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BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1:

SUMAS ENERGY 2 GENERATION
FACILITY

EXHIBIT ____ (EH-RT)

APPLICANT'S PRE-FILED REBUTTAL TESTIMONY

WITNESS: ERIC HANSEN

Q. Please re-introduce yourself to the Council.

A. My name is Eric Hansen. I am an air quality consultant with MFG, Inc. in Lynnwood, Washington.

Q. What are the issues will you address in this rebuttal testimony?

A. My rebuttal testimony will address issues related to air emissions from the modified SE2 proposal and the impacts of those emissions on ambient air quality. Specifically, I have reviewed the testimony of David Bates, Robert Caton and Michael Lepage

1 submitted by the Province of British Columbia, as well as the brief testimony of Jane
2 Koenig submitted by Whatcom County. Sanya Petrovic and I are submitting rebuttal
3 testimony to respond to the testimony of those witnesses. My rebuttal will focus on
4 the emissions and the modeling of ambient air concentrations, while Ms. Petrovic will
5 focus on the health implications of the ambient air quality information.
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13 **Annual Emissions**

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15 **Q. In their prefiled testimony, Robert Caton and David Bates contend that it is**
16 **important to consider both long-term term and short-term effects on air quality.**
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18 **Do you agree?**

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21 A. Yes. That is why the Second Revised Application contains information about annual
22 emissions as well as maximum short-term emissions (daily or hourly) emissions, and
23 how those emissions translate into annual average and maximum short-term ambient
24 concentrations.
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31 **Q. In his pre-filed testimony, Robert Caton criticizes you for focusing on short-term**
32 **(24-hour) emissions in your testimony, rather than long-term emissions (annual).**
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34 **Is that criticism fair?**

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37 A. It's true that my testimony focused more on short-term air quality issues than annual
38 average concentrations, but the Second Revised Application contains detailed
39 information about both short-term and long-term emissions.
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1 My pre-filed testimony focused on short-term emissions because that was the focus of
2 most of the concern during the first round of hearings. Dr. Caton did not participate in
3 those hearings, so he was understandably unaware of that focus.
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8 Even outside the hearings, concerns expressed about existing air quality in the Fraser
9 Valley have focused on short-term exceedences. My examination of Fraser Valley air
10 quality data (as documented in annual reports by the Greater Vancouver Regional
11 District) indicates that pollutant concentrations meet all air quality objectives
12 expressed as annual concentrations, but that ozone and PM10 concentrations during
13 certain discrete episodes occasionally exceed short term (hourly or daily) objectives.
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22 Finally, emissions from the modified SE2 project do not have a significant effect on
23 long-term (annual) ambient air quality. Tables 3.2-5 and 3.2-6 in the Application
24 identify annual average concentrations at the worst locations in the United States and
25 in Canada that are fractions of a microgram (one millionth of a gram) per cubic meter.
26 These are small fractions of existing concentrations and even smaller fractions of
27 regulatory standards and objectives applicable to annual averages.
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36 **Q. Dr. Caton claims that "there is little change in the annual air pollution emissions**
37 **from the facility." How do you respond to that statement?**
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39 **A.** The elimination of backup oil firing reduced maximum short term emissions more
40 dramatically, but it also reduced annual emissions of NOx by at least 5 tons, annual
41 emissions of CO by at least 14 tons, annual emissions of sulfur dioxide by at least 30
42 tons, annual emissions of PM10 by at least 14 tons, and annual emissions of VOCs by
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1 at least 2 tons per year. I should note that the Second Revised Application suggests
2 an increase in SO2 emissions because we are assuming a higher sulfur content in
3 natural gas, but in practice there is no difference in the gas SE2 would burn.
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5 Consequently, actual SO2 emissions will decrease as a result of the elimination of oil
6 firing even though the potential emissions identified in the application suggest an
7 increase.
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14 **Q. Dr. Caton and Mr. Lepage also criticized you for claiming that the Second**
15 **Revised Application reflects a 33% reduction in NOx emissions. They say that**
16 **the 33% reduction was already part of the record on which EFSEC based its**
17 **original decision. How do you respond to that statement?**
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22 **A.** Their statements are misleading. The January 2000 Application and all of the
23 emissions data and ambient air quality modeling data contained in that Application
24 were based upon an assumption that NOx control would be at 3 ppm. Likewise, both
25 the Environment Canada Ozone study (Ex. 25.3) and what we've referred to as the
26 "Joint Technical Report" produced by the Canadian agencies (Ex. 162.12) provide
27 analysis based upon those 3 ppm emissions. It is true, that SE2 announced its
28 commitment to install 2 ppm NOx controls prior to the first round of hearings, but the
29 vast majority of the modeling and technical analysis presented during the first round
30 of hearings was still based on the 3 ppm emissions. In preparing the Second Revised
31 Application, we revised the emission numbers and we re-ran the modeling to take into
32 account the reduction in NOx emissions – as well as other subsequent project
33 changes. So it is certainly accurate and appropriate for me to say that the Second
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1 Revise Application reflects a 33% reduction in NOx emissions relative to the
2 previous versions of the application.
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6 **Q. Dr. Caton claims that the annual emissions of particulate matter and NOx have**
7 **been reduced by only 6% and 7% respectively, and "[t]hat small of a drop**
8 **should have very little effect on the Council's air quality conclusions." Do you**
9 **agree with that conclusion?**
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11 **A.** No. The statement is itself difficult to understand. Dr. Caton is not himself offering
12 an expert opinion about the impacts of the project on ambient air quality. He instead
13 seems to be trying to predict how the new information will affect the Council's
14 assessment of the project.
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24 As I explained in response to an earlier question, the annual emissions from the
25 modified project have virtually no impact on long-term (annual) ambient air quality,
26 and will not cause any of the U.S. or Canadian ambient air quality standards to be
27 exceeded. In my professional opinion, the emissions from SE2's original proposal
28 would not have significantly affected annual average ambient air quality, and the
29 revised project will have even less of an impact. The following table compares the
30 maximum average ambient impacts in Canada calculated for the previous application
31 to those with the Second Revised Application.
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Pollutant	January 2000 Application	Second Revised Application	Approximate Change
NO2 (annual)	0.44 ug/m3	0.26 ug/m3	40% reduction
PM10 (annual)	0.42 ug/m3	0.38 ug/m3	10% reduction

1 The predicted impacts of the revised project (even at the worst case locations) are tiny
2 when compared to the Canadian air quality objectives, Canada-wide Standards or
3 even the so-called "health reference levels." So while the percentage reductions are
4 noteworthy, I suppose one could say the actual effect on annual concentrations is
5 small because the annual average impacts were so small even when oil firing was part
6 of the proposal.
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15 **Q. Dr. Caton suggests that the Council's previous decision was based in part on the**
16 **impact of average annual emissions. Do you agree?**
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18 **A.** My reading of the Council' decision is that it was based to a great extent on the
19 potential for health impacts on the occasional days with poor existing air quality. The
20 Council decision referred to "3 tons per day" of emissions multiple times, and noted
21 that there are times when existing air quality exceeds short-term air quality standards.
22 I think the Council recognized that air quality is usually good, as indicated by
23 GVRD's monitoring reports, but that there are occasional short-term episodes of
24 concern. It is during these short term events that the reduction in maximum daily
25 emissions will be most beneficial.
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37 Dr. Caton's prediction of the Council's reaction to the Second Revised Application
38 also seems inconsistent with the Council's previous actions and statements. The Final
39 Environmental Impact Statement (FEIS), which the Council unanimously adopted,
40 clearly stated that "no significant adverse air quality impacts would occur when the
41 facility is fired with natural gas," and they reached that conclusion before the other
42 modifications to the project. Similarly, in the Council's original decision on the
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1 Project, three Council members concluded that "[w]ithout backup oil firing, full
2 mitigation or offsets of the impact of this project would be very possible."
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6 Likewise, in the Fact Sheet accompanying the current Draft Prevention of Significant
7 Deterioration Permit, the Council's contractor, Washington Department of Ecology
8 permit writer Bernard Brady notes: "The modeled criteria pollutant concentrations
9 attributable to the operation of SE2GF are below the defined Class II significance
10 levels for all pollutants on both short-term (24 hour average or less) and long-term
11 (annual average) bases," and "The modeled maximum criteria pollutant
12 concentrations attributable to the operation of Sumas II are below the proposed Class
13 I significance levels for all pollutants on both short-term (24 hour average or less) and
14 long-term (annual average) bases." Thus, the Council's own independent and
15 experienced consultant has concluded that criteria pollutant concentrations
16 attributable to SE2 not only meet the ambient air quality standards but are
17 insignificant. Regardless of whether the impacts occur in a nonattainment area or a
18 pristine wilderness, the predicted concentrations are so small that regulatory agencies
19 would properly ignore them when assessing cumulative concentrations.
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36 **Q. At page 3 of his prefiled testimony, Michael Lepage contends that, if emissions**
37 **during start-up and shut-down are taken into account, annual average**
38 **concentrations of VOCs and CO may be "substantially higher" than predicted.**
39 **How do you respond to that claim?**
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44 **A.** There are several things to note in response.
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1 I acknowledge that emissions of VOCs and CO are higher during the first hour or two
2 of start-up than during base load operation. However, that does not mean the total
3 annual emissions are higher because you don't have a start-up unless the machine has
4 been down for a while. When the machines are off, there are no emissions and this
5 period of zero emissions offsets the higher emissions during the brief start-up period.
6
7 The degree to which those emissions are offset depends on the pollutant and how long
8 the machines are off. If a turbine is off for less than 8 hours, its restart is termed a hot
9 start. If a turbine has been off between 8 and 71 hours, it is deemed a warm start. If a
10 turbine has been off 72 or more hours, the restart is deemed a cold start.
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21 I have attached two tables – Exhibits EH-R1 and EH-R2 -- that provide information
22 related to start-up and shut-downs. The first table provides start-up and shut-down
23 emissions estimated by Westinghouse specifically for this project. The second table
24 provides my calculations of emissions avoided during representative periods of
25 “down time” that preceded the start-up, and the net emission rate considering down
26 time and the start-up/shut-down sequence. These data are based on the conservative
27 assumption that control equipment does not come on line during the start-period. In
28 practice, this control equipment would come on line during the startup period and
29 would lower “startup” emissions.
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41 On an annual basis, which is the focus of your question, these data indicate that it is
42 unlikely that there would be a net increase in annual VOC emissions if you took into
43 account start-ups and shut-downs unless all the startups were hot starts. However,
44 there could be an increase in annual CO emissions, depending on how long the plant
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1 was down prior to the startup. No one has suggested that the annual emissions of
2 VOCs or CO raise health concerns. In fact, VOCs and CO are not usually considered
3 in terms of annual average impacts. Neither Canada nor the United States has annual
4 standards for CO, and neither has any ambient air quality standard for VOCs.
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10 I also point out that the data indicate there would be a net reduction in PM10 and SO2
11 emissions regardless of whether it is a hot, warm, or cold start. The data also suggest
12 that there would likely be a reduction in annual NOx and VOCs because there is a net
13 reduction in NOx and VOC emissions for warm and cold starts, even though there is
14 an increase in emissions from hot starts.
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22 **Q. In their pre-filed testimony, Robert Caton and Michael Lepage point out that**
23 **the annual emissions of sulfur dioxide (SO₂) and sulfuric acid mist (H₂SO₄) are**
24 **higher in the Second Revised Application than in the January 2000 Application.**
25 **Are these increases problematic from the standpoint of ambient air quality?**
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30 **A.** SE2 identified higher anticipated SO₂ and acid mist emissions in the Second Revised
31 Application because we are finding that the sulfur content in natural gas is sometimes
32 higher than previously thought. This new information is taking a number of
33 applicants by surprise, and most applications are now acknowledging that SO₂
34 emissions may be higher than initially expected. Note that nothing in the project has
35 changed. What appears to be an increase in emissions is actually a disclosure of
36 higher sulfur in Canadian natural gas, which is a factor beyond our control.
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1 As noted in the application and by the Council's independent contractor for Ecology
2 in EFSEC's PSD Fact Sheet (issued to accompany the draft PSD permit), predicted
3 sulfur dioxide concentrations are still well below ambient air quality standards, PSD
4 increments, significant impact levels and Canadian Desirable Objectives. Similarly,
5 the fraction of sulfur that is oxidized to SO₃ and hydrated to acid mist (H₂SO₄) results
6 in ambient concentrations that are far below the Acceptable Source Impact Level
7 (ASIL). Even with the increase in the assumed sulfur content of the natural gas, there
8 are no significant air quality impacts.
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19 **Short-Term Emissions**

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21 **Q. Okay, let's talk about short-term emissions. Do Dr. Caton, Dr. Bates nor Mr.**
22 **Lepage disputes that short-term emissions of NOx, PM10 and other criteria**
23 **pollutants are substantially less during continuous operation when the facility is**
24 **operated with natural gas as opposed to diesel?**
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29 A. I don't believe so. Their testimony focuses on emissions levels during start-up and
30 shut-down the facility, an issue that was discussed during the first round of hearings.
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35 **Q. Both Dr. Caton and Mr. Lepage are very critical of your analysis of short-term**
36 **(24-hour) emissions, saying that the maximum short-term emissions will occur**
37 **during start-up and shut-down operations. How do you respond to their**
38 **testimony?**
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43 A. This seems to be a way of diverting attention from the very real decrease in maximum
44 short term (hourly or daily) emissions when oil firing is eliminated. This is very
45 important to us because so much attention was paid to our worst-case short term
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1 predicted concentrations during the first round of hearings. Now that SE2 has
2 addressed that concern, opposing witnesses are looking for another angle that has
3 nothing to do with the changes to the facility proposed in the Second Revised
4 Application. Rather than comparing base load emissions with natural gas with base
5 load emissions with diesel, Dr. Caton and Mr. Lepage would have us compare base
6 load emissions with natural gas with start-up emissions. There is no change in the
7 project that results in changes in start-up emissions, except that startup emissions with
8 gas are lower than with oil. The significant change in the project is that diesel firing
9 has been eliminated, and maximum short-term emissions are lower.
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21 **Q. Okay, but in case the Council is concerned about start-up and shut-down**
22 **emissions, can you explain how those emissions will affect short-term ambient**
23 **air quality?**
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26 A. Exhibits EH-R1 and EH-R2 provide information about emissions during start-up and
27 shut-down. As I noted earlier, I believe the primary areas of concern in the previous
28 hearings were short-term episodes of elevated particulate matter and ozone, so let me
29 focus on the emissions of particulate matter and NOx (precursor to ozone).
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36 First, particulate matter. Particulate matter emissions are lower during start-up and
37 shut-down than during comparable periods of base load operation. That means that
38 start-up and shut-downs are not relevant to the maximum short-term predicted
39 impacts on particulate matter concentration. In fact, if we took startups and shut-
40 downs into account the average impact on particulate matter concentration would go
41 down.
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Next, NOx emissions. Emissions of NOx are higher during part of the startup period than during base load operation, but that part of the start-up period only last an hour or two. and it follows a period of zero emissions when the plant has been off-line. The net effect on NOx emissions depends upon how long the plant has been offline, i.e. whether it is a cold, warm or hot start. As indicated in Exhibit EH-R2, the net effect on NOx emissions for a cold and warm start is a reduction in NOx emissions. For example, for a cold start, I assume the plant has been off line for 72 hours, and therefore has zero NOx emissions and then has (conservatively estimated) 1,519 lbs of NOx emissions during the 4 hours of start-up and 47 minutes of shut-down. The net effect is total emission of 1,519 lbs of NOx compared to 2,376 lbs for a comparable period of base load operations. During a hot start, the plant is off-line for less than 8 hours, and my calculations for an average hot start acknowledge that when the plant is down for only 4 hours, the net effect is an increase in NOx emissions. I note, however, that even the higher rate of NOx emissions during part of the start-up period is nowhere near the level that might threaten the short-term NOx objectives in Canada, or create a ground-level ozone problem.

Q. Looking at Exhibits EH-R1 and EH-R2, the emission numbers and assumptions you are using don't seem to be identical to the ones Mr. Lepage has used in his testimony. Can you explain the differences?

A Mr. Lepage used information about emissions and the timing of start-ups and shutdowns that were based on numbers he's seen for other power plants. I don't know if they are older plants or use different equipment. My calculations, however, are

1 based on the estimates provided by Westinghouse, concerning the equipment SE2 is
2 planning to use. He also assumes that all start-ups and shut-downs a "hot starts," and
3 assumes that 200 shut-downs and start-ups will occur in a year, which are
4 assumptions I find improbable in practice given my understanding that SE2 intends to
5 operate this facility as a base-load power plant.
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12 **Q. Mr. Lepage contends that "if start-ups were to occur in the daytime during smog**
13 **events, they could lead to a significant increase in the predicted maximum 1-**
14 **hour ozone concentrations." How do you respond to this claim?**
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18 **A.** Photochemistry is a very complicated process, and I am surprised that someone with
19 Mr. Lepage's background would make such a comment. Ozone is a regional air
20 pollution issue, and the chemistry that leads to regional ozone episodes is not strongly
21 influenced by an hour or two burst of NOx emissions from a relatively small source in
22 the airshed.
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30 We should also recognize that a startup would have been preceded by a shutdown that
31 would at least partially, if not totally, offset NOx and VOC emissions (the principal
32 precursors for ozone). For example, a hot start is defined as a startup that occurs
33 within 8 hours of a shutdown. Even if the shutdown had only lasted 4 hours, the net
34 increase in NOx would have been only 660 pounds and the net increase in VOC
35 emissions would have been only about 350 pounds. Note that these emission
36 increases overstate the actual value because the SCR and oxidation catalyst come on
37 line within an hour or two of the startup. There is a net decrease in NOx and VOC
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1 emissions for the average warm start and for all cold starts because the shutdown
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3 period offsets the higher emissions during startup.
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6 My examination of startup conditions leads me to believe that startups have a
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8 negligible effect on ozone episodes. I don't believe Mr. Lepage has provided us any
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10 factual evidence to the contrary.
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14 **Q. Mr. Lepage also contends that you have not taken into account higher**
15 **particulate matter emissions during start-up. How do you respond to that**
16 **contention?**
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20 **A.** Emissions data we have obtained from Westinghouse indicate that particulate matter
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22 emissions will be lower during startup. I believe page 4 of Mr. Lepage's testimony,
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24 where he acknowledges lower annual emissions of pollutants other than CO and
25
26 VOCs when startups are considered, is consistent with that data.
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30 **Q. Mr. Lepage also says that you have failed to take into account secondary**
31 **formation of particulates once the plume leaves the stack. How do you respond**
32 **to that criticism?**
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36 **A.** Over the last two years, we have conducted a number of assessments of particulate
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38 matter. The ISCST3 model, which is EPA's "work horse" dispersion model for
39
40 industrial source permitting, does not consider secondary aerosol formation.
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42 Consequently, PM10 predictions based on ISCST3 reflect only directly emitted
43
44 particulate matter.
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1 However, MFG also evaluated impacts attributable to SE2 on both the local and
2 regional scale using a sophisticated CALPUFF modeling approach that does consider
3 secondary aerosol formation. In order to combine secondary aerosol concentrations
4 with concentrations of PM10 directly emitted by SE2, MFG post-processed the
5 CALPUFF output files. Total PM10 concentrations were calculated by summing
6 direct PM10, sulfate, and nitrate concentrations after correcting for the assumed
7 molecular weight of the resultant secondary aerosols. It was assumed that sulfate and
8 nitrate would be in the form of ammonium sulfate and ammonium nitrate,
9 respectively.
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21 **Q. In her prefiled testimony, Jane Koenig expressed a concern about PM2.5**
22 **emissions and short-term ambient concentrations of PM2.5. How do you**
23 **respond to that concern?**
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27 A. In her testimony, Dr. Koenig has added the maximum predicted 24-hour average
28 PM2.5 concentration (in Abbotsford) resulting from SE2 to the maximum measured
29 24-hour PM2.5 concentration observed (in Chilliwack) over the last four years to
30 arrive at a cumulative concentration of 37.5 ug/m3. She indicates that this
31 concentration exceeds the recommendations from an ad hoc committee established by
32 the Puget Sound Clean Air Agency and exceeds Canada's 30 ug/m3 air quality
33 standard.
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42 I am not familiar with the ad hoc committee's criterion, but the Canada Wide
43 Standard (CWS) is based on the 98th percentile concentration (as was the EPA
44 standard initially proposed). This approach establishes a more robust standard than
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1 those that depend on extreme events (e.g., the maximum hour or day). As noted in
2
3 the Second Revised Application, the background values based on this 98th percentile
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5 metric employed by the CWS have been 18 ug/m3 for the two years for which we
6
7 have sufficient data. A very conservative assessment of the cumulative PM2.5
8
9 concentrations would be based on the 3.7 ug/m3 plus the 18 ug/m3 value, for a total
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11 of 21.7, which is less than the 30 ug/m3 Canadian standard Dr. Koenig references. If
12
13 we use the CALPUFF predictions, which include secondary aerosols, the cumulative
14
15 concentration at the worst case location in Canada would be 24.4 ug/m3, which is still
16
17 less than the Canada-Wide Standard. The interagency committee of Canadian review
18
19 agencies arrived at the same finding when they evaluated the likelihood that
20
21 emissions from the original SE2 project would exceed the CWS for PM2.5. The
22
23 committee stated:

24
25 “Since monitoring began in 1995, the PM2.5 CWS metric has not exceeded
26 18.2 ug/m3. Assuming PM10 emissions from Sumas2 are 100% PM2.5, and
27 given a maximum predicted impact of 7.4 ug/m3, a conservative estimate of
28 the resulting CWS metric is 26 ug/m3. Hence it is unlikely that emissions
29 from S2GF would result in the exceedances of the PM2.5 CWS, provided
30 current ambient PM2.5 concentrations remain similar to historical levels.”
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33 Note that this assessment was based on the maximum impacts associated with oil
34 firing; cumulative impacts with gas firing are lower.
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39 The Airshed

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41 **Q. In his prefiled testimony, Dr. Caton states that "[t]he ability of the Province to**
42 **make continuous improvement [in air quality] is threatened by the SE2 project,**
43 **which I understand, need not be sited in this airshed." How do you respond to**
44 **that statement?**
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1 A. It is similar to NIMBY – not in my back yard – arguments I hear all the time. In
2 theory, everyone would like to continually improve air quality in every airshed, and
3 adding any new source of emissions, in some sense, "threatens" that goal. To say that
4 the facility could be sited elsewhere just means that he wants someone else's air
5 quality improvement to be "threatened."
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12 The population in the region, on both sides of the border, is growing, and the demand
13 for electricity – not to mention the demand for transportation and all sorts of products
14 that result in air emissions during their production – is increasing. No regulatory
15 entity that I'm aware of on either side of the border has taken the position that "no new
16 emissions" are acceptable. The Province and the City of Abbotsford certainly have
17 not taken that position. For example, the Province was quick to allow increases in
18 emissions during the energy shortage this year, and the City of Abbotsford is busy
19 expanding its airport and trying to attract major truck loading facilities to the area.
20 Elsewhere in Dr. Caton's testimony he refers to "unavoidable increases in emissions
21 that accompany regional growth," but those increases are no more unavoidable than
22 SE2's emissions. They are increases that result from continued population growth and
23 economic growth. Regulators in Canada want to allow this continued growth, just as
24 regulators in Washington should allow continued growth in Sumas. The rational
25 approach for regulators on both sides of the border is to allow new emission sources,
26 but to require appropriate emission control technology to be implemented. SE2
27 proposes to implement the best available pollution control technology and more –
28 SE2 has also proposed offsets, something no one on either side of the border requires
29 in this region.
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Visibility

Q. Let’s talk about visibility. In his prefiled testimony, Michael Lepage said that the modeling demonstrated that the project would result in a perceptible reduction in visibility for up to 14 days/year. Is that true?

A I’m not sure how Mr. Lepage figured 14 days – even using the original analysis submitted to MELP. However, that analysis was updated in August 2001 when we discovered new information about the elemental carbon (soot) content of combustion turbine particulate matter. I submitted the refined results to the Council in an August 4, 2000 letter that included our comments on the original draft PSD permit, and have attached that letter to my testimony as Exhibit EH-R3. When we reassessed visibility with the new (and lower) elemental carbon assumption, visibility impacts associated with gas firing virtually disappeared. For most seasons and vistas, there was no perceptible change in visibility. The worst impacts were calculated for one of the six vistas examined during the fall season, when it was judged possible that someone could perceive a change in visual range on two days.

Q. In his prefiled testimony, Michael Lepage concluded that "the potential for visibility impacts in the Abbotsford area has been reduced by only a small amount." Do you agree with that conclusion?

A. The potential for visibility degradation on clear days was much higher when SE2 fired oil than when it fired gas. The only way you can conclude that the potential for visibility impacts has been reduced only a small amount is to point to the fact that oil firing would have occurred a maximum of 15 days per year. As I just noted, however,

1 the potential for visibility degradation now that the plant is entirely gas fired is very
2 small.
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6 **Q. Mr. Lepage also criticized the visibility modeling for its assumptions of wind**
7 **speeds. How do you respond to this criticism?**
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10 **A.** First of all, this testimony has nothing to do with the changes in the proposed project.
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12 The Province, through its Ministry of Environment, worked with MFG to develop an
13 approach to assessing visibility impacts. Such cooperation was important because,
14 unlike assessments of criteria pollutant concentrations, there are no standard
15 assessment protocols for this issue. The Province never raised any concern about the
16 meteorological assumptions being used in the model.
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25 Nonetheless, we acknowledge that surface winds in the CALPUFF model were higher
26 than measured values at the Abbotsford Airport for the same time period. However,
27 surface winds in the model were lower than the actual winds at other stations within
28 the domain (for example at Hope and at Vancouver International Airport). Overall,
29 the model is not biased regarding surface winds. In addition, the surface winds are
30 less important to the assessment than winds aloft. Our assessment was based on plume
31 height, and the winds considered in the visibility assessment vary with height. As far
32 as we know, the MM5/CALMET/CALPUFF approach that we used is the best model
33 available to conduct the haze assessment we provided to MELP.
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44 **Q. Mr. Lepage also criticizes the CALPUFF model as "simplified." Do you agree?**
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1 A. No. Again, it seems inappropriate for Mr. Lepage to criticize the CALPUFF model at
2 this late date. All of the air regulators in the region – WDOE, MELP, EPA – have
3 praised the CALPUFF model and MFG's use of the model in particular. Our
4 application of this model to SE2 was a quantum improvement over prior air quality
5 analysis in the Northwest.
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12 **Q. Mr. Lepage also criticized the visibility analysis for failing to take into account**
13 **large SO2 emissions. How do you respond to this criticism?**
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16 A Although the Second Revised Application includes an updated assessment of
17 potential visibility impacts to Class I areas, we did not update the local area visibility
18 assessment we conducted for MELP. When we assume a higher sulfur content in the
19 natural gas, we would also expect an increase in sulfate emissions, which can
20 combine with ammonium to create a secondary aerosol (ammonium sulfate). This
21 aerosol does scatter light and, in sufficient quantities, degrade visibility.
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30 However, the analysis that we conducted in April 2000 and updated in August (to
31 account for new information on elemental carbon) contained a number of
32 conservative factors that we would expect to more than make up for the higher sulfur
33 in gas. For example, neither the April nor the August assessments took into account
34 the decrease in NOx emissions from 3 ppm to 2 ppm. That would also reduce
35 emissions of nitrates, which combine with ammonium to create a secondary aerosol
36 that also affects visibility. Secondly, we “double counted” the ammonium sulfate that
37 Mr. LePage is concerned about by including it in the particulate matter and in the
38 sulfate emission rates. In short, we acknowledge that the increase in sulfur in natural
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1 gas that we have identified would have the potential to affect a power plant's impact
2 on visibility. However, we think overly conservative assumptions in other areas of
3 the analysis more than makes up for the change in sulfur content.
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9 **Q. Mr. Lepage also criticized the visibility analysis for failing to take into account**
10 **higher emissions during start-up and shut-downs. How do you respond to this**
11 **criticism?**
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15 A. The pollutants of concern when addressing the visibility implications of the project
16 are the directly emitted particulate matter and the secondary aerosols that form from
17 the conversion of some of the sulfur and nitrogen oxides to ammonium sulfate and
18 ammonium nitrate. Mr. Lepage noted in his testimony that CO and VOC emissions
19 increase during start-ups, but that annual emissions of other pollutants (presumably
20 NO_x, SO₂, and PM₁₀) would be lower when start-ups were considered. Our
21 Westinghouse information also indicates that SO₂ and PM₁₀ emissions are lower
22 during startups than with base load operations. Because the pollutants that are
23 associated with visibility impacts do not increase with startup, we would not expect a
24 significant effect on visibility during startups.
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37 **END OF TESTIMONY**
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