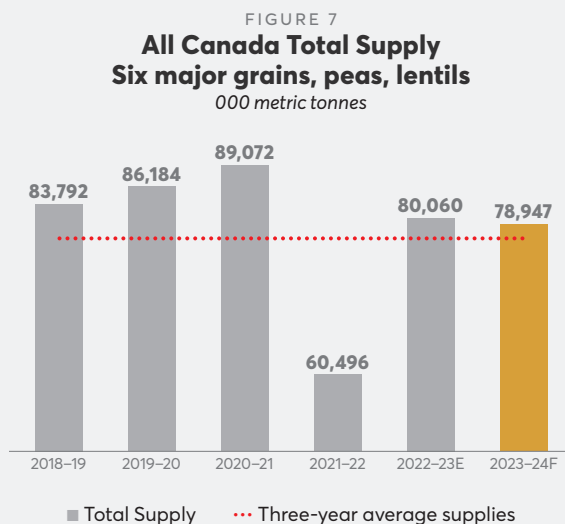
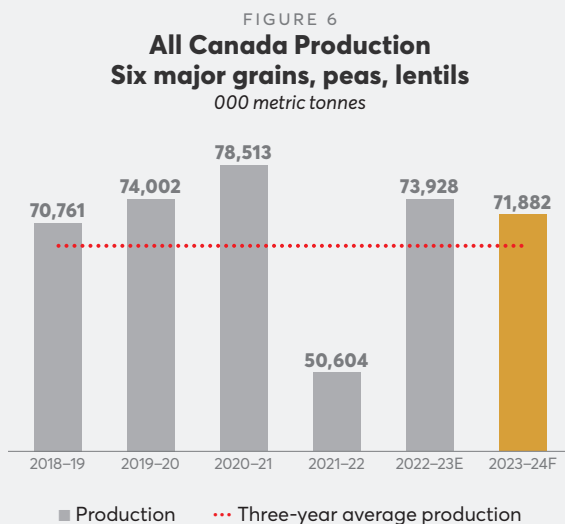
The grain industry uses trendline yield forecasts and estimates of seeded and harvested area to determine crop production forecasts, and estimates are modified through the growing season to reflect changes in harvested acreage and yield potential driven by weather and other factors. The first official producer survey of crop production is carried out by Statistics Canada in July, with the survey results released at the end of August.

As previous years have demonstrated, there can be sharp changes in production estimates from the first official survey to the last, as was the case in 2013 when overall final yield estimates for western Canadian grain production ended up being sharply higher compared to the initial July survey results. Conversely, Prairie crop production expectations in the summer of 2021 declined sharply from the start of the growing season to the completion of harvest due to widespread drought.

AAFC projects the following for the 2023–24² crop year:

- **Carry-in** supplies of the six major grains,³ peas and lentils to be 9.0 MMT, above the three-year average of 7.8 MMT.
- **Production** of the six major grains, peas, and lentils to be 73.7 MMT versus 73.9 MMT in 2022–23 and the three-year average of 67.7 MMT.

- **Total available supplies** to be 81.2 MMT compared to 80.1 MMT in 2022–23 and the three-year average of 76.5 MMT.
- **Exports** are to be 44.7 MMT compared to 44.5 MMT in 2022–23 and the three-year average of 41.5 MMT.
- **Carry-out** for 2023–24 to be slightly above the three-year average at 9.0 MMT.



²Based on the AAFC July 2023 Outlook for Principal Field Crops:

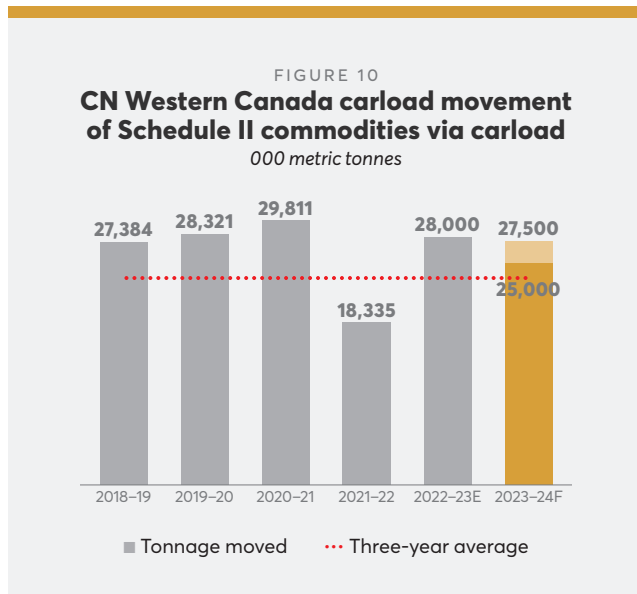
<https://agriculture.canada.ca/en/canadas-agriculture-sectors/crops/reports-and-statistics-data-canadian-principal-field-crops>

³Wheat, barley, oats, flax, rye, and canola

Feedback from customers, market analysts and other grain industry participants on crop production prospects is key to supporting CN's operational planning activities. Information supplied in this fashion is used to estimate the overall grain movement demand for the crop year and measured against CN's market share for rail transportation services. However, it should also be noted that at the time of the writing of this document, large areas of Western Canada were experiencing adverse growing conditions due to the impacts of drought, representing significant uncertainty with respect to crop production in 2023. Many of CN's customers and stakeholders have provided similar feedback, with many indicating that they expect Western Grain production to be below average in 2023. CN will update these estimates in its monthly Grain Plan updates as additional information becomes available.

Grain shipment forecasts

This Grain Plan assesses CN's ability to move the volumes of grain expected to be offered up by our customers for movement during the crop year. Specific to CN, the following volumes of grain and processed grain products have been moved in hopper cars, tank cars, and boxcars over each of the past five crop years, with grain volumes moved directly from Western Canada using intermodal equipment in addition to these volumes.



On an annualized basis, grain supply chain capacity of up to 36 MMT via carload on CN is available for the 2023-24 crop year, assuming all the conditions are in place to achieve maximum sustainable supply chain capacity (see Section CN's 2023-24 grain marketing programs). Based

on current AAFC estimates of total available supplies, the volume of grain and processed grain products offered to CN by customers for movement via carload over the course of the 2023-24 crop year is projected to be 25.0 to 27.5 MMT, with grain shipped via container direct from Western Canada in addition to these volumes. Experience shows that forecasts may not always reflect reality. Therefore, CN will refine our assessment of anticipated volumes to be moved based on overall crop production and other market factors sourced in part from information collected by grain customers and other industry stakeholders.

Containerized grain shipments direct from Western Canada are an important means of getting grain from the Prairies to domestic and overseas markets. As noted previously, CN moved over 0.8 MMT of grain direct from the Prairies via container during the 2022-23 crop year. CN expects that containerized grain shipments direct from Western Canada will continue to represent a significant volume of grain shipments in the upcoming crop year.

Establishing Maximum End-to-End Grain Supply Chain Capacity

- › Maximum sustainable grain supply chain capacity is a function of the capacity and operational efficiency of the individual pieces of that supply chain, from origin to destination.
- › CN has invested billions in rolling stock, locomotives, rail infrastructure, technology, and labour recruitment initiatives to help improve overall supply chain capacity.
- › All parts of the supply chain must work together to ensure the use of available rail corridors is balanced.
- › Regulatory measures can directly impact supply chain capacity and throughput.

The maximum sustainable capacity of the grain supply chain is a function of the capacity and operational efficiency of the individual pieces of that supply chain. All components of the supply chain need to be in sync and operating at peak efficiency to achieve maximum capacity on a sustainable basis. The supply chain stretches all the way back to the farm and from country elevator to destination. And the grain supply chain doesn't simply end with the unloading of a railcar at an export terminal — it encompasses the ocean-going bulk vessel hauling grain cargo to an end-user halfway around the world, or the container ship carrying containerized grain and other cargo.

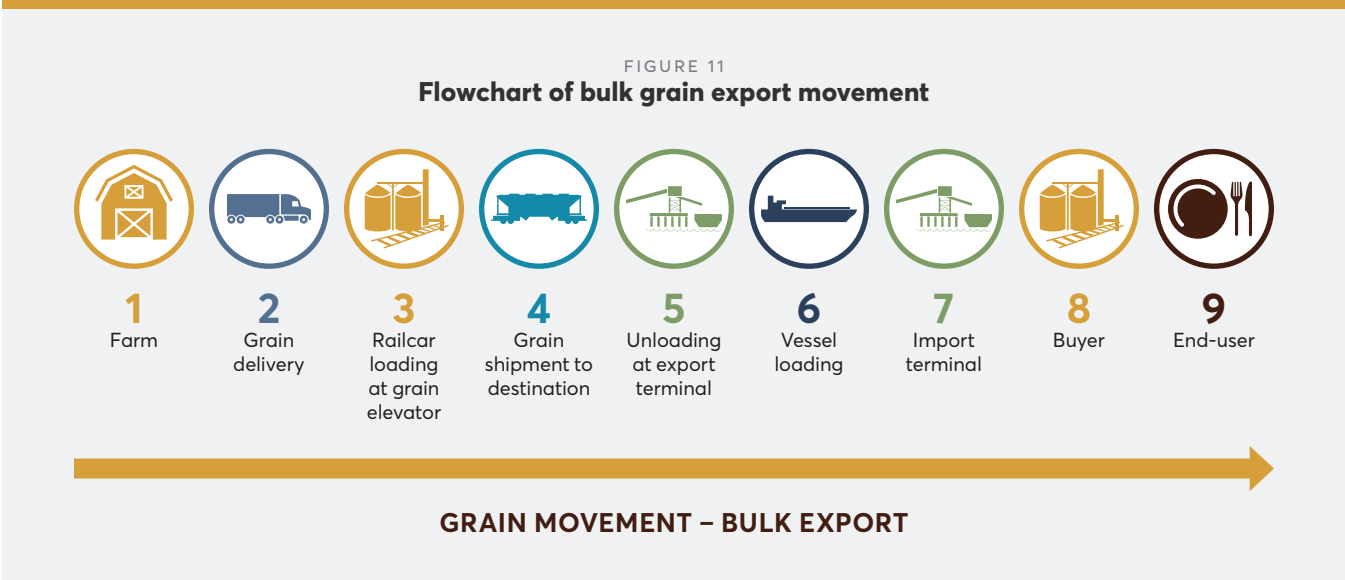
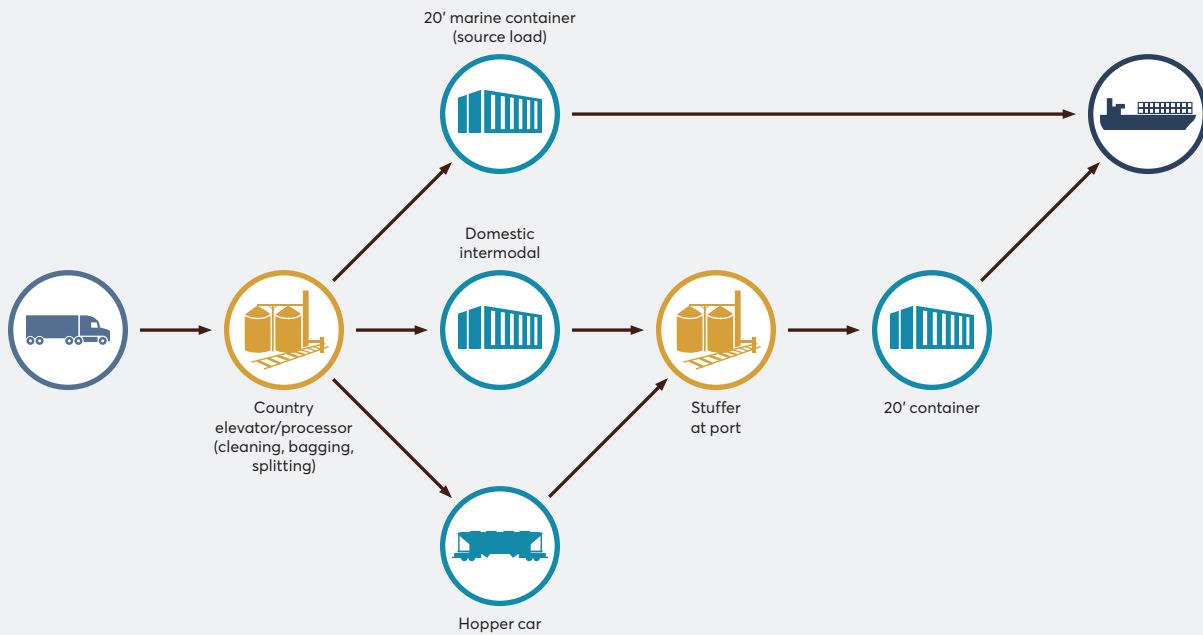
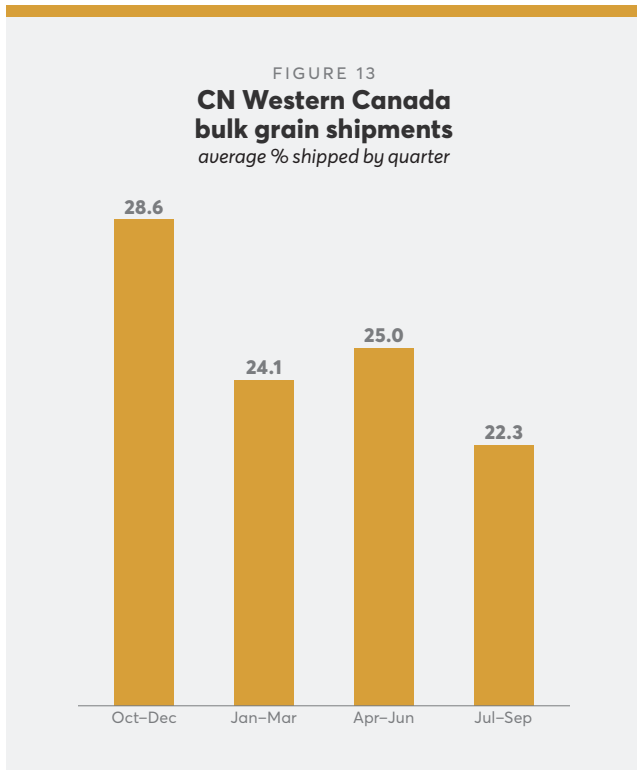


FIGURE 12
Flowchart of containerized grain export movement



The capacity of Canada’s grain supply chain also varies through the crop year, and multiple factors place a real limit on the volume of grain that can move through the end-to-end grain supply chain at any point in time. While most rail-served industries generate a relatively steady flow of traffic, the pattern of demand for grain movement creates a unique transportation situation. The harvest occurs over a short period of time, generating very large volumes of inventory that cannot all be moved immediately after harvest.

Because the amount of commercial grain storage in Canada is limited in relation to total grain production, grain companies rely on farmers to store most of the grain crop on-farm, unlike competing countries where grain companies store most of the grain. The peak demand period in the fall corresponds to the period reflecting the most profitable grain handling and trading margins, along with peak farmer grain delivery pressure. **The challenge is how best to align demand with end-to-end grain supply chain capacity and total rail capacity, as all grain cannot move into the supply chain at once — a fact that is true in every major grain-producing country in the world.**



The peak demand for grain movement in Q4 coincides with high demand for rail transportation from other commodities, especially to the West Coast. During that period, many industries are increasing shipments to Vancouver and Prince Rupert. Consistent with this reality, **the idea of corridor balance must be taken into consideration for grain and other commodities.** When the combined demand for grain movement from all customers in a specific rail corridor for a given week exceeds the capacity of that rail corridor, it becomes strategic to shift volumes to another corridor where capacity is available. Without that shift, demand must be revised to match capacity in the corridor or deferred to a future week when the demand can be accommodated.

Grain export facilities and container stuffing facilities have real limits as to the number of railcars that can be unloaded on any given day. Besides the impacts of inclement weather on terminal operations, terminal mechanical breakdowns, lack of terminal labour, type of commodity being unloaded, number of terminal shifts per day (not all major grain handling facilities operate 24/7), restricted terminal operations during holidays, and inability to unload railcars due

to lack of terminal space are all factors that affect terminal productivity. Not all grain handling facilities in the Port of Vancouver have grain storage facilities, which is another factor often overlooked when assessing supply chain infrastructure.

Grain traffic directed to a given destination terminal must be authorized by the receiving terminal. Any car orders not authorized by the destination terminal for shipment are considered unauthorized orders. As a result, these car orders are removed from CN's grain order book and customers can re-order cars in subsequent weeks once they have authorization from the receiving facility to ship cars. To maximize the capacity of the Vancouver corridor, it will continue to be critical that grain handling facilities provide shipment authorization only when the grain shipped is needed to meet commercial commitments. This is especially important considering that there is effectively no grain storage capacity on-site at most of the grain containerization facilities at Canada's West Coast ports. That means that unless the right containers are in place at those stuffing facilities lacking storage, hopper cars consume yard capacity, create congestion, and cannot be returned to the Prairies for the next load.

As noted earlier, persistent, heavy rainfall caused acute grain supply chain capacity issues on multiple occasions this past fall and winter at Canada's West Coast ports, with the most severe supply chain impacts at the Port of Vancouver during grain shipment weeks 13–15. At one point, CN had nearly 20 grain trains held back on the Prairies or along the route to Vancouver because advancing more trains would only create more congestion at the port. Those rain delays also meant grain cars weren't getting emptied and cycled back to get new loads. This issue has become the most significant factor affecting the Canadian grain supply chain and represents an opportunity for strategic investments.

Great Lakes–St. Lawrence Seaway system

The Port of Thunder Bay represents significant grain throughput capacity when the Great Lakes–St. Lawrence Seaway system is open outside of winter and presents a key opportunity to optimize corridor demand balance. There are six major terminals focused on bulk grain exports plus a loop track facility that handles unit train shipments of grain and other bulk commodities. CN also accesses multiple grain handling facilities in the Port of Duluth. The grain from these ports can be shipped directly overseas via ocean-going vessels or grain may be shipped by laker to facilities along the Great Lakes for domestic consumption. Grain can also be shipped to one of six major transfer elevators along the St. Lawrence River where grain is subsequently reloaded to ocean-going vessels.

Making the most of grain handling capacity in the Eastern Canada grain supply chain is key to maximizing total grain shipment volumes.

Typically, grain shipment volumes at the Lakehead decline during December in advance of the closure of navigation season for the Seaway system, and end-to-end grain supply chain capacity is significantly reduced when the Great Lakes–St. Lawrence Seaway system is closed. An opportunity exists for grain customers to maximize the use of the Lakehead while the Seaway is open.

Making the most of grain handling capacity in the Eastern Canada grain supply chain is key to maximizing total grain shipment volumes.



Along the St. Lawrence River, CN directly reaches grain transfer elevators at the Port of Montreal and the Port of Quebec, and CN can also interchange traffic for movement to the Port of Trois-Rivières. Historically, grain shipments during winter by direct rail to these ports represented a significant grain export program. The combined export throughput capacity of these direct rail facilities represents 15-plus unit trains per week. The 2022–23 crop year saw grain companies significantly underutilize Eastern Canada’s grain supply chain capacity, representing a missed opportunity to get western Canadian farmers’ grain to market. **Potash producers**, on the other hand, did take advantage of the unused capacity, with the Port of Thunder Bay’s potash movement reaching record levels. That redirected rail traffic benefited all customers, as it helped alleviate pressure in the busy Vancouver corridor.

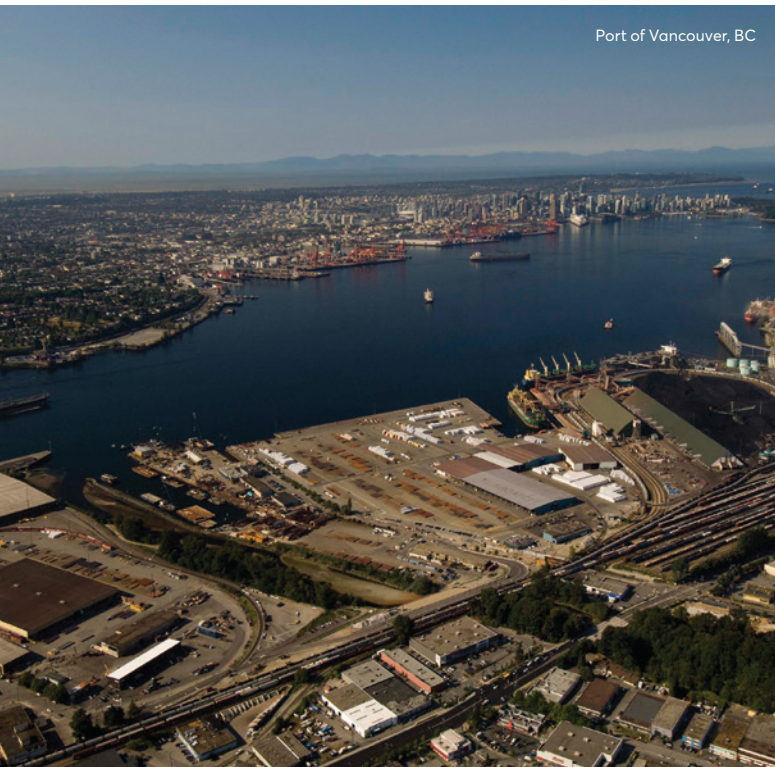
Loading grain in inclement weather at the Port of Vancouver

The ability to load grain during inclement weather in the Port of Vancouver has been on-again, off-again over time. Most recently, an arbitration ruling by the Canada Industrial Relations Board in February 2018 terminated the loading of grain during inclement weather in the Port of Vancouver via tarping of cargo holds, while grain loading via feeder holes was halted until additional safety measures could be implemented. Since then, the practice of loading grain via feeder holes has been reinstated with new safety protocols.

Anecdotally, some industry observers note the additional time and effort associated with the new protocols means that in most circumstances a grain company will elect not to load grain through feeder holes. Ultimately, individual grain companies make the commercial decision on how to load grain onto ships. Alternatives to loading through feeder holes do exist. Some grain handling facilities in the U.S. Pacific Northwest have invested in rain roof infrastructure. The technology offers promise for Canada as well.

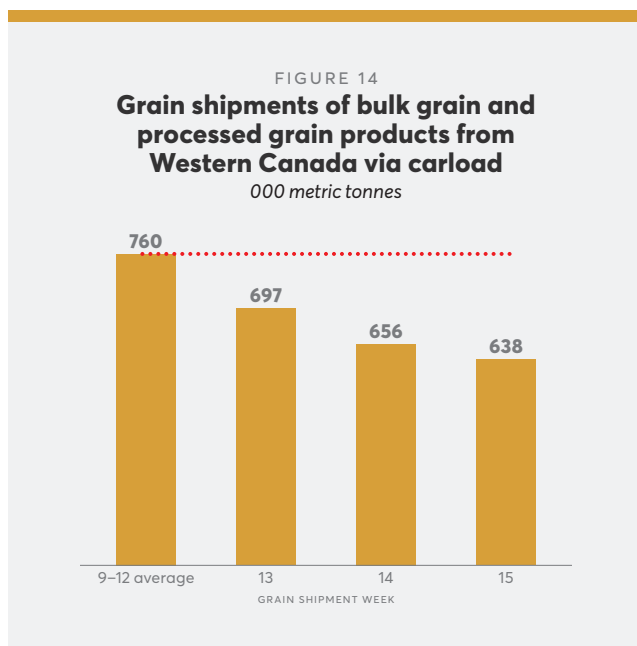
In any event, **it is crystal clear that this issue has a material impact on grain supply chain capacity.** If grain terminal space isn't available to unload grain from railcars, then loaded grain trains can't be moved forward. CN is forced to hold back trains en route to port and trains at origin in the country until the situation improves. Ultimately, the end-to-end supply chain is negatively affected as the delayed returns of empty hopper cars back to the Prairies impact CN's overall spotting program for the following week. At the time of the writing of this document, there has been no change in the situation in the Port of Vancouver concerning protocols for loading grain in inclement weather.

In the four weeks (grain shipment weeks 9–12) preceding the first week of October 2022 (when inclement weather took a significant bite out of end-to-end grain supply chain capacity), shipments of western Canadian grain and processed products on CN averaged 760,000 metric tonnes. Between grain shipment weeks 13–15, however, total grain shipments on CN declined by 289,000 metric tonnes compared to the previous four-week average, or the equivalent of 275,000 acres of western Canadian grain production.



Port of Vancouver, BC

The low point for grain shipments during this period occurred in grain shipment week 15 given the effects of the persistent rainfall in grain shipment weeks 13 and 14 compounding over time (see Figure 14). Other non-rail-related issues that occurred during this period, such as unplanned terminal maintenance, exacerbated the problems. The level of CN-supplied hopper car order fulfillment declined significantly during this period — CN could not accept as many orders as placed by customers due to the fact terminals could not make space to unload more rail traffic. The pace of farmer grain deliveries to primary elevators was materially impacted by terminal-related productivity issues in the Port of Vancouver — grain deliveries to primary elevators in grain shipment week 15 declined by over 30%, or over 400,000 metric tonnes compared to the average for grain shipment weeks 9–12.



Extended interswitching and its impact on supply chain capacity

Bill C-47 reintroduced extended interswitching in the Prairie provinces. **Extended interswitching reduces capacity and efficiency — the exact opposite of what Canadian supply chains need.** Expanding regulated interswitching distances to a 160 km radius around defined interswitching points creates a different pattern of regulated service because this longer distance forces railways to dedicate resources to inefficient movements. Furthermore, in many instances, when compared to a direct linehaul move by the rail carrier serving an origin, an extended interswitching move would frequently result in a much longer route, adding to equipment cycle times.

When car cycle times are elongated, the fleet utilization efficiency is reduced, which in turn effectively reduces fleet size (considering that more cars are required to move the same amount of volume). Extended interswitching reduces capacity.

Shuffling cars back and forth between rail carriers adds to transit times as each car requires more handling. Railyard space and other resources consumed by the additional handling will create congestion, especially during peak period grain movement and less grain will be moved. A slower network means more resources are required to move the same amount of traffic. A customer that wants to use extended interswitching on a section of the network at capacity creates more congestion and hurts everyone on that line — including themselves. As the efficiency of the rail network declines, costs go up across all rail traffic segments, including regulated grain rates.

Grain supply chain capacity will be impacted by the extent to which extended interswitching is utilized across all rail traffic segments and will be one of the conditions considered in assessing maximum sustainable end-to-end grain supply chain capacity for any given week. The same operating crews and locomotives that are used to move grain are resources that are shared across all rail traffic segments. Resources that could be moving grain to port are instead consumed moving grain or other non-grain traffic between railways through extended interswitching movements.

CN's 2023–24 grain marketing programs

Consistent with the evolution in grain handling infrastructure in Western Canada, **CN's rail efficiency incentives have also evolved to encourage more efficient grain handling infrastructure.** CN's programs include rate incentives that encourage high-efficiency unit train facilities with a hook-and-haul model for grain trains that can be loaded in 15 hours or less. This model keeps trains from occupying the mainline while spotting empties or pulling loads, which improves mainline efficiency. Most of the new grain handling facilities built in Western Canada are hook-and-haul facilities, and many have loop tracks that allow more cars to be spotted in a single placement (which means improved capacity utilization).

Starting in 2014, CN and our customers coordinated investments in grain facility infrastructure to allow loaded grain trains to be fully charged with air to reduce the time required for CN crews to depart the origin with a loaded train. Otherwise, in times of extreme cold, it can take 8–12 hours (or more) for a train to be fully charged with air by locomotives. Reducing the time required to charge trains with air reduces end-to-end train cycle times and improves car velocity. Over 95 per cent of CN-served facilities capable of loading grain unit trains have participated in this program, representing a win-win situation for CN and our customers.

With respect to commercial car supply products, CN prioritizes a large segment of its shared pool of hopper cars for customers interested in year-round car supply. These commercial car supply products also include reciprocal penalties for both CN and customers. CN anticipates that, for the 2023–24 crop year, over 90% of CN-supplied grain cars will be committed to customers in advance of harvest through commercial car supply agreements and other commercial car supply products. CN makes these products available to the market to ensure their widest possible application, with car block sizes of as few as 10 cars.

CN's commercial and export fleet integration programs allow customers to integrate high-quality jumbo capacity hopper cars into CN's common pool, in turn receiving priority car supply based upon the type of lane that the traffic is moving in (i.e., shorter distance traffic to Thunder Bay / Prince Rupert / Vancouver compared to longer distance traffic moving primarily to Eastern Canada and the United States) and the number of cars supplied by the customer. This program started in Western Canada in the 2014–15 crop year and has been very popular with customers of varying sizes.

CN also makes a segment of car supply available from our general pool of equipment, and customers can signal their demand up to 16 weeks forward in CN's grain car ordering system. In reviewing car orders on a weekly basis, and once car orders without terminal authorization are removed from the car order book, CN first allocates cars against valid customer orders that are tied to commercial car supply products. The remainder of the available car supply for a given week is allocated across the remaining orders.

It is CN's view that on a sustained basis, the end-to-end grain supply chain can accommodate up to 7,800 cars per week (up to 744,000 metric tonnes per week) of bulk grain and processed grain products outside of winter, and up to 6,250 cars per week (up to 595,000 metric tonnes per week) of bulk grain and processed grain products during winter. On an annualized basis, the end-to-end maximum sustainable supply chain capacity on CN represents a grain supply chain shipment capacity of up to 36 MMT, which is significantly higher than anticipated grain shipment volumes on CN for the 2023–24 crop year.

These maximum end-to-end grain supply chain capacity levels on CN assume that multiple conditions must be in place to achieve these levels. These conditions must include, but are not limited to:

- grain supply chain fluidity, capacity utilization and demand balance across all major rail corridors
- sufficient demand to meet these levels
- seven-day continuous operations at all major grain export facilities
- grain railcar unloading and vessel loading during inclement weather at all grain facilities
- normal winter rail operating conditions (issues related to winter operating conditions and measures CN has taken to address the impact of winter on rail capacity will be addressed in our Winter Plan)
- the extent to which extended interswitching is utilized by customers across all rail traffic segments, which in turn will determine the relative impact of extended interswitching on network fluidity and capacity
- no significant labour disruptions
- no mainline or other major supply chain disruptions, and
- a stable global trade environment

FIGURE 15.1
Maximum end-to-end sustainable supply chain capacity – bulk and processed grain products
metric tonnes shipped per week

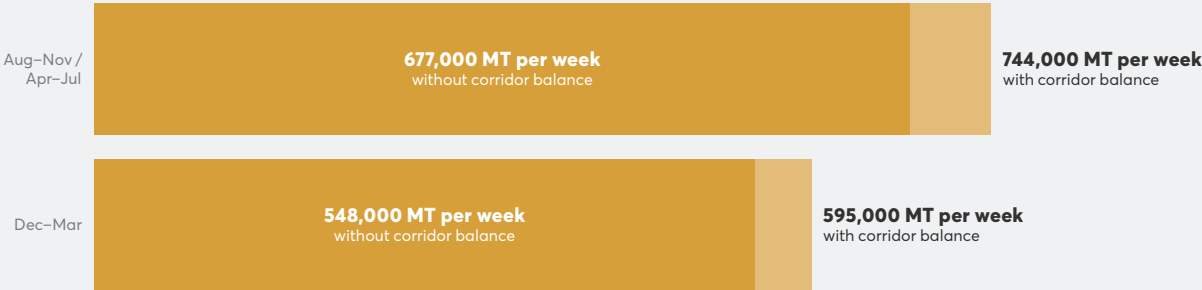
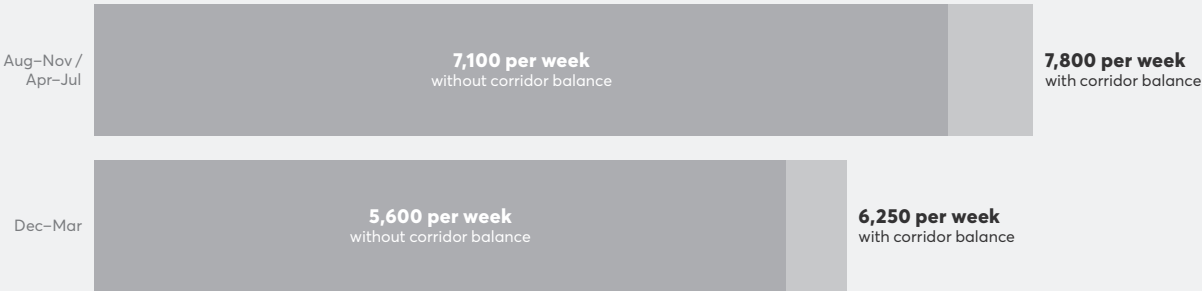


FIGURE 15.2
cars shipped per week



These conditions limit the amount of grain that can move through the supply chain at any point in time. If these conditions are not all in place for a given timeframe, it can be expected that grain shipment volumes will not reach maximum sustainable levels. In the case of a lack of corridor balance, for example, these maximum sustainable supply chain capacity levels may be reduced by as much as 8 to 9 per cent.

In the case of the impact of inclement weather in the Port of Vancouver on supply chain productivity, for example, it is fair to say that a period of persistent rainfall has the impact of reducing weekly port throughput by 20% or more.

The extent to which customers utilize extended interswitching in the Prairies during the 2023–24 crop year will also have a real impact on supply chain fluidity and efficiency. As noted earlier, extended interswitching will reduce network capacity. The more it is utilized by customers, the greater the adverse impact to supply chain capacity. For example, for each day that average cycle times are extended for hopper cars, grain supply chain capacity is reduced by the equivalent of 400–500 cars per week, or 40,000 to 50,000 metric tonnes per week.

The more extended interswitching is utilized by customers, the greater the adverse impact to supply chain capacity.



Port of Vancouver, BC
CREDIT: VANCOUVER FRASER PORT AUTHORITY, JOHN SINAI

CN Capacity

The following section outlines CN's expectations for hopper car fleet size, locomotive fleet size, and operating crew base over the course of the 2023–24 crop year, along with CN's rail infrastructure investment plans for 2023:

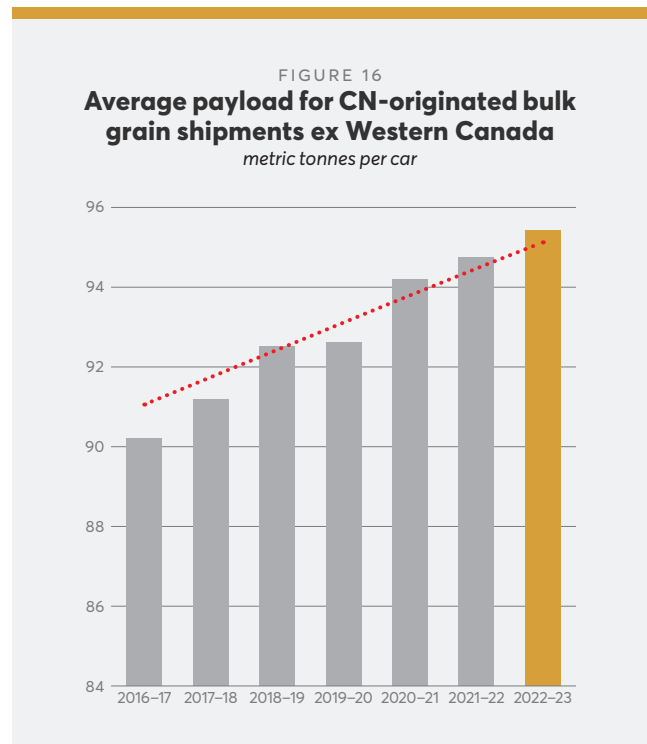
Hopper car fleet size and efficiency

Based on current overall demand forecasts, CN's assessment is that the grain hopper car fleet will be sufficient to move the anticipated volume of grain over the course of the 2023–24 crop year.

CN's approach to fleet composition for the movement of bulk grain has fundamentally changed over the past five years. What was once a fleet dominated by leased and owned CN-supplied hoppers is now much more diverse. This approach includes customer-supplied high-capacity hoppers integrated into CN's common pool, brand-new CN hopper cars, and high-capacity, customer-controlled private cars.

This fall, CN expects to have an owned/operated/leased fleet of approximately 11,800 grain hopper cars focused on bulk grain service in Western Canada. Once customer-supplied private hopper cars moving in bulk grain service are taken into consideration, the effective size of the hopper car fleet moving bulk grain from Western Canada on the CN network is expected to be approximately 13,500 cars.

Over the past five crop years, thanks to the wide variety of fleet solutions that customers can utilize, the average tonnage shipped per car on CN out of Western Canada has increased by over four metric tonnes, or over four per cent. Moving more tonnage per car means moving more tonnage during peak hopper car demand.



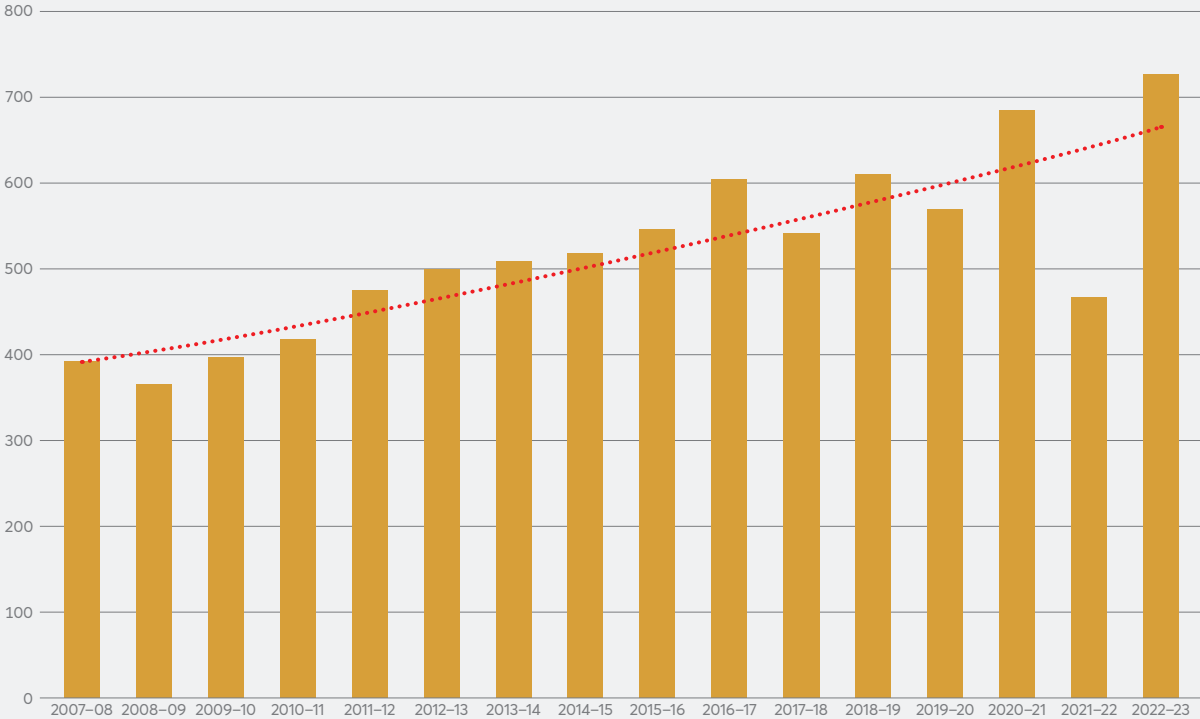
CN is also continuing our multi-year hopper car modernization program. CN took delivery of 500 new hopper cars between May and August 2023 and expects to take delivery of an additional 750 cars in 2024. **Since 2018, CN has taken delivery of 3,500 new-generation, high-efficiency hopper cars in total.** The increased cubic capacity of the new hopper cars means more tonnage of lighter-density commodities such as canola, barley and oats can be loaded in these cars before the car reaches its maximum permissible gross weight. The shorter length of these hopper cars (just over 55 feet) also means that more of these cars can be spotted on the same length of track compared to conventional hopper cars that are between 58 and 60 feet in length.

Between increased average payload per car and more cars per train pulled from the same origin, the efficiency gains add up fast, especially for lighter-density commodities — up to 20% more wheat moved per train and up to 40% more canola

depending on track capacity at the originating grain handling facility. CN’s innovative approaches to hopper car fleet supply and management, combined with investment by CN and customers at all levels of the end-to-end grain supply chain, have translated into stronger grain movement, with higher annual compound growth in weekly grain shipment volumes post-harvest compared to the compound growth of western Canadian grain production.

However, an unintended consequence of the regulatory uncertainty created by the Government of Canada’s decision to introduce extended interswitching is to create a disincentive for investment. Upon its completion, CN’s multi-year hopper car fleet renewal program was set to grow CN’s owned high-efficiency hopper car fleet to 6,000 hopper cars. **However, the adoption of extended interswitching creates uncertainty and is a disincentive to invest. CN will reassess our hopper car fleet renewal program based on customers’ use of extended interswitching.**

FIGURE 17
CN Average Grain Tonnage Shipped October–November
000 metric tonnes per week



Locomotives

Based on CN's current overall rail traffic demand forecasts, CN's assessment is that our locomotive fleet will be sufficient to move the anticipated volumes of western Canadian grain shipped during the 2023–24 crop year. Heading into this fall, **CN's inventory of high- and mid-horsepower locomotives is expected to be approximately 1,950 locomotives. CN had approximately 1,950 high- and mid-horsepower locomotives as of August 2022 and approximately 1,900 high- and mid-horsepower locomotives as of August 2021.**

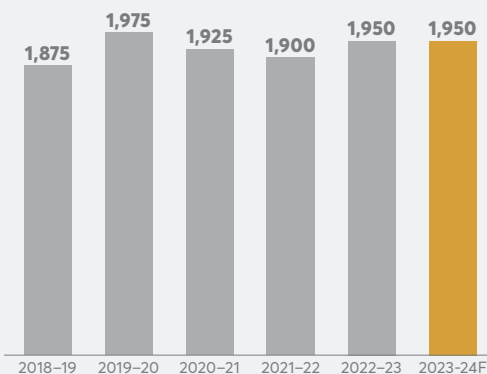
The CN locomotive fleet will include 60 newly acquired Dash-9s and 30 SD75 locomotives slated for modernization from DC- to AC-traction motors. AC locomotives have significantly better adhesion, improved traction power effort and are less prone to traction motor failures compared to DC locomotives. The traction motors of AC locomotives are also less prone to mechanical issues due to snow compared to DC locomotives.



CN works hard to ensure we have the locomotive fleet required to operate our rail network and move the traffic offered for shipment by our customers. Because of the long lead time required for locomotive acquisition, CN must plan well in advance. This is another reason why accurate customer demand forecasts are important to support CN resource planning activities.

CN has undertaken various actions to further increase the number of locomotives available for use across the CN network, as well as improving the overall efficiency of our locomotive fleet. CN's locomotive modernization program targets locomotives over 20 years of age, upgrading locomotives from direct current (DC)-traction motors to alternating current (AC)-traction motors, and installing state-of-the-art technology to support improved productivity and reliability. Implementation of new locomotive maintenance processes have also resulted in a reduced rate of locomotive failure, increasing overall locomotive availability on any given day.

FIGURE 18
CN high- and mid-horsepower locomotive fleet availability



Operating crew base

Based on current overall demand forecasts, CN's assessment is that the active operating crew base will be sufficient to move the anticipated volume of grain over the course of the 2023–24 crop year. **CN's operating crew base has increased steadily over the past 18 months in response to increased rail traffic demand and in anticipation of new federal regulations.**

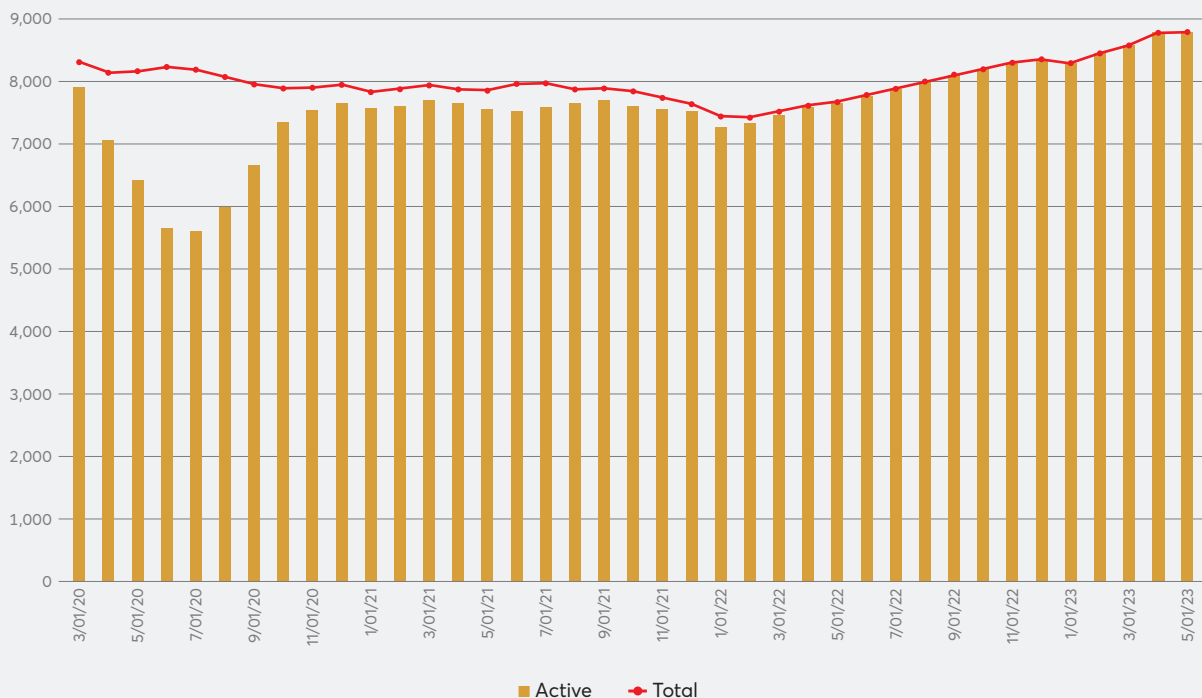
However, the full impact of new federal regulations on CN's rail operations remains unclear, and as such is a wild card heading into the 2023–24 crop year. CN has assessed the impacts of the new Duty and Rest Period Rules for Railway Operating Employees that came into effect on May 25, 2023. It has also assessed the regulatory changes that came into effect December 1, 2022, concerning the number of paid sick days workers in all federally regulated private sector workplaces are entitled to, as well as the prior new government regulation for five leave days. The union has interpreted these new regulated days off as "stackable" to the existing terms of their collective agreement, meaning their members should receive both.

It remains to be seen what operational adjustments will be required to maintain existing customer service levels. **CN's analysis of these regulatory changes shows that hundreds of additional personnel will be required in Canada (mostly in the West) to do the same amount of work as was done prior to the implementation of the regulations.** The implementation of policies such as these work counter to the Government of Canada's goals of supply chain resiliency, efficiency, and economic growth.

In an already challenging labour market with the lowest unemployment rate in decades, measures CN has taken to attract potential new employees include:

- Hiring bonuses of up to \$10,000 to support placements in hard-to-recruit areas of the CN Network.
- More targeted engagement with potential recruits in each region of Canada.
- Implementation of new technology and new hiring tools to assist CN recruitment efforts.

FIGURE 19
CN network-wide operating crew base statistics





When considering the workforce available to move rail traffic, the focus is on conductors and engineers. CN assesses our operating crew base down to the regional and individual terminal levels.

When considering the workforce available to move rail traffic, the focus is on conductors and engineers, referred to here as the operating crew base. CN assesses our operating crew base down to the regional and individual terminal levels. Recognizing, for example, grain traffic moving from the Prairies to Vancouver or Prince Rupert must move across British Columbia, the operating crew base in each of the rail terminals the traffic will move through along the route must be sufficient to facilitate efficient rail movement.

The ability to resource individual terminals is dependent on labour and economic dynamics in those individual regions, including proximity of the region to major population centres, cost of living, availability and affordability of housing, availability of education and other services. It is relatively more difficult to recruit and retain crews in remote areas compared to other parts of the CN network, with those regions also corresponding to some of the heaviest CN rail network traffic density and demand pressure across multiple rail traffic segments.

These labour market challenges are not unique to the rail transportation industry, considering unemployment levels are at their lowest levels in five decades and changes in population demographics are shrinking the potential size of the workforce. Furthermore, generational change is taking place in the workforce. Observers also reference changes to workers' perspectives on work-life balance and shift work/weekend work.

CN's Canadian training campus located in Winnipeg, MB, continues to graduate employees into Transportation (conductors and locomotive engineers), Engineering (track and maintenance-of-way) and Mechanical (car and locomotive repairs). These employees will replace those retiring and increase our crew base in key high-demand areas.

Rail infrastructure

CN invested over \$15 billion between 2018 and 2022, with nearly two-thirds of that investment going into track and railway assets. These investments ensure the continued safe and efficient operation of our rail network as well as increase capacity, improve fluidity and accommodate growth. **For 2023, CN's capital expenditures are expected to remain consistent with the range of investments in recent years.** New major rail infrastructure capacity enhancements expected to be in service in 2023 include:

BC NORTH

- Siding improvement – Bulkley Subdivision

BC SOUTH

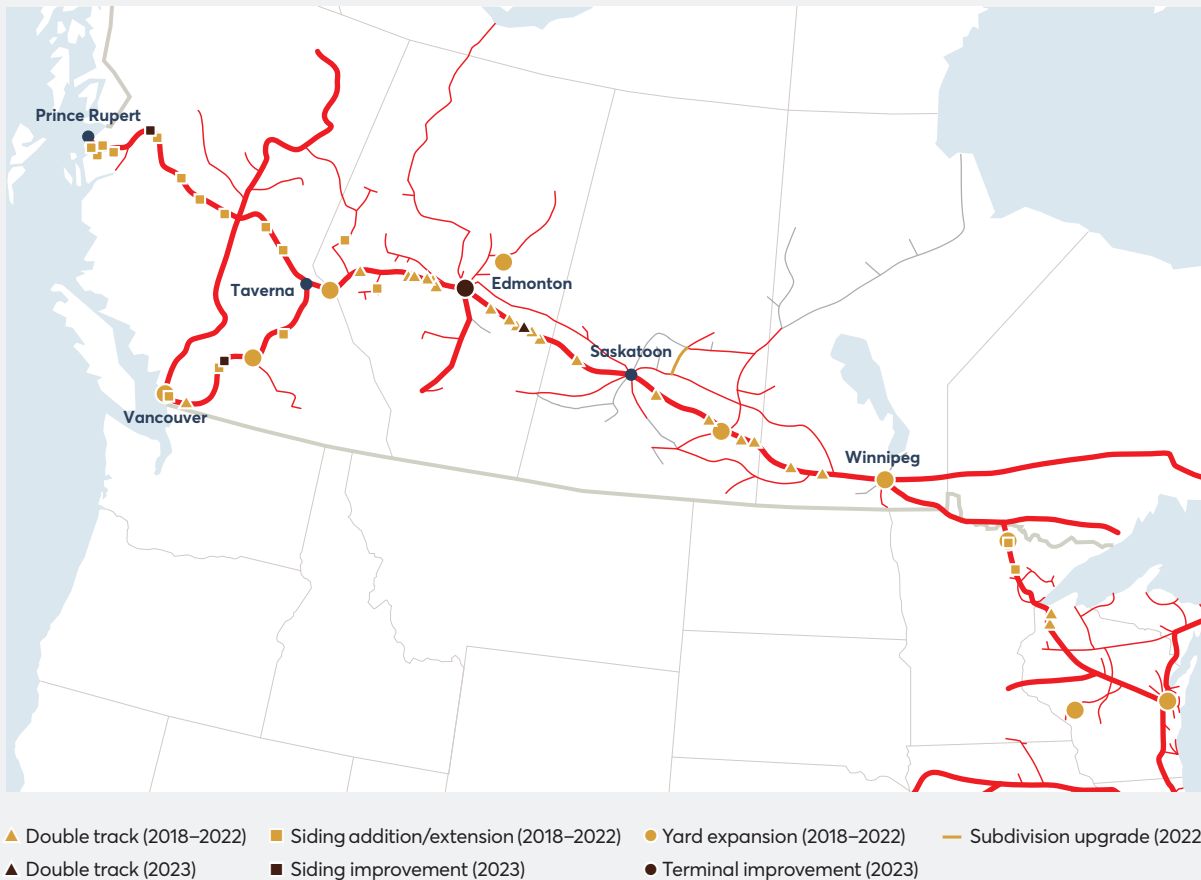
- Siding improvement – Ashcroft Subdivision

EDMONTON–WINNIPEG

- Construction of eight miles of double track east of Edmonton on the Wainwright Subdivision
- Edmonton terminal improvements, including the upgrade of one siding to improve track velocity

CN is working diligently to ensure these projects are completed prior to the coming winter. Managing major infrastructure work on busy corridors is a highly complex task. It requires significant planning and resources and involves some temporary disruptions of service to provide work crews with needed access to the network.

FIGURE 20
Major CN capital infrastructure investments between 2018 and 2023



Long-term investment to support future growth

CN expects significant growth in western region rail traffic volumes over the next decade. Besides the growth expected in western Canadian grain production attributable to anticipated yield gains, other rail traffic segments such as potash, propane, intermodal, and forest products are also expected to increase in volume, among others. **Long-term investment in rail infrastructure will be required to create capacity, especially in the Edmonton to Prince Rupert and Edmonton to Vancouver corridors.**

As part of our ongoing network capacity assessments, new projects for 2024 and beyond are well into the planning phase. The CN Service Design team works closely with CN's capacity planning group to turn traffic volume forecasts into workload forecasts for individual sections of the rail network, which in turn drives the planning process with respect to the addition of network infrastructure to support long-term growth, network fluidity, and network resiliency.

CN also has multi-year capital projects focused on removing bottlenecks and creating new capacity in the area around the Port of Vancouver and the Port of Prince Rupert. Many of these projects are constructed in conjunction with the port authorities and the Government of Canada.

Regrettably, the Government of Canada's decision to reintroduce extended interswitching is creating uncertainty for CN with respect to long-term investment in our infrastructure and other assets. It should be noted that regulatory certainty around investment with respect to hopper car fleets was the primary driver behind CN's western Canadian hopper car renewal program commencing in 2018. What had been a stable investment climate up until now has been destabilized and will jeopardize future investment.

Operational planning and capacity

CN has taken a back-to-basics approach to our rail operations to effect improvements in rail traffic velocity and other measures of operational performance. That translates into improved rail service delivery for CN's customers. CN will build on the past crop year's operational success by refining our operational planning and communication — there is always room for improvement.

CN's Scheduled Grain Service model contributes to overall network efficiency. CN utilizes our serving hubs within the Prairies and through our grain corridors to maximize grain supply chain and network efficiency. CN uses a hub-and-spoke model where we have major terminals in Winnipeg, Melville, Saskatoon, Edmonton, and Jasper. These major terminals allow CN to have a serving yard or consolidation point within a few hundred miles of all country elevators and grain processing facilities. CN can run as many as 200+ loaded or empty grain cars back and forth from these serving hubs to port, allowing CN to maximize train loads and maximize network capacity.



Edmonton, AB



Individual grain elevators have a specific day of the week designated for service, with exceptions communicated by our operations and planning teams directly to customers. Our goal is to spot empty hopper cars by 07:00 on the scheduled service day, leaving locomotive power with the train in anticipation of timely railcar loading, making it key that grain is in position to be loaded to contribute towards improved hopper car velocity.

This past fall, CN implemented scheduled slots for bulk unit trains in key corridors to increase rail capacity and velocity. CN also identified five rail traffic staging locations between Edmonton and Jasper, AB, to maximize the utilization of rail capacity. While the unplanned staging of traffic negatively impacts overall train speed, car velocity and other rail performance metrics, having the right traffic in the right position to take advantage of network capacity opportunities and make the best use of train slots in high-traffic areas (through the planned staging of rail traffic) is critical.

Balance is also required between loaded traffic moving to destination and empty car supply returning to origin to ensure corridor fluidity. The CN pipeline management and port operations group are in daily contact with grain shippers and with other rail carriers to efficiently manage the flow of grain traffic to the destination, recognizing that vessel arrival times, vessel readiness for loading, and weather impacts on terminal productivity continually change.

The operational performance of other rail carriers also has a direct impact on CN, considering that a significant amount of traffic CN handles does not terminate at a destination directly served by CN. A good example of this is the grain traffic that CN interchanges with CP in Vancouver for furtherance to South Shore grain terminals. CN and CP pipeline management/port operations groups coordinate the flow of traffic within the port, but the arrival of railcar traffic at the destination can be delayed if plans changed for any number of operational or other reasons, or if the time slots available for the interchange of traffic were significantly modified. Considering that most bulk grain traffic moves in CN-supplied equipment and recognizing that this is a shared pool of resources among customers, any delays in the unloading of railcars or the return of empty railcars to the interior for loading impacts all grain customers and serves to place a limit on end-to-end supply chain capacity.

Balance is required between loaded traffic moving to destination and empty car supply returning to origin to ensure corridor fluidity.

Advancements in technology to create capacity

While intense capital investment in network infrastructure like double tracking, the addition/extension of long sidings, or a rail yard expansion creates more physical capacity, technology can be used to create a more fluid and reliable railroad and further increase capacity. Investing in technology also allows CN to identify problems before they become more serious, like a steel wheel breaking. In that way, the potential for network disruptions can be reduced, keeping traffic moving on the network. Two major technological innovations that CN has implemented are the **automated track inspection program (ATIP)** and **automated inspection portals**.

Up until recently, the primary means of track inspection was by a track inspector in a high-rail vehicle moving at 15 to 20 miles per hour directly along the track, with stops along the route to have a closer look. The inspector has a fixed amount of time to assess the condition of the track, and during that time the track is unavailable for freight movement. However, today CN has 10 specialized track inspection cars moving across the rail network to supplement those inspections. **ATIP cars** are specially equipped railcars with the latest sensor and AI technology. They help to fully automate inspections.

Where the high-rail inspection program effectively consumes network capacity, the ATIP car moves at train speed right within a freight train already moving along the network, assessing such items as track gauge, geometry, and alignment. These fully autonomous railcars inspect 100% of CN's mainline and 45% of the entire network on a consistent basis. In 2021, some of our key corridors received up to 20 times more inspections than with previous methodologies. ATIP cars unlock capacity and improve service reliability by reducing track disruptions.

In the case of **automated inspection portals**, high-resolution imaging hardware is coupled with powerful machine learning software and is fundamentally changing how CN inspects our fleet. The portals allow for inspection of a train at track speed versus a roll-by inspection at train departure from a yard, significantly reducing initial train start delays and improving yard capacity. Further, the individuals performing roll-by inspections can be freed up to work on repairs and other tasks, using their time more efficiently. High-resolution cameras can take photos of equipment at all angles, with the quality of the images as if the train is standing still and an individual beside it is observing the train. Increased frequency and improved quality of inspections, especially on parts of the railcar more difficult to assess, like the undercarriage, support CN's safety agenda — and safety is a core value at CN. CN currently has seven inspection portals in operation across our network. Thanks to the inspection portals, many critical defects, which could have resulted in significant operational disruption or personal injury, have been detected and corrected.

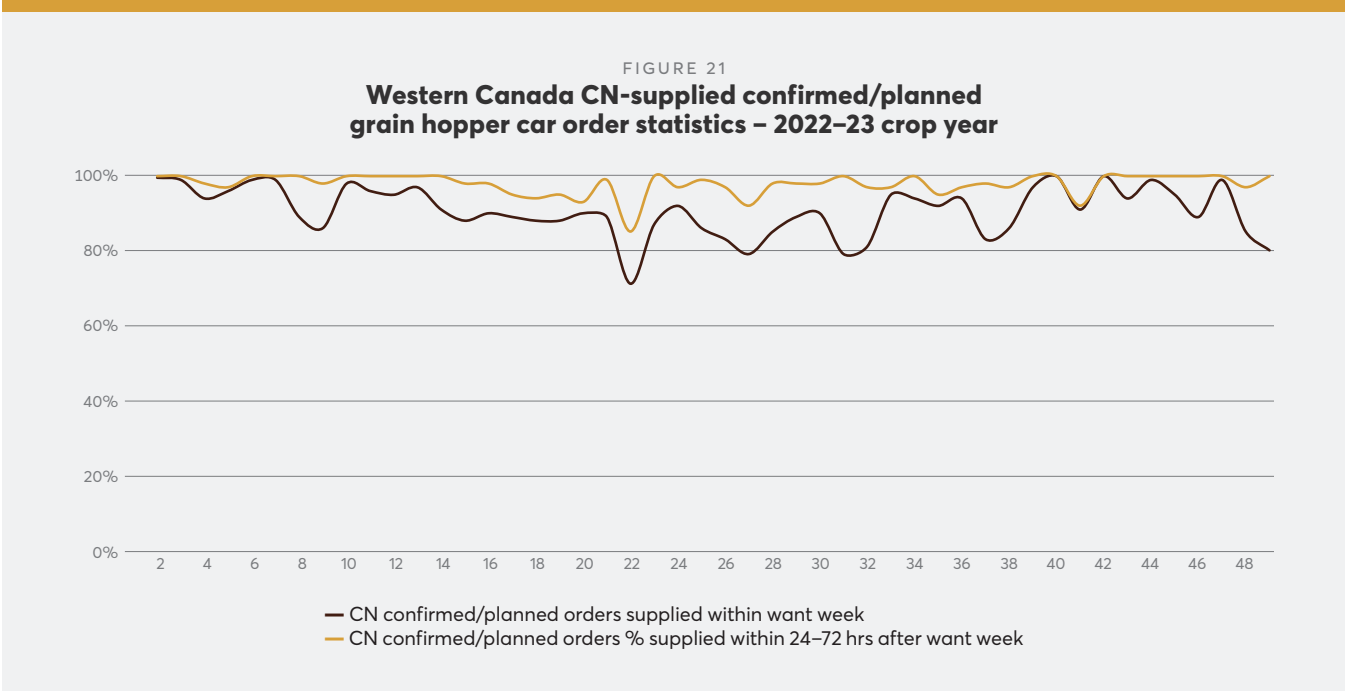
Other advancements in technology are far simpler. CN's **distributed braking cars**, which are unique to CN, are simply boxcars equipped with an air compressor. These cars are used as an air source in the train to maintain air brake pressure and extend operating train length. Each of these cars used within a train (up to a maximum of five air sources including locomotives) allow CN to run an additional 1,500 feet of train length. CN has approximately 100 of these cars available for use, and the cars are deployed along the mainline in one of CN's most traffic-dense corridors (Edmonton to Winnipeg).



Grain-Specific Supply Chain Reporting

Beyond simply projecting and reporting on the total amount of grain and processed grain products being shipped from Western Canada over a specific period, CN also measures and reports grain supply chain performance in many other ways, including the quality of the service being provided. This information is available in significant detail on a weekly basis through CN’s Western Canadian Grain report.⁴ This voluntary reporting captures 100% of grain shipments moving in CN-supplied hoppers and private hoppers along with 100% of the orders received for CN-supplied equipment.

CN reports total grain tonnage moved on a weekly basis by corridor for bulk grain and processed grain products, along with crop year-to-date shipments, followed by detail concerning customer orders for CN-supplied hopper cars. Preliminary car orders received for the week are reported, and car orders with no authorization from the receiving facility to be shipped are identified and removed from the car order list. What remains are valid orders. Customer self-cancelled orders are accounted for and the balance of car orders remaining is measured against the maximum sustainable supply chain capacity on CN. Sometimes orders far exceed what the end-to-end supply chain can realistically handle at any point in time, and these orders cannot be accepted.



⁴ Available at <https://www.cn.ca/en/your-industry/grain/western-canadian-grain/>

CN also reports in detail how CN executed the grain spotting plan. This reporting describes what happened to the CN-supplied hopper car spot plan after the plan was finalized (accounting for subsequent customer self-cancelled orders, for example) including the number of cars spotted for the week they were ordered in, cars spotted that were associated with the previous week's plan, and car orders spotted in advance of the week that they were requested for. On a weekly basis, CN indicates what percentage of CN-supplied hopper cars were supplied against the current week's spot plan along with the percentage of orders that were supplied either in the week requested or within 24 to 72 hours of the end of the want week. CN also provides details on why any cars were not supplied within the timeframe requested.

Additional detail specific to grain is reported to Transport Canada as part of federal reporting requirements.⁵ Grain car order placement and fulfillment data, for example, is reported on a province-by-province basis. There is also information on the number of grain cars loaded and billed moving in the system by province. Performance measurements are as follows:

- Cars loaded and billed, all systems
- Cars loaded and billed, train service
- Cars loaded and billed, other
- Orders placed
- Orders filled
- Orders 1 to 10 days past due
- Orders 11 or more days past due

Scorecarding the end-to-end grain supply chain

The Government of Canada's 2023 Budget contemplates the establishment of a **Transportation Supply Chain Office**.⁶ The Office is to "work in collaboration with industry to respond to disruptions and better coordinate action to increase the capacity, efficiency, and reliability of Canada's transportation supply chain infrastructure." In considering that, it is important to look at the current state of supply chain data and reporting — what's available, what's not, and what's needed.

After review, a clear gap emerges. In recent years, the government has focused almost exclusively on a single link in the entire end-to-end supply chain — rail transportation. If Canada hopes to improve how supply chains work, we need to change how we measure and report on data. **A balanced approach that considers all parts of the supply chain and improves supply chain visibility will help decision-makers better understand what is going on when problems arise and why. We hope that the Transportation Supply Chain Office and the adoption of real-time data regulations developed to assess the operation of the entire supply chain will support that purpose.**

We need greater transparency within the supply chain. Grain terminal inventory/space is a great example of where today's supply chain reporting falls short. Unfortunately, publicly reported data on terminal stocks are aggregated for the Port of Vancouver as a whole.

⁵ Available at <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310027501>

⁶ <https://www.canada.ca/en/transport-canada/news/2023/03/minister-of-transport-highlights-budget-investments-to-make-life-more-affordable.html>

However, there are multiple grain export terminals and container stuffing facilities at the Port of Vancouver, and on any given day the terminal fluidity/capacity at each of those facilities can look very different. One grain export terminal may have ample space while another is plugged and unable to unload railcars because the right vessel is not available to load grain to. Aggregated data masks what is really going on in the supply chain. If data can be reported for the single grain export terminal at the Port of Prince Rupert, surely data can be reported for all the individual grain export terminals in the Port of Vancouver, Thunder Bay, and for terminals along the Great Lakes–St. Lawrence Seaway system.

CN's weekly Western Canadian Grain Report summarizes all the major events affecting the supply chain. Unlike industry and government data, these reports get into the "why" of what's going on in the supply chain. CN's reporting includes a dashboard (presented earlier in this document) to illustrate how the end-to-end supply chain is doing and ties it back to all the conditions required to achieve the maximum supply chain capacity described in CN's Grain Plan. Detail is also included as to the underlying cause of good or bad performance for each of the supply chain components. If you don't have all the ingredients in place to bake the cake, so to speak, maximum end-to-end supply chain capacity cannot be consistently achieved.

Decision-makers looking for real, lasting solutions to supply chain problems must look beyond hopper car order fulfillment numbers. Instead, consider the activities of the whole supply chain, look at facts that include context, and keep Canada's long-term economic growth as a common goal. Canada's grain industry needs to move past political rhetoric and finger-pointing if we hope to encourage badly needed private investment in our nation's transportation infrastructure.

CN's weekly Western Canadian Grain Report summarizes all the major events affecting the supply chain.

CN 2023–24 grain supply chain reporting initiatives

CUSTOMER DEMAND FORECASTS

As discussed previously, timely and accurate customer demand information is critical to support CN's operational planning activities and maximize supply chain efficiency. This is a very simple and fundamental piece of the planning process — communication is a two-way street. Whereas some industry lobbyists have made a point of insisting railways provide a forecast of grain demand, CN must first have a demand forecast from customers to support our planning. At present, there is a wide range of approaches customers take with respect to supplying demand forecasts. Some customers choose not to supply a hopper car demand forecast at all while others provide detailed demand information up to eight weeks forward. In the case of domestic intermodal containers, customer demand forecast information is minimal.

In the absence of timely and accurate customer demand information, CN needs to make assumptions about trends in overall demand, demand across individual shipment corridors, regional demand trends, and other factors. The timing of new crop availability, for example, is key to ramping up hopper car fleet availability and getting hopper cars out of long-term storage in a timely fashion. Grain customers on the ground and closest to the action can provide the most accurate demand signal. In the absence of that signal, or if the demand information is far off from actuals, the supply chain cannot perform to its full potential.

As part of our monthly Grain Plan updates in 2023–24, CN will scorecard whether meaningful hopper car demand forecasts are supplied in advance by major grain customers at a corridor level. By the mid-part of each month, a demand outlook for the following month should be readily available from each major grain customer to support operational planning activities.

COUNTRY ELEVATOR LOAD TIMES

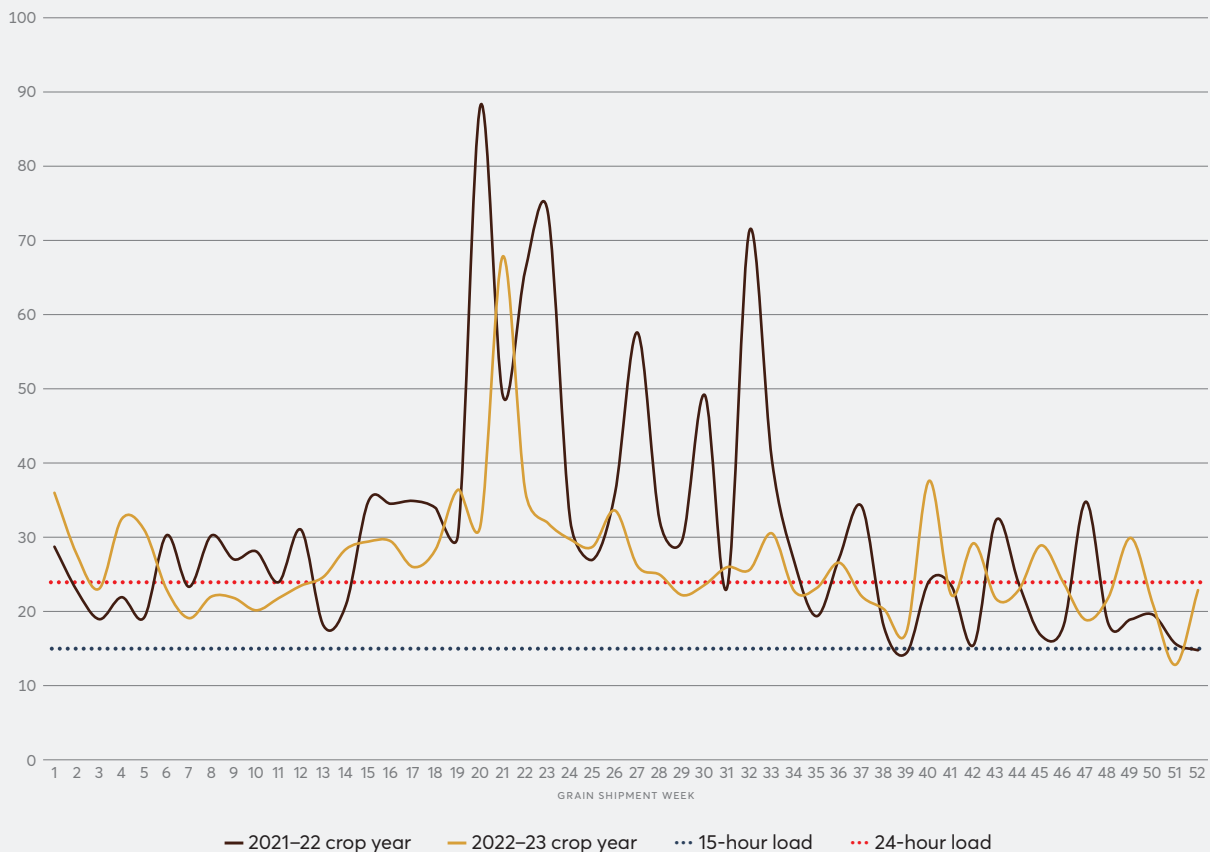
For the supply chain to reach maximum efficiency, all the components of the supply chain need to be operating at peak efficiency. Hopper car cycle times are a product of the time between placement and loading, between loading at origin to loaded release, the loaded transit time to destination, unloading time at destination, time from empty release to pull, and transit time back to the next loading origin.

There is currently no public data available regarding primary elevator loading times, and many issues can affect the time it takes for a primary elevator to load hopper cars. Extreme cold creates workplace hazards for grain elevator employees. Mechanical breakdowns can occur, grain of the right quality may not be in place at the time of loading, not enough

grain may be in the elevator to load the train, or holidays may prevent loading. Extreme winter weather can impede the movement of loading crews and grain graders and result in unsafe conditions at grain handling facilities, including frozen switches and snow-covered tracks.

The chart below illustrates the average customer loading time for the past two crop years for CN-supplied hopper cars. There is clearly significant variability from week to week in the data, reflecting the impacts of the factors noted above on primary elevator loading performance. In the 2023–24 crop year, CN will report grain hopper car loading times and unloading times on a weekly basis in our weekly grain supply chain reporting along with specific detail regarding individual instances of excessive loading times.

FIGURE 22
**Western Canada average loading time for CN-supplied hopper cars –
 CN placed empty to customer-loaded release**
average loading time (hours)





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Summary

Based on the information and assumptions outlined in this document, CN believes we have the resources in place to move this year's harvest over the course of the 2023–24 crop year. We also believe there is potential to build on the records set for grain movement during the 2022–23 crop year. However, CN remains concerned about the negative supply chain capacity consequences of extended interswitching and continued rain delays in loading grain vessels at the Port of Vancouver.

During the 2022–23 crop year, CN achieved strong, consistent results thanks to solid operational performance, strong domestic and global demand, and the investments CN and our partners have consistently made over the years. CN has made significant changes to our rail operations to deliver improved operational results and improve the quality of service to our customers.

With the right conditions, CN will be able to deliver strong performance for the upcoming harvest and beyond. During the 2023–24 crop year, CN is well positioned to ship **up to 7,800 cars per week (up to 744,000 metric tonnes per week) of grain and processed grain products outside of winter, and up to 6,250 cars per week (up to 595,000 metric tonnes per week) of grain and processed grain products during winter, assuming all the conditions required to meet these levels across the end-to-end supply chain are in place, including demand balance across corridors.**

Based on the best forecasts available, and assuming no year-over-year change in the external variables beyond CN's control, CN is confident the 2023–24 Grain Plan will meet the needs of our grain customers.





APPENDIX A

Grain Supply Chain Dynamics

Commercial decisions impact grain movement

Demand for grain movement in Western Canada is seasonal. While there are processors south of the border and in the domestic market that have steady demand year-round, most Canadian grain finds its way to the export market overseas. The demand for grain movement is generally strongest in the fall and winter when grain supplies are greatest. Demand generally drops off later in the year in response to stronger international competition, greater availability of domestic supplies in major importing companies given new crop availability, and reduced farmer selling interest. There is plenty of demand year-round across the globe for the crops that Prairie farmers produce considering that the global trade of grains, pulses and oilseeds exceeds half a billion tonnes annually.

Some customer demand for Canadian grain is very elastic, which is largely a function of the ability of an end-user to substitute Canadian grain for grain from competing origins. There is also local supply availability to consider. Some countries don't produce any of the grain they require while others do. Every market is different.

Western Canadian grain is unique in that it is the only commodity in North America where rates for movement to port are regulated through the Maximum Revenue Entitlement. In an environment where price is not available as an effective mechanism to ration demand, demand is even greater than it might otherwise be. There will always be a limit to how much demand the end-to-end supply chain can handle.

Unlike almost every other major grain exporting country in the world, western Canadian grain companies rely heavily on farmers to store grain on-farm and bring it into the primary elevators and processors (such as canola crush plants and wheat mills) over the course of the crop year. This limitation comes down to a lack of commercial grain storage in Western Canada. The licensed capacity of the western Canadian primary elevator network, for example, is roughly 8.4 MMT, compared to over 53 MMT of grain deliveries to primary elevators during the 2020–21 crop year. Canadian canola crush capacity is over 10 MMT, but canola seed storage at canola crush plants is minimal.

Grain companies make commercial decisions at multiple levels about their ability to participate in export opportunities and that drives the price back in the country. Farmers make commercial decisions about whether to participate in that market. It comes down to dollars and cents, target margins and profitability.



www.cn.ca/grain