ECOH
Environmental Consulting
Occupational Health

COMMENTS ON METROLINX HEALTH AND SAFETY PLAN FOR PAPE AVENUE JUNIOR PUBLIC SCHOOL

TORONTO, ON

Prepared for:
Toronto District School Board

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1. INTRODUCTION

ECOH Management Inc. (ECOH) was asked by the Toronto District School Board (TDSB) to comment on the draft Metrolinx health and safety plan ("the draft Plan) dated March 2023 with regard to construction of the Ontario Line near Pape Avenue Junior Public School (PAJPS).

This review covers the following issues addressed in the draft Plan. ECOH may address other issues and other aspects of these issues in future reports. Comments are also provided on supplementary documents provided to TDSB by Metrolinx.

- Noise
- Air Quality
- Vibration
- Traffic and Pedestrian Safety

The Addendum to this document presents definitions and explanations of basic noise terminology used in this report.

2. BACKGROUND

ECOH submitted a report to TDSB dated March 20, 2023, addressing health and safety aspects of construction of the Ontario Line, based on previous documents provided by Metrolinx. The draft Plan elaborates on the measures addressed in the previous documents.

The draft Plan covers health and safety issues related to the following activities to be conducted in close proximity to the school:

- Work to be performed by the responsible utility companies, e.g. Bell, Toronto Hydro, Enbridge and Rogers/Beanfield), e.g. to relocate utility lines.
- Installation of a microtunnel under the playground area of the school.
- Construction of a new portal for the transition of Metrolinx service into new tunnels.
- Demolition and other preparatory work.
- Installation and commissioning of track and rail systems within the new tunnels.

The draft Plan also states that further work will be done, for which additional health and safety information will be provided by Metrolinx.

The different elements of the work will be performed by contractors, overseen by Metrolinx, who will be responsible for meeting health and safety requirements.

The draft Plan states that a detailed package will be delivered to the school for each element of the work. These packages will provide specific plans, sequences and schedules before the work is begun.

3. NOISE

3.1 Highlights of Draft Metrolinx Plan and Monitoring Reports

Section 4.1 of the Metrolinx draft plan addresses noise, and set out the following limits for outdoor construction noise:

Table 4-1

***Leq*, dBA (daytime, 07:00 – 18:00)**	***Lmax*, dBA**	***Lpeak*, dBZ [1]**
69	85	120[2]

As a rationale for these limits, the draft Plan states, "these construction noise limits are consistent with applicable noise exposure regulations defined in Ontario Regulation 381/15 under the Occupational Health and Safety Act." The draft Plan also references documents from the World Health Organization (WHO), Health Canada and Toronto Public Health (TPH) regarding potential hearing damage due to noise.

The draft Plan also "acknowledges that additional mitigation may be required to address construction noise impact. Should monitoring identify an exceedance to the noise limits, the following mitigation options shall be investigated and implemented as agreed with the School."

As well the draft Plan states that "Warning/review levels will be set lower than those noted in Table 4-1, to provide opportunity for adaptive management where feasible prior to any potential exceedance." The plan does not state what these warning/review levels are.

The draft Plan states that noise will be monitored at two fixed locations, both in the playground areas on the east side of the school.

Metrolinx also provided TDSB with a report dated April 6, 2023 on monitoring baseline noise levels in the playgrounds on March 6, 2023. This report concluded that:

- The average noise level (Leq 07:00 – 18:00) ranges between 63 – 65 dBA during typical school operation. Therefore, an ambient noise level of 64 dBA as provided in the NVIAR is considered appropriate.
- The maximum noise limit (85 dBA Lmax) is exceeded during the baseline, both from extraneous noise (e.g. vehicle beeping, sirens, engines) as well as children in the playground.
- Peak noise levels (Lpeak) do not exceed the 120 dBZ limit during the baseline monitoring.

The April 6 report did not include monitoring inside the school. However, the presentation to TDSB dated February 23, 2023 reported on the following levels measured inside the school on January 4, 2023 during concrete cutting, hydrovac and jackhammering:

- Indoor of Wonderland Room (window open) = 56 dBA
- Indoor of Wonderland Room (window closed) = 45 dBA
- Background Indoor Noise (windows open, no construction) = 48 dB

3.2 ECOH Comments

3.2.1 Basis for noise targets

The Ontario noise regulation and other guidelines designed to protect against hearing loss are not appropriate as standards for noise levels in schools.

As discussed in the March ECOH report, noise can have numerous other impacts on children and the educational experience. Therefore, the criterion for noise limits should not be based on hearing loss. The draft Metrolinx plan uses selective sections of the material they reference to justify their limits. For example, the draft Plan states that "Toronto Public Health provides guidance on noise-induced hearing loss and notes 'noise-induced hearing loss is unlikely when average daily exposure (24-hour) to noise is below 70dBA. The equivalent 8-hour exposure threshold for hearing loss that includes impulse sounds is 75 dBA Leq, 8 hr. The average noise limit in Table 4-1 (69dBA) ensures compliance with the Toronto Public Health recommendation of 75dBA L*eq,* 8-hour."

However, the TPH report also reports health effects of noise at levels well below those that cause hearing loss. The report states "Toronto Public Health has reviewed the evidence that has accumulated since the [1999] WHO [World Health Organization) evaluation. Newer evidence confirms that health impacts can occur at levels between 42 and 60 dBA outdoors, which is below the 70 dBA benchmark that TPH had previously been considered protective of health." Therefore, using hearing loss as the outcome of concern when setting noise target levels is not appropriate.

The draft Plan states that the Leq (average noise) target of 69 dBA is based on 5 dBA increase above the ambient level, which, based on noise monitoring in the playground, it takes to be 64 dBA. As a reference for the 5 dB increase above ambient, the draft Plan cites Bies & Hansen "Engineering Noise Control Theory and Practice 3rd Edition", Table 2.1 The 4th edition of this reference indicates that 5 dB above background is "clearly noticeable" and that 3 dB above background is "just perceptible".

Metrolinx' own monitoring results for March 9, 2023, show that the daily Leq was 63 dBA, not 64 dBA, and that hourly Leq was below 63 dBA except for the hours of 12 noon to 2 pm.

3.2.2 Averaging periods

The averaging period for the Leq (average) noise limit of 69 dBA is unclear. Table 4.1 suggests that this is averaged from 7 a.m. to 6 pm. But a note accompanying the table states "L*eq* refers to the energy-average noise level, over the given period (e.g., 1 hour), as a measure of loudness."

The averaging period is important, because if Metrolinx is averaging in periods of quiet with the periods of construction noise, much greater excursions above 69 dBA may be experienced while remaining within the limit. For example, quieter periods may occur when children are not outdoors and construction equipment is not running. An averaging period of one hour as suggested in the notes would be much more protective.

3.2.3 Indoor noise

The noise levels that Metrolinx reports for its January 2023 monitoring indoors during construction with the window open was 56 dBA, a level comparable to routine classroom levels. The Metrolinx report did not say whether children were present when these measurements were made. School was not in session that day, and, given the relatively low noise levels, it is likely that children were not present in the room where the measurements were taken. The reported noise levels are consistent with baseline levels measured by ECOH in May 2023 during quiet classroom periods. Metrolinx has said that it will conduct indoor noise monitoring during construction.

3.2.4 Action levels (review levels)

The draft Plan states that "Warning/review levels will be set lower than those noted in Table 4-1, to provide opportunity for adaptive management where feasible prior to any potential exceedance." However, the Plan does not state what those warning/review levels will be. The Plan goes on to say, "should monitoring identify an exceedance to the noise limits, the following mitigation options shall be investigated and implemented as agreed with the School". The Plan then lists a variety of mitigation measures, in addition to the barrier that Metrolinx proposes to erect.

Metrolinx should provide TDSB with the action (review) levels it will use to provide opportunity for adaptive management [additional mitigation] where feasible prior to any potential exceedance". As the goal of noise control should be to minimize impacts on the educational experience and student/staff well-being, sound levels should ideally not exceed the measured baseline levels. Where this is not feasible, the additional mitigation measures listed in the draft Plan should be undertaken when levels are 3 dBA above baseline (i.e. the level indicated as "just perceptible" by Bies & Hansen. The outdoor action level should be an hourly Leq of 66 dBA when children are not outdoors (the measured baseline Leq of 63 dBA plus 3 dBA). The indoor action level should be 53 dBA in an unoccupied room with windows open (baseline of 50 dBA plus 3 dBA).

3.2.5 Location of outdoor noise monitors

The locations of the noise monitors shown in the draft Plan do not include monitoring at the kindergarten playground south of the school on Langley Avenue. As some of the construction

activities will take place on Langley, it is possible that noise at this playground will exceed the targets, yet not be indicated by the two fixed monitors. Therefore, noise should also be monitored at this playground when construction activities are conducted on Langley Avenue. This could be done using an additional fixed monitor, or through representative short-term samples.

4. VIBRATION

4.1 Highlights of Draft Metrolinx Plan

The draft Plan provides the following table regarding vibration limits:

Table 4-2 Construction Vibration Limits

Frequency of Vibration (Hz)	Maximum Vibration Peak Particle Velocity Limit for Standard Construction (mm/s)	Maximum Vibration Peak Particle Velocity Limit for Built Heritage Resources (mm/s)
Below 4H	8	3
4Hz and below 10Hz	15	3
10Hz and below 50Hz	25	8
50Hz and above	25	10

In the notes accompanying the table, the draft Plan states, “The Pape Avenue Junior Public School, given its age and construction, would apply the ‘Built Heritage Resources’ limits”.

The draft Plan also states that Metrolinx has been conducting vibration monitoring inside the school, but does not provide the results. It further states that “warning/review levels will be set lower than those noted in Table 4-2, to provide opportunity for adaptive management where feasible prior to any potential exceedance”. As with its statement on noise, the Plan does not indicate what those warning levels will be.

4.2 ECOH Comments

Adverse health effects of vibration are not expected at the levels that may cause damage to buildings; therefore the vibration limits presented in the draft Plan need be considered only with respect to potential building damage. The Plan is correct in its statement that the appropriate standards for vibration levels at PAJPS are those for Built Heritage Resources.

As noted in the draft Plan, construction vibration is governed under City of Toronto Bylaw 514, which requires adherence to vibration limits, stakeholder consultation, monitoring throughout the project, and mitigation actions. Based on reports by the project engineer, the City may impose additional requirements with respect to vibration limits.

Metrolinx should be asked to specify the action levels that will trigger further mitigation action and to consistently share results of vibration monitoring throughout the project.

The draft Plan notes that the target vibration levels are not intended to prevent possible release of asbestos fibres from building materials. As asbestos-containing material (ACM) is present in PAJPS, additional attention should be paid to the condition of this material during the construction period, to ensure that ACM does not deteriorate and potentially release fibres. This may require an update of the school asbestos survey.

5. AIR QUALITY

5.1 Highlights of Draft Metrolinx Plan

The draft Plan re-states the standards and measures included in the presentation to TDSB dated February 23, 2023, on which ECOH previously commented. Specifically, the Plan includes the following limits and guidelines for indoor and outdoor pollutants:

Table 5-1 Outdoor Ambient Air Quality Limits for Particulate Matter (PM) and Silica

Parameter	Ambient Air Quality Limits note 1	Averaging Time Period	Air Quality Action Level that triggers investigation	Length of time action level is exceeded that triggers investigation	Monitoring Method
$PM_{2.5}$ note 2	27 µg/m³ note 4	24 hours	81 µg/m³	15 minutes	Real-time, continuous
PM_{10} note 3	50 µg/m³	24 hours	150 µg/m³	15 minutes	Real-time, continuous
Respirable Crystalline Silica	5 µg/m³	24 hours	NA	NA	Time-interval sample analyzed at a laboratory

Table 5-2 Indoor Air Quality (IAQ) Reference Guidelines for Particulate Matter (PM) and Total Volatile Organic Compounds (TVOCs)

IAQ Parameter	Reference Guidelines note 1	Monitoring Method	Reference Source
PM_{10} note 2	50 µg/m³ note 4	Real-time, continuous	ASHRAE, USGBC LEED
TVOCs note 3	1000 µg/m³ (or 440 ppb)	Real-time, continuous	Health Canada

The draft Plan lists mitigation measures that will be taken when guidelines/limits are exceeded, including purchase of portable air cleaners (HEPA filters) for use inside the school.

5.2 ECOH Comments

ECOH adheres to our comments in our March 20 report, including the following.

Using the Ontario Ambient Air Quality Criteria values as 24-hour criteria for the construction project is not appropriate, as concentrations during construction will be averaged with night concentrations which will be much lower. The 24-hour criteria should be used as target concentrations during a school day when construction activities are being conducted.

The indoor criterion for PM10 is consistent with LEED recommendations and is acceptable. However, there is no criterion given for indoor concentrations of PM2.5. These should also be consistent with LEED criteria, i.e. 12 µg/m^3. Metrolinx states that it has conducted baseline indoor air monitoring, but does not indicate what levels it found. This information should be provided to TDSB.

The schedule for Metrolinx receipt of air monitoring reports is too infrequent. Metrolinx should receive and share with TDSB the daily logs of particulate concentrations. Where the concentrations during the school day exceed an average of 50 µg/m^3 (PM10) or 27 µg/m^3 (PM2.5), the additional mitigation measures should be implemented. It is recommended that these levels be re-evaluated after monitoring during construction, with a view to lowering them based on ALARA (as low as reasonably achievable) principles.

Monitoring indoors should also be conducted, with consideration given to additional mitigation measures. The draft Plan lists funding for purchase of indoor HEPA filters (portable air cleaners) as a dust mitigation measure where needed. This should be done if LEED standards for indoor air are exceeded and portable cleaners are needed in addition to those the school already has.

6. TRAFFIC AND PEDESTRIAN SAFETY

6.1 Highlights of Draft Metrolinx Plan

Section 6 of the draft Plan sets out general measures for ensuring pedestrian and traffic safety during construction activities near the school. Highlights of these measures include:

- A traffic signage plan will be developed for each element of the work
- Utilizing crossing guards assigned at intersections
- No construction vehicles during school drop off and pick up times
- Compliance monitoring by Metrolinx

The draft Plan states that as part of the process to obtain a permit contractors will submit traffic control plans that provide specific work details including scope, location, duration, and technical drawings. It also states that specific details of these plans will be provided to the school for each construction activity.

6.2 Documents regarding Bell Utility Relocation

Details were provided to TDSB with regard to Bell Utility Relocation in May and June of 2023. Documents provided included:

- A powerpoint deck setting out high level details regarding:
  - The type of work to be done (e.g. trenching, drilling)
  - General statements of impacts (e.g. noise, sidewalk closure)
  - Safety measures, including duty officers, temporary fencing, signage
  - Drawings showing location of sound barrier, work zones on Pape and Langley Avenues, accessible and closed pathways, and duty officers

- A site plan showing details of the work, including drilling locations, tree removal, and gas and hydro lines

- The City Cut Permit, which sets out general City requirements, including
  - Not interfering with rush hour traffic
  - Protection of city-owned trees
  - Signage and traffic control

6.3 ECOH Comments

The measures set out in both the draft Plan and the documents regarding the Bell Utility relocation do not provide sufficient details regarding safety protections for school occupants. Examples of issues that should be elaborated in more detail include:

- Safety protection during tree removal
- Avoidance of student pick up and drop off times
- Access to school (e.g. the second graphic on the powerpoint slide does not indicate an accessible pedestrian path leading to the school.)

(Note – a review of safety implications of the site plan showing drilling location, tree removal, hydro and gas locates, is beyond the scope of ECOH's comments in this report.)

It is recommended that prior to launch of each construction activity, a meeting be held between school leadership, contractors and Metrolinx to review and address any concerns regarding safety measures.

7. SUMMARY OF RECOMMENDATIONS

Following is a summary of ECOH's recommendations from the preceding sections:

Noise

1. The 69 dBA Leq noise level target should be based on a 1 hour averaging period throughout the school day.
2. Noise monitoring should be conducted both indoors and outdoors during construction

activities and include the Kindergarten playground.

3. Metrolinx should specify action levels for both indoor and outdoor noise that will trigger investigation and further mitigation measures. The action level should be based on the target of not elevating noise more than 3 dBA above baseline levels. Recommended action levels are a 1 hour Leq of 66 dBA outdoors when children are not present and 53 dBA indoors in an unoccupied room with windows open.
4. Metrolinx should share daily noise monitoring logs with TDSB.
5. Noise monitoring, targets and action levels should apply to the kindergarten playground as well as the playgrounds at the corner of Pape and Langley Avenues.

Vibration

6. Metrolinx should specify the vibration action levels that will trigger further investigation and mitigation measures.
7. An asbestos survey should be conducted for the school to ensure that all ACM is in good condition and will not release asbestos fibres due to increased vibration levels.

Air Quality

8. The 24-hour criteria for air contaminants should be used as target concentrations for a school day during construction activities (i.e. without averaging in night-time concentrations).
9. A criterion for indoor PM2.5 should be set, consistent with LEED criteria, i.e. 12 $\mu g/m^3$.
10. If indoor particulate concentrations exceed recommended levels, Metrolinx should follow through on its offer to fund portable air cleaners for use in the school where they are needed in addition to the existing portable cleaners.
11. Logs of particulate monitoring should be reviewed daily by Metrolinx and provided to TDSB. Increased mitigation measures should be implemented if daily concentrations exceed target levels.

Traffic and pedestrian safety

12. More details should be provided regarding measures to protect the safety of school occupants.
13. Metrolinx and contractors should meet with school leadership before commencement of each construction activity to address safety issues.

8. CONCLUSION

ECOH has reviewed sections of the draft Metrolinx health and safety plan regarding noise, vibration, air quality and traffic safety. Recommendations have been made regarding modifications of health and safety measures and additional information that should be provided by Metrolinx to TDSB. Results of monitoring for noise, vibration and air quality during construction should be reviewed on a regular basis and additional mitigation measures implemented where appropriate.

9. STATEMENT OF LIMITATIONS

The comments, recommendations and conclusions made by ECOH Management Inc. (ECOH) in this report are limited to the specific scope of work for which ECOH was retained and are based solely on information provided to ECOH by TDSB. Only those items that are reasonably obvious to ECOH personnel or have been identified to ECOH by other parties can be reported. ECOH has exercised a degree of thoroughness and competence that is consistent with the profession during the execution of this review. ECOH considers the opinions and information as they are presented in this report to be appropriate at the time of the review.

ECOH, to the best of its knowledge, believes this report to be accurate; however, ECOH cannot guarantee the completeness or accuracy of information supplied to ECOH by third parties.

ECOH is an Environmental Consulting Company and as such any results or conclusions presented in this report should not be construed as legal advice. The material in this report reflects ECOH's professional interpretation of information available at the time of report preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ECOH accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. Should additional information become available that suggests other environmental issues of concern beyond that described in this report, ECOH retains the right to review this information and modify conclusions and recommendations presented in this report accordingly.

10. CLOSURE

We trust that this report meets with your requirements. Should you have any questions, please contact us at (905) 795-2800.

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Attachment: ADDENDUM: Noise Measurement Terms and Abbreviations

ADDENDUM: Noise Measurement Terms and Abbreviations

1. dBA: Sound levels are usually expressed in decibels, which is a logarithmic scale used to indicate sound pressure. Decibel numbers may be weighted to give more or less importance to different frequencies of sound. The A-weighted decibel scale, abbreviated as dBA, is used for most noise measurements where we are concerned about human sensitivity to sound, because it gives more importance to the frequencies that humans are most sensitive to.
2. Leq: the average sound level during a specific measurement period.
3. Lmax: the maximum sound level over 1 second during the measurement period
4. Lpeak: the maximum instantaneous sound level