Bowmanville GO Train Extension - Amended Final Report

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1 — Executive Summary

The Bowmanville GO extension is an 18.7 km rail extension of Lakeshore East GO service from Oshawa to Bowmanville which has been talked about for decades. Up until 2020, the plan was for GO trains to cross Highway 401, west of the existing Oshawa GO station, to join up with the Canadian Pacific Kansas City (CPKC) freight railway corridor. However, in 2020, when the GM plant was set to close, Metrolinx decided to use the GM spur railway bridge east of Oshawa GO instead of the original alignment.

In 2021, when the plant was set to reopen, Metrolinx decided to build their own bridge for GO trains east of Oshawa GO station instead of going back to the original plan. This new alignment has an extremely tight curve east of the existing Oshawa GO station, which could result in slower trains, less service capable of running on the infrastructure, tricky geometry for diesel GO trains to traverse, and could raise safety concerns due to the steep grade and its tight turning radius. Note that we are not professional engineers and these are assumptions we are making.

In June 2023, Metrolinx held a public consultation which contained their planned infrastructure for the Bowmanville extension. When one of More Transit Southern Ontario's (MTSO) volunteers and other members of the public asked Metrolinx about the maximum train frequency the proposed infrastructure would be able to support. Metrolinx refused to give an answer. We decided to conduct our own analysis to determine the maximum train frequency this extension can support. It is important to recognize that we are not professional engineers and we do not have access to official project information. So it is impossible for our calculations to be accurate and we are estimating to the best of our abilities. Which is why we urge Metrolinx to be more transparent and cooperative by sharing more project information and answering important questions (such as the maximum frequency the proposed infrastructure can support). Based on our analysis, the proposed infrastructure would only support three trains per hour (or a train every 20 minutes) in each direction, which is simply inadequate to support the over 100,000 people and jobs that are planned to be located within walking distance of the future GO stations.

> **Our analysis found that the proposed infrastructure would only support three trains per hour (or a train every 20 minutes) in each direction, which is simply inadequate to support over 100,000 people and jobs that are planned to be located within walking distance of the future GO stations.**

Our analysis found that the original proposal could more easily support higher frequencies. For example, six trains per hour, or a train in each direction every 10 minutes could be built with comparable infrastructure east of Thronton's road. However, unlike the Lakeshore East GO line, the extension will not be electrified. Resulting in local emissions, slower service, and more difficulty increasing service to higher levels. This is because Metrolinx states it does not pursue electrification on corridors it does not own and claims CPKC rail will not allow electrification on its corridor. We believe that with a more aggressive attitude towards electrification, and more negotiation with CPKC rail electrification of the Bowmanville extension may be feasible. We urge Metrolinx to reconsider the Bowmanville extension design to support future demand on this corridor by accommodating at least six to eight electrified trains per hour. This will allow for sufficient service and capacity to support the massive development planned around future stations. As well as allow for all future electrified Lakeshore East GO trains in Durham to through run all the way to Bowmanville, strengthening connections with Durham and the rest of the Greater Toronto Hamilton Area (GTHA). Additionally, we recommend rethinking the design of the curve east of the existing Oshawa GO station, decreasing travel times, increasing safety, and making increased service possible.

2 — Introduction

The Bowmanville GO Extension is an anticipated 18.7 km expansion of Lakeshore East GO trains to Bowmanville. Even though the idea of extending GO train services to Bowmanville has been under consideration for decades, the project is now finally gaining momentum and moving forward.

Initially, the plan was for GO trains to travel across Highway 401, located west of Oshawa GO, and arrive at a new station at Thronton Road, known as Thronton's Corner GO. The existing Oshawa GO station would be shut down, and trains would proceed east to join the CPKC rail corridor. This plan was named Option 1. However, in 2020, Metrolinx abandoned this idea for Option 2. Due to the closure of the Oshawa GM plant, building a new bridge was deemed unnecessary. Instead, Metrolinx decided to utilize the GM spur bridge east of Oshawa GO to save costs. The railway would then proceed north to the new Thronton's Corner East station, joining the CPKC mainline on a freight separated railway, following the same alignment as Option 1, to Bowmanville.

Option 1

Proposed for GO trains to travel across Highway 401, west of Oshawa GO, and arrive at a new Thronton's Corner GO station. The existing Oshawa GO station would be shut down, and trains would proceed east to join the Canadian Pacific Kansas City rail corridor.

However, when the General Motors plant was scheduled to reopen in 2021, Metrolinx was compelled to re-evaluate their plan. Consequently, Metrolinx chose to proceed with Option 2, which involved constructing a new bridge for CPKC while retaining the existing one, ensuring that GO trains would remain entirely separate from freight traffic. The preliminary design business case (PDBC) stipulated hourly trains in each direction during off-peak periods, bi-hourly trains in both directions on weekends, and trains departing every 30 minutes in each direction during peak periods.

Option 2, compared with Option 1, would feature a significantly sharper curve and a steep grade which could make it challenging for diesel locomotives with bilevel coaches to navigate, and result in slower travel times. Although the existing Oshawa GO station would remain open, the proposed infrastructure, as detailed in Metrolinx's Environmental Project Report for the Bowmanville extension released in June 2023, would feature a single track from the existing Oshawa GO station to Thronton's Corner East GO. The infrastructure would join the CPKC rail corridor on a dedicated railway line to Ritson GO station, which would feature double tracks. The double tracks would continue to Courtice GO, which would also have two tracks. East of Courtice GO, the corridor would narrow to a single track until reaching Bowmanville GO, which would serve as a double-tracked terminus station.

Option 2 (option chosen by Metrolinx)

Would result in slower travel times due to a sharper curve and steep grade. The infrastructure would have a single track from the existing Oshawa GO station to Thronton's Corner East GO, then join the CPKC rail corridor on a dedicated railway line to Ritson GO station with double tracks. The corridor

In both Option 1 and Option 2, no electrification of GO track is proposed.

The Lakeshore East line is slated for electrification as part of the GO Expansion program. However, the Bowmanville extension's rail corridor does not share the same fate. Metrolinx has stated that CPKC will not allow electrification. Additionally, Metrolinx states it does not pursue electrification on corridors it does not own.

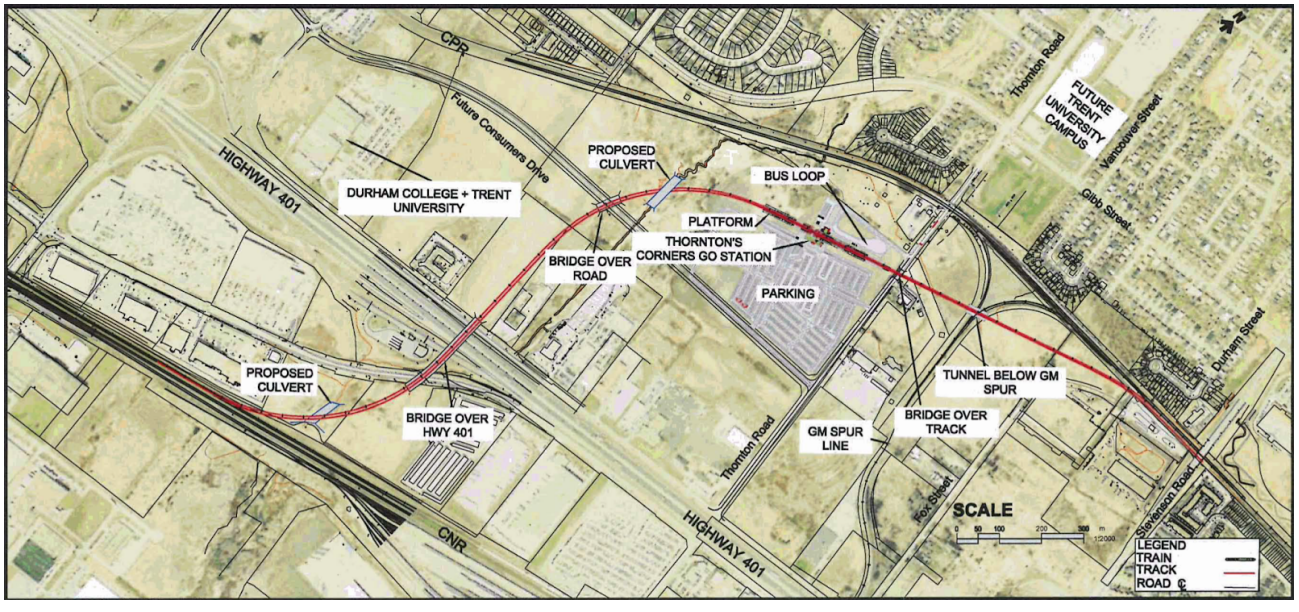

Figure 1: Map of Option 1 in West Oshawa

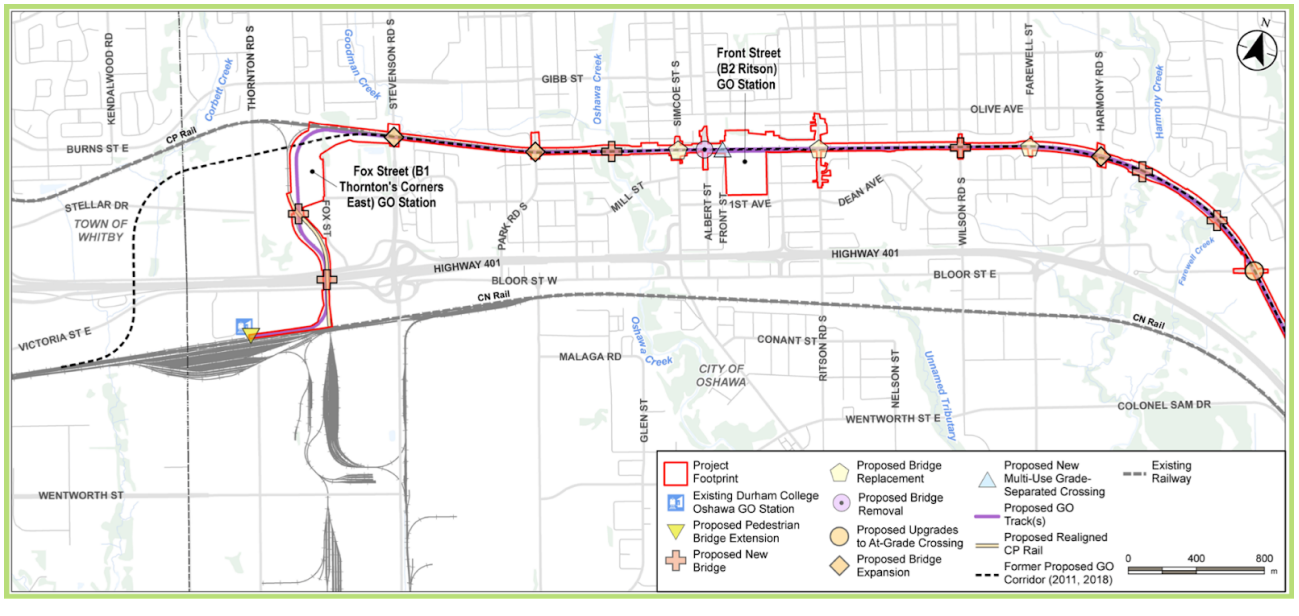

Figure 2: Map of Option 2 in West Oshawa (the chosen option by Metrolinx)

3 — Importance of the Bowmanville GO Extension

The Bowmanville GO extension stands out as one of the most significant transit projects in the GTHA with the potential to transform Durham Region. However, the current proposal will not enable the project to

achieve its maximum potential. Three extensive Transit Oriented Communities (TOCs) are planned around the future Ritson GO station, future Courtice GO station, and future Bowmanville GO station. These TOCs are designed to be compact and pedestrian-friendly, promoting a sustainable and environmentally conscious lifestyle that reduces reliance on cars.

These communities will also become destinations for people across the GTHA to live, work and play. In total, nearly 100,000 residents and over 16,000 jobs are planned to be located within walking distance of these three future stations. These communities are being planned with the Bowmanville extension being a fast, subway like service which will give people the freedom to travel within Durham region and the GTHA, whenever they want at high speeds.

> **These communities will also become destinations for people across the GTHA to live, work and play. In total, nearly 100,000 residents and over 16,000 jobs are planned to be located within walking distance of these three future stations.**

The Bowmanville extension can act as a subway-like service for Durham Region. Almost all Durham Region Transit routes start or end at a GO station. This means most residents of Durham will be a short bus ride and a train transfer away from these massive TOCs. Existing GO stations in Durham Region are set to see massive transit oriented development. More than 13,000 units are under construction or proposed within walking distance to Pickering, Ajax, and Whitby GO.

Frequent service on the Bowmanville extension will allow residents to travel seamlessly between these transit oriented communities. The Bowmanville extension will also connect to the Durham Scarborough BRT and Simcoe Street Rapid Transit at Ritson GO station. Rapid transit on Simcoe Street will connect to major destinations such as downtown Oshawa, Oshawa's hospital, Ontario Tech University and Durham College. By 2051, Simcoe Street is expected to see at least 38,000 daily transit riders. The Bowmanville extension will be the connection between Simcoe Street and the rest of the GTHA. Due to the high average travel speed of GO trains, people from Durham, Scarborough, and Toronto can travel swiftly to destinations on the Bowmanville extension and vice versa.

> **The Bowmanville extension will also connect to the Durham Scarborough BRT and Simcoe Street Rapid Transit at Ritson GO station. Rapid transit on Simcoe Street will connect to major destinations such as downtown Oshawa, Oshawa's hospital, Ontario**

If the Bowmanville extension is not built to handle electrified, through-running of all Lakeshore East GO trains, it will result in insufficient service to meet anticipated demand. Two trains per hour will not suffice to support the significant development planned along the route, with nearly 8500 housing units already proposed within walking distance of future GO stations.

If the trains do not come frequently enough, people may opt to drive on the congested Highway 401 through Durham instead of taking transit. Moreover, reduced service on the Bowmanville extension will limit access from other areas of the Greater Toronto and Hamilton Area (GTHA) to these communities.

By ensuring the Bowmanville extension gets adequate service, we can make big strides on solving congestion, the housing crisis, the climate crisis, and create world class neighbourhoods and transportation in Durham Region.

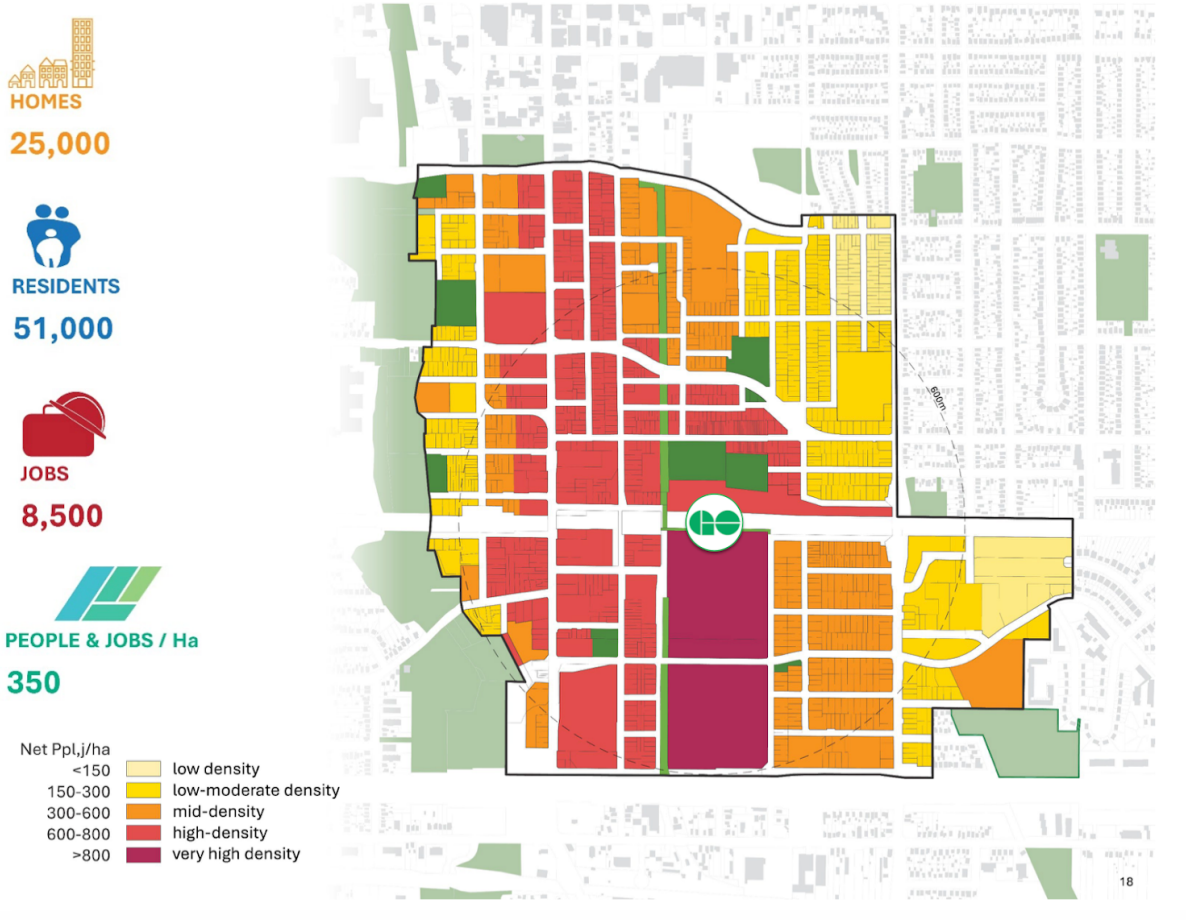

Figure 3: A proposed land use option for the future Ritson GO Station

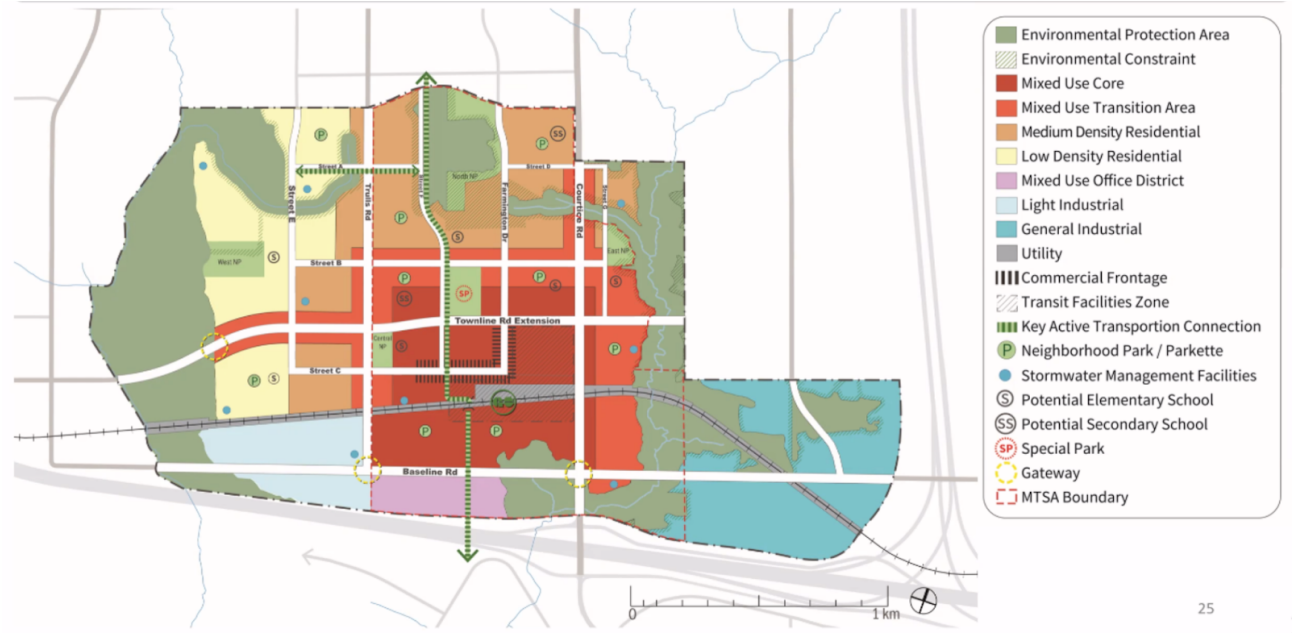

Figure 4: Proposed land use plan for the future Courtice GO station

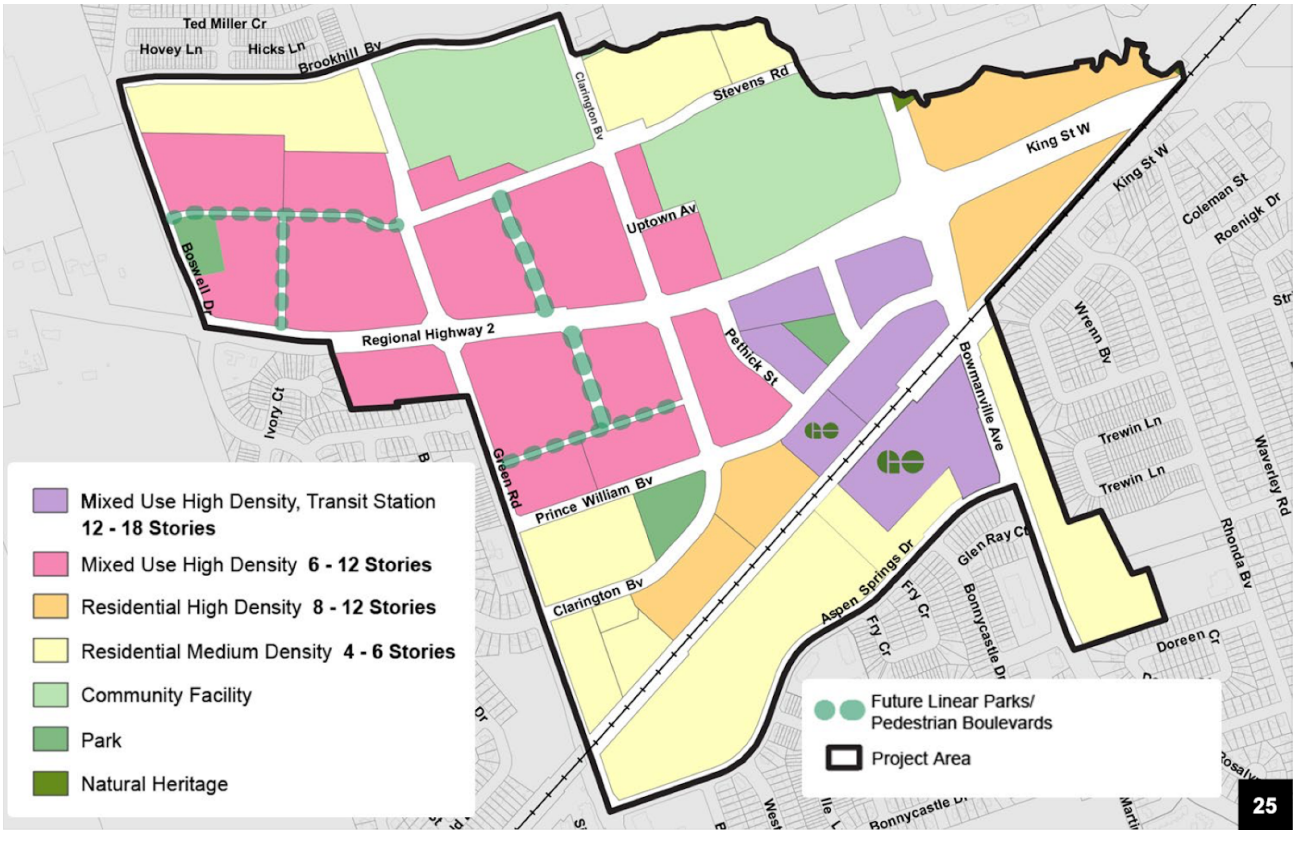

Figure 5: Proposed land use plan for the future Bowmanville GO station

4 — Proposed Infrastructure and Maximum Frequency

During the June 2023 Environmental Project Report Addendum consultation, one of our volunteers inquired about the maximum frequency of trains that the proposed infrastructure could support. This question was also raised by numerous members of the public.

Regrettably, Metrolinx declined to provide a direct answer and instead referred to the service proposals outlined in the business case. They stated that they could offer an all-day, two-way, 30-minute service as proposed for off-peak and weekend periods in the business case. However, this response does not address the maximum frequency that the proposed infrastructure can accommodate.

Subsequently, our volunteer contacted Metrolinx via email a few weeks later but received the same response.

5 — Frequency and Travel Time Analysis

Note: It's important to note that the following conclusions are based on available information and assumptions. We want to clarify that the authors of this report are not licensed engineers. Therefore, any outcomes derived from this information should not be taken as engineering recommendations, but rather as informed suggestions regarding the Bowmanville extension.

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More Transit Southern Ontario has done its own analysis to determine the maximum frequency of trains with the proposed infrastructure, determine the travel time on the extension, and find what additional infrastructure will be needed to run more service.

- We used Google Maps to measure the distance of the line, and mapdevelopers circle tool to measure the turning radii of curves. We used GO Transit's 2017 Track Standards to calculate maximum track speeds on curves. We used the maximum 4" imbalance allowed for GO trains and a maximum of 5" of superelevation. It is unknown how much imbalance Metrolinx is proposing for curves on the Bowmanville extension so we assume the scenario which would result in the highest maximum speeds.
- The operating speeds we used in our calculations are roughly 5-10 km/h lower than the calculated maximum speed. Between the existing Oshawa GO station and the future Thronton's Corner East GO station we used a 32 km/h operating speed which is 8 km/h lower than the design speed of 25mph Metrolinx has stated this segment of track will be built for. Straight segments of track would have an operating speed of 150 km/h. We used values of 0.33m/s^2 acceleration, 0.5m/s^2 deceleration, and 60 second station dwell times, as is common with diesel trains hauling bilevel coaches on the existing GO network.

- We assume the trains will always be accelerating if not traveling at the segment speed limit. This will result in the fastest theoretical travel time for trains on the extension. We will not be accounting for timetable padding in our calculations. This means that the actual travel time will be slightly slower than what we calculated, and the infrastructure we propose to add more service will need to be slightly modified since trains will take longer to traverse sections of track.
- We measured the extension at 18.6 km as opposed to Metrolinx's measurement of 18.7 km. We assume that space for additional double track can be added everywhere along the extension except between where the extension joins the CPKC rail corridor and Ritson GO station.

It appears that the corridor and CPKC currently permit only one GO track due to a fence, as depicted in Figure 6, and other limits shown in the key components presentation from the June 2023 public consultation (Figure 7). However, the 2011 Option 1 Environmental Project Report indicated two GO tracks along the entire extension in a future infrastructure improvement map named 'GO TRANSIT PHASE II' (Figure 8). This may be due to the fact that in the original proposal, the CPKC rail tracks and GO tracks were linked, whereas in the current proposal, they are separated entirely.

If additional double tracks are feasible in this location, it could lead to increased flexibility and frequency of service. However, if it's not feasible to add double tracks between the existing Oshawa GO station and Thronton's Corner East station and between Courtice GO station and Bowmanville GO station, this could result in less flexible and frequent service. We have compared both Option 1 and Option 2, assuming the same constraints for both since the alignment is identical east of the GM rail spur. Additionally, we assume that a new Option 1 proposal would be entirely separated from CPKC rail freight traffic, similar to the currently proposed Option 2.

Our calculations showed:
Option 1: ~15 minutes and 10 seconds from Thronton's Corner GO station to Bowmanville GO station.

Option 2: ~18 minutes and 55 seconds from the existing Oshawa GO station to Bowmanville GO station.

The distance for Option 1 is 17.6 km as opposed to the 18.6 km for Option 2.

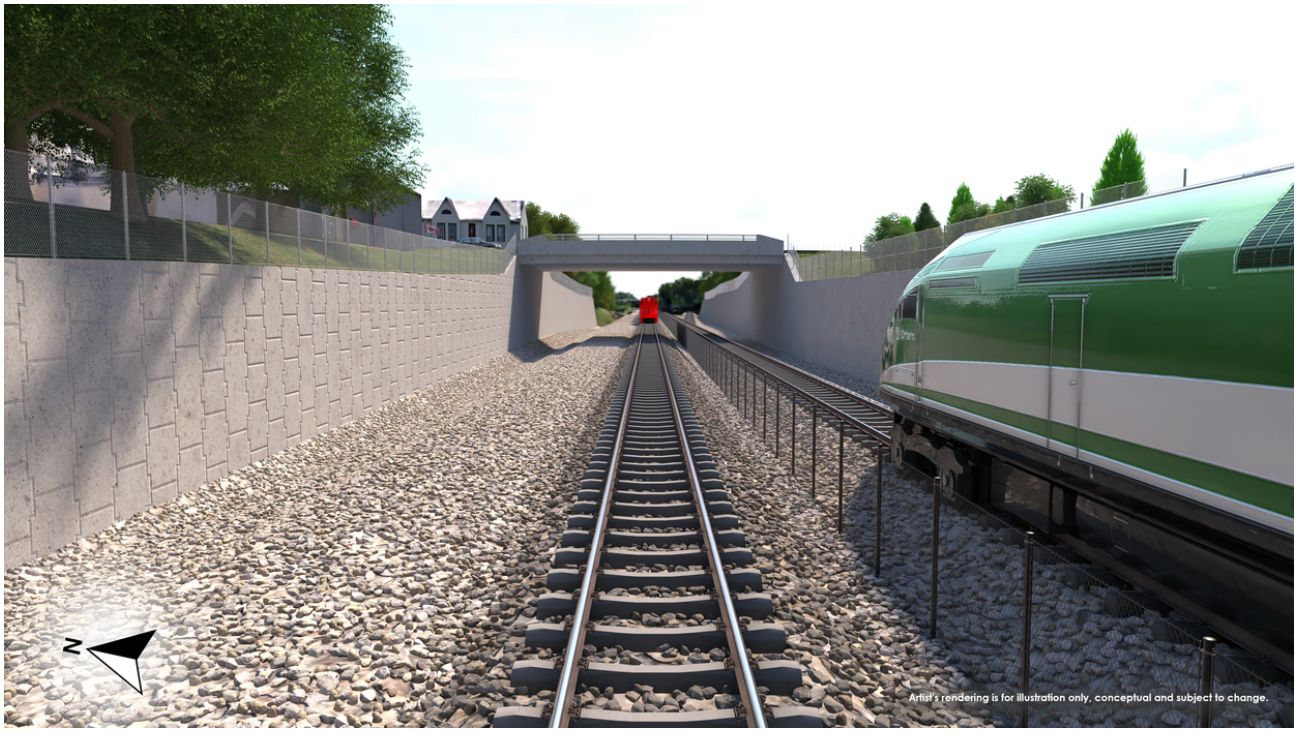

Figure 6: Render of Bowmanville Extension directly west of Ritson GO Station

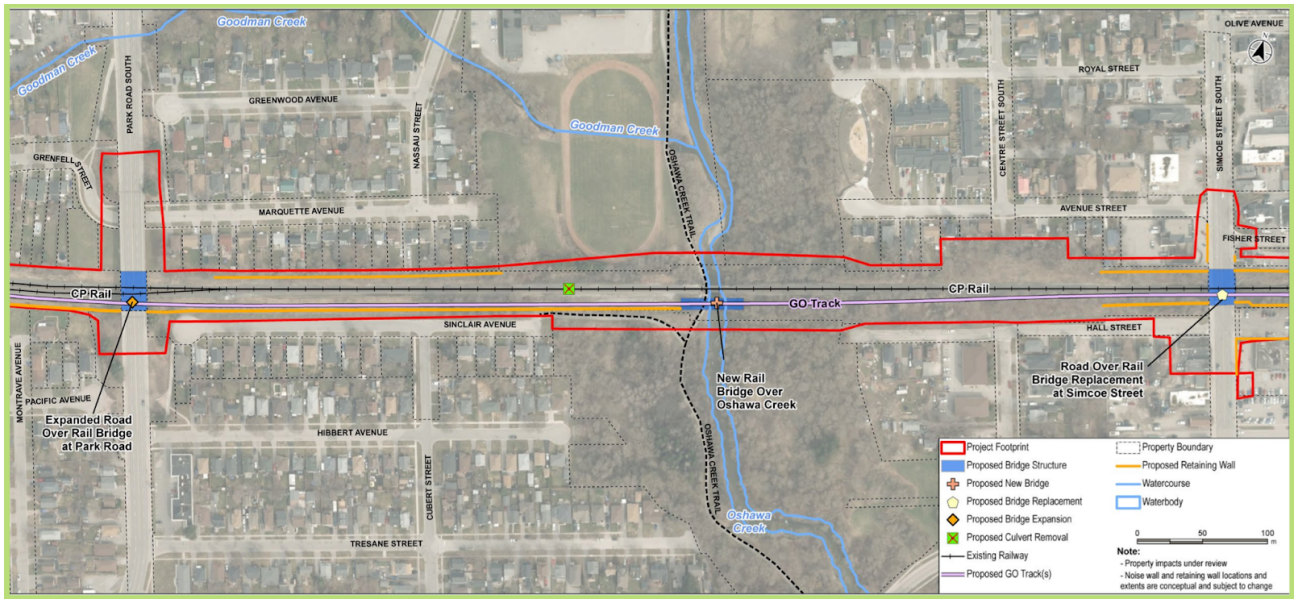

Figure 7: Infrastructure mapping directly west of future Ritson GO station

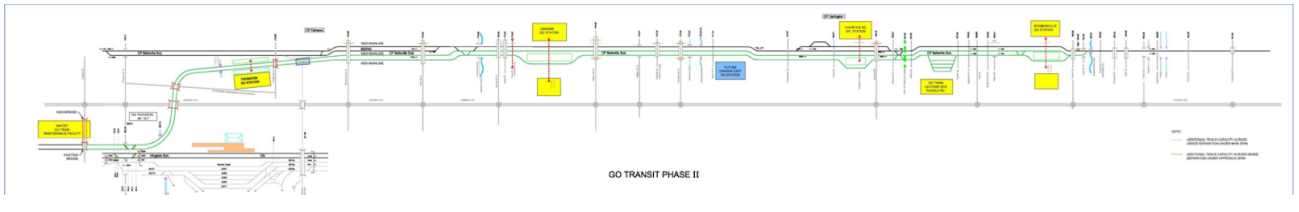

Figure 8: GO Transit Phase II infrastructure proposal

Option 2

These are position time graphs of the Bowmanville GO extension Option 2. The y axis represents distance traveled from the existing DC Oshawa GO to Bowmanville GO station. The x-axis represents time in minutes. Blue lines represent eastbound trains and red lines represent westbound trains. The black shaded area represents segments of double track where the lines can intersect (the trains can pass each other). Thronton's Corner East GO is located at 1.3 km, Ritson GO is located at 4.2 km, Courtice GO at 11.7 km, Bowmanville GO at 18.6 km.

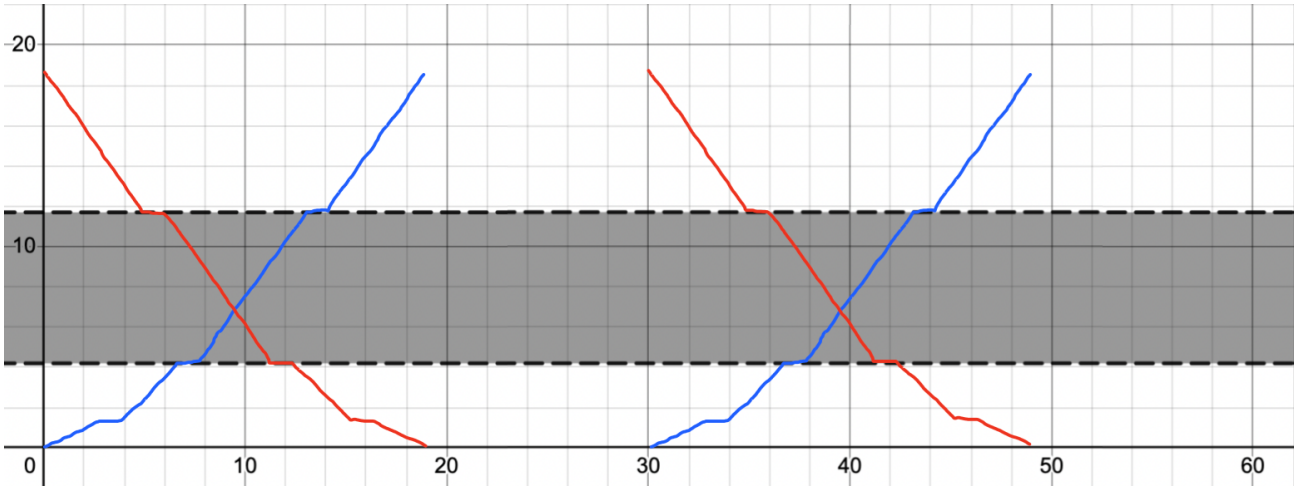

Figure 9: 30 minute service with proposed Option 2 Infrastructure

As expected, based on our analysis running a train every 30 minutes with the proposed infrastructure is possible.

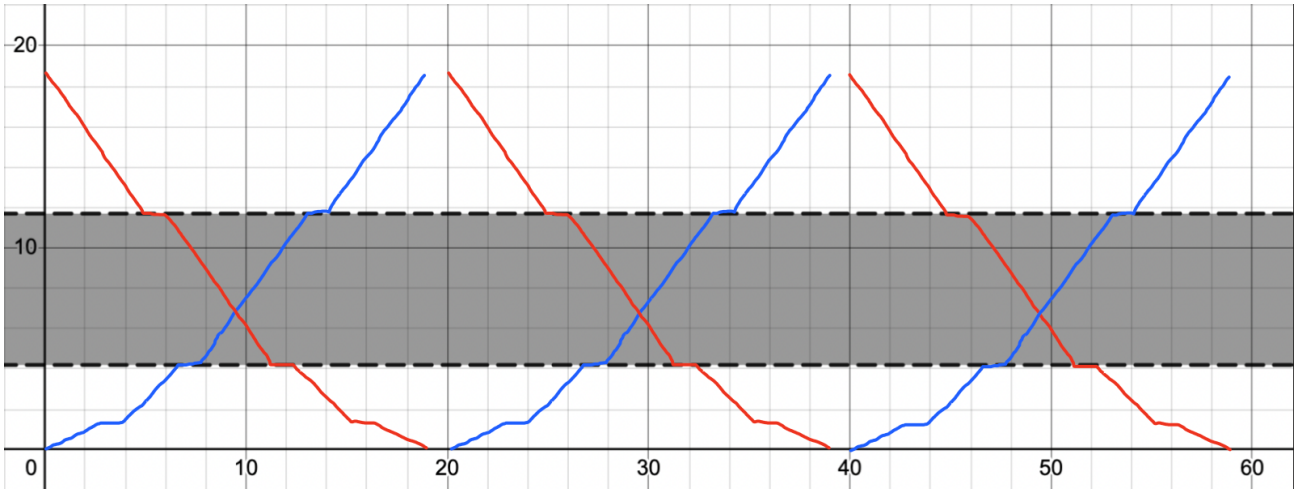

Figure 10: 20 minute service with proposed Option 2 Infrastructure

Based on our analysis, with the proposed infrastructure, running a train roughly every 20 minutes can be reasonably achieved. Which is the maximum frequency that is possible with the current proposed infrastructure.

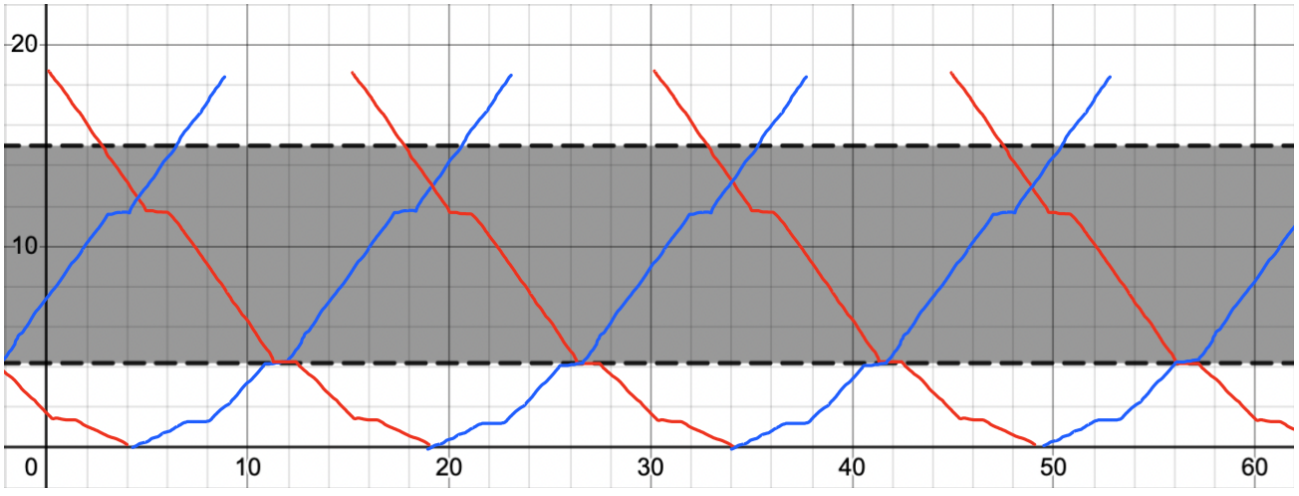

Figure 11: 15 minute service with proposed Option 2 infrastructure and additional double track

Based on our analysis, with an additional 3 km of double track to the east of Courtice GO station, and good scheduling achieving near 15 minute frequencies is possible.

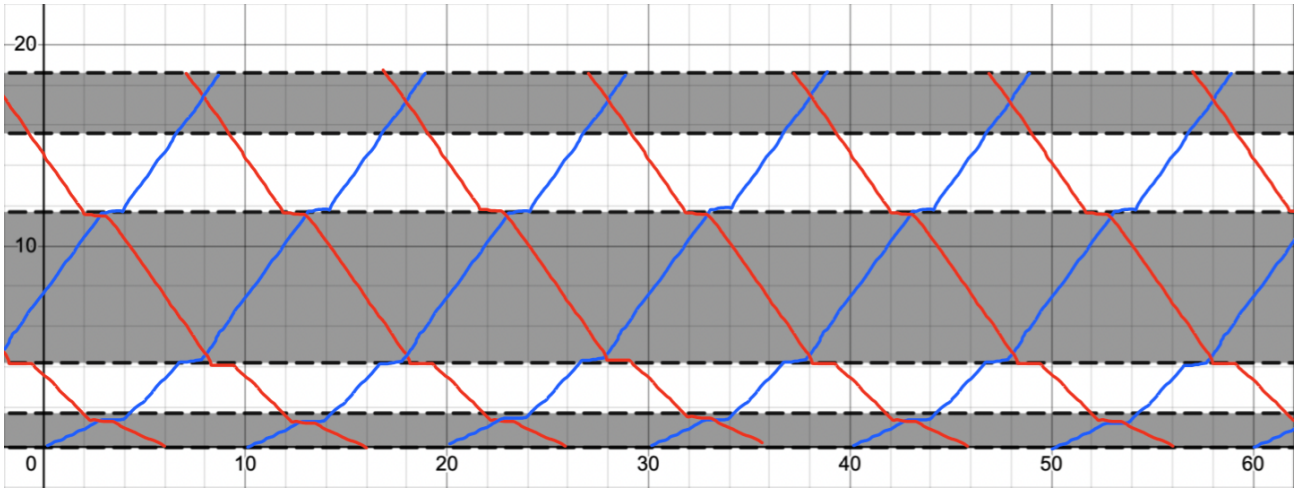

Figure 12: 10 minute service with proposed Option 2 infrastructure and additional double track.

Based on our analysis, with double track between Oshawa GO station and Thronton's Corner East station, double track at Thronton's corner station as well as additional double track directly north of Thronton's Corner East GO before joining the CPKC corridor. And 4 km of double track east of Courtice GO. Six trains per hour may be feasible with the option 2 alignment.

Option 1

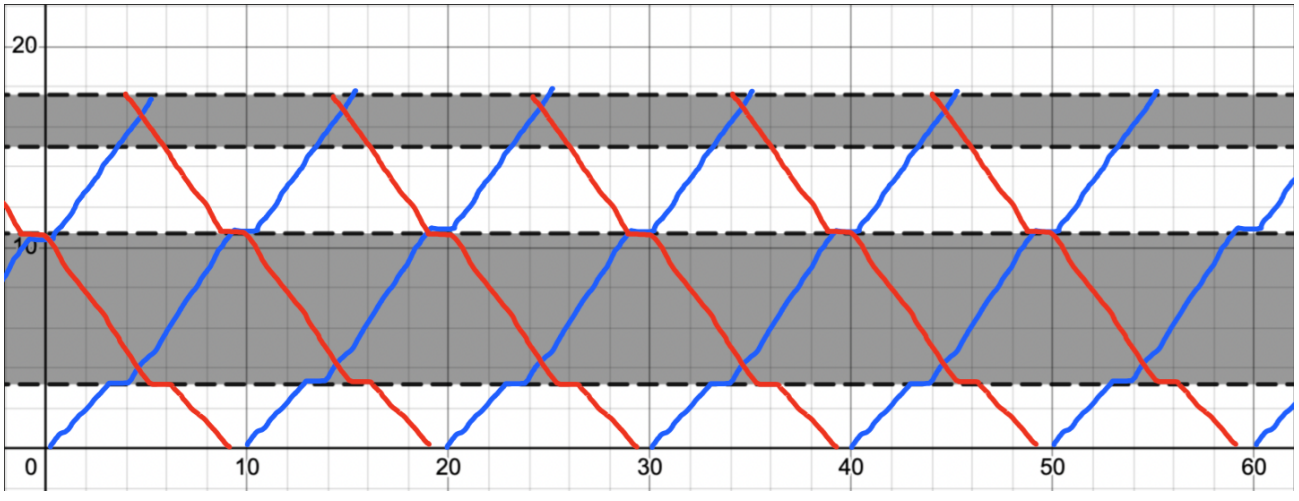

Figure 13: 10 minute service on Option 1

This is a position time graph of the Bowmanville GO extension Option 1. Thronton's Corner GO is located at 0 km, Ritson GO is located at 3.2 km, Courtice GO at 10.7 km, Bowmanville GO at 17.6 km. Based on our analysis (shown in Figure 13), running six trains per hour would be more than feasible with Option 1. With additional infrastructure and precise scheduling, eight trains per hour would be feasible.

6 — Conclusion

In conclusion, based on our estimations and analysis. The proposed infrastructure for the Bowmanville GO extension is insufficient to cater to the transportation needs of the corridor or support the proposed high-density communities around future stations. In our opinion, the infrastructure must be improved or protected to allow at least six to eight trains per hour per direction, enabling commuters to travel without referencing a schedule, provide sufficient capacity to accommodate the hundreds of thousands of people who will depend on the service, and allow for through running of all future electrified Lakeshore East GO trains to Bowmanville to strengthen local and regional connections.

We believe electrification of the Bowmanville extension is crucial to deliver this level of service. This is because running a high frequency of slow diesel trains on the same corridor as high frequency electrified trains between the existing Oshawa GO and Union Station could present operational challenges.

Electrification also offers benefits such as shorter travel times, reduced noise levels, zero local emissions, and the ability to run more trains on limited infrastructure due to faster acceleration and deceleration. Although Metrolinx claims that CPKC will not allow electrification in its corridor, there are many shared corridors within the GTHA where freight trains operate alongside electrified subway or light rail trains (as seen in Figure 14 and Figure 15). Thus based on this information, we believe that with enough negotiation with CPKC and a more aggressive attitude towards electrification by Metrolinx, electrification of the Bowmanville extension may be feasible.

Based on our estimations and analysis, the original Option 1 proposal had a faster travel time and is more readily upgradeable to provide the frequent service required for this corridor. For example, running at least six trains per hour would likely require less and cheaper infrastructure compared to the chosen Option 2. During the Fall 2023 Environmental Project Report Consultation, Metrolinx failed to include the preliminary profile drawings for the curve east of the existing Oshawa GO station to demonstrate the feasibility of the infrastructure previously promised to be included.

Once again, we are not professional engineers and we do not have access to official project information. So it is impossible for our calculations to be accurate and we are estimating to the best of our abilities. Which is why it is crucial that Metrolinx is more transparent and cooperative with discussing important project information. This report is not an engineering recommendation but rather is intended as a suggestion for better minds at Metrolinx to consider. Based on our analysis and opinion, we believe that Metrolinx made the wrong decision in 2020 to switch from the original Option 1 alignment to the current Option 2, and again in 2021, when it decided to double down on the Option 2 alignment, even with the GM plant reopening.

The Bowmanville extension represents an opportunity for Durham Region and the Greater Toronto and Hamilton Area (GTHA) to make significant progress towards resolving critical issues such as traffic congestion, housing, and climate change. It's imperative that we take the necessary steps to ensure that we execute this project correctly and effectively, as it's not too late to make any necessary adjustments.

We strongly urge Metrolinx to prioritize transparency and collaboration in developing the Bowmanville extension's infrastructure. This entails planning for accommodating at least six to eight electrified trains per hour.

Moreover, we suggest reevaluating the curve design east of the current Oshawa GO station, with a focus on enhancing safety measures, optimizing travel time and enabling increased service.

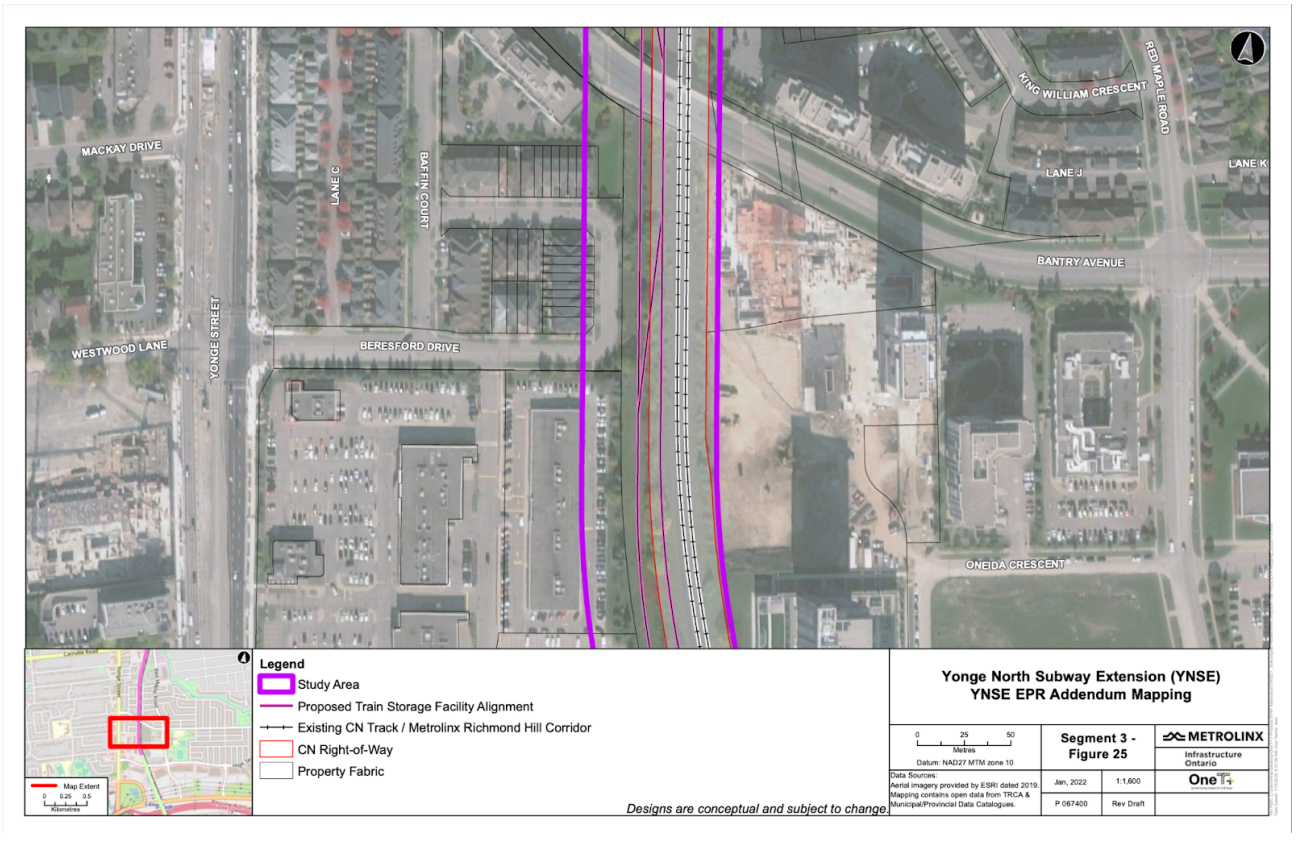

Figure 14: Proposed Yonge North Subway Extension with electrified subway tracks in CN rail freight right of way

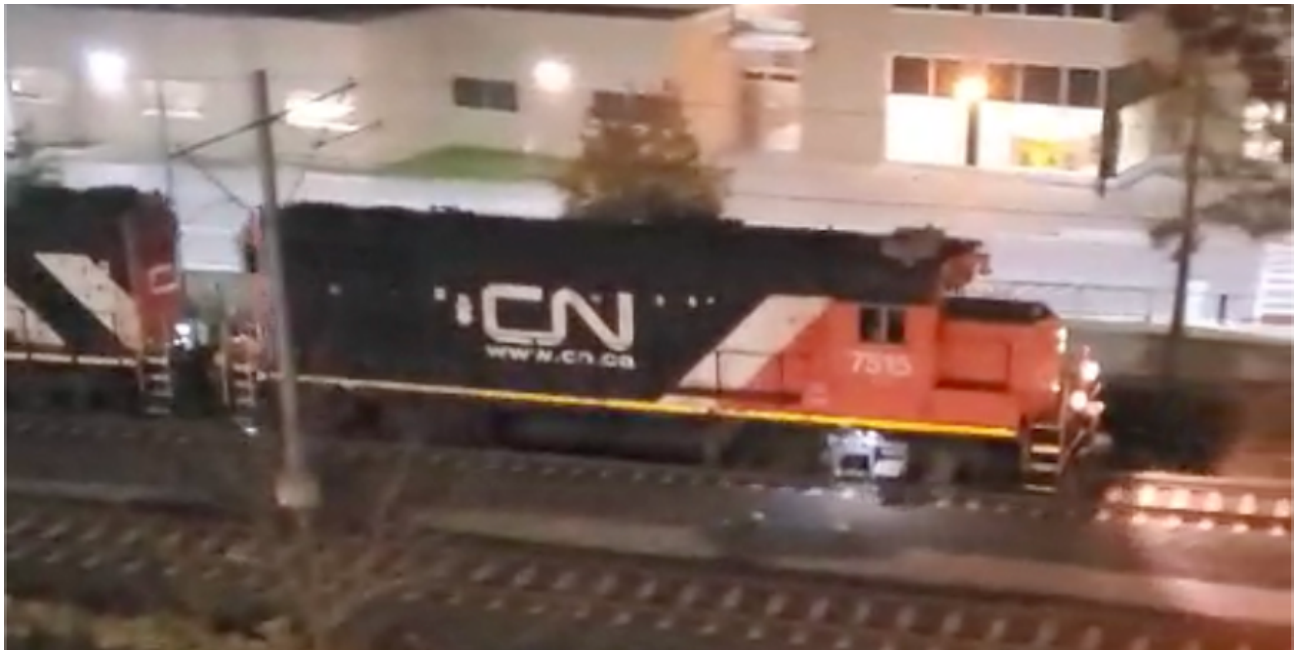

Figure 15: CN freight train under overhead electrification in Waterloo, Ontario

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8 — Acknowledgements

This report was written by Haadhi Faizal (Year One Civil Engineering, University of Waterloo), with assistance by Jonathan Lee. Special thanks to Jim McEwen and Reece Martin for their valuable insight.

More Transit Southern Ontario (MTSO) is a volunteer based organization focusing on advocating for making transit more accessible, frequent, fast, reliable, safe, and integrated across Southern Ontario.

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