

# SENES Consultants Limited

## MEMORANDUM



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TO: Murray Thompson, URS 33900-6

FROM: Harriet Phillips March 12, 2009

CC: Doug Chambers, SENES, Sandy Willis, SENES, Dave Wake, MTO

SUBJ: Response to Submission by City of Windsor - George Thurston memo

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This memo addresses the comments in the Executive Summary of Thurston's review which summarizes his detailed review comments. Before addressing the specific comments some background information on the Air Quality assessment is provided for context.

The study team recognized that one of the goals of the Environmental Assessment (EA) is to address changes associated with the proposed activity. Air quality is clearly an important factor and the study team did extensive analyses on potential air quality impacts. In order to ensure that this requirement was satisfied, the study team and its experts prepared air quality reports in support of the overall EA report. These reports include the Practical Alternatives Evaluation Working Paper: Air Quality Impact Assessment (May 2008); the Air Quality Assessment: Technically and Environmentally Preferred Alternative, December 2008 (TEPA); and the Human Health Risk Assessment: Technically and Environmentally Preferred Alternative, December 2008 (HHRA).

The air quality reports followed the structure identified in the DRIC Air Quality Workplan, (February 2006) which was circulated to regulatory agencies for review and comment prior to publication in 2006. The model selected for air quality assessment was the CalTrans CAL3QHCR roadway dispersion model, which is accepted for use in Ontario by the Ministry of the Environment (MOE) and is supported by Environment Canada for transportation assessments.

The reports concluded that the Parkway will result in *improvements* to air quality compared to a (future) "No Build" alternative due to decreased engine idling and increased buffer zones in the highway right-of-way. For the TEPA and the HHRA, all health based impact contaminants were either negligible relative to background (existing conditions) or were well below the guidelines even under maximum (the worst) conditions. Maximum conditions are not constant but rather predicted to occur only once per year. Considering the 14 contaminants that were assessed, the overall conclusion was that the Parkway would not cause any additional impact in comparison to the future "No Build" alternative, particularly as it relates to health impacts.

The **Practical Alternatives Report** assessed the relative differences among six practical alternatives and a future "No Build" alternative. This comparative assessment examined two health-based

indicator substances, nitrogen oxides (NO<sub>x</sub>) and fine particulate matter (PM<sub>2.5</sub>). The information gained through this assessment contributed to the evaluation of alternatives, leading to the selection of the Technically and Environmentally Preferred Alternative (TEPA).

Through the analysis of the practical alternatives, and in conjunction with ongoing consultation efforts, a sixth alternative was developed that combined beneficial features of the original alternatives. This alternative was identified as the Parkway in August 2007 and the air quality analysis of practical alternatives was updated to include it.

The Practical Alternatives Report assessed the maximum (worst) concentrations and exceedances (concentrations exceeding the Canada-Wide Standards guidelines) on a comparative basis for road segments within the transportation corridor. The Practical Alternatives Report was clearly stated to be a comparative analysis of the various alternatives. Moreover, the analysis was based on maximum concentrations predicted to occur only once per year. As indicated, the analysis showed no clear preference amongst the alternatives, as all alternatives would provide similar contaminant loading. The conclusion was that the mass of contaminants released to the air is the same for any alternative but still less than in a “No Build” scenario.

The analysis of practical alternatives showed that there is effectively *no difference* in air quality between the below-grade alternatives and the end-to-end tunnel alternative beyond 100 metres from the roadway, and only minor differences between 50 and 100 metres. Thus, tunnels may provide a means of moving emissions from one location to another (i.e., from one adjoining neighbourhood to another). This could affect very localized concentrations at some points along the roadway i.e. within 50-100m, but does not impact overall air quality in the Windsor air shed. Longer tunnels could in fact result in increased emissions near tunnel portals.

The **TEPA report** examined predicted impacts on air quality for both the TEPA and the future “No Build” alternative. This data was also used as input to the Human Health Risk Assessment. The results reported in the TEPA report describe both the relative difference between the TEPA and the future “No Build” alternative and the actual estimates of future air quality with the TEPA in place. As committed in the Air Quality Workplan (2006), the TEPA report assesses 14 contaminants.

Pollutant concentrations reported in the TEPA report are maximum predicted concentrations (i.e., the worst pollutant levels). It is important to note that the maximums are not usual and are predicted to occur only once per year. Where no specific air quality monitoring receptors are identified, these maximum concentrations represent the maximum concentrations at any of the receptors assessed and are not indicative of the typical concentrations at each individual receptor, nor are they indicative of the maximum concentrations at all receptors. All other receptors will be exposed to lower concentrations under all meteorological conditions.

Both the Practical Alternatives Report and the TEPA Report relied on information obtained from computer modeling of future conditions, which in turn depends on a variety of input parameters. For a comparative analysis, it is important to have the input parameters remain constant with variation limited to traffic data and roadway geometry. The parameters, which were kept constant for the “No Build” alternative, the TEPA and all other alternatives included: meteorological data, emission

factors for tailpipe emissions, US EPA road dust calculation methodology, receptor locations, vehicle weight and length, background ambient concentrations, and horizon years (2015, 2025, and 2035).

Over 2400 modelled receptors were examined for impacts. These receptors were spaced to determine both near-distance and farther distance results from the roadways. The first two rows of receptors were placed at 50 m intervals from each side of the existing road, followed by 100 m intervals up to 500 m away. Another grid with 500 m x 500 m spacing was then overlaid to cover the rest of the modelling domain, which was essentially all of west Windsor, and adjacent portions of LaSalle and Tecumseh. In preparing the TEPA report, the study team responded to comments received on the Practical Alternatives report, and highlighted 64 receptors, representing specific neighbourhoods, schools, parks and churches.

The studies concluded that the Parkway will provide *improvements* to air quality relative to a future “No Build” alternative due to decreased idling and the increased buffer zones of the right of way. While no alternative can be fully protective of air quality in Windsor and Essex County given the levels of trans-boundary pollution there (i.e., pollution originating at locations in the U.S. but carried by wind across the border), the studies concluded that the Parkway will actually *improve* air quality compared to a future “No Build” alternative.

The following discussion provides responses to the City of Windsor’s submission by George Thurston.

George Thurston states that “*the DRIC Human Health Risk Assessment is significantly deficient for the following reasons:*

- “*The Parkway’s negative health impacts have not been assessed due to the incorrect premise stated in the DRIC Air Quality Assessment TEPA (December 2008) that particulate matter is “not considered a health-based contaminant.”*

Response: The human health risk assessment did evaluate the effects due to particulate matter. Pages 27 to 34 of the Human Health Risk Assessment provided a discussion of the health effects of both PM<sub>2.5</sub> and PM<sub>10</sub> and Section 5.2 of the report provides an evaluation of the effects due to particulate matter arising from the Parkway.

- “*Both PM<sub>2.5</sub> and PM<sub>10</sub> are indeed-health based contaminants, with known increases in the risk of negative human health impacts per unit of increased pollution.”*

Response: The human health risk assessment did evaluate the effects due to particulate matter. Pages 27 to 34 of the Human Health Risk Assessment provided a discussion of the health effects of both PM<sub>2.5</sub> and PM<sub>10</sub>.

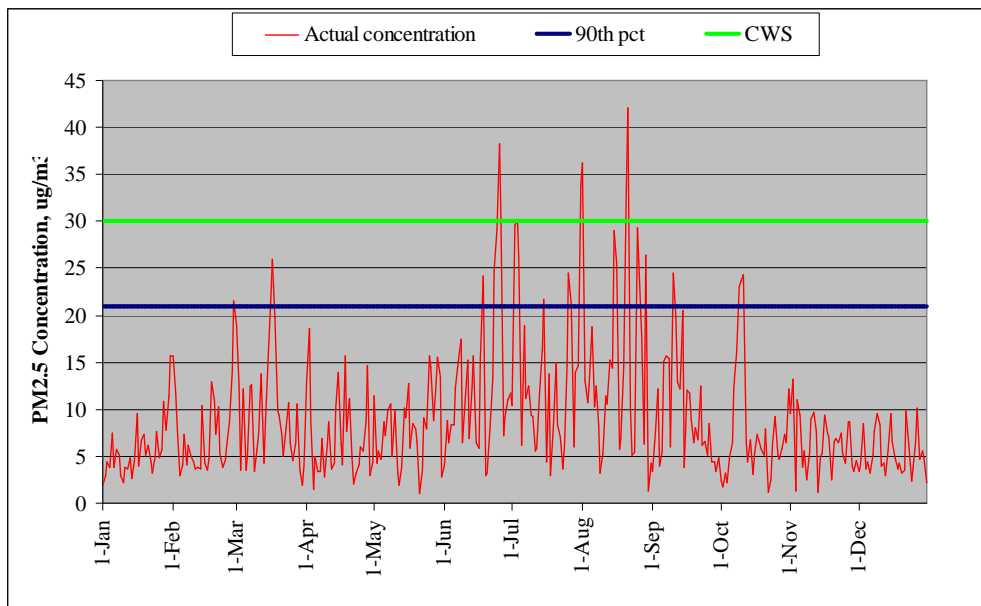
- “These negative human health impacts from the Parkway will be added to existing poor air quality that already places residents in Windsor, Ontario at risk.”

Response: Transboundary pollution is the driver of air quality in Windsor and has been recognized as such by the Ministry of the Environment (MOE) in their publications “*Preliminary Air Quality Assessment Related to Traffic Congestion at Windsor’s Ambassador Bridge, 2004*”, “*Transboundary Air Pollution in Ontario, 2005*”, and the annual Air Quality in Ontario publications. The Preliminary Air Quality Assessment Related to Traffic Congestion at Windsor’s Ambassador Bridge states:

“*Transboundary air pollutants from the United States account for up to 50 per cent of smog in Southwestern Ontario. In Windsor, this value may be as high as 90 per cent.*”

Monitoring data from the MOE Windsor stations for PM<sub>2.5</sub> is also indicative of periodic episodes of excursions of the Canada Wide Standard (CWS) 24 hour criteria of 30 µg/m<sup>3</sup> arising from background conditions as shown in Figure 1 .below. As there are excursions of the CWS of PM<sub>2.5</sub> no traffic related solution will be fully protective of air quality.

**Figure 1 - Daily Variability of PM<sub>2.5</sub> in Windsor**



The assessment methodology recommended by the MOE requires the use of the 90<sup>th</sup> percentile background to calculate maximum concentrations and exceedances. A 90<sup>th</sup> percentile background occurs only 10% of the year as 90% of the time the ambient conditions are lower. For PM<sub>2.5</sub>, the 90<sup>th</sup> percentile background is 21 µg/m<sup>3</sup> on a 24 hour basis for the Windsor area as shown in Figure 1.

Figure 2 illustrates the addition of the Parkway to the background for PM<sub>10</sub> taking into consideration the variable (i.e., daily) background for receptors close to the Parkway and Figure 3 illustrates the addition of the Parkway for receptors further away from the Parkway. While this example illustrates PM<sub>10</sub>, a similar pattern also applies for PM<sub>2.5</sub>.

The burgundy colour in the figure is the background and the turquoise colour is the background combined with the model results. As can be seen in the figures, background concentrations predominate. At a receptor closer to the road, the traffic increment is more obvious than for the receptor located further away. Thus any health effects are as a result of the background concentration in Windsor to which a relatively small increments due traffic are added and no road configuration will change this conclusion.

**Figure 2 PM<sub>10</sub> Concentration Profiles Within 50m of the Roadway**

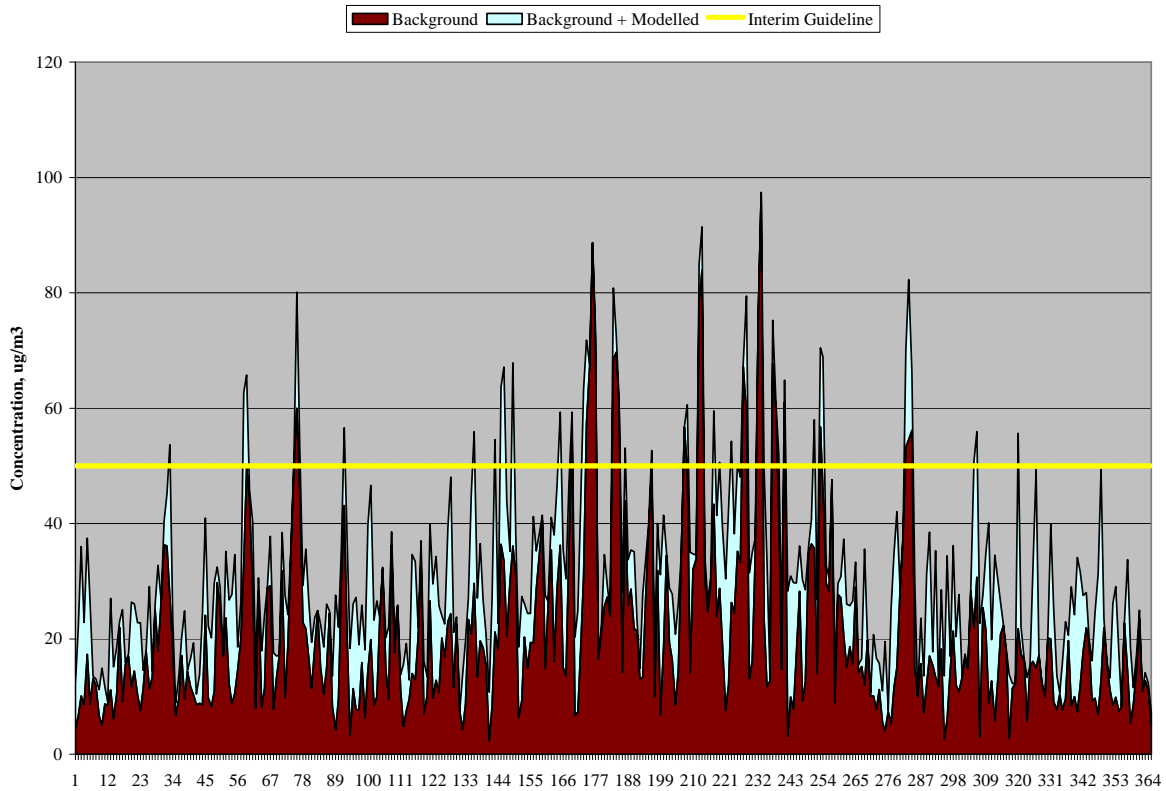
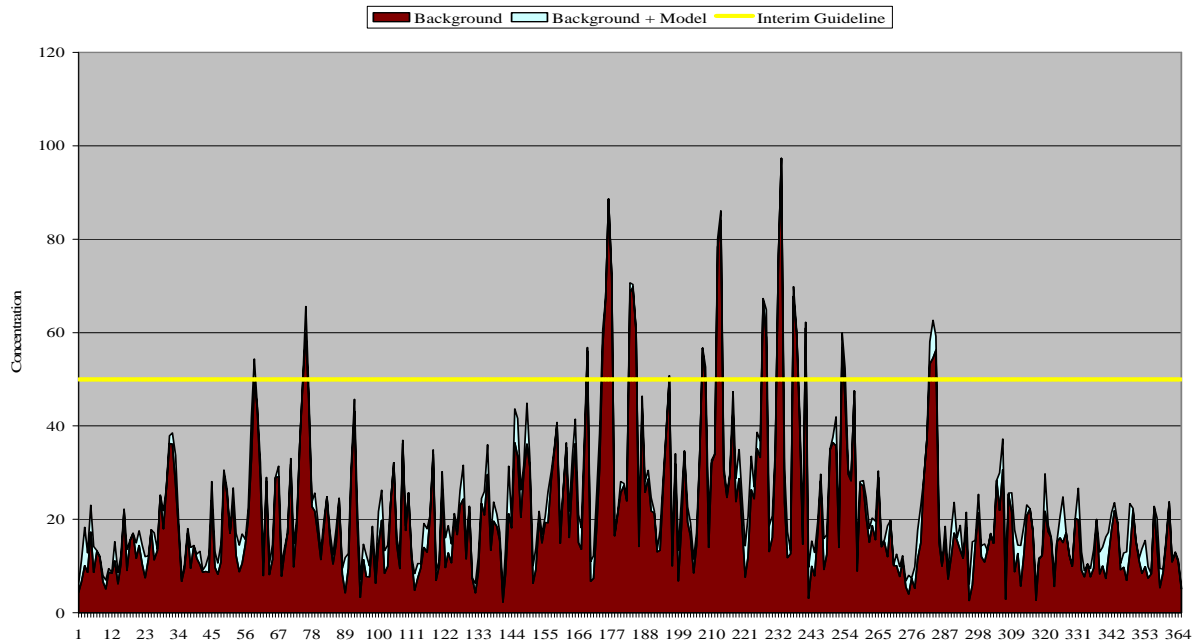


Figure 3 PM<sub>10</sub> Concentration Profiles Within 350m of the Roadway



- *“These negative human health impacts of PM<sub>10</sub> outside the ROW, for the homes, daycares, schools and old folk’s homes located adjacent to the access road have not been evaluated.”*

Response: The emphasis on particulate matter has been moving to the finer fractions of PM over the last 30 years as health studies and monitoring equipment have advanced to be able to detect differences in the particulate matter fractions. In the last five to ten years health impact studies have been focussing on the impacts of PM<sub>2.5</sub> and finer fractions.

The US EPA has revoked their PM<sub>10</sub> standard due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution. In addition, the Canadian Federal government has not developed a PM<sub>10</sub> Canada Wide Standard due to insufficient knowledge on the appropriateness of the standard. In addition, the federal government also recognizes that initiatives to reduce PM<sub>2.5</sub> will also likely reduce PM<sub>10</sub> concentrations.

In keeping with the both the U.S. and Canadian governments position on PM<sub>10</sub>, the Human Health Risk assessment focused on the potential effects associated with PM<sub>2.5</sub> exposure. The results of the risk assessment found that the risk from exposure to PM<sub>2.5</sub> at homes, schools, homes for the aged located along the proposed Parkway are no different from the exposure to PM<sub>2.5</sub> if the Parkway was not built and the current road remained in existence (termed the “No Build” scenario). In fact of the receptor locations considered along the Parkway, 10 of the locations were no different than the “No Build” scenario (this included the Home for the Aged in

LaSalle), 8 locations had a lower risk than the “No Build” scenario (this included some ballfields) and for only three locations was the risk higher for exposure to PM<sub>2.5</sub>. Background concentrations are the major contributor to exposure of PM<sub>2.5</sub>.

- *“Human health impacts of all the pollutants that will be present within the Parkway’s trails and greenspace have not been evaluated, despite excessively high pollution levels in an area that will be frequented by the human health “receptors” at greatest risk – babies, toddlers, children, pregnant mothers, grandparents and people with pre-existing medical conditions.”*

Response: As with most environmental assessment projects, the focus of the report was on the assessment of locations of permanent sensitive receptors such as residential areas, hence the Human Health Risk Assessment report evaluates receptors beyond the Parkway’s trails. The residential receptors were assumed to be exposed to emissions from the Parkway for 24 hours/day for 365 days per year for their entire lifetime and thus while short-term exposures within the greenspace were not explicitly evaluated, the residential receptor exposure would in the long run be the most exposed individuals.

The green spaces were not ignored however, and were included as a description in the Air Quality TEPA report under Section 4.5.2 where maximum concentrations were presented at the tunnel portals. The analysis examined the maximum concentrations that are predicted to occur once per year. Table 1 provides an example of the results for the Volatile Organic Contaminants (VOCs) and Criteria contaminants (CO and SO<sub>x</sub>). As seen from the table, all maximum predicted concentrations are below criteria where they exist but more importantly are a minor contributor relative to background. Thus, background air concentrations which are mainly the result of transboundary pollution are the main contributor to health effects.

**Table 1 – Predicted Concentrations Within the Right of Way (ROW) in µg/m<sup>3</sup>**

Chemical	1,3 butadiene 24 hr	Benzene 24 hr	Acetaldehyde 1 hr	Acrolein 24 hr	CO 1 hr	Formaldehyde 24 hr	SO <sub>x</sub> 1 hr	VOCs
Criteria	No criteria	No Criteria	500.	0.08	36200	65.0	690.0	No Criteria
TEPA Background	0.17	2.7	2.4	0.16	897	4.1	43	147
Max within ROW but not on road	0.27	3.3	3.7	0.20	3109	4.8	46	169
Max in usable spaces	0.24	3.2	3.2	0.18	2815	4.5	45	164

- *“The Parkway’s greenspace is designed to invite people to exercise and recreate, despite levels of pollutants so high that the risk of heart attack may increase as much as 563% after a 2 hour exposure in the highest exposure locales.”*

Response: See above comment which illustrates that within the greenspaces background air concentrations are still the dominant contributor to health effects.

- *“The Parkways negative health impacts from PM<sub>2.5</sub> have been dismissed on the basis that the impacts are similar to the No Build alternative, and it is not made clear that these negative health impacts could be avoided through the use of tunneling.”*

Response: A roadway currently exists in the location of the proposed Windsor-Essex Parkway and therefore the comparison of the Parkway to the current road configuration (i.e. the “No Build” scenario) is appropriate for the Environmental Assessment and Human Health Assessment. As discussed in the response below, the Practical Alternatives Report demonstrated that tunnels, regardless of length, only provide a means of moving emissions from one location to another (i.e., from one neighbourhood to another). Thus, the net health benefits would be positive for some communities and negative for others. Moreover, tunnels offer no benefit in terms of regional air quality in the Windsor airshed since background air quality that is influenced primarily from the Ohio Valley predominates and is the key health driver in the Windsor area.

- *“The potential human health benefit of a tunneled roadway, which could be used to effectively shield adjacent homes and sensitive individuals from the negative human health impacts of inhalable and respirable particulate matter resulting from the roadway has not been discussed.”*

Response: The scope of the human health assessment was to evaluate the Technically and Environmentally Preferred Alternative. The tunnel alternative was evaluated in the Practical Alternatives Evaluation Working Paper: Air Quality Impact Assessment (May 2008) which assessed several alternatives to determine the impacts of road alignments that were at grade, below grade, and fully tunneled. The Practical Alternative report showed that tunnels, regardless of length, only provide a means of moving emissions from one location to another (i.e., from one neighbourhood to another). Thus, while very local concentrations near tunnels i.e. within 50-100m roadways and towards the middle tunnels might be lower, the concentrations near tunnel portals would be higher. Similarly, the net health benefits would be positive for some communities and negative for others. Moreover, tunnels offer no benefit in terms of regional air quality in the Windsor airshed since background air quality that is influenced primarily from transboundary pollution predominates and is the key health driver in the Windsor area.



George Thurston concludes that *“the Parkway design results in significant acute and chronic adverse risks to the public health of those living, working, or recreating adjacent to the Parkway as a result of exposure to PM<sub>2.5</sub> and PM<sub>10</sub>. These negative impacts could be avoided by the use of real tunneling, to shield these sensitive receptors from exposure to these contaminants and bring some relief from the elevated PM exposures to which residents are presently exposed in Windsor.*

Response: Transboundary pollution is the driver of air quality in Windsor as has been recognized by the Ministry of the Environment (MOE) who state:

*“Transboundary air pollutants from the United States account for up to 50 per cent of smog in Southwestern Ontario. In Windsor, this value may be as high as 90 per cent.”*

Monitoring data from the MOE Windsor stations for PM<sub>2.5</sub> is also indicative of periodic episodes of excursions of the Canada Wide Standard (CWS) 24 hour criteria of 30 µg/m<sup>3</sup>. No monitoring data are collected for PM<sub>10</sub>.

The Air Quality TEPA assessment and the Human Health Risk Assessment demonstrate that background air quality (as a result of transboundary pollution) results in the majority of the exposure for air pollutants and that the proposed Parkway provides a small incremental health risk over the background risk. The air quality evaluation of the tunneling alternative showed that tunnels regardless of length, only provide a means of moving emissions from one location to another (i.e., from one neighbourhood to another). Thus, while very local concentrations near tunnels might be lower, the concentrations near tunnel portals would be higher. Thus, the net health benefits would be positive for some communities and negative for others. Moreover, tunnels offer no benefit in terms of regional air quality in the Windsor airshed since background air quality that is influenced primarily from transboundary pollution predominates and is the key health driver in the Windsor area.