Final Regulatory Analyses:

Including the:

- Final Cost-Benefit Analysis
- Least-Burdensome Alternative Analysis
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

Chapter 173-400 WAC, General regulation for air pollution sources

Chapter 173-425 WAC, Outdoor burning

Chapter 173-430 WAC, Agricultural burning

(Flame Cap Kilns and Air Curtain Incinerators)

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For the

Air Quality Program

Washington State Department of Ecology

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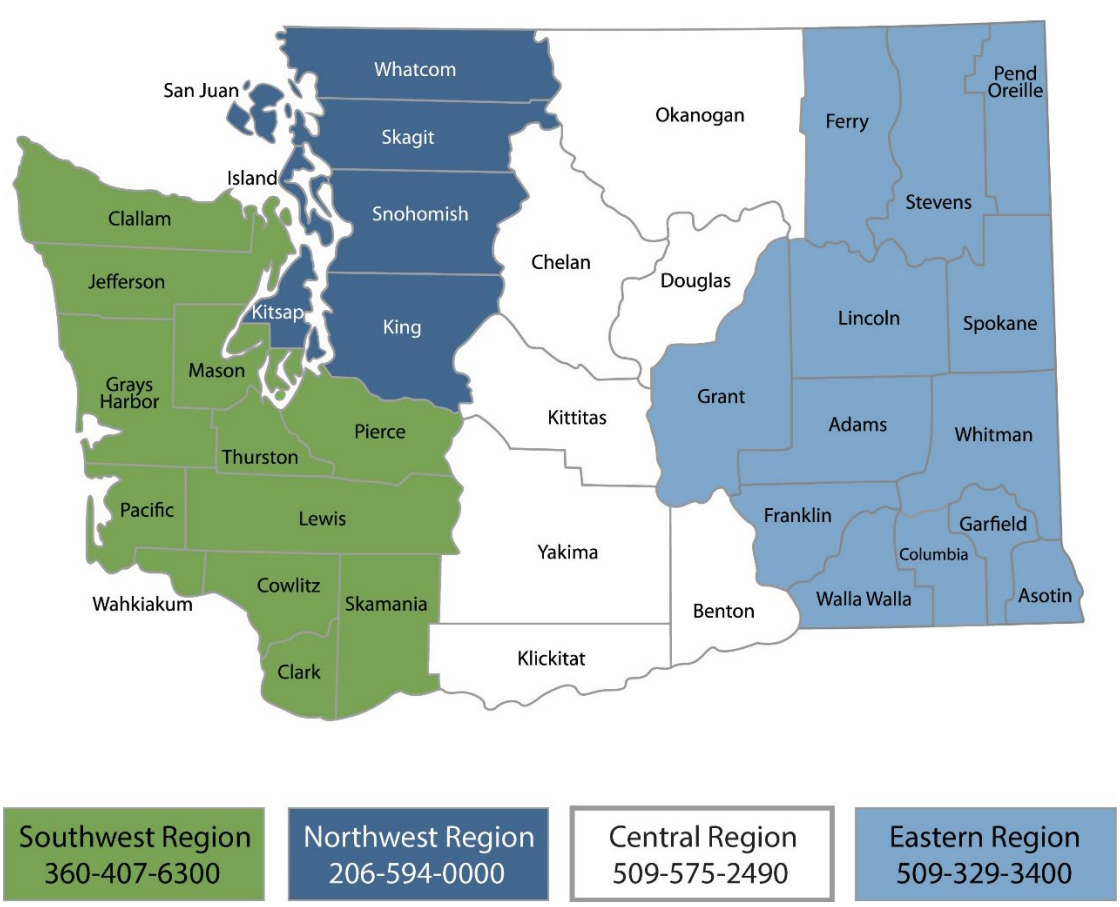
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Headquarters	Across Washington	P.O. Box 46700 Olympia, WA 98504	360-407-6000

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DEPARTMENT OF
ECOLOGY
State of Washington

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Abbreviations and Acronyms

ACI	"Air Curtain Incinerator", sometimes called an "Air Burner"
APA	Administrative Procedure Act
CBA	Cost Benefit Analysis
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
dscf	Dry Standard Cubic Foot
dscm	Dry Standard Cubic Meter
EIA	United States Energy Information Administration
EPA	United States Environmental Protection Agency
NO_x	Nitrogen Oxides
NMHC	Non-methane Hydrocarbons
PM	Particulate Matter
RCW	Revised Code of Washington
RFA	Regulatory Fairness Act
SO_2	Sulfur Dioxide
USC	United States Code
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

Executive Summary

This report presents the determinations made by the Washington State Department of Ecology as required under chapters 34.05 RCW and 19.85 RCW, for the Flame Cap Kiln and Air Curtain Incinerator rule amendments to chapters 173-400, 173-425, and 173-430 WAC (the "rule"). This includes the:

- Final Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The adopted rule amendments are designed to remove or reduce regulatory costs for two types of equipment that could help reduce harmful air emissions from agricultural and silvicultural burning: flame cap kilns and air curtain incinerators (ACIs). Flame cap kilns are shallow containers, designed so that any air flow to feed the fire comes from the top. An ACI is a burn system that includes an engine designed to continually stream a high-velocity air "curtain" directly above and into the fire and is generally larger than a flame cap kiln.

We analyzed the impacts of the rule amendments relative to the existing rule, within the context of all existing requirements (federal and state laws and rules). This context for comparison is called the baseline and reflects the most likely regulatory circumstances that entities would face if Ecology does not adopt the rule.

Relative to the baseline, the rule amendments would:

- Clarify the use of flame cap kilns in agricultural burning
- Adjust emissions standards for ACIs burning waste wood
- Clarify unit emission standards requirements

The legislature amended chapter 70A.15 RCW in 2024 to allow flame cap kilns to be used in agricultural and silvicultural burning whenever the normal requirements for burning have been met. The rule amendment incorporates the statutory changes into the appropriate WACs for agricultural burning, including the definition of "flame cap kilns", maintaining consistency between WAC and state statute. Statute also permits flame cap kilns for silvicultural burns, but these are permitted through the Washington Department of Natural Resources rather than Ecology.

There are no costs associated with the amendment related to flame cap kilns. There is some informational benefit associated with harmonizing chapters 173-425 and 173-430 WAC with the state statute. Aligning the WAC with the RCW has some positive value in reducing ambiguity for local clean air agencies and the public.

The rule amendments adjust emissions standards for ACIs burning waste wood that would otherwise be legal for silvicultural, agricultural or open burning. Anyone using an ACI for that purpose currently needs a variance for the emissions standard in WAC 173-430-050. Under the rule amendments, we expect particulate matter emissions from burning wood in an ACI would be less than the new emissions limit of 0.46 gram/dscm. By eliminating the requirement for a variance, the regulatory cost of using ACIs to burn certain types of waste wood is expected to decrease as a result of the rule amendment. The rule does not require anyone to use an ACI to burn waste wood, but it does reduce the costs of using an ACI should anyone choose to use it in place of pile burning.

In general, we assume that any ACI burn as a result of the rule replaces an equivalent agricultural or silvicultural pile burn. This choice has internal costs and benefits for whoever chooses to use an ACI, which may be a result of differences between the two burn methods in terms of: operational costs, permitting fees, burn timing, or air emissions. We assume that the benefits of using an ACI outweighs the cost for any person who chooses to use an ACI under the rule amendments. We focus our benefit and cost estimates on changes in air emissions because those are the costs and benefits borne by the broader public. We find that ACI burns would produce additional emissions from the ACI engine as well as vehicle emissions from transporting the ACI while generally reducing air emissions from the burn itself compared to an equivalent pile burn.

We estimate the costs of increasing emissions from ACI engines to be $7-$36 per hour of operation and the costs of increasing emissions from transporting ACIs to be $15-$17 per 25 miles. We estimate the benefit of reduced emissions from replacing pile burning with ACI burning is $689-$1,400 per ton.

We cannot estimate the total costs and benefits of the rule because forecasting changes in the ACI market cannot be done with any degree of accuracy. Among other uncertainties, ACI use is likely dependent on whether Ecology adopts a General Order which could further reduce permitting costs. General Orders are separate from rulemaking and would be addressed by a different process than this rulemaking.

To demonstrate the likely benefits and costs arising from air emissions we use a hypothetical case. In 2018 and 2019, the city of Leavenworth conducted a prescribed burn of 172 tons of wood collected within the apple maggot quarantine area. Given the location of the burn next to a populated area and the purpose of the burn to prevent the spread of pests, these are the sorts of burns that could potentially be done in an ACI as a result of the rule amendments.

We use this case to illustrate the potential net benefits of the rule if one burn switched from a pile burn to an ACI.

The expected net benefit from changes in emissions for this case is:

- $58,379 for the low net benefit estimate,
- $118,636 for the high net benefit estimate.

The actual changes in air emissions resulting from the rule amendment depend on how use of ACI evolves as a result, as well as any potential regulatory changes in the future. Despite adoption of the rule amendments, it remains uncertain how much ACIs will be used due to the remaining expenses associated with them. As illustrated by the case here, we expect any switch from pile burning to ACIs would result in a general reduction of emissions and a positive economic benefit.

Chapter 1: Background and Introduction

1.1 Introduction

This report presents the determinations made by the Washington State Department of Ecology as required under chapters 34.05 RCW and 19.85 RCW, for the Flame Cap Kiln and Air Curtain Incinerator rule amendments to chapters 173-400, 173-425, and 173-430 WAC (the "rule"). This includes the:

- Final Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to "determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented." Chapters 1 - 5 of this document describe that determination.

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives" of the governing and authorizing statutes. Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1)(a) - (c) and (f) - (h)) about the rule, including authorization, need, context, and coordination. Appendix A of this document provides the documentation for these determinations.

The Washington Regulatory Fairness Act (RFA; chapter 19.85 RCW) requires Ecology to evaluate the relative impact of proposed rules that impose costs on businesses in an industry. It compares the relative compliance costs for small businesses to those of the largest businesses affected. Chapter 7 of this document documents that analysis, when applicable.

All determinations are based on the best available information at the time of publication. We encourage feedback (including specific data) that may improve the accuracy of this analysis.

1.1.1 Background

Burning can be a valuable waste disposal practice for agricultural and forestry operations when done safely. Burning logging slash reduces potential fuel for wildfires. Trees infected by pests, such as the emerald ash borer or apple maggot, or disease, such as fire blight, are often burned as an effective means of destroying infected trees to limit further contagion. In some circumstances, burning can be used as an economical means of disposal for orchard pruning or tear-out. However, burning also produces harmful emissions, including particulates, carbon monoxide, sulfur dioxide, nitrogen oxides, and methane. These have the potential to contribute

to potentially serious cardiovascular and respiratory issues among nearby populations, including coughing, asthma, decreased lung function, and even heart attacks.[2]

The adopted rule amendments are designed to remove or reduce regulatory costs for two types of equipment that could help reduce harmful air emissions from burning: flame cap kilns and air curtain incinerators (ACIs). Flame cap kilns are shallow containers, designed so that any air flow to feed the fire comes from the top. It should be filled with larger logs on the bottom and smaller sticks and kindling on the top. It is ignited from the top so that the entire top of the kiln is "capped" by flames which should burn some of the smoke that would otherwise escape.[3] The result is lower emissions than alternatives, like pile burning.[4] The legislature amended chapter 70A.15 RCW in 2024 to allow flame cap kilns to be used in agricultural burning. The adopted rule amendment incorporates those changes into the appropriate WACs.

An ACI is a burn system that includes an engine designed to continually stream a high-velocity air "curtain" directly above and into the fire.[5] Most ACIs are attached to metal boxes, larger units look similar to roll-off dumpsters, where material is burned and the air curtain is attached to the top of one side of the box. Other ACIs are designed to operate above fires that are contained by earthen trenches. Most ACIs are considerably larger than flame cap kilns, burning through far more material, but are also considerably heavier, often requiring commercial vehicles to transport. Much like flame cap kilns, ACIs are designed to burn more completely to prevent emissions.[6] They may also control embers better, which, along with emissions reductions, may allow more flexibility in when and where burning can safely occur. The rule amendments will reduce some of the permitting costs associated with using ACIs to burn certain waste wood.

1.2 Reasons for the rule amendments

The legislature amended chapter 70A.15 RCW in 2024 to allow flame cap kilns to be used in agricultural and silvicultural burning whenever the normal requirements for burning have been met. The rule amendment incorporates statutory changes into the appropriate WACs for agricultural burning, maintaining consistency between WAC and statute. Silvicultural burning is regulated by the Washington Department of Natural Resources, so those rules cannot be amended by Ecology.

There has been an increased interest in the use of ACIs, notably their potential to reduce the human health impacts from smoke resulting from burns near areas where weather conditions or population density may intensify the impact of fires on respiratory health. Despite these potential benefits, burning wood in an ACI that could otherwise be pile burned currently requires a variance before it can be permitted in Washington. Silvicultural pile burning is regulated under chapter 332-24 WAC and agricultural burning is regulated under chapter 173-

[2] EPA (2025c)
[3] Kansas Forest Service (2018), USU (2019)
[4] Puettmann, et al. (2020)
[5] https://www.oregon.gov/deq/aq/cao/pages/air-curtain-incinerators.aspx
[6] Oregon DEQ (2023)

430 WAC. However, if an agricultural or silvicultural burn takes place in an ACI rather than a pile, it becomes subject to chapter 173-400 WAC, which has additional emissions requirements. The relevant requirement for the rule amendment is WAC 173-430-050, which requires that emissions particulates for ACIs be less than 0.23 gram per dscm regardless of whether the ACI is burning waste wood that could otherwise be burned under agricultural or silvicultural burn rules. ACI emissions testing suggests particulate emissions for these burns may be above the 0.23 gram per dscm limit, although they would be considerably less than an equivalent pile burn. Because their emissions would be above the particulate emissions limit, ACI burns could not be permitted without a variance for this requirement from Ecology, or from the local clean air agency with Ecology's approval. Ecology has granted one variance on the basis that the burn replaced a pile burn, which would have had higher emissions.

Part of the rule amendment adjusts emissions standards for ACIs burning waste wood that would otherwise be legal for silvicultural, agricultural or open burning. Anyone using an ACI for that purpose would no longer need a variance, though they would still require a notice of construction. Along with recent changes by the EPA to remove Title V permitting requirements for most ACIs burning wood waste, the rule amendment streamlines the permitting process somewhat and decreases the regulatory cost of using ACIs.[7] Adopting this rule amendment may also allow Ecology to adopt a new General Order for using ACIs in place of the notice of construction requirement, which would further reduce the time and expense of obtaining a permit.

1.3 Summary of the rule amendments

The adopted rule amendments:

- Clarify the use of flame cap kilns in agricultural burning
- Adjust emissions standards for air curtain incinerators burning waste wood
- Clarify unit emission standards requirements

1.4 Document organization

The chapters of this document are organized as follows:

- **Chapter 2 - Baseline and the rule amendments:** Description and comparison of the baseline (what would occur in the absence of the rule amendments) and the rule requirements.
- **Chapter 3 - Likely costs of the rule amendments:** Analysis of the types and sizes of costs we expect impacted entities to incur as a result of the rule amendments.
- **Chapter 4 - Likely benefits of the rule amendments :** Analysis of the types and sizes of benefits we expect to result from the rule amendments.

[7] https://www.epa.gov/system/files/documents/2024-04/fact-sheet_acirule_final-4-11-2024.pdf

- **Chapter 5 - Cost-benefit comparison and conclusions :** Discussion of the complete implications of the CBA.
- **Chapter 6 - Least-Burdensome Alternative Analysis:** Analysis of considered alternatives to the contents of the rule amendments.
- **Chapter 7 - Regulatory Fairness Act Compliance:** When applicable. Comparison of compliance costs for small and large businesses; mitigation; impact on jobs.
- **Appendix A - APA Determinations:** RCW 34.05.328 determinations not discussed in chapters 5 and 6.

Chapter 2: Baseline and Rule Amendments

2.1 Introduction

We analyzed the impacts of the adopted rule amendments relative to the existing rule, within the context of all existing requirements (federal and state laws and rules). This context for comparison is called the baseline and reflects the most likely regulatory circumstances that entities would face if Ecology does not adopt the rule.

2.2 Baseline

The baseline for our analyses generally consists of existing laws and rules. This is what allows us to make a consistent comparison between the state of the world with and without the rule amendments.

For this rulemaking, the baseline includes:

- State statute and rules governing flame cap kilns for agricultural burning
    - Washington Clean Air Act (chapter 70A.15 RCW), including amendments to allow the use of flame cap kilns in agricultural burning (RCW 70A.15.1030 and RCW 70A.15.5090).
    - Chapter 173-425 WAC, Outdoor burning
    - Chapter 173-430 WAC, Agricultural burning
- State statute, state rules, and federal rules relevant to ACI use in the rule amendment, including:
    - Chapter 173-400 WAC, General regulations for air pollution sources
    - The Washington Clean Air Act variance process (RCW 70A.15.2310)
    - Chapter 332-24 WAC, Forest Protection
    - Chapter 173-430 WAC, Agricultural burning
    - Chapter 173-401 WAC, Operating permit regulation and the Clean Air Act Title V permit requirements
    - Control of emissions from nonroad compression-ignition engines (40 CFR 1039)

2.2.1 Baseline for flame cap kilns

Under chapter 173-425 WAC, any outdoor containers used for burning must meet specific requirements, including container requirements specified in WAC 173-425-050(5):

> Outdoor containers (such as burn barrels and other incinerators not regulated under WAC 173-400-070(1)) used for outdoor burning, must be constructed of concrete or masonry with a completely enclosed combustion chamber and equipped with a

permanently attached spark arrester constructed of iron, heavy wire mesh, or other noncombustible material with openings not larger than one-half inch, and they may only be used in compliance with this chapter.

Chapter 173-430 WAC defines rules for agricultural burning but does not explicitly define allowable containers that may be used for agricultural burning. Specific requirements for agricultural burning appear in WAC 173-430-040.

In 2024, Substitute Senate Bill 6121 amended chapter 70A.15 RCW to allow the use of flame cap kilns in silviculture and agricultural management of natural vegetation.

RCW 70A.15.1030 defines "flame cap kiln":

> "'Flame cap kiln' means an outdoor container used for the combustion of natural vegetation from silvicultural or agricultural activities that meets the following requirements:
>
> (a) Has a solid or sealed bottom including, but not limited to, mineral soils, so that all air for combustion comes from above;
>
> (b) Is completely open on top with no restrictions;
>
> (c) Is a shallow container where the width is greater than the height; and
>
> (d) Has a volume of 10 cubic meters or less."

RCW 70A.15.5090(1) allows flame cap kilns to be used for agricultural burning so long as they meet the normal requirements for agricultural burning:

> "For the purposes of this section, agricultural burning includes the combustion of natural vegetation from agricultural activities in portable flame cap kilns, provided that the biomass does not contain any prohibited materials as defined in RCW **70A.15.5010**(1)."

2.2.2 Baseline for air curtain incinerators

An air permit from Ecology or a local clean air agency is generally required for businesses and individuals that emit air pollution through industrial processes or burning. For ACIs, a permit includes a notice of construction that must be filed and approved as part of a new source review (WAC 173-400-110(2)). WAC 173-400-111 details the notice of construction process. Permitted portable sources can be relocated without a new approval order provided they meet the conditions defined in WAC 173-400-036.

In addition to general emissions standards, such as opacity and sulfur dioxide emissions defined in WAC 173-400-040, WAC 173-400-050(1) sets particulate matter emissions for combustion and incineration units. No unit is allowed emissions of more than 0.23 grams/dscm (0.1 grain/dscf) unless it is combusting waste wood to produce steam, in which case the limit is 0.46 grams/dscm (0.2 grain/dscf).

Anyone operating an ACI can apply for a variance to adjust emission requirements under WAC 173-400-180 and RCW 70A.15.2310. A variance requires:

- Proof of hardship
- A public notice and comment period in accordance with WAC 173-400-171
- EPA notification
- Annual renewals

Any burning that takes place in an ACI is permitted under chapter 173-400 WAC, even if it would otherwise be considered an agricultural or silvicultural burn. Agricultural and silvicultural burning are governed by chapters 173-430 and 332-24 WAC, respectively. These chapters outline the specific requirements for each of these burns and when burning is prohibited. In general, silvicultural burns are permitted through the Washington Department of Natural Resources while agricultural burns are permitted through Ecology or a local clean air agency.

Large ACIs may require an additional federal permit under Title V of the Clean Air Act, which Washington administers under chapter 173-401 WAC with federal approval. In general, the EPA will not require an ACI to get a Title V permit unless it burns more than 35 tons per day of waste wood.[8] Some large ACIs can burn more than 10 tons of wood per hour and could potentially still be required to obtain a Title V permit.

Many ACIs are powered by tier 4 diesel engines that must meet the emissions requirements defined in 40 CFR 1039.

2.3 Rule amendments

In relation to the baseline, which includes existing requirements such as Washington statute, the rule amendments would:

- Clarify the use of flame cap kilns in agricultural burning,
- Adjust emissions standards for air curtain incinerators burning waste wood
- Clarify unit emission standards requirements

2.3.1 Clarify the use of flame cap kilns in agricultural burning

Baseline

Substitute Senate Bill 6121 finds that the use of flame cap kilns in agricultural burning is consistent with the goals of the Climate Commitment Act under RCW 70A.65.260 and the sustainable farms and fields grant program under RCW 89.08615. Using flame cap kilns is therefore appropriate for land management practices that reduce emissions, produce carbon storage, and minimize air quality impacts from open burning.

RCW 70A.15.5090:

- Defines flame cap kilns.

[8] 90 F.R. 27910

- Defines permitting authority, requirements and procedures for agricultural burning.
- Specifies that agricultural burning includes the combustion of natural vegetation from agricultural activities in portable flame cap kilns as long as it does not contain any prohibited materials under RCW 70A.15.5010(1).

The structure of agricultural burning permits, including requirements, definitions, and fees, is set out in chapter 173-430 WAC. Before this rulemaking, the WAC had not been amended to incorporate the changes to RCW 70A.15.5090 based on Substitute Senate Bill 6121.

Adopted

The rule amendment adds a definition of 'flame cap kiln' to chapter 173-430 WAC that exactly matches the definition in RCW 70A.15.1030:

> (9) "Flame cap kiln" means an outdoor container used for the combustion of natural vegetation from silvicultural or agricultural activities that meets the following requirements:
>
> (a) Has a solid or sealed bottom including, but not limited to, mineral soils, so that all air for combustion comes from above;
>
> (b) Is completely open on top with no restrictions;
>
> (c) Is a shallow container where the width is greater than the height; and
>
> (d) Has a volume of 10 cubic meters or less.

The amendment to WAC 173-430-040 allows flame cap kilns to be used as an acceptable agricultural burning device as long as permitting processes and fee requirements are followed.

The amendment to WAC 173-425-050 specifies that the use of flame cap kilns is regulated by chapter 173-430 WAC. It is not governed by chapter 173-425 WAC and is excluded from the container requirements for outdoor burning:

> Use of flame cap kilns is exclusively regulated under chapter 173-430 WAC for use in agricultural burning and chapter 332-24 WAC for use in silvicultural burning.

Expected impact

There are no costs associated with this aspect of the amendment. There is some informational benefit associated with harmonizing chapters 173-425 and 173-430 WAC with the state statute.

The rule amendment would allow the use of flame cap kilns for agricultural burning, which has previously been allowed under statute. Anyone using flame cap kilns for agricultural burning would be subject to the same requirements and fees for agricultural burning as defined in the baseline chapter 173-425 WAC in accordance with chapter 70A.15 RCW. While it may be within Ecology's discretion to adjust fees for agricultural burns using flame cap kilns, this was not directed by statute and is not part of the rule amendment. We interpret the rule amendment as consistent with the baseline and have not determined that Ecology has exercised any discretion for this part of the rule amendment.

Given that this change harmonizes the rule with statute, there are no costs associated with it. Aligning the WAC with the RCW has some positive value in reducing ambiguity for local clean air agencies and the public.

2.3.2 Adjust emissions standards for air curtain incinerators burning waste wood

Baseline

Under the baseline, silvicultural and agricultural burning is permitted according to chapters 332-24 and 173-430 WAC, respectively. Burning any material using an ACI falls under chapter 173-400 WAC, instead.

The baseline includes anticipated emissions associated with ACIs in the absence of the rule amendments. The emissions limit for combustion and incineration emissions units is 0.23 grams/dscm in the baseline WAC 173-400-050. Testing completed for the Oregon Department of Environmental Quality suggests emissions from burning wood in ACIs may exceed this limit. Three experimental runs produced emissions between 0.25 and 0.34 grams/dscm.[9]

As a result, ACIs cannot be used to burn waste wood in Washington without first obtaining a variance for the requirements in WAC 173-400-050. A variance requires additional applications, notifications, and a public comment period, which may necessitate a public hearing. These requirements make the process costly for potential ACI operators.

Operating an ACI also requires a notice of construction through Ecology or the appropriate local clean air agency, in addition to a variance. It may take Ecology up to sixty days to issue a draft permit decision, and it typically takes between two and six months to get a final permit. In 2026, the initial fee to the applicant for Ecology to review a notice of construction permit application is $2,256 for basic projects (covering up to 16 hours of review) and $14,946 for complex projects (covering up to 106 hours of review).

Before the rule amendments were proposed, one variance had been granted along with a notice of construction for the burning of up to 150 tons per day, and up to 966 total tons, of logging slash that would otherwise be eligible for an open burn permit through the Washington Department of Natural Resources. The basis for granting the variance was that burning in an ACI under the variance would reduce emissions compared to open burning. The operator of the ACI was not required to obtain a silvicultural permit to burn waste wood.

Adopted

The amendment to WAC 173-400-050 adjusts particulate emissions limits for ACIs from 0.23 gram/dscm (or 0.10 grain/dcsf) to 0.46 gram/dscm (0.20 grain/dcsf) as long as two requirements are met:

[9] Montrose Air Quality Services (2023)

- The ACI is disposing of waste wood that would otherwise be legal for silvicultural, agricultural, or open burning.
- The ACI is not located in an area identified in WAC 173-425-040.

Expected impact

The rule amendment reduces the costs of burning eligible waste wood in an ACI. Specifically, anyone using an ACI to burn waste wood would no longer be required to get a variance from Ecology because we expect particulate matter emissions from burning wood in an ACI would be less than the new emissions limit of 0.46 gram/dscm. By eliminating the requirement for a variance, the regulatory cost of using ACIs to burn waste wood is expected to decrease because of the rule amendment.

There are no benefits or costs to the rule unless someone chooses to use an ACI to burn waste wood, likely in place of a pile burn. Any rule impacts depend on the extent to which anyone chooses to use ACIs to burn waste wood as a result of the rule.

Any costs associated with the rule are ones that are voluntarily taken on and are not required by the rule under baseline operations. However, for anyone who chose to burn silvicultural or agricultural waste wood in an ACI instead of a pile due to the rule amendments, there would be some change in costs. There would be costs associated with operating an ACI: including purchasing the equipment, and transporting, fueling, and operating it. There would also be changes in permitting costs. Rather than permitted through a silvicultural or agricultural permit, an ACI operator would be required to complete the requirements for a new source in chapter 173-400 WAC. If the ACI had a sufficiently high capacity, there may also be additional permitting requirements through chapter 173-401 WAC that are required by the EPA, although this would only be applicable to the largest ACIs.

Potential benefits associated with burning wood in an ACI rather than pile burning include human health and environmental benefits from reduced emissions, reduced wildfire risk, more flexibility in burn timing, more effective pest and disease control, and less damage to the land where the burn takes place. While some of these benefits would accrue to the person operating the ACI, others are more general. In particular, reduced emissions from ACIs compared to pile burning would be broadly beneficial, especially among people affected by health conditions that can be exacerbated by smoke inhalation.

We anticipate that anyone who chooses to use an ACI in place of open burning as a result of the rule amendment will do so because they believe the benefits will outweigh the costs for themselves. While there are some costs that would be public, such as vehicle and ACI engine emissions, most of the costs of burning wood in an ACI compared to a pile burn are incurred by the person using the ACI. We expect any public costs associated with ACIs under the rule to be more than compensated for by public benefits from decreased emissions compared to pile burning. This was the rationale for granting the variance for the permitted ACI unit.

It is uncertain how much ACI use would change due to the rule amendments. ACIs are costly and anyone choosing to operate an ACI would still have to have a notice of construction approved by Ecology under WAC 173-400-110. Given the time and expense associated with

obtaining a notice of construction, rates of ACI use may remain low in Washington. Permitting costs may be reduced if Ecology were to adopt a General Order for using ACIs to burn certain waste wood. Along with recent changes by the EPA to remove Title V permitting requirements for most ACIs burning wood waste, this action could considerably streamline the permitting process for these burns, decreasing the regulatory barriers to using ACIs.[10]

2.3.3 Clarify unit emission standards requirements

Baseline

WAC 173-400-050(1) defines two unit emissions standards depending on the type of unit and its operation:

- 0.23 gram per dry cubic meter at standard conditions (or 0.1 grain/dscf)
- 0.46 gram per dry cubic meter at standard conditions (or 0.2 grain/dscf)

Adopted

The rule amendment clarifies the grain loading emissions standard to more precisely match the emissions standard defined by the "grams per dry cubic meter at standard conditions." For each grain loading emissions standard, the rule would add a trailing zero to each decimal, making that standard more explicit and precise. The standards would change to:

- 0.23 gram per dry cubic meter at standard conditions (or 0.10 grain/dscf)
- 0.46 gram per dry cubic meter at standard conditions (or 0.20 grain/dscf)

Expected impact

This change clarifies an existing standard and makes no other changes to the rule. There is no expected impact from this rule change.

[10] https://www.epa.gov/system/files/documents/2024-04/fact-sheet_acirule_final-4-11-2024.pdf

Chapter 3: Likely Costs of the Rule Amendments

3.1 Introduction

We analyzed the likely costs associated with the rule amendments, as compared to the baseline. The rule amendments and the baseline are discussed in detail in chapter 2 of this document.

Future costs are discounted to the present value using a real annual discount rate of 0.41%. This means that a cost that occurs in one year will be worth 0.41% more than if it had occurred in the following year. This discount rate is determined by using the average return on U.S. Treasury I-Bonds and subtracting changes in inflation measured by the consumer price index, resulting in the real average annual return over the previous twenty years on an investment that can be considered essentially risk-free.

3.2 Cost analysis

The rule amendments will:

- Clarify the use of flame cap kilns in agricultural burning
- Adjust emissions standards for air curtain incinerators
- Clarify unit emission standards requirements

3.2.1 Clarify the use of flame cap kilns in agricultural burning

There is no cost to this aspect of the rule because it does not make any amendment that falls within Ecology's discretion.

This part of the rule amendment updates chapters 173-425 and 173-430 WAC for consistency with state statute.

3.2.2 Define emissions standards for air curtain incinerators

There are no direct costs associated with this aspect of the rule for anyone engaged in burning because it does not impose any requirements as compared to the baseline. The amendment reduces some of the costs associated with using an ACI in certain cases, but does not require it. Anyone can choose to continue using whatever disposal method they would have used in the absence of the rule amendment.

If anyone chose to use an ACI due to the rule, they would have different costs compared to a pile burn. These costs would be voluntarily assumed by whoever chooses to use an ACI. Depending on the degree to which ACIs are used and how the market for ACIs develops, there may also be a change in air emissions, which could impact the public. Members of the public affected by this change did not voluntarily adopt these costs, so we focus on quantifying these air emissions in this section.

Because any wood burned in an ACI under the rule amendment could otherwise be pile burned under existing burn rules, we assume that any ACI burning that occurs after the rule amendment would have been disposed of in one of two ways under the baseline:

- Burned in an ACI after getting a variance. The rule amendment removes the need for a variance but all other behavior would remain the same. The cost of a variance, including administrative fees, would be avoided with no change in emissions.
- Burned in a pile under the baseline silvicultural or agricultural rules, in which case the rule amendment caused a voluntary change in burn method. This changes the cost, both for the person doing the burning as well as the public more broadly. Because air emissions are considerably reduced by using an ACI, we expect the public costs to be lower as well.

Internal Costs of ACIs

It is helpful to distinguish between "internal" and "external" costs. The costs that are voluntarily incurred by the person using the ACI are internal costs, meaning the person making the decision is also the person bearing the cost. Whenever there is a switch to burning in an ACI due to the rule, we expect the person using the ACI chose to incur the associated internal costs. These could include the cost of purchasing or renting an ACI, operating and maintaining the ACI, transporting the ACI, and disposing of remaining ashes. These would vary greatly according to the exact details of the burn. Because internal costs are voluntarily taken on if a person elects to use an ACI, we assume that the internal benefits of using the ACI outweigh the internal costs for anyone who chooses to use it, making the rule amendment a net positive for anyone choosing to use an ACI.

Internal costs also include costs associated with permitting. Under the rule, any ACI would still require an approved notice of construction from Ecology or the relevant local clean air agency. The notice of construction for the one ACI permitted in the state of Washington cost $1,904 under a previous fee structure. After the rule is adopted, applicants to Ecology would likely be assessed a fee of $2,256 to review the permit as of 2026 updates to permit fees, though this could be higher for more complex projects.[11] It is also potentially costly in terms of time: Ecology has up to sixty days from submission to make an initial determination on the application, and it typically takes between two and six months to get a final permit. If Ecology were to adopt a General Order governing burning waste wood in an ACI, these costs may be significantly reduced.

Given the high cost of equipment, regulatory barriers, and lack of explicit incentives to use them, ACIs may remain infrequently used. We expect any use of ACIs to occur in cases where the internal costs are relatively low and/or the benefits are relatively high compared to open burning.

[11] More generally, Ecology permit fees for applicants in 2026 are $2,256 for up to 16 hours of review for basic projects and $14,946 for up to 106 hours of review for complex projects, plus $141 per hour for any additional hour of review https://ecology.wa.gov/regulations-permits/permits-certifications/air-quality-permits/notice-of-construction-permit

Air Emissions from ACIs

Air emissions associated with using an ACI can lead to external costs. An external cost occurs when a choice has a cost for a person not involved in making the decision. Burning wood in an ACI creates air emissions that can be harmful for the health of people in the surrounding area and may contribute to greenhouse gas emissions. However, ACIs generally have significant emissions reductions compared to pile burning, resulting in lower net emissions by replacing pile burning with ACI burning. For that reason, we categorize the emissions from burning wood in an ACI instead of a pile as a benefit and estimate that benefit in Section 4.2.2.

Apart from the emissions from the burn itself, which we cover in Section 4.2.2, there are two other emissions that may be produced by using an ACI: emissions associated with the ACI's engine and the vehicle emissions from transporting an ACI.

Emissions from ACI generators are defined here by the regulatory limits associated with Tier 4 diesel engines.[12] This is an oversimplification as most engines would be below these threshold limits, and some ACI models have electric engines which would generally have lower emissions. However, in the absence of exact emissions data, this assumption accounts for air emissions produced by ACI engine operation. The range reflects the potential engine maximum power, generally falling between 10 and 75 horsepower. The amount of carbon dioxide produced per hour is based on the manufacturer's reported rates of fuel use, and the EIA's emission coefficients for diesel fuel.[13] There is a wide range of potential emissions, which reflect the range of potential ACI sizes and the corresponding range of engine sizes. Smaller ACIs may only burn a ton of wood per hour while larger units with more powerful engines may burn ten times that amount.

Vehicle emissions assumptions for methane and carbon dioxide are based on EPA greenhouse gas emission factors for medium- and heavy-duty trucks.[14] PM2.5 vehicle emissions factor estimates come from data reported by the Bureau of Transportation Studies, projected for the year 2025.[15] Given the predominance of diesel engines in the classes of vehicles that would transport ACIs, we use the diesel vehicle estimates. While small ACIs may be towed by light-duty trucks, the gross vehicle weight under tow is sufficient to make emissions most consistent with medium- and heavy-duty trucks, so we adopt those values.

Whenever there is a switch to burning in an ACI due to the rule, we expect the ACI use would contribute to the following air emissions:

- Emissions from the ACI engine (per hour of operation)[16]
    - 1.65 grams of PM

[12] https://www.ecfr.gov/current/title-40/chapter-I/subchapter-U/part-1039
[13] EIA (2024)
[14] EPA (2025b)
[15] BTS (2025)
[16] We use an hourly rate here for inconvenience, which can be scaled to the estimated time it would take to complete the burn.

- 60 - 240 grams of NO_x
- 4.5 - 57 grams of NMHC[17]
- 12.5 - 67 kilograms of CO_2

- Emissions from transporting ACIs (per 25 miles)[18]
  - 2.2 grams of PM 2.5
  - 62.3 grams of NO_x
  - 32.45 kilograms of CO_2
  - 5.7 grams of methane
  - 0.94 grams of nitrous oxide

We translate emissions increases from these two sources to costs using EPA's COBRA tool,[19] which estimates the health-related benefits from air emissions changes. Within the tool, we attribute the emissions from ACI engines and ACI transport to miscellaneous non-residential fuel consumption and diesel highway emissions, respectively. In both cases, changes are attributed to the entire state of Washington to be as general as possible. Carbon dioxide, methane, and nitrous oxide are not included in the COBRA tool. Instead, we adopt the social cost published by the EPA.[20] We use the values associated with the 1.5% near-term discount rate since that most closely matches the value Ecology uses. The EPA provides ranges of cost estimates for greenhouse gas emissions in both 2020 and 2030, and we average across these two years to approximate the costs for the year 2025.

We estimate the costs of emissions from ACI engines to be $7-$36 per hour of operation and the costs of emissions from transporting ACIs to be $15-$17 per 25 miles.

This is our estimated costs of air emissions from operating and transporting an ACI but excludes the air emissions from burning. Because ACIs have lower emissions than the pile burning they would replace, we calculate net emissions reductions as a benefit in Section 4.2.2. Chapter 5 then uses a burn scenario to illustrate the potential relative net benefits from net changes to emissions that could result from using an ACI instead of a pile burn for a particular burn instance.

[17] The federal standard for Tier 4 diesel engines combines NO_x and NMHC. It's broken out here according to the emissions factors for diesel engines assumed by the Santa Barbara County Air Pollution Control District: https://www.ourair.org/emission-factors-2/

[18] We use 25 miles as a reasonable approximation for a distance that an ACI might be transported, which can then be scaled according to the particular case, as we do for the case we present in Chapter 5.

[19] EPA (2025a)

[20] EPA (2023)

3.2.3 Clarify unit emission standards requirements

There are no costs associated with this aspect of the rule. The standard remains unchanged after the rule is adopted.

Chapter 4: Likely Benefits of the Rule Amendments

4.1 Introduction

In this chapter we analyze the likely benefits associated with the rule amendments, as compared to the baseline. The rule amendments and the baseline are discussed in detail in chapter 2 of this document.

Future benefits are discounted to the present value using a real annual discount rate of 0.41%. This means that a benefit that occurs in one year will be worth 0.41% more than if it had occurred in the following year. This discount rate is determined by using the average return on U.S. Treasury I-Bonds and subtracting changes in inflation measured by the consumer price index, resulting in the real average annual return over the previous twenty years on an investment that can be considered essentially risk-free.

4.2 Benefits analysis

The rule amendments:

- Clarify the use of flame cap kilns in agricultural burning
- Define emissions standards for air curtain incinerators
- Clarify unit emission standards requirements

4.2.1 Clarify the use of flame cap kilns in agricultural burning

This part of the rule amendment updates chapters 173-425 and 173-430 WAC for consistency with state statute.

Aligning the WAC with the RCW has some positive value in reducing ambiguity for local clean air agencies and the public.

4.2.2 Adjust emissions standards for air curtain incinerators

There are potential benefits associated with this aspect of the rule for anyone engaged in burning because it reduces the regulatory costs associated with operating an ACI. We expect that anyone operating an ACI as a result of the rule does so because the benefits are greater than the cost for them. Depending on the degree to which ACIs are used and how the market for ACIs develops, there may also be a change in air emissions, which could impact the public.

As in chapter 3, we assume that any waste wood burning that occurs in an ACI after this rule amendment would have been disposed of one of two ways under the baseline:

- Burned in an ACI after getting a variance. The rule amendment removes the need for a variance but all other behavior would remain the same. This would result in a benefit by avoiding the cost of a variance, including administrative fees, with no change in emissions.

- Burned in a pile under the baseline silvicultural or agricultural rules, in which case the rule amendment caused a voluntary change in burn method. This changes the benefits, both for the person doing the burning as well as the public more broadly. Because air emissions are considerably reduced by using an ACI, we expect the public to benefit.

Internal Benefits of ACIs

As in chapter 3, we refer to internal and external benefits. The benefits that are enjoyed by the person using the ACI are internal benefits, meaning the person making the decision is also the person receiving any benefits. Whenever there is a switch to burning in an ACI due to the rule, we expect the person using the ACI to do so for these benefits. These could include: the possibility of more flexibility in burn days and locations, reduced land damage from burning, quicker burns in a more confined area, and the benefit of being perceived as a responsible neighbor for limiting smoke.

The internal benefits would also include foregoing the permitting process and fees for pile burns. Under the rule amendments, burning in an ACI requires a notice of construction, but would not require either a silvicultural or agricultural burn permit. The fees for silvicultural burns are listed by the Washington Department of Natural Resources.[21] Agricultural burns are permitted through a local clean air agency, or Ecology if the county does not have one. Ecology's fees are $80 for the first 80 tons and $1 per ton thereafter for pile burning.[22] These fees would be avoided if an ACI was used for pile burning. However, there would be other fees required for ACI use as outlined in Section 3.2.2, though these fees could be reduced if Ecology were to implement a General Order.

Air Emissions from ACIs

External benefits are those that are enjoyed by others who did not make the decision to operate an ACI. This could include the benefit of pest and disease control and reduced emissions. While we note that ACIs may be used to effectively destroy contaminated wood that might otherwise risk spreading to healthy trees, we focus our quantitative estimates on the emissions that would be avoided by replacing a pile burn with an ACI burn.

External benefits would primarily include the foregone emissions from replacing a pile burn with an ACI burn. The exact air emissions associated with either pile burning or ACI burning wood will depend on the type, age, and moisture content of the wood being burned as well as how the fire is managed. Regardless of the particular burn context, measures have consistently found that ACI burning generally results in far fewer emissions than pile burning.

For this analysis, we assume air emissions for an ACI burn will be similar to those measured in an ACI test by Oregon's Department of Environmental Quality.[23] These air emissions

[21] https://dnr.wa.gov/sites/default/files/2025-03/rp_burn_feesched.pdf
[22] https://ecology.wa.gov/air-climate/air-quality/smoke-fire/agricultural-burning
[23] Montrose Air Quality Services (2023)

measurements for ACIs are generally higher than estimates published elsewhere,[24] making these emission factors relatively conservative.

For the sake of comparing pile burning emissions to an ACI burn, we assume pile burn emissions will be similar to the Pacific Northwest Piled Fuels Biomass Emissions Calculator[25] and the emissions factors used for silvicultural burns in Ecology's Comprehensive Emissions Inventory.[26] We use these values because they correspond most closely to the burn tested by the Oregon Department of Environmental Quality that we use as the basis for ACI burn emissions.

Based on our assumed emissions values, the emissions changes from replacing a ton of hardwood burned in a pile with the same ton burned in an ACI are:

- 9.25 fewer pounds of PM 2.5
- 0.14 more pounds of sulfur dioxide
- 2.02 fewer pounds of NO_x
- 17.16 fewer pounds of VOCs
- 4.93 fewer pounds of methane
- 0 pounds of CO_2[27]

Emissions of sulfur dioxide increased by 0.14 pounds, but all other emissions are significantly lower for ACI burning compared to pile burning. Recall that these are fairly conservative assumptions based on somewhat higher estimates for ACI emissions than published elsewhere.

As in Section 3.2.2, we translate these emissions changes to economic benefits using EPA's COBRA tool[28] to estimate the health-related benefits from the air emissions changes outlined above. Within the tool, we attribute the emissions to a decrease in open burning across the entire state of Washington to be as general as possible. We assumed a discount rate of 0.41% for these calculations. Methane is not included in the COBRA tool. Instead, we adopt the social cost published by the EPA.[29] We use the values associated with the 1.5% near-term discount rate since that most closely matches the value Ecology uses.

We estimate the benefit of reduced emissions from replacing pile burning with ACI burning is $689-$1,400 per ton.[30]

[24] e.g., Zahn (2005)
[25] https://depts.washington.edu/nwfire/piles
[26] Ecology (2024)
[27] The results in Zahn (2005) suggest carbon dioxide emissions are marginally greater when using an ACI. However, there are some published claims that ACIs reduce carbon dioxide emissions based on claims that air curtain incinerators produce biochar which may capture and store additional carbon.
[28] EPA (2025a)
[29] https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf
[30] Less than 1% of this benefit is due to reductions in the social cost of methane and other greenhouse gas emissions.

This is our estimated benefit from air emissions reductions from switching from pile burning to ACI burning of waste wood that could occur as a result of the rule. It does not include potential additional air emissions from operating and transporting an ACI, which we quantify in Section 3.2.2. In order to compare the costs and benefits from switching from pile burning to ACI burning, Section 5.1 uses a burn scenario to illustrate net economic benefits that could result from using an ACI instead of a pile burn for a particular burn instance.

4.2.3 Clarify unit emission standards requirements

There is some minor benefit associated with making an existing standard more explicit and precise. This could reduce uncertainty or confusion for local clean air agencies and the public.

Chapter 5: Cost-Benefit Comparison and Conclusions

5.1 Summary of costs and benefits of the rule amendments

5.1.1 Clarify the use of flame cap kilns in agricultural burning

There are no costs associated with this part of the rule. The rule amendments were already a part of statute, and it does not make any changes that fall within Ecology's discretion. There is some benefit in amending the rules to maintain consistency with statute, though we did not quantify that benefit here. We expect the benefits of this part of the rule amendment will be greater than the costs.

5.1.2 Adjust emission standards for air curtain incinerators

The rule does not require any behavioral changes. We expect that anyone who chooses to use an ACI for burning will do so because they expect the benefits to be greater than the costs for them.

We also expect replacing pile burning with burning using an ACI to have positive net benefits for the general public. However, the magnitude of those benefits depends on the extent to which ACIs replace pile burning, and the associated change in emissions as a result.

To contextualize the change in emissions associated with switching from pile burning to an ACI, we apply our estimates of emission rates to a particular hypothetical case. In 2018 and 2019, the city of Leavenworth conducted a prescribed burn of wood collected within the apple maggot quarantine area. Wood waste from this area cannot be disposed of in normal household waste collection due to the potential to spread the infestation. An estimated 172 tons of waste were burned in 2018 and again in 2019. Given the location of the burn next to a populated area and the purpose of the burn to prevent the spread of pests, these are precisely the sorts of burns that could potentially be done in an ACI due to the rule amendments.

We use this case to illustrate the potential net benefits of the rule from the case of one burn switching from a pile burn to an ACI. As in chapters 3 and 4, we focus solely on the public net benefits through changes in emissions and assume that anyone choosing to use an ACI would expect to have a positive net benefit for themselves.

For this illustrative case, we use the emissions from ACI burning listed in chapter 3 and the pile burning emissions listed in chapter 4, scaled to 172 total tons of wood to match the burn in a single year. We present two scenarios: a low net benefit scenario and a high net benefit scenario. The difference between the two is primarily in the emissions assumptions associated with ACI use, the low net benefit scenario assumes more emissions from the ACI engine and transportation.

To calculate potential transportation-related emissions requires an assumption of where an ACI might be located. It is possible there would be an ACI based in Leavenworth as a way to destroy waste wood in the quarantine area, in which case there would be no transportation emissions.

Alternatively, there has been interest in using ACIs for burning in the Methow Valley, making that a potential location for an ACI if their use were to become more widespread.

For the low net benefit scenario, we assume a low-capacity ACI capable of burning 1 ton per hour was transported from Methow to Leavenworth for the burn and back (168 total miles). For the high net benefit scenario, we assume a high-capacity ACI capable of burning 12 tons per hour was based in Leavenworth at the burn area and did not need to be transported.

The estimated change in air emissions associated with switching to an ACI in place of pile burns for this case is:

- 1590 - 1591 fewer pounds of PM 2.5
- 324 - 341 fewer pounds of NO_x
- 24 more pounds of SO_2
- 2950 fewer pounds of VOCs
- 848 fewer pounds of methane
- 1769 - 5210 more pounds of CO_2
- 0 - 0.014 more pounds of nitrous oxide

As in chapters 3 and 4, we use the EPA's COBRA tool[31] to estimate the health-related costs from the air emissions changes outlined above. As in chapter 3, we attribute the emissions from ACI engines and ACI transport to miscellaneous non-residential fuel consumption and diesel highway emissions, respectively. As in chapter 4, we attribute the decrease in emissions from burning in an ACI instead of a pile as a change in emission from open burning. And we assumed a discount rate of 0.41% as in chapters 3 and 4. The emissions changes are assigned to Chelan County where the burning would occur in this case. Methane, carbon dioxide, and nitrous oxide are not included in the COBRA tool. Instead, we adopt the social cost of each published by the EPA.[32] We use the values associated with the 1.5% near-term discount rate since that most closely matches the value Ecology uses.

Both the COBRA cost estimates and the EPA social cost of carbon include ranges of cost estimates for air emissions. For each cost, we took the most extreme low benefit and high cost option for the low net benefit estimate and the opposite extremes for the high net benefit estimate.

The expected net benefit from changes in emissions for this case is:

- $58,379 for the low net benefit estimate,
- $118,636 for the high net benefit estimate.

Focusing just on the cost of greenhouse gas emissions associated with carbon dioxide, methane, and nitrous oxide, the estimated net benefit is $890 in the high net benefit estimate

[31] https://cobra.epa/gov
[32] EPA (2023)

and -$142 in the low net benefit estimate. The reduction in methane emissions from using an ACI compared to pile burning outweighed the carbon emissions associated with the ACI engine and also recovered a large proportion of the greenhouse gas emissions costs of transporting the ACI for the low net benefit estimate. This is despite the conservative assumptions we made for emissions reductions using an ACI, emissions from ACI engines, and transport distance for the ACI.

The actual air emissions from the rule amendment depend on how use of ACI evolves as a result, as well as any potential regulatory changes in the future. Even after the rule amendments are adopted it remains uncertain how much ACIs will be used due to the remaining expenses associated with them. As illustrated by the case here, we expect any switch from pile burning to ACIs would result in a general reduction of emissions and a positive economic benefit.

5.1.3 Clarify unit emission standards requirements

There are no costs associated with this part of the rule. The rule amendment does not change the emissions standards but does make the standards more explicit. There is some benefit in amending the rule to explicitly add precision to the emissions standards, though we did not quantify that benefit here. We expect the benefits of this part of the rule amendment will be greater than the costs.

5.2 Distribution of net emissions

Air emissions from ACI burns, including emissions from the ACI engine, are lower than for pile burns. For any burn that switched from a pile burn to an ACI burn as a result of the rule, the air emissions in and around the burn would decrease substantially. This could have positive health impacts for the surrounding population.

Depending on how ACI use and the market for ACI services changes as a result of the rule, there may be some marginal increase in air emissions along roadways associated with ACI transport. However, this marginal increase would be so low as to be undetectable. For context, at the time of the rule proposal in October 2025, there were 1,921 active permits issued by the Washington Department of Natural Resources for silvicultural pile burns of 10 tons or more. If each of these active permits separately caused an ACI to be transported 168 total miles round-trip, equivalent to our low-benefits scenario in Section 5.1.2, that would increase estimated NO_x emissions from road transportation sources in Washington by just 0.001%.

5.3 Conclusion

We conclude, based on a reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule amendments, as compared to the baseline, that the benefits of the rule amendments are greater than the costs.

Chapter 6: Least-Burdensome Alternative Analysis

6.1 Introduction

RCW 34.05.328(1)(e) requires Ecology to "…[d]etermine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection." The referenced subsections are:

> (a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements;
>
> (b) Determine that the rule is needed to achieve the general goals and specific objectives stated under (a) of this subsection, and analyze alternatives to rule making and the consequences of not adopting the rule;
>
> (c) Provide notification in the notice of proposed rulemaking under RCW 34.05.320 that a preliminary cost-benefit analysis is available. The preliminary cost-benefit analysis must fulfill the requirements of the cost-benefit analysis under (d) of this subsection. If the agency files a supplemental notice under RCW 34.05.340, the supplemental notice must include notification that a revised preliminary cost-benefit analysis is available. A final cost-benefit analysis must be available when the rule is adopted under RCW 34.05.360;
>
> (d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

In other words, to be able to adopt the rule, we must determine that the requirements of the rule are the least burdensome set of requirements that achieve the goals and objectives of the authorizing statute(s).

We assessed alternative proposed rule content and determined whether they met the goals and objectives of the authorizing statute(s). Of those that would meet the goals and objectives, we determined whether those chosen for inclusion in the rule amendments were the least burdensome to those required to comply with them.

6.2 Goals and objectives of the authorizing statute

The authorizing statute for this rule is chapter 70A.15 RCW, Washington Clean Air Act. Its goals and objectives are:

- Secure and maintain levels of air quality that protect human health and safety.
- Promote economic and social development in Washington and facilitate the enjoyment of the natural attractions of the state.

- Protect public welfare, preserve visibility, protect scenic, aesthetic, historic, and cultural values, and prevent air pollution problems that interfere with the enjoyment of life, property, or natural attractions.

6.3 Alternatives considered and why they were excluded

We considered the following alternative rule requirements and did not include them in the rule amendments. Each section below explains why we did not include these alternatives.

- Exclude amendments related to flame cap kilns
- Do not address air curtain incinerator use

6.3.1 Exclude amendments related to flame cap kilns

We considered not amending the rules to include flame cap kilns. However, Substitute Senate Bill 6121 in 2024 directs Ecology to add the definition of 'flame cap kiln' to WAC to align with RCW 70A.15.5140.

6.3.2 Do not address air curtain incinerator use

We considered not amending the rules to address the use of ACIs in burning waste wood. However, we identified the variance application required for ACI operators who burn waste wood as unnecessarily burdensome for potential permittees. Failing to address ACI use for this purpose would cause these burdens to remain in place.

The notice of construction is a costly permit process that remains in place after the rulemaking. However, adjusting the emissions requirements for ACIs burning waste wood is a necessary prerequisite for establishing a General Order for using ACIs to burn waste wood. It is possible for Ecology to establish a General Order in the future, which would eliminate the notice of construction requirement for ACI use and create a less costly permitting process.

6.4 Conclusion

After considering alternatives, within the context of the goals and objectives of the authorizing statute, we determined that the rule amendments represent the least-burdensome alternative of possible rule requirements that meet the goals and objectives.

Chapter 7: Regulatory Fairness Act Compliance

We analyzed the compliance costs of the rule amendments in chapter 3 of this document. We determined that there were no direct costs imposed by the rule amendments as it does not require actions by any regulated entities compared to the baseline. Any activities permitted in the baseline may continue under the rule amendments without any additional costs. Addressing each aspect of the rule amendments in turn, it would:

- **Clarify the use of flame cap kilns in agricultural burning.** The rule amendments are implementing statutory changes. There are no costs to this part of the rule amendment.
- **Define emissions standards for air curtain incinerators.** The rule amendment does not require ACIs to be used. Under the rule amendments, all baseline activities may continue as before without any additional costs. Any ACI use as a result of the rule is expected to create a net benefit and will not create direct costs for any small business. Any costs related to using ACIs that are incurred due to the rule are strictly voluntary.
- **Clarify unit emission standards requirements.** The amendment adds precision but does not change the underlying standards. Because the emissions standards do not change, there are no costs to this part of the rule amendment.

Based on this analysis, Ecology is exempt from performing additional analyses under the Regulatory Fairness Act.

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Appendix A: Administrative Procedure Act (RCW 34.05.328) Determinations

A. **RCW 34.05.328(1)(a) – Clearly state in detail the general goals and specific objectives of the statute that this rule implements.**

See chapter 6.

B. **RCW 34.05.328(1)(b) –**

1. **Determine that the rule is needed to achieve the general goals and specific objectives of the statute.**

See chapters 1 and 2.

2. **Analyze alternatives to rulemaking and the consequences of not adopting this rule.**

For the flame cap kilns portion of the rulemaking, there is no alternative. The legislature has directed Ecology to add the definition of "flame cap kiln" to WAC via Substitute Senate Bill 6121 (2024 session) to align with the definition in RCW 70A.15.5140. An alternative option to the air curtain incinerator portion is to not enter into rulemaking. The application process for air curtain incinerator permitting would remain unchanged, and would continue to be time and resource consuming for both applicants and Ecology.

Please see the Least Burdensome Alternative Analysis, Chapter 6 of this document, for discussion of alternative rule content considered.

C. **RCW 34.05.328(1)(c) - A preliminary cost-benefit analysis was made available.**

When filing a rule proposal (CR-102) under RCW 34.05.320, Ecology provides notice that a preliminary cost-benefit analysis is available. At adoption (CR-103 filing) under RCW 34.05.360, Ecology provides notice of the availability of the final cost-benefit analysis.

D. **RCW 34.05.328(1)(d) – Determine that probable benefits of this rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.**

See Chapters 1 - 5.

E. **RCW 34.05.328 (1)(e) - Determine, after considering alternative versions of the analysis required under RCW 34.05.328 (b), (c) and (d) that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated in Chapter 6.**

Please see Chapter 6.

F. **RCW 34.05.328(1)(f) - Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.**

This rulemaking does not require those to whom it applies to take any action.

G. **RCW 34.05.328 (1)(g) - Determine that the rule does not impose more stringent performance requirements on private entities than on public entities unless required to do so by federal or state law.**

No. The flame cap kilns portion of this rulemaking does not impose any requirements, and the air curtain incinerators portion of this rulemaking eases the permitting process for applicants.

H. **RCW 34.05.328 (1)(h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter.**

No

If **yes**, the difference is justified because of the following:

☐ (i) A state statute explicitly allows Ecology to differ from federal standards. [If checked, provide the citation included quote of the language.]

☐ (ii) Substantial evidence that the difference is necessary to achieve the general goals and specific objectives stated in Chapter 6.

[If checked, explain.]

I. **RCW 34.05.328 (1)(i) – Coordinate the rule, to the maximum extent practicable, with other federal, state, and local laws applicable to the same subject matter.**

The purpose of the flame cap kilns portion of this rulemaking is to align WAC with RCW 70A.15.5140 and the recently added definition of "flame cap kiln." The air curtain incinerators portion of this rulemaking deals exclusively with streamlining the state permitting process. The Department of Natural Resources, our silvicultural burning partner, has been consulted and invited to participate in the rulemaking process. They stated that they do not intend to move forward with their own rulemaking at this time, but have been in attendance at public meetings. The local clean air agencies have also been invited to participate in public meetings and provide comments.