
# State Implementation Plan Revision – Appendices A - B

## Second Regional Haze Plan (2018 – 2028)

By

**Air Quality Program**

Washington State Department of Ecology
Olympia, Washington

## Ecology held consultation periods with the Federal Land Managers on:

(Date / Consultation format / FLMs)

- June 9, 2017 / 1-day interagency informational workshop / NPS, USFS, EPA
- August 8, 2017 / Conference call / NPS, USFS
- March 14, 2018 / Conference call / NPS
- April 11, 2018 / Conference call / USFS
- June 11, 2019 / Email / NPS
- October 28 – 30,2019
- July 16, 2020 / Skype meeting / NPS, USFS, USFWS, EPA
- September 22 – November 6, 2020 / Review of the preliminary RH SIP drafts / NPS, USFS, USFWS, EPA
- October 6, 2020 / Skype meeting / NPS, USFS, USFWS, EPA

# Appendix A. Federal Land Manager Consultation Log and Informal Comments and Responses

## A1. Summary of Ecology – Federal Land Managers Consultations

| Date / Consultation format / FLMs | Type of meeting & topics |
|---|---|
| June 9, 2017<br><br>1-day interagency informational workshop<br><br>NPS, USFS, EPA | **Informational workshop to kick off planning for the 2021 Washington Regional Haze Plan**<br>**Agenda:**<br>Ecology: Introduction to Visibility.<br>NPS: Washington's National Parks and Wilderness Areas: Clearing up the Haze.<br>EPA: Regional Haze Rule Overview: New Requirements.<br>WRAP: WESTAR / WRAP Regional Analysis and Planning.<br>Ecology:<br>WA Regional Haze: Lessons Learned and Looking Ahead:<br>• BART and other controls<br>• Inventories<br>• Timelines, Challenges & Budget<br>Washington Smoke Management Plan Update.<br>Proposed New Tracking Metric: Evaluation and Implications.<br>• Emission Inventories:<br>• Custom emissions inventory<br>• Future projections<br>• Chemical-transport modeling<br>Reasonable Progress Analysis:<br>• Where can we look for reductions?<br>• WA RACT and four-factor analysis<br>• Role of Fire<br>• Other<br>Next Steps |

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| August 8, 2017<br><br>Conference call<br><br>NPS, USFS | **Ecology Consultation with the Federal Land Managers on 2021 RH SIP**<br><br>NPS had a list of questions based on the EPA's draft guidance. Ecology clarified that Ecology would start in September collecting EI information for sources from local clean air agencies and Ecology regional offices. We would start compiling a list of possible RACT sources, preparing for 4-factor analysis. As far as monitoring information, the progress report analysis was still pretty accurate. There will be some changes due to wildfire effects. We will go through which sources and source categories to look at. |
| March 14, 2018<br><br>Conference call<br><br>NPS | **Phone consultation with NPS on Q/D analyses and Four-Factor Analysis**<br><br>Call with National Park Service to discuss the Q/d analyses and answer any of their questions, and further discuss the 4-factor analyses. |
| April 11, 2018<br><br>Conference call<br><br>USFS | **Phone consultation with USFS on Q/D analyses and Four-Factor Analysis**<br><br>Call with US Forest Service to discuss the Q/d analyses and answer any of their questions, and further discuss the 4-factor analyses. |
| June 11, 2019<br><br>Email<br><br>NPS | **Email soliciting input on the screening process for the Four-Factor Analysis/RACT**<br><br>Ecology finalized the screening process for the Regional Haze 4-factor/RACT analysis for WA state, using the EPA recommended Q/d method. We identified 18 sources that are subject to the analysis and we are in the process of notifying the sources on the list.<br><br>A white paper on the selection criteria and the table with the sources subject to the analysis were provided to FLMS for review and comment. |

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| October 28 – 30,2019 | **Three-day Regional Haze national conference**<br>We consulted with representatives from EPA, FWS, USFS, National Park Service, Montana, and Wyoming and also met with WRAP. We discussed:<br>• IMPROVES monitoring.<br>• Glide path adjustments.<br>• FLM requirements.<br>• Coordination on timing for data input to the WRAP.<br>• Need for ADA compliant documents (with Mary Uhl of WRAP). She will check into this more.<br>• Format of progress reports – it was suggested that the progress report be a separate section in the SIP revision. |
| July 16, 2020<br><br>Skype meeting<br><br>NPS, USFS, USFWS, EPA | **Skype meeting to discuss the scope of the upcoming draft for FMLs review**<br>Purpose of the meeting was to reach an agreement on what information would be supplied to the FLMs, when it would be provided, and the length of this first FLM review of the RH SIP draft.<br>Ecology plans to provide the following information for early review:<br>• Long-term Strategy<br>• Q/d and source selection<br>• Four-Factor Analysis (4FA)<br>• Reasonable Progress Goals with 2028 emission projections |
| September 22 – November 6, 2020<br><br>Review of the preliminary RH SIP drafts<br><br>NPS, USFS, USFWS, EPA | |

| Date / Consultation format / FLMs | Type of meeting & topics |
|---|---|
| October 6, 2020<br><br>Skype meeting<br><br>NPS, USFS, USFWS, EPA | **Federal Land Managers and Ecology early consultation**<br><br>Overview of chapters provided for review: LTS, Q/d and four-factor analysis, and RPG<br><br>Clarification on labeling of RPGs – the RPG is the 2028 projection. ECY will make changes to labels in Chapter 9.<br><br>Information requests:<br><br>Rick Graw requested more information on the prescribed burning that affects Glacier Peak Wilderness and the Pasayten. How do we know it is prescribed burning? ECY responded that the WRAP data shows large amounts of organic mass carbon (OMC) which is the signature of fire. The most impaired days (MID) already has the highest 5% removed to account for catastrophic wildfires. The data also show fires contributing large amounts of OMC in the spring and fall which is not when WA has wildfires but is when prescribed burning occurs. He requested that we get information from DNR about who the permittees are.<br><br>Andrea Stacey wanted to know more about the state oil and gas emission programs mentioned in Chapter 10. Ecology will provide more information. She also requested information on the Cardinal Glass permit. That information is available on line and ECY will send the link.<br><br>Most participants wanted access to the four-factor analysis data. Phil will make that available this week.<br><br>ECY engineering staff gave an overview of what sources ECY evaluated with a four-factor analysis and potential controls.<br><br>ECY has requested FLM comments by November 6, 2020 or before. USFS requested until the end of November because of fire responsibilities. ECY agreed but requested that other agencies provide input prior to that if possible.<br><br>The FLMs also requested a directory of ECY RH team members. That will be provided. |

## A2. Federal Land Manager comments for Chemical Pulp and Paper Mills and Ecology's Responses

| # | Federal Land Manager Comment | Ecology Response |
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| 1 | Following is my initial feedback on the four-factor analyses conducted on the pulp & paper mills in WA. The overarching issues are the costs of potential controls and the visibility improvements that could result from cost-effective emission reductions. While I appreciate that Ecology has adjusted the costs presented by All4 (the consultant for the Washington Pulp & Paper Mills) to correct for All4's incorrect interest rate, All4's application of a 1.5 retrofit factor without adequate justification leads me to believe that even the adjusted costs may be overestimated and the cost-effective emission reductions underestimated. Also, All4 has not provided the data inputs to the SNCR and SCR workbooks it used to generate its cost estimates--without those inputs, i cannot properly evaluate its cost estimates.<br><br>[November 19, 2020 email from NPS] | Thank you for your feedback. These comments are addressed as they are raised individually below. |
| 2 | Regarding the potential visibility improvements, it appears that Ecology is relying upon its 2016 RACT analysis and associated visibility modeling to conclude that the visibility improvements that could result from cost-effective emission reductions are not significant. However, as noted above, if the amount of emission reductions is underestimated due to overestimated costs, then the resulting visibility improvements would also be underestimated. And, although we believe we have seen the 2016 RACT analysis, or, at least, part of it, Ecology should provide this analysis in its entirety because it is such a critical component of Ecology's current analysis.<br><br>[November 19, 2020 email from NPS] | Specific comments about cost are addressed as they are raised below. The 2016 "Washington Regional Haze Reasonably Available Control Technology Analysis for Pulp and Paper Mills" (2016 RACT Analysis) was provided to the NPS on 10/27/2020 in its entirety. |

| # | Federal Land Manager Comment | Ecology Response |
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| 3 | (Note: Under the Reasonable Progress provisions of the Clean Air Act, visibility improvement is not a fifth-factor "off-ramp" for emission controls. EPA guidance has placed certain constraints on its use and we need to be sure we understand how Ecology is applying this "fifth-factor.")<br><br>[November 19, 2020 email from NPS] | Washington State has a Reasonably Available Control Technology (RACT) provision that can be applied to attainment areas (unlike some other states and EPA which generally apply RACT exclusively to non-attainment areas). The five factors of Washington State's RACT rule are listed on page 4 of the 2016 RACT Analysis. Two of the factors (impact of source on air quality, and impact of additional controls on air quality) are described in Chapter 5 of the 2016 RACT Analysis. Two other factors (available controls; and cost) have an entire chapter devoted to each factor. Chapters 3 and 4 of the 2016 RACT Analysis describe in depth a fifth factor in the WA RACT process (emission reductions to be achieved by additional controls).<br><br>According to Washington State University, which prepared Appendix C of the 2016 RACT Analysis, "Results from this modeling study show that RACT implementation in the pulp and paper industry does little to improve visibility in Class I areas." They found that "the 8th highest deciview change was less than 0.05 dv at all of the IMPROVE sites." This is a valid off-ramp for using the WA RACT provisions to address regional haze.<br><br>In terms of 4-factor analyses, the pulp mill information presented to Ecology fully satisfies the current EPA requirements for regional haze 4-factor analysis as specified in the August 20, 2019 EPA Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (2019 EPA Guidance). Based on the current 2019 EPA Guidance, and confirmed on November 3, 2020 in consultation with EPA, Ecology is in full compliance with the regional haze rule by deciding to not pursue controls for pulp mills at this time.<br><br>In terms of Reasonable Progress provisions of the Clean Air Act, WA is successfully navigating regional progress goals and will continue to do so as we will also re-evaluate these sources during the next implementation period. |

| # | Federal Land Manager Comment | Ecology Response |
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| 4 | I am very pleased to read that the mills have mostly eliminated use of #6 fuel oil (some have eliminated all fuel oil firing) and that some mills have installed additional emission controls during the last planning period. However, according to the All4 report, "Most of the recovery furnaces in this analysis fire either natural gas or No. 2 fuel oil as auxiliary fuel, with two recovery furnaces firing No. 6 fuel oil." Which two furnaces are still firing #6 oil? All4 goes on to say, "The cost of switching to low-sulfur No. 2 fuel oil for the remaining two recovery furnaces is approximately $12,000/ton SO2 removed based on fuel prices from the U.S. Energy Information Administration and using a 10% capacity factor." Please provide supporting documentation and calculations.<br><br>I agree that adding NOx and PM emission controls to the recovery furnaces and lime kilns is probably not practical. The best NOx control strategy we have seen for recovery furnaces is quaternary combustion controls (which would be very difficult to retrofit).<br><br>[November 19, 2020 email from NPS] | The two recovery furnaces that use No. 6 fuel oil are Nippon RB#10 and WestRock (WR) Tacoma RF#4. [Note: the terms recovery boiler (RB) and recovery furnace (RF) are used interchangeably by the chemical pulp mills.]<br><br>At the Nippon RB#10 unit, supplementary No. 6 fuel oil is used very rarely; primarily during startup, shutdown, and malfunction events. In 2018, it only used #6 fuel oil about 4% of the year.<br><br>At WR Tacoma RF#4 unit, they only use supplemental oil during startups, shutdowns, and to help stabilize combustion of black liquor. The mill provided the following information to clarify:<br><br>“We expounded on the use and purpose of a Kraft Mill’s Recovery Boiler/Furnace and the fuels it burns to provide additional information/ understanding for the FLMs. The primary purpose of the recovery boiler is to recover inorganic cooking chemicals from the pulping process so they can be reused. The spent pulp cooking chemicals are called black liquor, and black liquor is the primary fuel for the recovery boiler. When fired in the recovery boiler, the organic portion of the black liquor burns and the resulting heat is used to make steam (which is used in the pulping and papermaking processes) and the inorganic portion is recovered in the form of smelt (which is dissolved to regenerate the pulp cooking chemicals and used to make pulp). Oil is a purchased fuel and is used only as a supplemental fuel. The mill typically burns oil during RB4 startups, shutdowns, and to help stabilize combustion of black liquor. The boiler is limited in the amount of oil it can burn to a 10 percent annual capacity factor (40 CFR 60.44b(c) and Condition A.4 of the AOP). This usage is tracked to ensure that compliance with the capacity factor is met.” |

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| 5 | All4 has proposed a retrofit factor of 1.5 for several of the emission units for which it conducted a cost analysis. Not only is it highly unlikely that all of these emission units would experience the maximum degree of difficulty recommended by the EPA Control Cost Manual (CCM), these broad assertions are unsubstantiated and undocumented. Instead, we recommend that consultants and states itemize costs or show how they derived their retrofit factors as discussed in Estimating Costs of Air Pollution Control, by William M. Vatavuk, Lewis Publishers, 1990, pp. 60-62.<br><br>[November 19, 2020 email from NPS] | Cost factors. The chemical pulp mills in Washington state are among the oldest major industrial facilities in the Pacific Northwest (GP Camas dates back to 1885). Applying a 1.5 retrofit factor is reasonable. |
| 6 | All4 states: "Based on a review of recent information on the effectiveness of applying SNCR to industrial boilers, including recent WestRock experience at multiple locations, our analyses assumed SNCR would achieve 35% control on a solid fuel-fired boiler and 45% control efficiency on a gas-fired boiler." According to the CCM, the effectiveness of SNCR is typically a function of the NOx emission rate--the higher the NOx rate, the more efficient SNCR is likely to be. All4 should provide those NOx emission rates and document and justify its assumptions about SNCR efficiency.<br><br>[November 19, 2020 email from NPS] | Control efficiencies. The mills used the cost manual estimates except where they have actual information from their emission units. Efficiency rates are what the mills have actually experienced. Emission rates are provided in annual emission inventories which the FLMs already have access to. |

| # | Federal Land Manager Comment | Ecology Response |
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| 7 | All4 states that, "The costs of installing and operating an SNCR on mill boilers was estimated using U.S. EPA's "Air Pollution Control Cost Estimation Spreadsheet for Selective Non-Catalytic Reduction (SNCR)" (June 2019)." However, All4 has not provided the inputs to that process, making it impossible for us to evaluate its accuracy.<br><br>All4 states that, "The costs of installing and operating an SCR on mill boilers were estimated using U.S. EPA's "Air Pollution Control Cost Estimation Spreadsheet for Selective Catalytic Reduction (SCR)" (June 2019)." However, All4 has not provided the data inputs to that process, making it impossible for us to evaluate its accuracy.<br><br>In its section 3.3.3 "Energy and Non-Air Related Impacts," All4 has raised additional impacts cost issues that should have already been included in the cost analyses. All4 also raises issue of safety and environmental impacts associated with SCR that are common to all SCR installations and can be addressed by proper safety, operation, and maintenance measures.<br><br>All4 included sales taxes in its analyses.<br><br>All4 used a 4.8% interest rate in many of its analyses. The CCM recommends use of the current prime = 3.25%.<br><br>[November 19, 2020 email from NPS] | Ecology agrees that All4 interest rates were out of date. Ecology adjusted the interest rates from All4 to 3.25%. Our work is shown in the spreadsheet called "all controls" sent to the NPS on 10/9/2020. This spreadsheet contains the data inputs and scr/sncr cost input summaries used to arrive at the All4 cost estimates. |
| 8 | Do any of the mills generate a waste caustic solution that could be used to scrub SO2?<br><br>[November 19, 2020 email from NPS] | According to the Ecology's Industrial Section:<br><br>"Kraft pulp mills generates process-related caustic solutions which are an inherent part of the pulp making process. These caustic solutions are white liquor and weak wash (a dilute solution of white liquor). Weak wash is already commonly used at smelt dissolver tanks as a scrubbing solution. Smelt dissolver tanks are not significant sources of SO2 emissions. The recovery furnaces at the pulp mills do not have scrubbers installed as emission control devices, instead relying on precipitators." |

| # | Federal Land Manager Comment | Ecology Response |
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| 9 | All4 included used a 7% interest rate with a 10-year life in its analyses of adding Low-NOx Burners. The CCM recommends use of the current prime = 3.25%.<br><br>[November 19, 2020 email from NPS] | Ecology agrees that All4 interest rates were out of date and that a 10-year life for low-NOx burners was inappropriate. Ecology adjusted the interest rates from All4 to 3.25% and the 10-year life value to 20 years. Our work is shown in the spreadsheet called "all controls" sent to the NPS on 10/9/2020. This spreadsheet contains the data inputs and scr/sncr cost input summaries used to arrive at the All4 cost estimates. |
| 10 | I have attached an annotated excerpt from Ecology's four-factor analyses for the Pulp & Paper industry that contains our feedback on that document. Please provide the Ecology 2016 RACT analysis for pulp/paper mills.<br><br>[November 19, 2020 email from NPS] | The 2016 RACT Analysis (in its entirety) was provided to the NPS on 10/27/2020. |
| 11 | "Was this a BACT determination?" (RE: WR Tacoma PB #6 low NOx burner).<br><br>[November 19, 2020 email from NPS] | It was not a direct BACT determination. The facility installed them on their own. However, the fact that they installed them on their own for reasons other than non-attainment (or similar reasons such as MACT considerations), makes it a relevant cost incurred for BACT considerations. |
| 12 | "What is the basis for this assumption?" (RE: RACT cost of 50% of BACT cost)<br><br>[November 19, 2020 email from NPS] | When not being applied to address non-attainment area concerns, RACT in Washington State is understood by at least three agencies (NWCAA, PSCAA, and Ecology) to be a C-grade level control or emission limit. There is a precedent threshold in a previous WA state RACT determination from p. 77 of 107 of the combined (Ecology/ NWCAA/ PSCAA) Washington State Oil Refinery RACT – TSD FINAL – 11/25/2013: "The proposed RACT defines a reasonably efficient refinery… comparable to or above the 50% percentile of similar-sized US refineries…"<br><br>Ecology used its discretion to also apply a similar type of 50% factor to BACT costs to arrive at a RACT cost. In a December 5, 2019 conversation between Ecology and EPA, EPA agreed that this was a reasonable approach. |
| 13 | "Please show your math. Please update" (RE: proposed RACT costs).<br><br>[November 19, 2020 email from NPS] | Our work is shown in the spreadsheet called "all controls" sent to the NPS on 10/9/2020. This spreadsheet contains the data inputs and scr/sncr cost input summaries used to arrive at the All4 cost estimates, as well as the costs Ecology arrived at. Ecology's listed cost threshold values are reasonable and defendable and it is therefore unnecessary to update them. |

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| 14 | Nippon Boiler #7 @ $6441/ton and WestRock Tacoma Boiler #6 @ $6302/ton are not significantly higher and could result in an additional 97 tons/yr NOX removed.<br><br>[November 19, 2020 email from NPS] | A low NOx burner at WestRock Tacoma is already installed. This was the unit from which Ecology used their actual costs for this analysis. Adding a Low-NOx burner to Nippon boiler #7 would reduce NOx by 28 tpy not 97 tpy. The reasoning behind the suggestion to raise the cost threshold is not supported. If removing more regional haze pollutants were the only criteria, there would be no upper limit for a cost threshold. Whereas Ecology's cost threshold value of $6,300/ton value (rounded down from $6,302/ton) for low NOx burners is reasonable and defendable. |
| 15 | SCR on WestRock Tacoma HFBoiler #7 @ $6508/ton and SNCR on WestRock Longview HFboiler 20 @ $6245/ton are not significantly higher and could result in an additional 646 tons/yr NOX removed.<br><br>[November 19, 2020 email from NPS] | An SNCR at WestRock Longview is already installed. This was the unit from which Ecology used their actual costs for this analysis. Adding an SCR WR Tacoma HF Boiler #7 could potentially reduce NOx by 457 tpy not 646 tpy. The reasoning behind the suggestion to raise the cost threshold is not supported. If removing more regional haze pollutants were the only criteria, there would be no upper limit for a cost threshold. Whereas Ecology's cost threshold value of $6,250/ton value (rounded up from $6,245/ton) for SNCR/SCR is reasonable and defendable. |
| 16 | An additional 743 tons of NOX could be removed by slightly raising your cost-effectiveness thresholds (or reducing the costs).<br><br>[November 19, 2020 email from NPS] | If Ecology raised the NOx cost threshold, the additional amount of NOx removed would potentially be 485 tpy not 743 tpy. The reasoning behind the suggestion to raise the cost threshold is not supported. If removing more regional haze pollutants were the only criteria, there would be no upper limit for a cost threshold. Whereas Ecology's cost threshold value of $6,250/ton value (rounded up from $6,245/ton) for SNCR/SCR and the $6,300/ton value (rounded down from $6,302/ton) for low NOx burners are reasonable and defendable. |
| 17 | "Please provide this analysis." (RE: 2016 Ecology RACT analysis).<br><br>[November 19, 2020 email from NPS] | The 2016 RACT Analysis (in its entirety) was provided to the NPS 10/27/2020. |

| # | Federal Land Manager Comment | Ecology Response |
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| 18 | This is irrelevant. The potential for an adverse impact determination only occurs when new emissions from a major source or major modification rise to the level that the FLM has no other recourse. Instead of these rare instances, the facilities under review here are already in existence and have much greater emissions. Due to such congoing emissions, the DoI made a determination in 1985 that all Class I areas it administered were experiencing impaired visibility—that determination has not been changes and is supported by current visibility monitoring data. For example, our monitoring data indicates that visibility in Mount Ranier, North Cascades, and Olympic national parks is "fair" and unchanging.<br><br>[November 19, 2020 email from NPS] | Pointing out that the FLMs have not issued an adverse impact to the chemical pulp mills in Washington state is relevant. In consultation with the FLMs, Ecology wishes to focus its resources on areas that the FLMs consider the greatest concern to regional haze. Because the FLMs issued a recent adverse impact determination to the WA refinery sector, Ecology is focusing its resources on refineries during this round of regional haze. Ecology acknowledges that an adverse impact determination is not required to address regional haze. However, due to the recent adverse impact determination issued for the refinery sector, as well as recent Washington State University modeling showing that controls on chemical pulp mills "does little to improve visibility in Class I areas" (see response to comment No. 3 above), Ecology is focusing its resources on refineries more than chemical pulp mills during this current regional haze implementation period. Even so, Ecology has included other industries besides refineries in its Q/D analysis and required them to submit 4-factor analysis just like the refineries. All of them have done so in accordance with the 2019 EPA Guidance. |
| 19 | Please describe emission reductions that have occurred or will occur during this planning period.<br><br>[November 19, 2020 email from NPS] | As noted in Ecology's analysis, the GP Camas facility is no longer operating as a chemical pulp mill. In addition, there are now enforceable conditions that would prevent GP Camas from operating as a chemical pulp mill during this planning period. If GP Camas pursues operation as a chemical pulp mill in the future, they will need to go through new source review. |
| 20 | If the cost-effective controls evaluated in the Initial Review were implemented, emission reductions and visibility improvements would be even greater.<br><br>[November 19, 2020 email from NPS] | It is very unlikely that emission reductions would be greater. The controls considered in the 2016 RACT Analysis were primarily wet heat recovery as was used at the GP Camas mills. Unless the other mills needed wet heat recovery, it would be very difficult to force them to modify their facilities for this reason. In the 2016 RACT Analysis, Washington State University modeling shows that even if the highest standard of SO2 control (the GP Camas SO2 limit is as stringent as anywhere in the world), were applied to the other mills in the state, it would do "little to improve visibility in Class I areas." |

| # | Federal Land Manager Comment | Ecology Response |
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| 21 | As Ecology noted above, perceptibility is not an acceptable criterion. Please provide the information on which Ecology made its "demonstration." Ecology should also consider the cumulative impacts and benefits on all of the Class I areas evaluated.<br><br>[November 19, 2020 email from NPS] | Ecology did not state that "perceptibility is not an acceptable criterion." But rather, Ecology quotes the 2019 EPA Guidance directly, and therefore more accurately as follows: "a measure may be necessary for reasonable progress even if that measure in isolation does not result in perceptible visibility improvement."<br><br>The actual quote clearly states that "a measure may be necessary for reasonable progress." It does not state that a measure is necessary in all circumstances for reasonable progress. Based on the circumstances in WA State as described in Chapter 11 of Ecology's analysis, Ecology appropriately considered this information from the 2019 EPA Guidance for 4 factor analyses. The information presented in Chapter 11 (including but not limited reference to the 2016 RACT Analysis), supports Ecology's conclusions. The 2016 RACT Analysis (in its entirety) was provided to the NPS on 10/27/2020. Ecology's analyses of all of its Class I areas shows that Washington State is meeting and addressing the 2064 glide path goals appropriately. |
| 22 | That cost-effectiveness value would be $6,350 in 2019$ based upon the CEPCI.<br><br>[November 19, 2020 email from NPS] | As WestRock Tacoma noted in its response to Ecology's follow-up requests regarding cost for the low NOx burners, they were already using "actual capital costs in 2019 dollar's." Therefore, the suggested cost conversion is not necessary.<br><br>It would also not make any difference because Ecology's adjusted threshold of $6,300/ton for low NOx burners (after accounting for 20 years' useful life and a 3.25% interest rate, as described in comment 9), is almost identical to what is being suggested in the comment.<br><br>It would not pull in any additional units for consideration. A low NOx burner at WestRock Tacoma is already installed (see response to comment No. 14). |
| 23 | That cost-effectiveness value would be $6,520 in 2019$ based upon the CEPCI.<br><br>[November 19, 2020 email from NPS] | As WestRock Longview noted in its response to Ecology's follow-up requests regarding cost for the SNCR, they were already using "actual capital costs in 2019 dollar's." Therefore, the suggested cost conversion is not necessary. |

| # | Federal Land Manager Comment | Ecology Response |
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| 24 | We are aware of cost-effectiveness thresholds of $4400 - $7600/ton among the WRAP states.<br><br>[November 19, 2020 email from NPS] | Ecology's cost thresholds for chemical pulp mills (~$6300 - $7,800) are mostly within this range, accept for Ecology's particulate matter threshold which is slightly above this range ($7,800). Each state is able to determine their own cost threshold independently. The costs incurred by one industry for a control technology may vary from the costs incurred by another industry. Cost incurred for control technologies could also vary from state to state. Ecology's cost threshold values are well reasoned and defendable. |
| 25 | Perceptibility is not an acceptable criterion. Please provide the information on which Ecology based this conclusion. Please provide the information on which Ecology based its conclusion.<br><br>[November 19, 2020 email from NPS] | See Ecology's responses to Comment No. 3 and Comment No. 21 above. |
| 26 | I am especially concerned about the "Cost Estimate" pages 117-158 of that document. …<br><br>Neither the "Data Inputs" nor the "Design Parameters" sheets were included in the WA All4 document--that is why i requested them in my email to you dated 11/19/2020 (attached)….<br><br>I am particularly interested in what values are contained in the "Design Parameters" cells for "Total operating time for the SNCR (top) =" and "Total operating time for the SCR (top) =."<br><br>[January 14, 2021 email from NPS (portions omitted to focus on main questions/concerns)] | In response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the kraft pulp mills (portions omitted to focus on response to main questions/concerns):<br><br>"ALL4 staff performed the analysis in a short amount of time with a limited amount of data using generic EPA control cost templates as a guide. Any cost estimate developed from the EPA spreadsheets is going to generate some level of disagreement in review due to individual interpretation of how the control cost factors are applied to a particular unit at a particular facility. The EPA control cost spreadsheets were not developed by EPA using cost data for installations at pulp and paper mill boilers, but were developed using data for large fossil fuel-fired utility boilers that operate continuously at high load. The ALL4 report notes that more study would be necessary to deem any control feasible, that individual cost elements vary from site to site, and that not all site-specific factors could be accounted for in the analyses due to the limited time available to prepare the report. …" |

| # | Federal Land Manager Comment | Ecology Response |
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| 27 | We suggest that Ecology include the 2016 Pulp & Paper RACT Analysis in the SIP package because it appears to be the basis for Ecology's determination that visibility improvements resulting from additional controls at the pulp & paper mills are not enough to warrant their cost.<br><br>[February 19, 2021 email from NPS] | Ecology is not required to put all documents that support a SIP determination into a SIP. The amount of documentation from all the different programs and permits that support SIP determinations is immense. It is not historical practice to include all such documentation in a SIP and is problematic due to changing conditions (in permits for example), which may not be related to the SIP determination. In such situations (and many others), the SIP would unnecessarily contain inaccurate and outdated information. However, the 2016 Pulp & Paper RACT analysis has already been included as an appendix in the 5-year Regional Haze report (~2018). |
| 28 | In that analysis, Ecology modeled 2007 baseline actual emission rates and the potential RACT emission rates using CMAQ and excluded all NOx reductions and all lime kiln emission reductions.<br><br>[February 19, 2021 email from NPS] | In the 2016 Analysis, Ecology focused on the greatest amount of potential regional haze pollutant reductions. NOx and lime kiln emissions reductions were minimal as supported by Chapter 4 of that analysis and specifically: Tables 33 and 34 and Figures 4, 5, 6, and 7. |
| 29 | Instead, Ecology should have used a more recent emission inventory and explained that modeling annual emissions against a "dirty" background underestimates the benefits of reducing emissions. It is generally recognized that NOx emissions in the local climate have an enhanced impact upon visibility impairment and their reductions should not have been excluded.<br><br>[February 19, 2021 email from NPS] | The comment about dirty background is too general to be applicable to the 2016 RACT analysis. It does not specify: which dirty background, by what Class I area, and which local climate would be affected differently by using more recent pulp mill emissions inventories. NPS does not provide specific supporting information regarding emission inventories to alter the following Washington State University conclusion: "Results from this modeling study show that RACT implementation in the pulp and paper industry does little to improve visibility in Class I areas." See also response to Comment 3 above and response to Comment 30 below. |

| # | Federal Land Manager Comment | Ecology Response |
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| 30 | Ecology appears to have set 0.13 dv as its criterion for what constitutes a significant improvement in visibility. Ecology provides no justification for this criterion. For comparison, EPA used 0.3% change in extinction, which is approximately equal to 0.03 dv, as its significance criterion in its TX FIP. However, in determining if a visibility improvement was adequate, Ecology dismissed greater improvements at 16 Class I areas.<br><br>[February 19, 2021 email from NPS] | The comment is incorrect. Ecology did not set 0.13 dv as a criterion. Ecology also did not set the BART 0.5 dv as a criterion. Instead, Ecology stated the following in Chapter 7 (p. 73) of the analysis:<br><br>"An impact of 0.5 dv was considered the minimum visibility impact for a source to be subject to BART. While a potential visibility improvement of 0.5 dv or more would have clearly triggered a more in-depth evaluation of the RACT/Four-Factor reasonable progress factors, the significantly smaller annual visibility improvements that have been modeled were determined to be too small to pursue further at this time."<br><br>Considering that one deciview is generally considered to be the minimum amount of visibility change the average person can detect, Ecology would not require the controls listed in the 2016 RACT analysis for non-detectable (to humans) visibility improvements of only 0.03 dv. |

| # | Federal Land Manager Comment | Ecology Response |
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| 31 | All4, the consultant for the Northwest Pulp & Paper Association (NWPPA), says, "The cost of switching to low-sulfur No. 2 fuel oil for the remaining two recovery furnaces is approximately $12,000/ton SO2 removed based on fuel prices from the U.S. Energy Information Administration and using a 10% capacity factor." Please provide supporting documentation and calculations.<br><br>[February 19, 2021 email from NPS] | Ecology and the pulp mill already addressed this comment in the response to Comment #4 above. However, in response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the kraft pulp mills:<br><br>"The two furnaces that do not currently fire No. 2 fuel oil are the Nippon Dynawave Recovery Furnace No. 10 and the WestRock Tacoma Recovery Furnace No. 4. Supporting calculations for the $12,000/ton estimate were requested. Fossil fuel is primarily fired in a recovery furnace during startup and shutdown and is not typically fired during normal operation. A 10% capacity factor is a typical assumption for maximum fuel oil firing in a recovery furnace and is often a limit taken by facilities to avoid NSPS Subpart D applicability. An example calculation is included below and demonstrates that the difference in fuel oil cost alone is around $12,000/ton; the cost per ton would be greater if the capital cost related to the fuel switch were included."<br><br>"Example fuel oil calculation – switching from 6 oil to 2 oil for a recovery furnace<br><br>Fuel oil burners size ..... 600 MMBtu/hr<br>Hours on fuel oil ..... 876 hours per year (10 %capacity)<br>No. 6 oil ..... 150 MMBtu/Mgal<br>Fuel oil burners size ..... 600 MMBtu/hr<br>Hours on fuel oil ..... 876 hours per year (10% capacity)<br>No. 6 oil ..... 150 MMBtu/Mgal<br>.....1.8 percent sulfur content<br>.....166 cents/gal(EIA)<br>..... $ 5,816,640 fuelcost<br>..... 1575 lb/Mgal(AP-42)<br>..... 495.12 tpySO2<br>No. 2 oil ..... 140 MMBtu/Mgal<br>..... 0.0015 percent sulfur content<br>.....318 cents/gal(EIA)<br>..... $11,938,629 fuel cost<br>..... 1425 lb/Mgal(AP-42)<br>..... 0.44 tpySO2<br>..... $12,376 cost per ton toswitch" |

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| 32 | All4 has proposed a retrofit factor of 1.5 for several of the emission units for which it conducted a cost analysis. Not only is it highly unlikely that all of these emission units would experience the maximum degree of difficulty recommended by the EPA Control Cost Manual (CCM), these broad assertions are unsubstantiated and undocumented. Instead, we recommend that, for each emission unit, consultants and states itemize costs or show how they derived their retrofit factors as discussed in the CCM and in Estimating Costs of Air Pollution Control, by William M. Vatavuk, Lewis Publishers, 1990, pp. 60-62.<br><br>[February 19, 2021 email from NPS] | Ecology addressed this comment in the response to Comment #5 above. However, in response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the Kraft pulp mills:<br><br>"The U.S. EPA's cost manual allows a retrofit factor of greater than one. The mills covered in the ALL4/NWPPA report have not performed site-specific engineering analyses to determine whether any particular control is feasible and what the particular site-specific factors would be that would impact implementation. Only readily available information was used to determine if additional emissions controls may be feasible and cost effective. A retrofit factor is justified when generic costing approaches are used and when there is limited experience across the industry in applying a certain control technology, as is the case for SNCR and SCR. Very few pulp and paper boilers have successfully utilized these technologies."<br><br>"A retrofit factor of 1.5 was applied to SNCR to account for the need to add multiple levels of injectors on pulp and paper mill boilers that operate at variable loads and to perform additional tuning of the system across loads. The OAQPS Cost Manual (Section 4, Chapter 1) indicates that difficult installation conditions are often encountered for small boilers, and the boilers evaluated in this report are much smaller than the coal-fired utility boilers upon which the cost and design algorithms were based. Most of the NWPPA member boilers evaluated are of an age such that they were not designed with retrofitting NOx controls in mind. For example, the existing combustion air systems could require rework to allow installation of SNCR injection ports in the proper furnace locations. "<br><br>"A retrofit factor of 1.5 was applied to SCR because the EPA cost equations were developed based on large utility boiler applications, SCR has not been applied to pulp and paper mill boilers, and to account for space constraints, additional ductwork, installation of a small duct burner to reheat the exhaust gas to the required temperature range, and the likelihood of needing a new ID fan to account for increased pressure drop. The mills will also have to consider safety factors and the possible need for program improvements when adding ammonia storage and handling operations. Given all of these considerations, a retrofit factor of 1.5 is justified and could possibly be higher for some installations. Data are not available to itemize specific costs that would comprise the retrofit factor." |

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| 33 | The spreadsheet called “all controls” sent to Don Shepherd on 10/9/2020 did not contain all of the data inputs used to arrive at the All4 cost estimates. Now that we have the "Data Inputs" and "Design Parameter" pages in the All4 workbooks (thanks you), we can see that All4 overrode the "Total operating time for the SCR" parameters to increase those values. (The altered values in the All4 "Design Parameters" page are internally inconsistent.) We suggest that All4 should have, instead, adjusted the inputs on the "Data Inputs" page to produce results reflective of the actual boiler operations. At the very least, All4 should have provided notations showing where they overrode the EPA Design Parameters spreadsheet (like they did in a similar report for the NWPPA in Oregon).<br><br>[February 19, 2021 email from NPS] | The spreadsheet contains the data inputs and scr/sncr cost input summaries used to arrive at the All4 cost estimates. In response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the kraft pulp mills:<br><br>“The latest SNCR and SCR cost spreadsheets developed by the U.S. EPA and available on its website are based on information gathered on installation of these controls on large fossil fuel-fired utility boilers that only fire one type of fuel. These utility boilers typically operate continuously at high load to produce electricity. Industrial boilers are typically smaller than utility boilers and they may not operate continuously at their rated capacity. Many times, a solid fuel-fired boiler at a pulp and paper mill is fired on a mixture of fuels (e.g., biomass and other fossil fuels) and operates over a range of loads that follow the steam demands of the production process. In addition, the spreadsheets were designed to evaluate reductions in allowable emissions and do not directly lend themselves to estimating the cost of reducing actual emissions in their published state. Therefore, because the industrial boilers evaluated do not operate at capacity for 8760 hours per year, we plugged in values for actual representative annual hours of operation instead of letting the spreadsheet calculate the annual hours of operation based on the boiler’s capacity factor (the ratio of actual annual fuel consumption to maximum annual fuel consumption). We entered an estimated NOx emission rate and the actual annual hours of operation so that the annual tons of NOx reduced would correlate to the representative actual NOx emissions in tons per year times the anticipated control efficiency. Thus, the hours of operation and NOx emission entries were done to produce results reflective of actual boiler operations. Allowing the spreadsheet to calculate a low annual hours of operation based on a calculated capacity factor would result in a low estimate of operating costs. Calculating cost per ton based on allowable emissions and not actual emissions is not representative of the cost a facility would incur to realize an actual impact on visibility at a Class I area.” |

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| 34 | For SNCR, we suggest that data in Figure 1.1c in the CCM be used to estimate SNCR control efficiency and CCM equation 1.17 to estimate the Normalized Stoichiometric Ratio.<br><br>[February 19, 2021 email from NPS] | In response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the kraft pulp mills:<br><br>"As we did not perform site-specific studies of NOx emissions rates or feasibility of NOx controls for any of the boilers included in the analysis, we used our best estimate of what an SNCR application might be able to achieve in an industrial boiler (35 to 45%). The actual control efficiency achieved could in fact be lower, based on factors like furnace geometry and temperature. The WestRock Longview boiler SNCR system was designed to achieve about 40% reduction and achieves 35% reduction. The EPA Control Cost Manual provides a very wide range of control efficiency estimates for SNCR. The uncontrolled NOx emissions and the control efficiency are estimates, as indicated above, since the boilers do not have NOx CEMS and experience a range of operating conditions." |
| 35 | Does WA levy sales and/or property taxes on air pollution control equipment?<br><br>[February 19, 2021 email from NPS] | In response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the Kraft pulp mills:<br><br>"Sales and property taxes were included in cost estimates that were prepared based on Control Cost Manual examples. From the latest version of Section 1, Chapter 2 (Cost Estimation: Concepts and Methodology1) of the Control Cost Manual, "total direct cost includes purchased equipment cost, which in turn, is the sum of the base equipment cost (control device plus auxiliaries), freight, instrumentation, and sales tax." Sales tax is typically estimated as 3% of the purchased equipment cost. Section 2.6.5.8 of the Control Cost Manual states that property tax is calculated at 1% of the total capital investment. It is our understanding that property tax is charged on pollution control devices and that some types of devices are exempt from sales tax in Washington."<br><br>1 https://www.epa.gov/sites/production/files/2017-12/documents/epaccmcostestimationmethodchapter_7thedition_2017.pdf |

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| 36 | The CCM discourages use of cost estimates more than five years old.<br><br>[February 19, 2021 email from NPS] | In response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the Kraft pulp mills:<br><br>"NPS commented that the Control Cost Manual "discourages use of cost estimates more than five years old." Our analysis used the most recent EPA cost spreadsheets for SNCR and SCR (updated in 2019) and costing procedures based on the Control Cost Manual examples. We used currently applicable operating cost data (e.g., labor, chemicals, electricity). Because it takes time and money to engage vendors to prepare control cost estimates, we utilized the Control Cost Manual and other relevant available cost estimates to estimate capital costs for our Four-Factor Analyses.<br><br>Some of the capital costs for control equipment were from the study "Evaluation of Air Pollution Control Costs for the Pulp and Paper Industry" by National Economic Research Associates (NERA), May 2003. This study was specific to our industry, unlike most of the cost estimating procedures presented by EPA in the Control Cost Manual (most of these cost estimates are based on the utility industry or the chemical industry). Although NPS indicates that EPA prefers more recent cost estimating procedures, we note that in EPA's 2020 proposed update to the wet scrubber chapter the bulk of the information presented in Subchapter 1.3 for the wet packed tower gas absorbers is unchanged from the previous version of the Control Cost Manual (the section is dated December 1995) and presents and uses cost data from 1991. The Control Cost Manual section for Electrostatic Precipitators has not been updated since 1999. We believe that using reports with capital cost estimates developed specifically for pulp and paper mill sources is more valid than using even older Control Cost Manual capital cost estimates." |
| 37 | Did Ecology consider using waste caustic as a SO2 scrubbing reagent?<br><br>[February 19, 2021 email from NPS] | Ecology addressed this comment in the response to Comment #8 above. |

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| 38 | Why did Ecology assume only a 20-year scrubber life instead of 30 years?<br><br>[February 19, 2021 email from NPS] | In cell A21 in the tab titled: "Wet Scrubber" in the spreadsheet provided to NPS on October 9 2020, Ecology provides the following reason for using a 20-year scrubber life:<br><br>"The 4-factor analysis assumed 15-year useful life. Ecology updated values using 20 years based on EPA cost manual Section 5 SO2 and Acid Gas Controls (uses 20-30 years)."<br><br>Also, in response to these concerns, Ecology inquired of the Northwest Pulp & Paper Association (NWPPA), who received the following information from the consultant (All4) who prepared the 4-factor analyses for the Kraft pulp mills (portions omitted to focus on response to main questions/concerns):<br><br>"The ALL4/NWPPA analysis did not use a 30-year equipment life for all controls evaluated because using a standard 30-year equipment life for all types of controls is not a valid assumption. For example, 10 years is used for low-NOx burners (LNB) because a 10-year equipment life for LNB is included in the Cleaver Brooks document "Profire Burner Retrofits"2 and was used by EPA for several non-EGU sources in their assessment of non-EGU NOx control costs for the recent Cross State Air Pollution Rule (CSAPR) update3. The latest EPA Control Cost Manual Chapters for SNCR and SCR state that equipment life is 15 to 25 years for SNCR and 20 to 25 years for SCR for industrial applications. NPS has specifically asked about using a 20 year life for scrubbers. The wet scrubber cost examples in Section 5, Chapter 1 and Section 6, Chapter 2 use a 15-year equipment life forwet scrubbers…."<br><br>" …NPS seems to be recommending a 30-year equipment life for all controls based on a non-specific reference in Section 1, Chapter 2 (Cost Estimation: Concepts and Methodology5) of the Control Cost Manual that provides a table of "Typical Control Device Parameters" which contains a 30-year equipment life. This chapter also specifies that the "lifetime not only varies according to the type of the control system, but with the severity of the environment in which it is installed," which indicates that 30 years should not be used in every single case. In addition, equipment that was originally installed 30 years ago may since have been rebuilt (which requires capital) so assuming that the equipment life in a certain case begins with original installation of the control is also not always appropriate." |

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| 39 | Please show how Ecology's cost threshold value of $6,300/ton for Low-NOx Burners was derived. According to Ecology, "a 2012 SNCR NOX control installed at WestRock Longview hogged fuel boiler #20 to meet MACT requirements at $6,245/ton." Ecology says WestRock was already using "actual capital costs in 2019 dollar's." Please show how costs were converted from that 2012 project to 2019.<br><br>[February 19, 2021 email from NPS] | Ecology explained it's pulp and paper cost threshold values in Chapter 11 of its draft 2021 Regional Haze SIP development. WestRock Longview converted the 2012 costs to 2019 dollars. The 2019 dollar costs are provided on p. 3 of WestRock Longview's response to Ecology's request for follow-up information letter dated January 13, 2020. |
| 40 | Why use different cost thresholds for different controls within the same source sector?<br><br>[February 19, 2021 email from NPS] | Ecology explained its pulp and paper cost threshold values in Chapter 11 of its draft 2021 Regional Haze SIP development. The reason for having different cost thresholds for different controls provides more accuracy of actual costs incurred. For the case of NOx control, the costs turned out to be similar for Low NOx burners and SNCRs. Ecology extrapolated the costs for SNCR to SCR even though there are some differences. The reason for this, is because Ecology did not have cost incurred information for SCRs. Costs incurred for different pollutants could also vary, as was found to be the case for PM which happened to have recent cost incurred information. |
| 41 | The BP Cherry Point adverse impact determination is irrelevant. Visibility monitoring at all three NPS Class I areas (Mount Rainier, North Cascades, Olympic) in WA continue to show visibility impairment.<br><br>[February 19, 2021 email from NPS] | Ecology addressed this comment in the response to Comment # 18 above. |
| 42 | If the cost-effective controls evaluated in the Initial Review were implemented, emission reductions and visibility improvements would be even greater.<br><br>[February 19, 2021 email from NPS] | Ecology addressed this comment in the response to Comment # 20 above. |

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| 43 | Please let me know if you have questions or comments--i would be happy to discuss these issues with you--thanks!<br><br>[February 19, 2021 email from NPS] | Ecology's comments are listed next to each NPS question. Ecology does not have questions for the NPS and considers the issues raised by NPS to have been fully addressed. |
| 44 | We commend Washington Ecology for developing an organized, detailed SIP, and for engaging with the NPS throughout the SIP development process. Washington was the first of the Western Regional Air Partnership (WRAP) states to engage with the NPS on source selection beginning in 2018 and is also the first WRAP state to complete a draft SIP for our review. We are satisfied that Washington Ecology considered the anthropogenic emission sources with the greatest potential to affect visibility in our Class 1 Areas. We also recognize and appreciate emission reductions and visibility improvements that Washington has achieved in the last decade. Still, additional progress is necessary before the ultimate visibility goal of no human caused visibility impairment is realized at Mount Rainier, North Cascades, and Olympic National Parks. It is with this in mind that we provided SIP review feedback during our consultation call, summarized here.<br><br>[June 29, 2021 email from NPS] | Ecology appreciates the FLM's recognition of our substantial effort to address regional haze and to consult with the FLMs throughout development of the RH SIP. This includes the early presentation of drafts that Ecology provided to the FLMs on September 23, 2020, and follow-up requests for information that Ecology provided to the FLMs on November 9, 2020, and November 27, 2020. Ecology has also provided detailed responses to address FLM comments in January 2021 and again in April 2021. |
| 45 | Chemical pulp and paper mills in Washington are the biggest source of haze causing emissions for Mount Rainier NP and among the top sources for all NPS Class 1 Areas in the state. Washington Ecology identifies several technically feasible and cost-effective controls to reduce haze causing emissions for these facilities. We appreciate Washington Ecology's efforts to correct errors in the cost analyses provided by facilities and their consultants. Our analysis indicates that the costs may be still lower than estimated when additional errors are corrected. | Ecology believes it has addressed the pulp mill's four-factor analysis satisfactorily even though the initial interest rates provided by the facilities were out of date. We adjusted the interest rates to the rates available during the summer of 2020 prior to submitting our recommendations to the FLMs.<br>Some of the control equipment lifespans suggested by the mills were too short in our opinion and we adjusted equipment lifespans prior to submitting our recommendations to the FLMs.<br>Ecology does not agree with the FLM's suggestions of additional errors, such as exaggerated retrofit factors. |

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| | We recommend that Washington Ecology consider adopting a cost/ton similar to the one used by Oregon ($10,000/ton) to create a level playing field for the pulp and paper industry in the region. Please see the attached .zip file (NPS-WA_RH-PulpPaperReview2021.zip) for an overview of our pulp and paper analysis as well as source-specific summaries and calculation worksheets.<br>[June 29, 2021 email from NPS] | Ecology disagrees with the FLM's suggestion to apply Oregon's cost thresholds instead of Washington's thresholds. Each state and the industries in that state have specific circumstances that preclude direct comparison between states. EPA advises that states consider the cost-effectiveness thresholds set by other states, but does not require the use of a higher (or the highest) threshold value set by any state. Ecology did consider other state thresholds in setting our state threshold; it is not the sole consideration.<br>For the reasons stated in Chapter 7 of the SIP (not repeated here) Ecology is prioritizing implementation of potential new controls and is starting with refinery facilities. We will consider reasonable controls for pulp mills after we complete the reasonability analysis and determination for the refinery facilities. This will be included in a SIP supplement when completed.<br>See also Ecology Response to Comments #7, #12, and #18 through #22. |
| 46 | We are concerned that, despite identifying several technically feasible and cost-effective emission control opportunities for pulp and paper facilities in the draft SIP, Washington Ecology chooses not to require these controls based on a 2016 visibility benefit study. This study is both irrelevant to the SIP and technically flawed:<br>Individual facility emission control decisions should be based upon the four factors identified in the Clean Air Act and not introduce visibility benefit as a fifth factor.<br>The 2016 modeling study improperly modeled individual controls against a dirty background.<br>[June 29, 2021 email from NPS] | Ecology chose to focus on refinery controls as described in Chapter 7 of the SIP, as we have identified potential reasonable controls at a multitude of sources and are prioritizing the refinery subset of those sources as they constitute a vast majority of the visibility benefit during this implementation period<br>The 2016 reasonably available control technology (RACT) analysis is both relevant to the SIP and valid. We disagree that it is technically flawed.<br>Ecology did not introduce a fifth factor to the regional haze four-factor analysis. Ecology does refer to the five factors in its RACT process. Please refer to Chapter 7 of the SIP for an in-depth discussion of how the four-factor analysis and the Washington RACT process are analogous and why Washington is using our RACT process.<br>Washington State University, which implemented the modeling, followed a rigorous modeling process. The 2016 RACT analysis accurately compared actual background conditions to the visibility condition with proposed controls. As explained in Appendix C of the 2016 RACT Analysis: "Because the metrics that determine an acceptable SIP consider only the best and worst quintiles of the distribution of visibility, this analysis seeks to find 365 day periods that have greater than average numbers of observations in those quintiles." Therefore, the 365-day period used, considered both best and worst quintiles, not solely the worst (or "dirtiest").<br>See also Ecology Response #2. |

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| 47 | Washington Ecology further cites lack of NPS Adverse Impact Determinations as rationale for not requiring controls. Adverse Impact Determinations are not part of the RH process or reasonable progress determinations. We find that reasonable, cost-effective controls for pulp and paper sources are available and should be implemented to reduce haze causing emissions in this planning period.<br><br>[June 29, 2021 email from NPS] | Ecology, as discussed in Chapter 7 of the SIP, is choosing to focus on potential refinery emission controls first. Ecology plans to evaluate controls for chemical pulp mills following the refinery evaluation with determinations for reasonable control installation. Ecology agrees the presence or lack of a NPS Adverse Impact Determination does not enter into the evaluation of reasonable controls. |
| 48 | The NPS values clean air and clear views and recognizes these as essential to our visitor experience and the very purpose of our Class 1 Areas in Washington. Additional progress will be needed to reach the ultimate regional haze goal of no human-caused visibility impairment at Mount Rainier, North Cascades, and Olympic National Parks as well as other Class 1 Areas in the region. We welcome future opportunities to engage with Washington Ecology and work together on efforts to reduce haze causing pollution and address regional haze in our national parks. If you have any questions, do not hesitate to reach out to us. Also, feel free to let us know if you have any edits to this summary and especially if any corrections are needed.<br><br>[June 29, 2021 email from NPS] | Ecology appreciates and shares the FLM's concern for Washington's Class 1 Areas. For this reason, Ecology is pleased to report that Washington has made progress toward natural conditions during this implementation period and continues to be on track to meet natural conditions in all Class 1 Areas by 2064. |
| 49 | Cost-Effectiveness Thresholds<br>Ecology based its cost-effectiveness threshold on recent RACT determinations on boilers at WestRock PC's Longview and Tacoma Kraft mills and described its results below:<br>For $NO_x$ control using a low-$NO_x$ burner, the following units have estimated cost/ton value less than the potential RACT threshold of $6,300/ton. Adding these controls could potentially reduce $NO_x$ emissions by approximately 150 tpy.<br>Nippon Boiler #9 ($2,754/ton);<br>PCA boiler #1 ($5,893/ton);<br>PCA boiler #2 ($4,834/ton).<br>For $NO_x$ control using an SCR or SNCR, the following units have a cost/ton value less than the potential RACT threshold of $6,250/ton. Adding one of these controls could potentially | Please see Ecology Response #2. |

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| | reduce $NO_x$ emissions by approximately 500 tpy to 1,025 tpy.<br>Nippon hog fuel (HF) boiler #11 ($5,413 for SNCR); ($5,466/ton for SCR);<br>Nippon Boiler #9 ($6,041 for SCR).<br>EPA advises that states consider the cost-effectiveness thresholds set by other states. We agree and recommend that Ecology consider a cost-effectiveness threshold that would constitute a "level playing field" for the Pulp & Paper source sector. To that end, Ecology should consider setting a cost-effectiveness threshold similar to the $10,000/ton threshold established by Oregon. (In this round of regional haze SIP development, Colorado is applying a $10,000/ton threshold to all sources sectors and New Mexico is using $7,000/ton.)<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations, June 24, 2021] | |
| 50 | Cost-Effectiveness Analyses<br>Although Ecology corrected cost analyses submitted by the consultant (All4) for the Northwest Pulp & Paper Association (NWPPA) for interest rate (3.25%) and remaining useful life (per EPA's Control Cost Manual recommendations), several issues were not addressed by Ecology that resulted in costs continuing to be overestimated; many of these issues will be discussed for each emission unit evaluated by the National Park Service (NPS) Air Resources Division (ARD).<br>An issue common to several emission units is the appropriate retrofit factor. The EPA Control Cost Manual (CCM) recommends that site-specific retrofit factors (greater than the 1.0 default value) should be based upon a thorough and well-documented analysis of the individual factors involved in a project. For example, using the methods outlined by William Vatavuk on pages 59-62 in his book Estimating Costs of Air Pollution Control. That process involves estimating and assigning a retrofit factor to each major element of a project and from that deriving an overall retrofit factor. The CCM also | Please see Ecology Response #2. |

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| | addresses “Retrofit Cost Considerations” in section 2.6.4.2. In the absence of such a proper analysis, assume a retrofit factor = 1.0, which represents a 30% increase above costs for a “greenfield” project.<br>Although we were not provided the workbooks/spreadsheets used by the NWPPA consultant, our review of the PDF versions of those workbooks leads us to conclude that certain components of the "Design Parameters" spreadsheets of the EPA CCM SCR and SNCR workbooks were altered to try to approximate actual conditions. It appears that the consultant over-rode the calculation of control equipment operating time to produce the operating times and emission rates that reflect actual values. However, the control equipment operating time parameter is not intended to reflect actual operating time—instead, it is the method used by the spreadsheet to adjust operating parameters for the actual capacity utilization. We recommend that only the parameters on the "Data Inputs" spreadsheet be adjusted to generate the appropriate design parameters and cost estimates. We adjusted the annual fuel consumption on the “Data Inputs” spreadsheet to approximate the current annual (uncontrolled) emissions indicated by the “Design Parameters” spreadsheet. Nevertheless, the alterations made by the consultant do not appear to have adversely effected their results.<br>One factor that the NWPPA consultant consistently underestimated was the 2019 Chemical Engineering Plant Cost Index (CEPCI); the 2019 CEPCI was 607.5 (instead of 603.1).<br>In some cases, our application of the default retrofit factor (1.0), as well as other corrections, resulted in cost-effectiveness estimates that dropped from above the Ecology threshold to below the Ecology threshold. (Likewise, regarding the Oregon threshold.)<br>[NPS ARD Review of Washington Ecology’s Chemical Pulp & Paper Mill FFA Recommendations<br>June 24, 2021; January 11, 2021 e-mail from the National Park Service to the Washington Department of Ecology] | |

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| 51 | Cost-Effectiveness Analyses Results<br>Based upon the Ecology thresholds, we find that the controls below would be reasonable and emission reductions are shown: (Green highlights indicate Ecology's estimates that are below Ecology's threshold; yellow highlights indicate ARD results that are below the Ecology threshold).<br>Nippon Dynawave<br>Power Boiler #6: Ecology => no additional controls; ARD => no additional controls<br>Power Boiler #7: Ecology => no additional controls; ARD => no additional controls<br>Power Boiler #9: Ecology => SCR @ 175 tpy; ARD => SCR @ 175 tpy<br>Hogged Fuel Boiler #11: Ecology => SCR @ 848 tpy; ARD => SCR @ 848 tpy<br>Packaging Corporation of America<br>Power Boiler #1: Ecology => LNB @ 26 tpy; ARD => LNB @ 26 tpy<br>Power Boiler #2: Ecology => LNB @ 30 tpy; ARD => LNB @ 30 tpy<br>Hogged Fuel Boiler #11: Ecology => no additional controls; ARD => SCR @ 255 tpy<br>Port Townsend Paper<br>Hogged Fuel Boiler: Ecology => no additional controls; ARD => no additional controls<br>Package Boiler: Ecology => no additional controls; ARD => no additional controls<br>WestRock-Longview<br>Power Boiler #20: Ecology => no additional controls; ARD => no additional controls<br>WestRock-Tacoma<br>Power Boiler #6: Ecology => no additional controls; ARD => no additional controls<br>Power Boiler #7: Ecology => no additional controls; ARD => SCR | Please see Ecology Response #2<br>See also Ecology Response to Comments #12, #18 to #22, and #23. |

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| | @ 458 tpy<br>Based upon Ecology's estimates and its cost thresholds, 1,079 tons of $NO_x$ could be reduced annually. Our estimates indicate that an additional 713 tpy reduction could be achieved (for an overall reduction of 1,792 tpy).<br>Applying the Oregon thresholds, we find that the controls below would be reasonable and emission reductions are shown: (Green highlights indicate Ecology's estimates that are below Oregon's threshold; yellow highlights indicate ARD results that are below the Oregon threshold.)<br><u>Nippon Dynawave</u><br>Power Boiler #6: Ecology => no additional controls; ARD => no additional controls<br>Power Boiler #7: Ecology => no additional controls; ARD => SCR @ 50 tpy<br>Power Boiler #9: Ecology => SCR @ 175 tpy; ARD => SCR @ 175 tpy<br>Hogged Fuel Boiler #11: Ecology => SCR @ 848 tpy; ARD => SCR @ 848 tpy<br><u>Packaging Corporation of America</u><br>Power Boiler #1: Ecology => LNB @ 26 tpy; ARD => SCR @ 46 tpy<br>Power Boiler #2: Ecology => SCR @ 54 tpy; ARD => SCR @ 55 tpy<br>Hogged Fuel Boiler #11: Ecology => SCR @ 255 tpy; ARD => SCR @ 255 tpy<br><u>Port Townsend Paper</u><br>Hogged Fuel Boiler: Ecology => no additional controls; ARD => SCR @ 194 tpy<br>Package Boiler: Ecology => no additional controls; ARD => no additional controls<br><u>WestRock-Longview</u><br>Power Boiler #20: Ecology => no additional controls; ARD => SCR @ 295 tpy<br><u>WestRock-Tacoma</u> | |

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| | Power Boiler #6: Ecology => SCR @ 64 tpy; ARD => SCR @ 53 tpy<br>Power Boiler #7: Ecology => SCR @ 457 tpy; ARD => SCR @ 458 tpy<br>Based upon Ecology's estimates and Oregon's cost thresholds, 1,879 tons of $NO_x$ could be reduced annually. Our estimates indicate that an additional 550 tpy reduction could be achieved using this same cost threshold (for an overall reduction of 2,429 tpy).<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations June 24, 2021] | |
| 52 | Although Ecology determined that several $NO_x$ control options would be reasonably cost-effective, it dismissed controls for two primary reasons:<br>*Factors considered for this approach are based on the 2016 Ecology RACT analysis that showed minimal deciview or inverse megameters, Mm-1, (visibility) benefit even if the facility implements substantial controls.*<br>*The RHR requires that states complete an FFA. The FFA does not point to meaningful RH improvement or noticeable benefit toward the reasonable progress goals during this second implementation period, so we determined that no additional controls were reasonable.*<br>Based upon Ecology's 2016 Pulp & Paper RACT Analysis,[1] Ecology has determined that visibility improvements resulting from additional controls at the pulp & paper mills are not enough to warrant their cost, even though Ecology found several control options reasonably cost-effective. There are two fundamental flaws in the Ecology rationale:<br>Visibility is not a "fifth-factor" off-ramp under the Reasonable Progress provisions of the Clean Air Act.<br>In that 2016 analysis, Ecology modeled 2007 baseline actual | See Ecology Responses to Comment #2, #3, #4, and #11. |

[1] We have enclosed comments we sent to Allen Newman of Ecology in 2018 regarding that analysis.

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| | emission rates and the potential RACT emission rates using CMAQ against a "dirty" background. This is contrary to EPA guidance and underestimates the visibility benefits of reducing emissions.<br>Also, Ecology considered the following information as part of its intermediate analysis:<br>The Federal Land Managers (FLMs) have not issued an Adverse Impact Determination for any of the chemical pulp mills in Washington State, as they have for other industries included in Ecology's current Q/d analysis.<br>The amount of RH pollutants from the chemical pulp mills has decreased by 2,362 tpy from the estimated emission averages used in the 2016 RACT Analysis to 2019 EIs.<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations, June 24, 2021] | |
| 53 | The adverse impact argument is irrelevant. The potential for an adverse impact determination only occurs when new emissions from a major source or major modification rise to the level that the FLM has no other recourse. Instead of these rare instances, the facilities under review here are already in existence and have much greater emissions. Due to such ongoing emissions, the Department of the Interior made a determination in 1985 that all Class 1 Areas it administered were experiencing impaired visibility—that determination has not been changed and is supported by current visibility monitoring data. For example, our monitoring data indicates that visibility in Mount Rainier, North Cascades, and Olympic national parks is "fair" and unchanging.<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations, June 24, 2021] | See Ecology Response to Comment #4. |

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| 54 | The emission averages used in the 2016 RACT Analysis were based on 2007 data and are clearly obsolete. While it is encouraging that emissions form the pulp & paper source sector have decreased, they remain significant and likely contribute to the existing visibility impairment at our three national parks in Washington. Predicted visibility impairment below the Regional Haze "glidepath" does not constitute a "safe harbor" that would exempt a state from taking additional measures to make reasonable progress.<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations, June 24, 2021] | The 2007 data indicated a time when the chemical pulp mills were emitting greater amounts of regional haze pollutants than they do today. As noted on page 67 of the 2016 RACT Analysis: Ecology's approach was "based on a survey of average emission reductions using average emission inventory emissions from multiple years, so that average individual unit percent reductions are assumed to be applicable to approximately any given year that the facility operated around this timeframe."<br>Ecology chose years of higher emissions, which yielded higher emission reductions and therefore greater visibility benefit as predicted by the WSU modeling.<br>In other words, if Ecology used more recent data, there would be even less visibility benefit. Ecology is therefore justified in using the more conservative approach, whereas the FLM's suggestion would have shown modeling results of even less visibility benefit than the non-perceptible amounts shown with the 2007 data (<0.05 dv benefit [10.05 Mm-1]). |
| 55 | • Ecology has identified several potential $NO_x$ emission controls that meet its cost-effectiveness thresholds; Ecology should take action to require implementation of these controls in this planning period.<br>• Ecology should consider our analyses of additional emission controls as well as use of the cost-effectiveness threshold established by Oregon.<br>• The 2016 RACT analysis used by Ecology to justify taking no action cannot be used to avoid emission control because visibility is not a "fifth factor" under the Regional Haze provisions of the Clean Air Act. Further, EPA Guidance does not allow modeling against a "dirty" background as was done in that analysis. (We have also noted other significant flaws in that analysis.)<br>[NPS ARD Review of Washington Ecology's Chemical Pulp & Paper Mill FFA Recommendations, June 24, 2021] | Ecology has explained in Chapter 7 of the SIP its rationale to focus on refineries during this implementation period and its justification to prioritize addressing the refineries first. Ecology considers, but is not obligated, to adopt cost thresholds of other states. Each state has unique circumstances to consider as part of the whole in setting cost thresholds.<br>Ecology empathizes with the FLMs about how convenient it would be if every state used the same cost thresholds. However, regional thresholds would not capture the unique circumstances and economies of the individual states. An example of differing economies between WA and Oregon (OR) is that, Washington has a sales tax but no income tax and OR has an income tax but no sales tax. This illustrates that it is inaccurate to assume similar economic conditions across all states.<br>See also Ecology Responses to Comment #2, #4, and #18 to #22. |

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| 56 | In its Washington State Regional Haze 5-year Progress Report, Ecology committed "…to perform a RACT evaluation of one or more source categories. We have evaluated the effects of imposing a RACT level of emission control on the chemical pulp mill combustion sources in Washington." While we agree that the pulp and paper industry is a major contributor to statewide emissions, we note that limiting the analysis to the recovery furnaces and lime kilns captures only 53% of the visibility-impairing pollutants (PM, $SO_2$, $NO_x$) emitted by the facilities evaluated (based upon the 2011 National Emissions Inventory). Power boilers at these facilities are typically the largest emission units, and we recommend that they be included.<br><br>[FLM comments[2] for the Washington State Regional Haze 5-year Progress Report; September 2017; Publication no. 17-02-008] | Ecology has included the RH four-factor analysis requirements for additional boilers (including power boilers) from each of the chemical pulp and paper mills for the current implementation period. |
| 57 | Ecology states that it conducted a "RH RACT analysis." However, by using RACT as a surrogate for Reasonable Progress (RP) under the Regional Haze (RH) Rule, Ecology has introduced "impact of additional controls on air quality" i.e., visibility improvement, as an additional factor for RP. The Clean Air Act does not include visibility improvement as a factor in the RP analysis. Therefore, RACT cannot be substituted for a proper RP analysis.<br><br>[FLM comments for the Washington State Regional Haze 5-year Progress Report; September 2017; Publication no. 17-02-008] | Ecology used input from the 2016 RACT analysis, but not as a surrogate. Instead, Ecology required and obtained four-factor analyses from each of the pulp and paper mills in WA State during this implementation period. Please refer to Chapter 7 of the SIP for an in-depth discussion of how the four-factor analysis and the Washington RACT process are analogous and why Washington is using our RACT process. |
| 58 | Even though limits on fuel sulfur content as low as 0.5% are contained in the Longview Fiber operating permit, Ecology dismisses "Low sulfur fuel selection ($SO_2$)" stating that, "This technology has not been demonstrated in practice at the mills surveyed…" Limiting fuel sulfur content is an established strategy for reducing $SO_2$ emissions from most fossil fuel burning emission units, including those at pulp mills, and should | The two recovery furnaces that use No. 6 fuel oil are Nippon RB#10 and WestRock (WR) Tacoma RF#4. [Note: The chemical pulp mills use the terms recovery boiler (RB) and recovery furnace (RF) interchangeably.]<br>At the Nippon RB#10 unit, supplementary No. 6 fuel oil is used very rarely; primarily during startup, shutdown, and malfunction events. In 2018, it only used #6 fuel oil about 4% of the year.<br>At WR Tacoma RF#4 unit, they only use supplemental oil during startups, |

[2] Ecology is not required to respond to FLM comments regarding the 2017 Progress Report. Comments in this table are intended for the 2021 SIP only. However, to the extent that the FLM comments overlap with the 2016 RACT Analysis, Ecology has included responses to the FLM comments.

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| | have been evaluated.<br><br>[FLM comments for the Washington State Regional Haze 5-year Progress Report; September 2017; Publication no. 17-02-008] | shutdowns, and to help stabilize combustion of black liquor. The mill provided the following information to clarify:<br>"We expounded on the use and purpose of a Kraft Mill's Recovery Boiler/Furnace and the fuels it burns to provide additional information/ understanding for the FLMs. The primary purpose of the recovery boiler is to recover inorganic cooking chemicals from the pulping process so they can be reused. The spent pulp cooking chemicals are called black liquor, and black liquor is the primary fuel for the recovery boiler. When fired in the recovery boiler, the organic portion of the black liquor burns and the resulting heat is used to make steam (which is used in the pulping and papermaking processes) and the inorganic portion is recovered in the form of smelt (which is dissolved to regenerate the pulp cooking chemicals and used to make pulp). Oil is a purchased fuel and is used only as a supplemental fuel. The mill typically burns oil during RB4 startups, shutdowns, and to help stabilize combustion of black liquor. The boiler is limited in the amount of oil it can burn to a 10 percent annual capacity factor (40 CFR 60.44b(c) and Condition A.4 of the AOP). This usage is tracked to ensure that compliance with the capacity factor is met."<br>Ecology also contacted the NWPPA, who received the following cost information from the consultant (All4) who prepared the four-factor analyses for the Kraft pulp mills:<br>"The two furnaces that do not currently fire No. 2 fuel oil are the Nippon Dynawave Recovery Furnace No. 10 and the WestRock Tacoma Recovery Furnace No. 4. Supporting calculations for the $12,000/ton estimate were requested. Fossil fuel is primarily fired in a recovery furnace during startup and shutdown and is not typically fired during normal operation. A 10% capacity factor is a typical assumption for maximum fuel oil firing in a recovery furnace and is often a limit taken by facilities to avoid NSPS Subpart D applicability. An example calculation is included below and demonstrates that the difference in fuel oil cost alone is around $12,000/ton; the cost per ton would be greater if the capital cost related to the fuel switch were included."<br>"**Example fuel oil calculation – switching from 6 oil to 2 oil for a recovery furnace**<br>Fuel oil burners size 600 MMBtu/hr<br>Hours on fuel oil 876 hours per year (10 %capacity)<br>No. 6 oil 50 MMBtu/Mgal<br>Fuel oil burners size 600 MMBtu/hr |

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| | | Hours on fuel oil 876 hours per year (10% capacity)<br>No. 6 oil 150 MMBtu/Mgal<br>1.8 percent sulfur content<br>166 cents/gal (EIA)<br>$ 5,816,640 fuel cost<br>1575 lb/Mgal (AP-42)<br>495.12 tpy $SO_2$<br>No. 2 oil 140 MMBtu/Mgal<br>0.0015 percent sulfur content<br>318 cents/gal (EIA)<br>$11,938,629 fuel cost<br>1425 lb/Mgal (AP-42)<br>0.44 tpy $SO_2$<br>$12,376 cost per ton to switch" |
| 59 | Ecology modeled 2007 baseline actual emission rates and the potential RACT emission rates using CMAQ, and excluded all $NO_x$ reductions and all lime kiln emission reductions. Instead, Ecology should have used a more recent emission inventory and explained that modeling annual emissions against a "dirty" background underestimates the benefits of reducing emissions. It is generally recognized that $NO_x$ emissions in the local climate have an enhanced impact upon visibility impairment and their reductions should not have been excluded. Ecology appears to have set 0.05 dv (98th percentile) as its criterion for what constitutes a significant improvement in visibility. Ecology provides no justification for this criterion. For comparison, EPA used 0.3% change in extinction, which is approximately equal to 0.03 dv, as its significance criterion in its TX FIP. However, in determining if a visibility improvement was adequate, Ecology dismissed greater improvements at six Class 1 Areas:<br><br>[FLM comments for the Washington State Regional Haze 5-year Progress Report; September 2017; Publication no. 17-02-008] | In the 2016 RACT analysis, Ecology focused on the greatest amount of potential regional haze pollutant reductions. NOx and lime kiln emissions reductions were minimal as supported by Chapter 4 (specifically: Tables 33 and 34 and Figures 4, 5, 6, and 7) of the 2016 RACT Analysis. These emissions were in the current four-factor analyses that Ecology required from all the chemical pulp mills in Washington State.<br>Ecology did not set a specific visibility criterion threshold in the 2016 RACT analysis:<br>Neither of the two guidance issued (August 20, 2019, and July 8, 2021) by EPA for the current implementation period suggest that states should use a criterion of 0.03 dv [10.03 Mm-1].<br>However, Ecology is focusing on refinery emissions first as they are the vast majority of emissions. Please see Ecology Response to comment #4.<br>Ecology addressed the "dirty background" and "2007" emissions comments in Ecology Response to Comments #3 and #11 respectively. |

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| 60 | In Section 6. Estimated Costs, Ecology states:<br>Prior to implementing a RACT limit, Ecology intended to work closely with the source category sources to develop a more accurate cost evaluation. As the visibility improvement modeling presented in Chapter 5 and Appendix C shows minimal visibility improvement, Ecology does not believe that it is necessary to develop mill specific cost estimates for implementing the evaluated RACT limits.<br>Considering the magnitude of the emissions from these facilities and the differences among them, we recommend that future evaluations be conducted on a facility-by-facility basis.<br>[FLM comments for the Washington State Regional Haze 5-year Progress Report; September 2017; Publication no. 17-02-008] | Ecology received detailed four-factor analysis from each of the chemical pulp and paper mills for the current implementation period, which includes facility-by-facility analyses of costs. |
| 61 | FLM comment for: Nippon Dynawave Packaging Company<br>**ARD Comments**<br>**Low-NOX Burners**<br>The only cost information provided is in Ecology's "all controls" workbook. (Ecology should provide the background for its analysis.) Ecology estimated that adding Low-$NO_X$ Burners (LNB) would exceed its threshold for Power Boiler Nos. 6 and 7 but would be well below its threshold for Power Boiler 9. (Ecology's estimates were below the Oregon threshold for all three power boilers.)<br>**SNCR**<br>NDPC assumed a control efficiency of 45% and applied a retrofit factor = 1.0 for adding SNCR to these three boilers. The NDPC and Ecology cost-effectiveness estimates for SNCR exceeded the Ecology threshold for all three power boilers. We applied the CCM methods to these three power boilers with a CCM default retrofit factor of 1.0. The cost-effectiveness of adding SNCR exceeded the Ecology cost-effectiveness threshold for all three power boilers, but, for Power Boiler #9, did not exceed the Oregon threshold.<br>**ARD estimates** (We used the CCM default retrofit factor = 1.0.):<br>Power Boiler #6: $0.2 million to remove 17 ton/yr for a cost- | Please see Ecology Responses #2, #4, and #12. |

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| | effectiveness of $11,600/ton<br>Power Boiler #7: $0.3 million to remove 25 ton/yr for a cost-effectiveness of $10,800/ton<br>Power Boiler #9: $0.6 million to remove 88 ton/yr for a cost-effectiveness of $6,700/ton<br>**SCR**<br>**NDPC** assumed 90% control and applied the maximum retrofit factor of 1.5 for addition of SCR. The NDPC cost-effectiveness estimates for SCR exceeded the Ecology threshold for all three power boilers. It appears that Ecology accepted NDPC's retrofit factors and nevertheless arrived at cost-effectiveness values for adding SCR to Power Boiler #9 that is below Ecology's $6250/ton cost-effectiveness threshold. The cost-effectiveness of adding SCR exceeded the Ecology cost-effectiveness threshold for Power Boilers #6 & #7. We applied the CCM methods to these three power boilers with a CCM default retrofit factor of 1.0 because neither NDPC nor Ecology provided the level of justification recommended by the CCM. Adding SCR to Power Boiler #9 did not exceed the Ecology threshold. (Adding SCR to Power Boiler #7 did not exceed the Oregon threshold.)<br>**ARD Comments**: NDPC applied a retrofit factor of 1.5 for adding SCR to this boiler. Nevertheless, Ecology arrived at a cost-effectiveness value for adding SCR that is below Ecology's $6250/ton cost-effectiveness threshold. We applied the CCM methods to this boiler with a CCM default retrofit factor of 1.0 because neither NDPC nor Ecology provided the level of justification recommended by the CCM. The cost-effectiveness of adding SCR was even more evident at slightly above $4,000/ton.<br>**ARD Comments:** While we are aware that quaternary air has been added to some recovery furnaces, we suggest that this technology can be deferred to the next planning period.<br>**Conclusions & Recommendations**<br>Ecology estimated that adding Low-$NO_X$ Burners to Power Boiler #9 would be cost-effective and remove 97 ton/yr at an | |

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| | annual cost of $0.3 million at $2800/ton.<br>The cost-effectiveness of adding SNCR exceeded the Ecology cost-effectiveness threshold for all three power boilers, but, for Power Boiler #9, did not exceed the Oregon threshold.<br>Adding SCR to Power Boiler #9 is cost-effective based upon either the Ecology or Oregon threshold and should be implemented; $NO_X$ emissions could be reduced by about 175 tons per year.<br>Adding SCR to Hogged Fuel Boiler No. 11 is cost-effective and should be implemented; $NO_X$ emissions could be reduced by about 850 tons per year.<br>$NO_X$ controls for the Recovery Furnace can be deferred to the next planning period.<br>Application of the Ecology cost-effectiveness thresholds would result in addition of SCR to Power Boiler #9 and to the Hogged Fuel Boiler #11 with a combined $NO_X$ reduction of 1023 ton/yr.<br>Application of the Oregon cost-effectiveness threshold would result in addition of LNB to Power Boiler #6 and SCR to Power Boiler #7 with a combined $NO_X$ reduction of 69 ton/yr.<br>[FLM comments[3] for Nippon (June 22, 2021)] | |
| 62 | FLM comments for: Packaging Corporation of America (PCA) Wallula Mill<br>**Nos. 1 and 2 Power Boilers**<br>**ARD Comments**<br>**Low-NOX Burners**<br>The only cost information provided is in Ecology's "all controls" workbook. (Ecology should provide the background for its analysis.) Ecology estimated that adding Low-$NO_X$ Burners (LNB) would be below its threshold for Power Boilers #1 & #2. Adding LNB to these two boilers could reduce $NO_X$ emissions by over 50 | Please see Ecology Responses #2, #4, and #12. |

[3] Note: Ecology did not relist in this response to comment space, the lengthy quotes from the pulp mills four-factor Analyses found in the FLMs site specific comments. The four-factor analyses are already provided elsewhere in the SIP. Ecology is also unable to embed the tables from the FLM's comments and workbook spreadsheets into this response table. Therefore, Ecology lists only relevant portions of the FLM site specific comments, which are often restated elsewhere in the FLM's other comments.]

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| | tons per year.<br>**SNCR**<br>PCA assumed a control efficiency of 45% and applied a retrofit factor = 1.0 for adding SNCR to these two power boilers. The NDPC and Ecology cost-effectiveness estimates for SNCR exceeded the Ecology and Oregon thresholds for both power boilers. We applied the CCM methods to these three power boilers with a CCM default retrofit factor of 1.0. The cost-effectiveness of adding SNCR exceeded the Ecology and Oregon thresholds for both power boilers.<br>**SCR**<br>**ARD Comments**: PCA assumed 90% control and applied the maximum retrofit factor of 1.5 for addition of SCR. It appears that Ecology accepted PCA's retrofit factors and arrived at cost-effectiveness values for adding SCR to Power Boilers #1 & #2 that are above Ecology's $6250/ton cost-effectiveness threshold. (Adding SCR to Power Boiler #2 did not exceed the Oregon threshold). We applied the CCM methods to these two power boilers with a CCM default retrofit factor of 1.0 because neither PCA nor Ecology provided the level of justification recommended by the CCM. The cost-effectiveness of adding SCR exceeded the Ecology cost-effectiveness threshold for Power Boilers #1 & #2 but did not exceed the Oregon threshold. Our analysis indicates that SCR could meet the Oregon cost-effectiveness threshold for both power boilers. We also estimate that adding SCR to these two boilers could reduce $NO_X$ emissions by about 100 tons per year.<br>**Hogged Fuel Boiler**<br>**SNCR**<br>**ARD Comments**: PCA assumed 35% control and applied a retrofit factor of 1.5 for adding SNCR to this boiler. Ecology arrived at cost-effectiveness values for adding SNCR that are above Ecology's $6250/ton cost-effectiveness threshold, but below the Oregon threshold. We applied the CCM methods to this boiler with a CCM default retrofit factor of 1.0 because neither PCA nor Ecology provided the level of justification | |

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| | recommended by the CCM. The cost-effectiveness of adding SNCR was slightly below $6,000/ton for SNCR.<br>**SCR ARD Comments:** PCA assumed 90% control and applied a retrofit factor of 1.5 for adding SCR to this boiler. Ecology arrived at cost-effectiveness values for adding SCR that are above Ecology's $6250/ton cost-effectiveness threshold, but below the Oregon threshold. We applied the CCM methods to this boiler with a CCM default retrofit factor of 1.0 because neither PCA nor Ecology provided the level of justification recommended by the CCM. The cost-effectiveness of adding SCR was slightly below the Ecology threshold at $5,800/ton. Adding SCR to the Hogged Fuel Boiler is cost-effective and should be implemented; $NO_X$ emissions could be reduced by about 250 tons per year.<br>**Results & Conclusions**<br>Application of Ecology's cost-effectiveness threshold could reduce emissions from Power Boilers #1 & #2 by over 50 tons per year by installation of Low-$NO_X$ Burners. Addition of SCR could reduce $NO_X$ from the Hogged Fuel Boiler by 255 tons per year.<br>Application of Oregon's cost-effectiveness threshold could reduce emissions from Power Boilers #1 & #2 by about tons per year by installation of SNCR.<br>[FLM comments for PCA (June 23, 2021)] | |
| 63 | FLM Comments for: Port Townsend Paper (PTP)<br>**ARD Comments**<br>**Low-NOX Burners**<br>The only cost information provided is in Ecology's "all controls" workbook. (Ecology should provide the background for its analysis.) Ecology estimated that adding Low-$NO_X$ Burners (LNB) to Biomass Boiler #10 would reduce emissions by 50% (15 ton/yr) and cost-effectiveness (over $24,000/ton) would be above its (and Oregon's) threshold for Biomass Boiler #10.<br>**SNCR**<br>PTP assumed a control efficiency of 35% and applied a retrofit | Please see Ecology Responses #2, #4, and #12. |

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| | factor = 1.5 for adding SNCR to Biomass Boiler #10. The PTP and Ecology cost-effectiveness estimates for SNCR exceeded the Ecology and Oregon thresholds. We applied the CCM methods to these boilers with a CCM default retrofit factor of 1.0 to Biomass Boiler #10. The cost-effectiveness of adding SNCR exceeded the Ecology threshold but not the Oregon threshold.<br>**SCR**<br>PTP applied a retrofit factor of 1.5 for adding SCR to Biomass Boiler #10. Ecology arrived at cost-effectiveness values for adding SCR that are above Ecology's $6250/ton cost-effectiveness threshold and above the Oregon threshold. We applied the CCM methods to Biomass Boiler #10 with a CCM default retrofit factor of 1.0 because neither PTP nor Ecology provided the level of justification recommended by the CCM. The cost-effectiveness of adding SCR was slightly over $8,000/ton. Adding SCR to Biomass Boiler #10 is cost-effective and should be implemented; $NO_X$ emissions could be reduced by about 200 tons per year.<br>**Conclusions & Recommendations**<br>None of the control options met Ecology's cost-effectiveness thresholds.<br>The cost-effectiveness of adding SCR to Biomass Boiler #10 is below Oregon's threshold and could remove almost 200 ton/yr.<br>[FLM comments for Port Townsend Paper (June 23, 2021)] | |
| 64 | **ARD Comments:**<br>WRL evaluated addition of SCR and assumed a retrofit factor of 1.5 with inadequate justification. WRL redacted the unit costs of operator labor, reagent (urea), electricity, and catalyst replacement, but we were able to back-calculated reagent and electricity costs and used default values for labor and catalyst values instead—this yielded annual SCR costs lower than the costs estimated by WRL. We estimated that SCR could reduce $NO_X$ emissions by 486 ton/yr at an annual cost of $2.9 million for a cost-effectiveness of $6000/ton.<br>It appears that WRL and Ecology assumed that SCR would be | Please see Ecology Responses #2, #4, and #12. |

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| | operated in addition to the existing SNCR and did not account for the cost-saving that would result from cessation of SNCR operation. We applied the CCM to estimate the discontinued SNCR direct operating costs and subtracted them from the operating costs and annual costs of a new SCR system applied to the original uncontrolled $NO_X$ emissions.<br>**Results & Conclusions**<br>The replacement of the existing SNCR with new SCR would remove an additional 293 ton/yr at an additional cost of $2.4 million for an incremental cost.<br>[FLM Comments for: WestRock Longview (WRL) Mill] | |
| 65 | FLM Comments for: WestRock Tacoma Mill<br>**ARD Comments**<br>**Power Boiler No. 6**<br>**Low-NOX Burners**<br>It appears that Ecology based its estimates on a 48% $NO_X$ reduction by the Low-NOx Burners installed in 2018 at WestRock Tacoma boiler #6 (at $6,302/ton) as a basis for determining reasonable cost, the only cost information provided is in Ecology's "all controls" workbook. Ecology should provide the background for its analysis.<br>**SNCR**<br>**WRL and Ecology evaluated addition of SNCR to reduce $NO_X$ by 45% and assumed a retrofit factor of 1.0.**<br>Although WRL redacted the unit costs of fuel, reagent (urea), water and electricity, we were able to back-calculate fuel, reagent, and electricity costs and used default values for fuel costs instead—this yielded annual SNCR costs higher than the costs estimated by WRL because our application of the CCM yielded a larger normalized stoichiometric ratio and higher reagent usage.<br>**SNCR**<br>It appears that WRL based its estimates on emissions prior to addition of LNB and the resulting values should be disregarded. Addition of SNCR exceeds the Ecology cost-effectiveness | Please see Ecology Responses #2, #4, and #12. |

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| | threshold but not the Oregon threshold.<br>**SCR**<br>WRL and Ecology evaluated addition of SCR at 90% control and assumed a retrofit factor of 1.5 with inadequate justification.<br>Although WRL redacted the unit costs of operator labor, reagent (urea), electricity, and catalyst replacement, we were able to back-calculate reagent and electricity costs and used default values for labor and catalyst values instead—this yielded annual SCR costs lower than the costs estimated by WRL. (We used the CCM default retrofit factor = 1.0.)<br>It appears that WRL based its estimates on emissions prior to addition of LNB and the resulting values should be disregarded. Addition of SCR exceeds the Ecology cost-effectiveness threshold but not the Oregon threshold.<br>**Power Boiler No. 7**<br>**SNCR**<br>WRL and Ecology evaluated addition of SNCR at 35% control and assumed a retrofit factor of 1.5 with inadequate justification.<br>Although WRL redacted the unit costs of fuel, reagent (urea), water, electricity, and ash disposal, we were able to back-calculate fuel, reagent, and electricity costs and used default values for fuel and ash disposal costs instead—this yielded annual SNCR costs lower than the costs estimated by WRL primarily because we used the CCM default retrofit factor = 1.0.<br>**SCR**<br>WRL and Ecology evaluated addition of SCR at 90% control and assumed a retrofit factor of 1.5 with inadequate justification.<br>Although WRL redacted the unit costs of operator labor, reagent (urea), electricity, and catalyst replacement, we were able to back-calculate reagent and electricity costs and used default values for labor and catalyst values instead—this yielded annual SCR costs lower than the costs estimated by WRL. (We used the CCM default retrofit factor = 1.0.)<br>Conclusions & Recommendations | |

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| | Application of SNCR to Power Boiler #6 would meet the Oregon threshold for reasonableness.<br>Application of SCR to Power Boiler # would meet the Ecology threshold for reasonableness.<br>Addition of these controls at WestRock Tacoma could reduce combined $NO_X$ emissions by 489 tons per year.<br>[FLM comments for WestRock Tacoma (June 23, 2021)] | |
| 66 | The costs of potential emission controls are consistently overestimated in the four-factor analyses for this industry. This results from:<br>• Unsupported retrofit factors (> 1) • Overestimated fuel costs<br>• Improperly handled control equipment operating hours (entered directly)<br>• Incorrect CEPCI (too low)<br>• Normalized stoichiometric ratio overestimated for SNCR on solid fuel boilers<br>• Based on our analysis a number of the emission reduction technologies evaluated are below the state's cost effectiveness threshold and should be required. We will follow up with detailed analyses.<br>• We recommend that Ecology consider setting a cost-effectiveness threshold similar to the $10,000/ton threshold established by Oregon. This would promote a "level playing field" for Pulp & Paper in the region.<br>Based upon our application of the methods described in EPA's Control Cost Manual, the reduced control costs and resulting improved cost-effectiveness indicate that additional emission units should be controlled.<br>[6/16/2021 NPS Formal Consultation Call with Washington State Department of Ecology for Regional Haze SIP Development] | Ecology addressed these comments in Ecology Response to Comments #2, #12, and #15. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 67 | Visibility Benefit:<br>Washington identifies several technically feasible and cost-effective emission control opportunities for pulp & paper facilities in the draft SIP and chooses not to require these controls based on a 2016 visibility benefit study.<br>This study is both irrelevant to the SIP and technically flawed.<br>Individual facility emission control decisions should be based upon the four factors identified in the Clean Air Act and not introduce visibility benefit as a fifth factor.<br>The 2016 modeling study improperly modeled individual controls against a dirty background.<br>Adverse Impact Determination by FLMs for a specific facility are not relevant to reasonable progress determinations.<br>While the degree of visibility improvement as a result of emission controls was considered in BART determinations, the CAA explicitly omits this factor from Reasonable Progress determinations. This explicit omission recognizes the cumulative nature of visibility impairment and the eventual necessity of controlling numerous small sources to achieve the ultimate visibility goal of no human- caused impairment. Based upon Ecology's 2016 Pulp & Paper RACT Analysis, Ecology has determined that visibility improvements resulting from additional controls at the pulp & paper mills are not enough to warrant their cost. There are two fundamental flaws in the Ecology rationale:<br>• Visibility is not a "fifth-factor" "off-ramp" under the Reasonable Progress provisions of the Clean Air Act.<br>• In that 2016 analysis, Ecology modeled 2007 baseline actual emission rates and the potential RACT emission rates using CMAQ against a “dirty” background. This is contrary to EPA guidance and underestimates the visibility benefits of reducing emissions. The adverse impact argument is irrelevant. The potential for an adverse impact determination only occurs when new emissions from a major source or major modification rise to the level that the FLM has no other recourse. | Ecology provided detailed responses to these comments in Ecology’s Response to Comments #3, #4, #11, and #16.<br>Ecology appreciates the input provided by the FLMs. However, we have the discretion to determine what sources of information are, or are not, relevant to the WA State 2021 regional haze SIP. Ecology has carefully followed EPA guidance and consulted with EPA staff throughout the entire SIP development process. Both for the reasons stated in the 2021 SIP and provided in these response to comments, Ecology is justified in its use of available information and the decisions it makes from them. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| | Instead of these rare instances, the facilities under review here are already in existence and have much greater emissions. Due to such ongoing emissions, the Department of the Interior made a determination in 1985 that all Class 1 Areas it administered were experiencing impaired visibility—that determination has not been changed and is supported by current visibility monitoring data. For example, our monitoring data indicates that visibility in Mount Rainier, North Cascades, and Olympic National Parks is "fair" and unchanging.<br><br>[6/16/2021 NPS Formal Consultation Call with Washington State Department of Ecology for Regional Haze SIP Development] | |
| 68 | Kudos to Washington for being the first western state to engage with the NPS on source selection back in 2018 and for selecting a reasonable set of sources to evaluate.<br><br>[6/16/2021 NPS Formal Consultation Call with Washington State Department of Ecology for Regional Haze SIP Development] | The FLMs might not agree with all of Ecology's decisions, but we appreciate the FLMs acknowledgment of Ecology's extensive consultation efforts.<br>See also Ecology Response to Comment #1. |
| 69 | Source selection: NPS initially recommended 19 sources for consideration. Washington engaged with us early and selected 17 sources for analysis including 15 that we originally recommended. We are satisfied that Washington considered the point sources with the greatest potential to affect visibility in our Class 1 Areas. | Thank you for letting us know that you are satisfied with our consideration of point sources. The method we used to select sources is described in Chapter 7 of the SIP submittal. |

# A3. Federal Land Manager comments for Petroleum Refineries and Ecology's responses

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 1 | First, some general feedback on the "Refineries" section of your draft chapter 11 (see attachment):<br><br>I really like the comparison of emissions/bbl among the US refineries--i had not seen that sort of thing before and it will be helpful to us as we look at other refineries across the nation.<br><br>While we bureaucrats understand acronyms like "AO" and "FFA", it would probably be a good idea to define them for the public.<br><br>It was not until i had reviewed multiple refinery reports that i began to realize how Ecology selected emission units within a refinery for review. I found your approach to evaluate "each fluid catalytic cracking unit (FCCU), boiler greater than 40 MMBtu/hr, and heater greater than 40 MMBtu/hr" makes sense in dealing with facilities with so many emission units and i recommend that you state that explicitly in your draft SIP. I also appreciate that you are willing to add the calciners at BP-Cherry Point.<br><br>I recommend that you explain why Ecology is only evaluating NOX emissions and not SO2.<br><br>Although i know of no regulatory basis for exempting emission units modified after 2005, i am K with the results of applying that filter.<br><br>It is my understanding that you intend to address RP for the refinery sector via a RACT action--is that correct? What is your timeline for that--can you complete that action in time to allow us to review it and for Ecology to include it in your SIP submittal? | Below are the responses to the comments given:<br><br>First bullet – no response required<br><br>Second bullet – Ecology will review the document to ensure that the initial use of an acronym is spelled out.<br><br>Third bullet – Ecology will make will add in the refinery sections introduction language that states what equipment is being evaluated.<br><br>Fourth bullet – an explanation on what equipment was selected for further evaluation will be added<br><br>Fifth bullet – this will be part of the explanation on the fourth bullet<br><br>It is Ecology's intention to start a RACT process for the refineries. The RACT process requires rule making and will not be completed before the Draft RH SIP is submitted to EPA. The rule making itself will be open to the public and it is encouraged for all stake holders (which include the FLMs) to participate. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 2 | "I agree that BP has overestimated costs of NOx controls and commend Ecology for using the Control Cost Manual (CCM) to conduct its independent analysis. I offer these observations in support of your approach. (Please see the attachment for more specifics.):<br><br>The "Jacobs" report upon which BP based its analysis is too old (per the CCM). The method BP used to escalate costs from the Jacobs report were not adequately explained.<br><br>BP appears to have included costs of lost production without explaining how they relate to conducting modifications during turnarounds.<br><br>BP has overestimated Capital Recovery Costs and reagent costs."<br><br>NPS's comments:<br><br>The adverse impact determination was dated December 15, 2016 and was never withdrawn.(Ecology will change)<br><br>The NPS identify various flaws in BPs cost analysis | The observation support Ecology's planned approach. For this reason no responses are required. |
| 3 | I agree that Phillips 66 (P66) has overestimated costs of NOx controls and commend Ecology for using the Control Cost Manual (CCM) to conduct its independent analysis. I offer these observations in support of your approach. (Please see the attachment for more specifics.)<br><br>The report upon which Phillips 66 based its analysis is too old (per the CCM).<br><br>P66 has overestimated Capital Recovery Costs.<br><br>NPS's comments:<br><br>The NPS identify various flaws in Phillip 66's cost analysis | The observation support Ecology's planned approach. For this reason no responses are required. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 4 | I agree that Marathon has overestimated costs of NOx controls and commend Ecology for using the Control Cost Manual (CCM) to conduct its independent analysis. I offer these observations in support of your approach. (Please see the attachment for more specifics.)<br><br>Marathon has overestimated Capital Recovery Costs and reagent costs.<br><br>NPS's comments:<br><br>The NPS identify various flaws in Tesoro's cost analysis | The observation support Ecology's planned approach. For this reason no responses are required. |
| 5 | "I agree that Shell has overestimated costs of NOx controls and commend Ecology for using the Control Cost Manual (CCM) to conduct its independent analysis. I offer these observations in support of your approach. (Please see the attachment for more specifics.)<br><br>Shell's cost analyses are unsupported.<br><br>Shell has overestimated Capital Recovery Costs.<br><br>I have attached a workbook that includes data from the 2019 emission inventory provided by NWCAA."<br><br>Don's comments:<br><br>Need copies of support data from Shell<br><br>Retrofit Factor justification needed<br><br>Should use current interest rate of 3.25%<br><br>Need federally enforceable limit on equipment life (Erie City Boiler)<br><br>Noted FCCU SO2 of 142 tpy | The observation supports Ecology's planned approach. For this reason no responses are required for the first section. Open bullets responses are given below.<br><br>2019 emission inventory with Shell and Ecology's reviews highlighted in yellow<br><br>Ecology plans to perform an engineering study on the three turbines and may set lower limit based on RACT<br><br>Ecology: FLM's comments will be included in appendix. |
| 6 | Finally, we have a question regarding Chapter 10 of the draft SIP. On page 5, the SIP refers to "state oil and gas emissions control programs". Can you explain what this is referring to? | This is actually 40 CFR 60, subpart OOOO requirements. This does contain transportation requirements for movement of natural gas. Also some information is provided by the Western Regional Air Partnership and it may be more relevant to other western states.<br><br>It is Ecology's intent to clarify this point and correct any inconsistencies. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 7 | Refineries: This industry is responsible for a significant portion of haze causing air pollution affecting NPS Class 1 Areas in Washington. Emission control opportunities are likely technically feasible and cost effective. All technically feasible, cost-effective controls that can reduce haze causing emissions from sources affecting visibility in Class 1 Areas should be required in this planning period.<br>For example, the top two sources contributing to visibility impairment at North Cascades National Park are the BP Cherry Point and Tesoro Northwest Refineries.<br>NPS ARD staff provided technical review of the Refinery sector four-factor analyses to Washington Ecology staff in November, 2020. We support Ecology's use of the EPA Cost Control Manual to correct facility/consultant estimates when calculating the cost-effectiveness of technically feasible controls. We agree that SCR is likely cost effective and would be a robust approach to reducing NOx emissions in the region. | Ecology received four-factor analyses from the refineries concluding that additional emission controls were not reasonable. Ecology then evaluated emission controls using the EPA Control Cost Manual (EPA Manual) with a retrofit factor of 1.0. The difference in the results between the refineries' values and the EPA Manual's values were enough that Ecology concluded that a more in depth analysis is necessary. Please refer to Chapter 7 of the SIP for an in depth discussion of how the four-factor analysis and the Washington RACT process are analogous and why Washington is using our RACT process.<br>It is important to note that the refineries have strongly disputed the EPA Control Cost Manual's application to refinery emissions. The refineries contend that the worksheet for SCR systems is not applicable to their facilities and grossly underestimate the actual cost to install the control devices.<br>Thus, the accuracy, validity, and exactness of the results from the four-factor analyses submitted by industry and the EPA Control Cost Manual by Ecology have unresolved questions. Ecology is proceeding with a rigorous analysis to resolve those questions or address concerns.<br>If the RACT analysis determines that reasonable control equipment is available, Ecology will make a determination requiring the reasonable controls. The determination will identify what new emission equipment will be required, what facility equipment will be required to install the new control equipment, and timeframes in which to install the equipment. |
| 8 | Reliance on the state RACT process is not appropriate. In fact, this approach circumvents Regional Haze Rule by avoiding:<br>• established timelines,<br>• FLM involvement,<br>• and four-factor based criteria for requiring controls.<br>States should have sufficient authority to implement any SIP that the state adopts.<br>WA should not need to fall back on a RACT rule that may provide less stringent controls and undermine the ability for the FLMs to provide input on controls. | Please refer to Chapter 7 of the SIP for an in depth discussion of how the four-factor analysis and the Washington RACT process are analogous and why Washington is using our RACT process.<br>Regarding avoiding established timelines: the Regional Haze Rule (RHR) allows implementation of identified reasonable controls in future planning periods. Regardless of the method used to determine reasonableness (e.g., RACT or four-factor analysis), the implementation of most reasonable emission control equipment at refineries would need to occur during a scheduled maintenance shutdown for the cost to be reasonable. If the facility were to shut down only for the installation of control equipment, the costs would be unreasonable. Thus fitting the control installation into the maintenance schedule may result in identified equipment installation occurring in future implementation periods. The installation of control equipment will occur at the same time |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| | | using either the RACT process or the four-factor analysis process. Ecology will remain engaged with the FLMs during the RACT process. To establish the equipment requirements and timeframes for installation, the RACT process includes the cost and emission reduction analysis. Ecology will have various public comment periods and Ecology will solicit FLM comments. |

# A4. Federal Land Manager comments for Cement industry and Ecology's responses

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 1 | In Chapter 11, page 16, the discussion on potential NOx controls at Ash Grove says:<br><br>"Selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) emission control systems are two potentially viable methods of reducing NOX emissions. The exit stack temperature at the facility is typically around 350°F. This stack temperature is less than the typical SCR operation temperature and requires additional heating to 650°F. The temperature is significantly lower than optimal SNCR temperatures and requires heating, which generates more NOx."<br><br>-- We note that SNCR would not be located at the exit stack, so the temperature at that point would not preclude SNCR. Typically on a cement kiln the reagent would be injected into the kiln, not downstream at the exit stack. | Ecology acknowledges this comment and is working with the facility to gather additional information. The original analysis was for a SCR system and not for a SCR and SNCR system. Resolution of this issue will be added to the proposed RH SIP when opened for formal public comment. |
| 2 | On page 17, the discussion says: "The facility is located on a confined property with very little available area to install new equipment. The facility would need to move and relocate existing facilities in a vertical fashion to free up space. Another option would be to reduce the space allowed for stockpiles, but this would result in potential operational impacts and increased vessel traffic to deliver materials more frequently."<br><br>-- We have not previously encountered a cement plant that did not have sufficient space for an SNCR system. The primary components of an SNCR system are reagent tanks and an injection system. The analysis should include an evaluation from an SNCR vendor to determine whether installation of a system is physically feasible. | Ecology acknowledges this comment and is working with the facility to gather additional information. The original analysis was for a SCR system and not for a SCR and SNCR system. Resolution of this issue will be added to the proposed RH SIP when opened for formal public comment. |

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 3 | **Cement**<br>Ash Grove Cement has approved 30-day NOx limit of 5.1 lb/ton clinker and an installed SNCR system used on an as-needed basis.<br>Other cement plants with SNCR have substantially lower limits (e.g., CEMEX Lyons at 1.85 lb/ton clinker).<br>The draft SIP defers evaluation of NOx reductions from requiring SNCR to next planning period because state's Class 1 Areas are making progress.<br>2028 projections below the URP glidepath do not represent a "safe harbor" for avoiding otherwise reasonable emission controls.<br>As SNCR is clearly reasonable, its routine use should be required to reduce emissions in this planning period. | Ecology detailed in Chapter 7 of the SIP that it is using the requirements in the Consent Decree (CD) between EPA and Ash Grove Cement as federally enforceable emission requirements. Ash Grove Cement has also submitted a permit modification request to incorporate an SNCR system at the facility. The permitting authority for the facility, Puget Sound Clean Air Agency (PSCAA), has not processed the permit modification request at this time. PSCAA has some concerns with the application as submitted. Ecology is working with PSCAA and the cement plant to facilitate to resolve the concerns. PSCAA can issue the permit requiring a SNCR system once the issues are resolved (following statutory requirements). |

# A5. Federal Land Manager comments for the Glass Industry and Ecology's responses

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 1 | I also have a question regarding the Cardinal FG Company glass facility. Chapter 11 of the draft SIP indicates that the company has submitted an application to modify the facility's permit and will install an SCR system. According to the SIP, NOX at the SCR inlet will be 437.5 lbs/hr and 49.1 lb/hr at the SCR outlet, for an emissions reduction of 88%. According to the permit technical support document, Tech Support Doc 20-3409TSD.pdf page 8, the SCR will have a "minimum" efficiency of 80%, and the emissions rate will be 1.63 lb/ton glass and 101.1 lb/hr (24-hour average). Maybe I am misunderstanding this, but it seems like there is some inconsistency here. Can you clarify what the NOx removal efficiency will be with SCR? Also, we are aware of a glass facility in New Jersey that was required to install an SCR system and achieve an emissions rate of 1.2 lb/ton of glass with a 90% control efficiency. I have attached a copy of the settlement announcement for your reference. | The facility has requested the permit modification numbers in order to keep the facility below PSD permit levels. This will allow for the recension of the current PSD permit. This permit modification was on a voluntary basis, so the permittee established the technical requirements.<br><br>The facility will operate the SCR system in the manner required by the newly modified permit and the manufacturer's operating requirements.<br><br>It is expected that the efficiency of the system will be greater than 80%, but the permitted levels will be at 80%.<br><br>Ecology does acknowledge that higher efficiency can be achieved. With the facility doing this change on a voluntary basis, Ecology is accepting this change in regards to RH emission reductions. |
| 2 | Glass Manufacturing.<br><br>Cardinal FG Company Winlock is installing SCR for NOx control in 2021. NOx annual limits will be reduced by almost 600 tons.<br><br>We appreciate the company's voluntary installation of controls and reduction in haze-causing pollutants. | Ecology also appreciates Cardinal FG Company Winlock installing an SCR emission control device at their facility. Ecology would also like to recognize the Southwest Clean Air Agency (SWCAA), the permitting authority, for processing this permit modification and providing pertinent information to us. |

# A6. Federal Land Manager comments for the Aluminum Industry and Ecology's responses

| # | Federal Land Manager Comment | Ecology Response |
|---|---|---|
| 1 | Aluminum production: We appreciate Washington's stipulation through Agreed Orders that Alcoa facilities will need to conduct complete four-factor analyses if they come out of curtailment. We request notification and opportunity to review the analyses if this occurs. | Ecology will add the FLMs to the appropriate ListServs and will notify the FLMs as opportunities to engage and respond occur on any four-factor analyses submitted under the Agreed Order for the Alcoa facilities. |

# Appendix B. IMPROVE Sites

This appendix contains additional information for the six IMPROVE sites that measure visibility impairment for the eight mandatory Class I Areas in Washington. The supplemental information includes nearby populations, industrial centers, and wind patterns.

## Olympic IMPROVE Site: OLYM1

### Nearby Population/Industrial Centers and Local Sources

Because of the size of the Olympic National Park, different areas may be affected by different sources. For the northeastern National Park area, where the OLYM1 monitoring site is located, nearby industrial and urban emission sources that most immediately affect the area are in Port Angeles, 35 km (20 mi) west, emissions from which may include residential woodstove emissions. Other portions of the eastern National Park area are across Puget Sound from the Seattle metropolitan area 50 km (30 mi) to the east and downwind for prevailing west wind conditions. For the western Park area including the Coastal section, there are no additional large source areas, although there may be timber and shipping related industries.

### Wind Patterns

Prevailing winds at well-exposed locations near the northwestern U.S. coast are generally from the north or northwest throughout the year and especially in the summer months, a consequence of the semi-permanent high pressure that lies off the Pacific Coast. Southerly and easterly winds can occur during the winter, when the Pacific High moves southward and weakens. This pattern is indicated in monthly Quillayute Washington wind roses for summer months, which show the prevalence of westerly coastal winds. Winter Quillayute Washington wind roses may be more influenced by local diurnal flows as air drains to the west off the slopes of the Olympic range in the absence of strong opposing western synoptic flow.

The Olympic Mountains present an unusual near-circular obstruction to westerly winds, which consequently tend to divide at low levels and flow to the north and south, converging on the lee side, where the OLYM1 IMPROVE site is located. At times, channeling and compression of westerly winds the Strait of Juan de Fuca can result in high speed “Strait Winds”. Rising motions above the low-level convergence zone produce clouds and precipitation that may affecteastern portions of Olympic National Park to some extent. Near the IMPROVE site, resulting westerly flow is from the direction of Port Angeles 35 km (20 mi) west of the site. In the western National Park area and the Coastal area there will be a more direct effect from the ocean including periodic sea and land breezes. These areas are also sheltered and generally upwind from anthropogenic sources around Puget Sound that have more direct impact on eastern Park areas.

Potential local transport routes towards the OLYM1 site include transport or anthropogenic components from the west, the direction of Port Angeles. Transport from the heavily populated Seattle area on the east side of Puget Sound may occur during infrequent easterly wind conditions.

## Inversions/Trapping

Temperature inversions are relatively common in the greater Puget Sound area that includes northeastern National Park locations represented by OLYM1. In wintertime, the common situation is a surface based radiation inversion that can persist until ventilated by an incursion of marine air from the Pacific. In the extended summer months, May to October, the common inversion condition over the eastern Pacific is a subsidence inversion caused by the persistent sub-tropical high-pressure system. Typical inversion heights are 300 to 600 m (1,000 to 2,000 ft), and the OLYM1 monitoring site may be near this height much of the time. In western National Park areas the summertime subsidence inversion, aided by a diurnal sea/land breeze is likely, more so than the wintertime surface inversion.

# North Cascades IMPROVE Site: NOCA1

## Nearby Population/Industrial Centers

The northern Puget Sound area near the mouth of the Skagit River is ~ 100 km (60 mi) west of the NOCA1. The city of Seattle is 160 km (100 mi) southwest.

## Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. This pattern can be seen in monthly Seattle Washington wind roses although these surface wind patterns may differ somewhat from upper level winds because of terrain effects. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common.

The NOCA1 IMPROVE site is within the upper Skagit River channeled flow regime, with westerly channeled up valley flow enhanced at times by prevailing westerly synoptic flow.

## Inversions/Trapping

Locally, the NOCA1 site is in a lower valley location and may at times be within valley trapping inversions that do not extend to higher National Park elevations. On a larger scale, inversion breakup and vertical mixing during periods of weak synoptic forcing could at times bring urban emissions from Seattle and northern Puget Sound 100 to 160 km to the west into the area.

Mixing heights calculated for Salem Oregon (Ferguson and Rorig, 2003), a maritime location similar to the Seattle and Puget sound region, show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the NOCA1 site elevation, but Spring and summer Salem mixing heights frequently reach to 1,500 m or higher which could allow Puget Sound urban emissions to mix to the NOCA1 elevation. Resulting transport to NOCA1 could result from concurrent afternoon up valley flow or from entrainment of emissions near the mixing height into higher-level airflow, and subsequent transport to the monitoring site. Calculated Fall Salem mixing heights were typically 300 to 600 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the NOCA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), well above the NOCA1 IMPROVE site. With weak northwesterly winds, Puget Sound emissions can become trapped against the Cascades and/or pushed up the Skagit River valley towards the NOCA1 IMPROVE site. Highest regional aerosol concentrations may occur during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.

# Snoqualmie Pass IMPROVE Site: SNPA1

## Nearby Population/Industrial Centers

The Seattle metropolitan area and Puget Sound source region is about 50 km (30 mi) west of SNPA1 at its closest point, and 1,000 to 1,100 m (3,200 to 3,600 ft) lower in elevation. The city of Seattle is 70 km (40 to 45 mi) west northwest of the monitoring site. East of the Cascades, the cities of Wenatchee and Yakima are near 150 km (90 to 100 mi) to the east and southeast respectively.

## Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. This pattern can be seen in monthly Seattle Washington wind roses although these surface wind patterns may differ somewhat from upper level winds because of terrain effects. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common. The SNPA1 IMPROVE site is located near the crest of the Cascades and may be exposed to airflow over the Cascades and to aerosols transported from upwind sources by upper level winds. Although it is above valley elevations to the west, SNPA1 may at times see diurnal up valley transport from the Seattle area via the South Fork of the Snoqualmie River. If it occurs, such flow transport would show a diurnal pattern of aerosol characteristics.

## Inversions/Trapping

Locally, the SNPA1 site is at a ridge crest location and probably above trapping inversions that may develop at valley bottom locations east and west of the Cascade crest. On a larger scale, inversion breakup and vertical mixing during periods of weak synoptic forcing could at times bring urban emissions from the Seattle and Puget Sound source region 50 to 75 km (30 to 50 mi) west of Wilderness boundaries to western Wilderness and SNPA1 elevations. Mixing heights calculated for a similar maritime location at Salem, Oregon (Ferguson and Rorig, 2003) show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the SNPA1 site elevation, but Spring and summer Salem mixing heights frequently reach to 1,500 m or higher which could allow urban emissions to arrive at SNPA1. This could result from concurrent afternoon up valley flow or from entrainment and transport by higher-

level flow. Fall mixing heights are typically 300 to 600 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the SNPA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), well above the SNPA1 IMPROVE site. With weak northwesterly winds, Puget Sound emissions can become trapped against the Cascades and possibly impact lower crest elevations such SNPA1. Highest aerosol concentrations may result during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.

# Mount Rainier IMPROVE Site: MORA1

## Nearby Population/Industrial Centers

The small community of Ashford (pop ~300) is located about 6 km (3.7 mi) east of the site. The nearest major population center is Tacoma, some 50 to 60 km (~ 35 mi) due northwest.

Washington State Highway 706, a main entrance to the National Park from the west, goes through the valley within 1 km of the monitoring site.

## Wind Patterns

Generally, wind directions at the site are channeled to an east/west direction. In absence of synoptic forcing, the site is characterized by mountain/valley circulations, with easterly (from the east) nighttime drainage flow and westerly daytime upslope flow in the valley. The west to east orientation of the valley may serve to enhance synoptic westerly wind flow. Historical data show predominantly east and northeast directional flow during October – December and westerly flow during January – February.

## Inversions/Trapping

This valley may be subject to inversion and trapping of pollutants during periods of high pressure and stagnation. In those cases, the monitoring site, located at the bottom of the valley, would be contained within the trapped stable layer.

# White Pass IMPROVE Site: WHPA1

## Nearby Population/Industrial Centers and Local Sources

The significant population centers and source regions nearest to the Goat Rocks Wilderness and the WHPA1 IMPROVE site are Seattle and the Puget Sound area 100 km (60 mi) to the northwest and Portland Oregon 120 km (75 mi) to the southwest. The Centralia power plant, which has implemented emission controls in recent years, is located near Centralia Washington 100 km due west near the Cowlitz River that has origins in the Goat Rocks Wilderness.

## Wind Patterns

Synoptic winds in the region are generally westerly. During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic)

flow is common. The WHPA1 IMPROVE site is located near the crest of the Cascades and should be well exposed to these upper airflows and to aerosols transported aloft from upwind sources. Lower Goat Rocks Wilderness elevations may see more typical mountain/valley circulation patterns, especially during periods of weak synoptic forcing, which bring valley air to higher elevations during the day. At WHPA1, aerosols transported with this mountain valley circulation would likely show a diurnal pattern.

### Inversions/Trapping

Because of WHPA1's high elevation relative to surrounding terrain it should be generally above surface based valley inversions in Wilderness Area headwaters basins. Summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system can result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), near the WHPA1 site elevation.

## Pasayten IMPROVE Site: PASA1

### Nearby Population/Industrial Centers

Seattle and Puget Sound source regions are ~ 200 km (120 mi) west of the PASA1 site, on the other (west) side of the Cascade crest. Aerosols may be transported to the monitoring site from the Puget Sound region by upper level (850 mb) westerly winds. Columbia Plateau sources and the Spokane Washington area are close to the PASA1 site. Columbia Plateau sources including agricultural and crustal (dust) components may affect the site during regional summertime stagnation periods when lofted to upper levels on hot afternoons.

### Wind Patterns

Synoptic winds in the region are generally westerly, with more northwesterly flow during the summer when the Pacific High is off the coast of northwestern U.S., and more westerly flow during the winter when the Pacific High has retreated southward. Monthly Spokane Washington wind roses indicate this pattern, although wintertime wind directions are more northeasterly, bringing continental air southward with high pressure over the Canadian interior. Note that these surface wind patterns may differ somewhat from upper level winds because of terrain effects.

During the winter, with high pressure over the Great Basin and Idaho and low pressure west of the Cascades easterly gradient (synoptic) flow is common. Upper westerly flow may bring Puget Sound area emissions to the monitoring site. With weaker summertime regional pressure gradients, a diurnal pattern may allow Columbia River Basin and Plateau emissions to be lofted to upper levels, including the PASA1 site, during the day and return with down slope flow at night (Ferguson, 1998).

### Inversions/Trapping

The PASA1 site is at a ridge top location and should be above local surface based trapping inversions. On a larger scale, persistent low-level temperature inversions over the Columbia Basin keep pollutants trapped at low elevations during most of the winter. Mixing heights

calculated for Spokane Washington (Ferguson and Rorig, 2003), show winter heights generally below 300 m (1,000 ft), which would prevent urban emissions from reaching the PASA1 site elevation, but spring and summer Spokane mixing heights frequently reach to 1,500 m (4,920 ft), allowing Columbia Basin emissions to reach the PASA1 site elevation of 1,634 m (5,360 ft).

Calculated Fall Spokane mixing heights were typically near 900 m, lower than in the spring and summer but occasionally high enough to bring valley emissions to the PASA1 site elevation.

Regionally, summertime subsidence inversions associated with the establishment of the semi-permanent Pacific high-pressure system could result in regional aerosol buildup over periods of days. Subsidence inversion heights are typically at elevations of 2,000 to 3,000 m (6,000 to 10,000 ft), near or above the PASA1 site elevation. Highest regional aerosol concentrations may occur during summertime stagnation and subsidence inversion periods in conjunction with western wildland fires.