

Colorado Smoke Management Program Manual



photo courtesy Fred Ellis



Colorado Department
of Public Health
and Environment

Air Pollution Control Division

Colorado Department of Public Health and Environment

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I. Application, Elements Common to [Forms A \(piles\) and B \(broadcast\)](#)

A) Burn name: For permitting purposes, what is a “project”?

Implementation Guidance: This question of what constitutes a project comes up most often with respect to scattered piles. Our criterion for lumping piles is that the project should affect the same receptors from a similar distance and to a similar extent. Also, the activity included on a single permit should be planned for generally the same treatment. Usually if burn units are on the same NEPA and burn plan, they should have the same smoke permit. District-wide pile burn plans are an exception, and will require multiple permits.

For example, if the piles in one fuel break come in two fairly similar sizes, include them on the same permit with details about sizes and an explanation. But if the piles instead are next to different communities, each should have its own permit. As always, please [contact us](#) if you have unique situation.

B) Permit year: Can a permit for a planned ignition cross two years?

Requirements: A permit may not cover ignition in more than one calendar year. There must be a separate application and permit for each year.

Background: The question about multi-year permits arises most often for piles. Reasons include that it may not be known in the fall whether there is going to be enough early snow, or it may be likely the project will take days in both years of a single winter to complete.

Implementation Guidance: If you don’t already have a permit and want your planned ignition to be permitted over a 2-year period:

- 1) Fill-out the first year application ([Form A or B](#)).
- 2) Make an (electronic) copy. Change the burn year on the copy.
- 3) Submit them together with a single set of any needed attachments.

If you already have a permit for the current year, request a renewal as described below.

Once a permit has been issued it cannot be “undone” or the issuance rescinded even if the permit will not be used.

Authority: [Reg. 9](#) IV C 10: “The permit is valid only for the date or period specified in the permit.”

C) Allocation of split bill: How is the cost of a permit allocated among multiple payers?

Requirements: If more than one agency or landowner will each pay a portion of the cost of the permit, on the application indicate what percent each will pay. If APCD does not already bill one or both entities, include all needed billing contact information.

Background: Split bills almost always are associated with cross-boundary projects. For more information about how fees are determined and billed in general, see the smoke program’s [fees webpage](#).

Intent: This decision is yours, not ours. As long as both parties agree you may split it up on any basis, or charge the entire permit for a multi-owner project to only one owner.

Implementation Guidance: Put the billing contact information in the landowner section or in 'other notes.'

Authority: [Reg. 9](#) Appendix C, Distribution of Costs

D) Renewal: How should I renew a permit for a subsequent year?

Requirements: To renew a permit, send an email to cdphe_fireapps@state.co.us. Include the name(s) and/or permit number(s) that you want to renew. Also either state that the only change is to the permit's year, or describe simple changes. If there are substantial changes, instead submit a revised application form.

Background: The question about multi-year permits arises most often for piles. Reasons include that it may not be known in the fall whether there is going to be enough early snow, or it may be likely the project will take days in both years to complete.

Implementation Guidance: Before sending a renewal request, carefully review the current permit. Check each element in the application portion for needed updates. Requesting a renewal implies the same degree of responsibility for ensuring that the application is currently accurate as does sending in a new application.

If you send in an application as part of your renewal request, point out updates, such as by using 'track changes.'

Authority: [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."

E) Administrative unit: There are multiple landowners / agencies. Which should I list?

Requirements: On the application list all agencies or people who own the land. Ultimately each landowner or line officer is responsible for what happens on their land, including adherence to permit conditions.

[Thresholds for significant users](#) of prescribed fire could become relevant on multi-owner projects. If the landowner has not completed significant user review, APCD will apply toward their PM-10 ceiling a proportion of the project's expected emissions equal to their share of the acres burned. In that case APCD needs to know each owner's share of acres.

The annual emissions inventory must reflect land ownership. On daily activity reports (Form E), indicate what portion of the acres actually burned belong to each landowner or agency.

Background: The boundaries of some burns cross jurisdictional lines. Or a burn done by one agency can be on a second agency's land.

Implementation Guidance: Beyond the formalities or who is ultimately responsible for adherence to a permit, whoever signs the permit must ensure that the burn boss has the information needed to adhere to the permit, that reporting is completed, and that the

prescribed fire fee invoice is paid.

See also the question above about split bills.

Authority: [Reg. 9](#) V A: “Significant users of prescribed fire shall apply for and may obtain a... permit if they also satisfy the requirements of section VII of this regulation.” [Reg. 9](#) V B: “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planned ignition fire permit.”

F) Landowner: Do permitted land users on federal land need smoke permits?

Requirements: A public land permittee, such as a ski resort operator, needs a permit. However, small projects may be eligible for a [general open burning permit](#).

Background: Many ski resorts operate entirely or partly on federal public land under a special use permit. Ski areas sometimes burn piles on USFS land, for example after falling hazard trees near runs. *Authority:* [Reg. 9](#) V B: “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planned ignition fire permit.”

G) Local fire department: Why does APCD ask which fire department has jurisdiction?

Background and History: Some years back, two fire departments requested notification when APCD issues a prescribed fire permit for burning within their jurisdiction. It is much simpler for us to process permits the same way statewide, and we realized other departments may also be interested. Because federal land management agencies are the fire control authority on land they oversee, the processing step applies only to land owned by individuals, businesses, or local governments.

Intent: The purpose of asking about fire control permitting authority is to meet the requirement in Regulation 9 that in the issuance of any smoke permit, the Division “shall consider... [c]ompliance by the application for the permit with applicable fire protection and safety requirements of the local authority.” (IV.B.1.c.)

Implementation Guidance: As a courtesy to aid in local coordination and challenges with managing burning piles on private lands, APCD forwards the completed smoke permit to the person listed on the application as the fire department contact.

H) Location: Which is better, lat/long or a legal location (TRS)?

Requirements: In a permit application, include either lat/long, Public Land Survey System (PLSS) location, or both. If you send lat/long, aim generally for the center of the project. If you send the PLSS township, range and section(s) (TRS), list all sections in which any burning may occur.

Implementation Guidance: For us, each option has its advantages. TRS is easier to place on a paper atlas and can help us understand the configuration of a large project. Federal reporting we must do requires lat/long, although we have automated the conversion. If the project stretches for several miles, including a map would be helpful. For some permitting categories, unit maps are required. Otherwise, we still might request one for a large project.

Authority: [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burning to any building or other structure...” ; V.D.3: [and t]he location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn;”.

I) County: How and why are smoke permits different for some piles in Grand County?

Requirement: Grand County has a delegation from APCD to issue permits locally for general open burning. County representatives requested and received an additional delegation to permit larger piles, only for entities that are not [significant users of prescribed fire](#). Permits for [significant users of prescribed fire](#), whether public or private, are issued by APCD.

Background: Due to insect epidemics, in parts of Colorado many private landowners want to burn logging piles. Even small logging piles generally cannot be out cold by sunset. So the piles are larger than counties with delegated general open burn authority may permit.

Grand County wanted to give local landowners a simpler and less expensive smoke permitting option. APCD’s primary interest is to ensure that the effect of smoke permit conditions on air quality remains reasonably consistent statewide. We also want to be responsive to a county’s needs and preferences. APCD and Grand County staffs worked together to figure out procedures that met these criteria.

Some other counties’ staffs have considered a broader delegation and decided not to request one. A county delegation would have added work with little or no associated revenue.

Intent: In essence, Grand County staff have volunteered to do some of the work for both APCD as state regulators and private landowners as burners. They issue the permits for some smaller projects, inspect piles, and track weather in order to give a daily go/no go smoke authorization. They also assist with public outreach.

Implementation Guidance: It may not be important to know which agency should issue the permit for a particular project. If you need a County permit instead of APCD’s or vice versa, either agency will let you know. Contact either [APCD](#) or your [county](#).

Authority: A copy of the formal delegation from APCD to Grand County is available by [contacting APCD](#). Reg. 9 allows for the Division or an approved local agency to issue permits: [Reg. 9](#) V.A.

J) Spread: Why does the application ask if some piles are farther than a mile apart?

Intent: A generalization that has exceptions is that only within a mile of piles is smoke concentrated enough to smell. And with rare exceptions, the health effects of smoke too dilute to smell are not acute. So it is APCD’s intent to allow that groups of piles separated from each other by at least a mile be allowed to be burned simultaneously.

The intent is formalized in a permit condition that concurrent operations are allowed for groups of piles at least 1.0 miles apart provided plumes from the sites do not visibly intersect. Each separated operation may burn up to the permit’s daily limits. We include this permit condition only on permits whose application has a check in the box for ‘yes, spread is at least one mile.’

For some projects, an alternative would be to issue multiple permits, each for a smaller geographic area.

Implementation Guidance: Indicate on your permit application if a project has a spread wider than a mile. However, permission to use concurrent operations will require that each daily notification and activity report indicate whether they are expected to be or actually were used on each particular day.

Authority: [Reg. 9](#) IV B 1 e: “The division shall consider... the potential contribution of the proposed burning to air pollution in the area”

K) Receptors: Should I list an isolated home as a receptor?

Requirement: You may list individual homes as receptors but it is not required.

Intent: We use a project’s list of receptors to help us visualize a burn. For example, the location of receptors helps us understand and review wind direction requests. The receptor list does not determine what category of conditions applies. Distance to nearest occupied home determines conditions category.

The home of a smoke-sensitive individual, such as a person with respiratory illness, is a critical concern when managing a project’s smoke. It is not necessary to list the sensitive individual’s home as a receptor. (Each known sensitive person’s situation must be addressed, however.) If there are key considerations specific to this burn about known or possible smoke-sensitive individuals, describe them in the narrative or call if you’d rather not put health information in a public permit document.

Authority: [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burn to any building...” [Reg. 9](#) II R, definition of smoke-sensitive receptors: “... urban and rural population centers... and other locations that may be sensitive...” [Reg. 9.V.C:](#) “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”

L) Receptors: I will be burning within a Class I area. Is it considered to be a receptor?

Requirements: When a burn is inside a Class I area, the Class I area itself does not need to be listed as a receptor.

Intent: APCD recognizes that management of National Parks and other [Class I areas](#) involves tradeoffs among natural resources. Managers charged with oversight of Class I areas must consider all the resources in the area for which they are responsible, including air. We also take into account that Wildernesses and some National Parks exist in part to preserve and protect natural processes including fire.

In the application narrative, describe the mitigations that will be used. The usual range of options is relevant, especially visitor interpretation and refraining from burning during periods of highest visitor use such as federal holiday weekends. If air quality, camera, or acid deposition monitoring is scheduled during your project, notify the monitor coordinator of burn activity.

Authority: [Reg. 9](#) V D 3: “The division shall consider... the location of the proposed burn... and

Class I areas that might be impacted.”

M) Miles to nearest home: For permits, what determines whether a home is occupied?

Requirements: In determining whether a house is occupied, we require reasonable attempts. What is reasonable varies by project. There is no requirement to contact the owner or occupant of every structure if other methods are effective. (If the home is occupied and you are trying to mitigate distance, personal contact IS required. Please see that separate topic, below.)

In the space for actual distance to nearest home on the application, put the distance to the nearest home whether or not it is occupied. Then in the adjacent box for mitigated distance, put the distance to the nearest actually-occupied home (or the nearest one that is not mitigated as described in the next topic).

Whether a residence is occupied can change from day to day. For example, use of some second homes is reliably seasonal. For permit purposes, “occupied” refers to day(s) when ignition occurs. If whether a home is in fact occupied is likely to vary depending on the time of year, say so in the narrative.

Only for piles < 300 ft³ each, a residence can be considered unoccupied if every resident of the home is at work or otherwise gone during the day.

In your project file keep basic documentation of determinations whether residences are occupied. Show the documentation to APCD on request, but do not submit it routinely.

Intent: [Reg 9](#) is concerned with protecting public health and welfare, not buildings. The goal is to protect public health and welfare, and this is moot if the home is unoccupied.

Small piles have different occupancy requirements. Nighttime drainage smoke that may infiltrate nearby homes comes mostly from larger piles. Drainage smoke from small piles is further minimized if chunking is undertaken.

Implementation Guidance: Options for figuring out whether anyone is occupying a home may include:

- In winter, watch where there are tracks in the snow or where the snow plow quit.
- Consider not burning on weekends if most nearby houses are second homes
- Ask the agency law enforcement officer.
- Talk to local residents.
- Distribute flyers to homes or cabins, post notices in common areas, and ask.

Authority: [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burn to any building...” and [Reg. 9](#) IV C 2: “Each permittee shall use the best smoke management techniques appropriate to the proposed burn.” [Reg. 9.V.C](#): “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”

N) Miles to nearest home: Can I ‘mitigate’ an occupied residence?’

Requirements: Yes. To count an occupied home as unoccupied for purposes of permit distance categories, contact a person in the household by phone or in person to establish that no member of the household has unmitigated health concerns related to smoke.

Indicate on the application both the actual distance to the nearest occupied home and also the ‘mitigated’ distance. Space for each appears on the same line on the first page of Forms A and B.

Smoke impacts at mitigated homes still should be part of the burn’s routine smoke monitoring. Adjustments should be made as needed in order to minimize smoke impacts to occupants.

Intent: We want to provide some flexibility for the isolated home or ranch whose occupants have no health issues related to smoke and whose tolerance for seeing, smelling and breathing limited smoke is established. Mitigating distance means working with permit conditions that effectively presume that a household doesn’t exist, or similarly that within a wider range of smoke concentrations, their welfare is of no concern. That is a strong action. For it we require a strong test. We intend to give people in each mitigated residence a very easy opportunity to make their concerns known. That is why affirmative personal contact is required.

Implementation Guidance: Contacting individual homes is labor-intensive. It isn’t practical for whole subdivisions or neighborhoods, or in places with lots of ‘no trespassing’ signs. It isn’t meant to be. Those areas should be labeled as occupied.

Other than in working with health-sensitive individuals, APCD does not require house-to-house contact. It is optional, and usually done only to put the project in a less restrictive distance category.

- Using personal contacts in order for a project to be eligible for less restrictive permit conditions is an option we offer that you may decide helps you do your work.
- With respect to establishing distance to nearest occupied home, you have the option to assume that every home is occupied, or of using other reasonable methods to determine that the house is vacant.
- Simple public notification as opposed to distance mitigation may always be done via impersonal media, whether it is a news release, signs posted in appropriate places, HOA newsletters and/or other means. Again, working with people who have known health sensitivity to smoke is an exception.

Authority: [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burn to any building...”; [Reg. 9](#) IV C 2: “Each permittee shall use the best smoke management techniques appropriate to the proposed burn.” [Reg. 9](#).V.C: “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”

O) Management purposes: Are training burns exempt from smoke permits?

Requirement: Training projects are exempt from smoke permits only if they also otherwise qualify as [general open burning](#). For broadcast that means less than 10 acres of grass or 5 acres of other fuels. If a training burn needs a regular smoke management permit rather than a general open burn permit, it is not exempt.

Intent: The training exemption applies if the burn's sole purpose is firefighter training. It's a rare prescribed fire that doesn't provide training benefits. Our presumption is that a project too big for a general open burn permit has more benefits than training alone. The size threshold is also a surrogate for the burning having enough potential to affect air quality to be regulated.

One of the subjects firefighters must learn about during their training is managing smoke. That includes working with smoke permits.

Implementation Guidance: Although it is not required, the general [open burning staff](#) appreciate it if you notify them when you are implementing an exempt training burn.

Authority: [Reg. 9](#) III B 3: "The following activities are exempt.... Fires used for instructional or training purposes, except instructional or training wildland pile or broadcast fires larger than the de minimis thresholds of a low smoke impact burn pursuant to Appendix A of Regulation Number 9;"

P) Requested wind directions: How tightly must I constrain wind directions? How close to the burn can the receptor be and still be OK?

Requirement: If wind direction needs to be constrained including to avoid a smoke-sensitive receptor, eliminate direction(s) defined to the closest of the 8 basic compass directions.

Implementation Guidance: If the receptor to be protected falls near a line dividing two of the eight directions, both may need to be eliminated. For example, a receptor to the N may be a reason to eliminate S wind. SW and SE would still be acceptable. If the receptor were NNE, then both S and SW may need to be eliminated. How far from a burn receptor must be mitigated individually is a project-specific decision. In general, consider the closest town or large subdivision in each of the four cardinal directions and within 25 miles of the burn. Not all the receptors you consider this way will require wind constraints, but how much they are likely to be impacted and receptor specific smoke mitigations need to be considered. List all the receptors and document smoke mitigations other than wind direction restraints in the smoke management narrative. *Authority:* [Reg. 9](#).IV.C.6: "The authority granting the permit may impose conditions on wind direction..."; [Reg. 9](#).V.C "...application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes... the impacts of the smoke on visibility and on the health and welfare of the public."; [Reg. 9](#).V.D.3, 6 & 8.a: "The Division...shall consider...in determining whether, and under what conditions, to issue a... permit: 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn; 6. The smoke mitigation techniques proposed; 8.a That best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors;"

Q) Requested wind directions: I expect to loft smoke completely over a nearby receptor. Is that adequate mitigation?

Background: Generally, no. What follows is a long explanation of why.

There are two general methods of changing the smoke a burn does produce so that impacts are minimized: dilution and removal/avoidance. Dilution ‘thins out’ smoke, so that even if it stays on the ground and passes through receptor areas, it is less dense. Removal/avoidance occurs when the receptor is avoided through wind direction or by lofting a column up over close receptors, with the expectation that when it eventually resurfaces downwind, it will be highly diluted.

From a weather perspective, different conditions are required to promote dilution versus lofting. Good dilution occurs when winds are strong and the mixing layer is deep. Smoke disperses through a large volume of ambient air. Optimal lofting occurs when the air is unstable and winds are relatively light. Instability, which is related to a deep mixing layer, promotes both loft and dilution. Unlike instability, wind has opposite influences on loft and dilution. Relatively light winds can help a column develop, while strong winds are needed for dilution.

There is little certainty that lofting from an ordinary sort of prescribed fire will protect nearby receptors. In contrast, it is common for major wildfires to loft smoke well. There are two reasons for the difference.

- First, most wildfires occur in summer when instability peaks.
- Second, the wildfire’s vertical lift is usually generated by draw within a condensed convection column. An intense fire’s smoke assisted by rising through unstable air has enough initial momentum to reach a height in the atmosphere where the water vapor in the smoke condenses. When the vapor condenses, the water’s phase changes from gas to liquid. The condensation represents a second release of heat. The second pulse of heat boosts the smoke’s vertical velocity.

A researcher at Missoula explained that the released latent heat of condensation far exceeds the sensible energy (heat) in a fire’s flames. That is, for lofting it matters a lot more whether the column becomes fully formed than whether the flames are impressive. The total amount of heat energy in a condensed column may loft smoke well. But does the burn plan for this project really imply this prescribed fire will have a fully-developed, condensed column?

Otherwise, the kind of lofting that ordinary favorable ventilation can provide is already taken into account through ventilation adjective.

Implementation Guidance: To decide which if any method of dispersing smoke is feasible and appropriate requires familiarity with a site and its planned fire. Reliable mitigation by lofting depends on generating a fully developed column. Under some circumstances a more intense fire with good loft is harder to control. On the other hand, the higher winds required for dilution can also portend control challenges. If you plan to use lofting as mitigation, describe the logic well in your narrative. Address the atmospheric dynamics and fire behavior you expect. Consider adding the mitigation of a maximum eye-level windspeed, one at which you believe the plume won’t lay over enough to adversely impact nearby receptors. Expect to be d to provide APCD with

R) Contingency: What is meant by smoke contingency?

Intent: Every permit includes a smoke contingency plan for a couple reasons.

1. First, we want to be sure that implementers will be prepared to respond if smoke impacts are unexpectedly bad, so the. Like escaped fire or medical contingency plans made for most prescribed fires, we don't expect situations to arise often when a smoke contingency would have to be implemented.
2. Second, understanding the smoke contingency plan helps us understand and evaluate how risky for smoke a particular permit application is. The more a contingency plan is likely to be sufficient to stop a bad smoke situation quickly, is realistic, and has been thought out ahead of time with care, the shorter the duration and perhaps even lower severity a bad smoke situation is likely to be.

Understanding smoke risk is a key part of evaluating a smoke permit application. For example, a paved road that cuts through a large ponderosa burn unit that is likely to have fire on only one side of the road at a time, a well-oiled homeowner association communication network, a loader and operator on site when machine piles are burned, or even an over-sized burn organization all can significantly reduce the likelihood that residents will breathe heavy smoke for a long time. Knowing those kinds of details helps us figure out how loosely or tightly to set the burn's conditions, including whether standard conditions are appropriate.

Implementation Guidance: The contingency plan that is part of each permit application describes a planned response to excessive smoke. The smoke contingency plan ideally includes commitments of what will occur if its implementation is triggered, rather than exclusively listing options that the burn boss may consider. Example contingency provisions:

- Two added information officers will attempt to contact each household within 1.0 miles downvalley within 2 hours.
- All assigned operational resources will mop up until sunset.

In reviewing smoke contingency plans, above all we consider how realistic the proposal sounds. Can it be implemented as planned?

Authority: [Reg. 9.V.D.8](#), "...applicant will conduct the burn in accordance with a smoke management plan or narrative that requires:... d. That smoke management contingency measures will be taken if smoke impacts occur at smoke-sensitive receptors;"

S) Contingency: When things go really wrong with smoke, what must the burn boss do?

Requirements: The header of the smoke contingency block in the application addresses excessive impacts:

"If unhealthful or excessive smoke impacts develop, implement the smoke contingency plan you describe below. If the smoke contingency plan does not mitigate smoke impacts by sunset of the next day, additional smoke mitigation measures will be developed in collaboration with APCD. If agreement on a collaborative plan cannot be reached and implemented, APCD may rescind this permit immediately."

A required component of every smoke contingency plan, included in the application form, is to advise APCD within 2 hours.

If implementing the smoke contingency plan is insufficient and excessive smoke impacts are likely to continue longer than a day, we'll ask to discuss options with you. If 24 hours from the end of ignition we cannot come to agreement about what your 'extended attack' on the smoke will involve, we may suspend the project's permit. Possible consequences then include enforcement action for burning without a permit and/or needing formally to convert the burn to a wildfire.

Implementation Guidance: It is our expectation and hope that we may never need to use the last resort of rescinding a permit. It is present only in case in APCD's judgment a burn boss who is managing serious problem smoke is not responsive to the need to mitigate the smoke impacts. We realize that a day or more into serious smoke trouble, options may be limited. We expect the burn boss and their organization to make a strong effort to do what is feasible and effective.

If APCD staff request, or if the burn boss thinks documentation is wise regardless, prepare a smoke incident report. We have some example forms. Also, once things settle down we encourage the burn boss to call us and discuss in more detail what happened and why.

If there were problems with smoke but not a full-blown incident, call us anyway. From a punitive perspective, timely self-reporting may go a long way toward softening enforcement. From a professional perspective, sharing the learning helps everyone.

Authority: [Reg. 9.V.D.8.d](#): "The division shall consider... whether... smoke contingency measures will be taken if unacceptable smoke impacts occur" and [Reg. 9.IV.C.12](#): "If at any time the division... determines that the permittee has not complied with any terms... the permit is subject to partial or complete suspension."

T) Other notes: What should be included in 'other notes or considerations?'

Implementation Guidance: Only some applications need a narrative. But if you have information that doesn't logically fit elsewhere and that APCD staff should take into account in reviewing an application, write it in a cover note or in the narrative block on the application.

The simplest way to figure out what to put in the 'other notes' section is to include anything that you would want to know if you were in our shoes and that isn't already conveyed in a different part of the application. Examples:

- You need your application processed very quickly. Say so. We'll try.
- You may, undertake additional mitigations. Put them in the 'notes' box on the application. Be clear which proposed actions are firm commitments and which are options for the burn boss to consider.
- If you are attaching a photo, put a caption or description in the narrative if needed.
- If outreach has turned up anything surprising it usually works best if we all know it.

- If you think this burn will be a great opportunity for shared learning about smoke but you can't afford to staff extra documentation, say so. We can't always help or find loaner resources but we'll try.
- If you think it will help us visualize your project, describe how the fuels or other characteristics of this project relevant to smoke are similar to or different from other specific burns.
- You are requesting a visit, or already have in mind the date when you may burn.

U) Submit to: May I submit my application electronically?

Requirements: You may choose how to send forms, maps, photos, and any optional attachments. Your options are email, traditional mail, and fax. The email address, cdphe_fireapps@state.co.us, is right below your signature block on the application. New permittees may also have to fax or mail a signature page, but we will tell you if that is necessary.

Implementation Guidance: We prefer electronic applications. We can process them faster, including because w.

Authority: Electronic signatures are widely accepted. As an example, the Colorado Air Commission's [Procedural Rules](#) allow in section 1.3.8(2)(a) "Service by electronic mail shall be complete when the Office of the Air Quality Control Commission receives an electronic mail containing an attached, signed version of the document to be filed, and a message is transmitted back to the sender from the Office of the Air Quality Control Commission, confirming the filing was received. When a party files by electronic mail, it shall be considered an agreement to be served by electronic mail." [Reg 9.V.C](#), "Persons seeking a planned ignition fire permit shall submit to the Division or authorized local agency an application on a form approved by the Division for each separate burn."

V) Signature date: How long does it take to review and process an application?

Implementation Guidance: Most permits are on their way back within a week or two. However it can take up to 30 days after receiving a complete application to make a decision on a permit. The 30 days does not include a public comment period if one is required (rare).

Please expect and plan for some delays. Even when application packets include all the pieces and are prepared carefully, we usually end up asking questions about new projects. Phone or email tag may further delay processing. When we have all the requested information, we date an application as 'complete' and the 30-day clock starts.

The more complicated and risky a project is for smoke, the more rounds of discussions APCD staff are likely to have with you and with each other. The reverse is also true. Small, simple projects generally take less time to work through.

Usually it does not take the full 30 days to issue a permit. We take pride in issuing most permits considerably sooner. Exceptions:

We tend to have small backlogs in December and January, since every permit expires on New Year's Eve.

We may take more time if a project won't be burned for many weeks or months.

If a project is a rush, we may be able to push one application ahead of everyone else's - but not if it would hold up burning for people who submitted earlier.

Processing the few projects subject to public comment probably will take the full 60 days allowed by regulation.

Occasionally we get waylaid for emergencies. We still expect to meet the 30 day deadline pretty much no matter what.

Authority: For those few applications that receive formal public comment, [Reg. 9 VI E 2](#) requires that the Division “within 30 days of the close of the comment period... shall either grant or deny the permit.”

II. Application Form A, Portion for Piles Only

A) Annual number of piles: Is there a cap on pile size in Colorado?

Requirements: There is no smoke permitting limit on a pile's size.

Implementation Guidance: The weather options the smoke permit will provide for large piles are tighter than they would be for smaller piles. Details are provided in the [pile worksheet](#).

Where landing configurations and other considerations allow, we recommend a windrow shape for larger piles. All else being equal, they are better for smoke than round footprints. When one long edge of a windrow is ignited, the fire reaches the opposite side relatively quickly, encouraging early and rapid burnout. And if bad smoke impacts require it, a long narrow pile is more accessible to water and heavy equipment than a very large round pile.

Authority: [Reg. 9](#) IV B 1 f: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area; [and] whether burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public."

B) Annual number of piles: May I use the biomass calculator's corrected volume?

Requirements: No. APCD uses the biomass calculator's "geometric volume," not the "corrected" volume.

Background and History: USFS' Pacific Northwest Research Station has computerized the calculation of some geometric shapes in an on-line [biomass calculator](#). The calculator's "geometric volume" uses standard geometry formulas. Geometric volumes assume that pile shapes conform to standard geometric shapes like half spheres, standing cylinders, etc. The biomass calculator's geometric volume matches the [pile volume calculator](#) on APCD's website. Our spreadsheet in turn draws on an [even older PNW publication](#).

In addition to geometric volume, the biomass calculator gives a "corrected volume." The researchers used 3-dimensional locations of multiple points at the outer edges of their sampled piles. They modeled the points in a [TIN format](#) to calculate a volume formula closer to observed volume. From that they derived by regression a relationship between geometric volume and TIN-measured volume. The regression applied to the dimensions entered into the biomass calculator yields a corrected volume.

Intent: We share with many people an interest in figuring out the best way to calculate pile volumes. Following are reasons we think geometric volume is currently the best one to use for Colorado's smoke program.

a) Every pile project's volume statewide should be estimated using the same algorithm. At least as important as precision is parity among projects. If one project is calculated in one way, all should be.

b) Is it valuable to introduce more complexity for everyone by using corrected volumes in the interest of what may be more accurate? That depends on the consequences. The recalculation wouldn't make much difference in the real world, so it's not clear that adding complexity would be worthwhile. While the research seems sound and well done, the

correlations aren't so high as to inspire great confidence that the "adjustment" is a reliable improvement.

Except to the slight extent that the adjustment is not linear, using the biomass calculator's "correction" wouldn't change either bills or permit conditions. Smoke permit bills are based on relative shares of burn activity rather than absolute sizes of projects.

One might wonder if a lower calculated volume would let people burn piles with fewer restrictions by putting projects in lower-numbered categories. It wouldn't. Standard conditions describe not theory but observations of what has worked. "Less than 300 ft³" labels piles that have been measured via geometric shapes in the past. If we used "corrected" volumes, we should adjust the size cut points on standard conditions as well.

c) If nonetheless there were a compelling reason to use a slightly more complicated system in order to work with more accurate volumes, we should ask ourselves where the biggest source of error is now, and work on improving that. By that criterion the biomass calculator's correction would seem to focus attention in the wrong place.

There is a lot of inaccuracy in using shapes. They are rough estimates. As the [biomass calculator's research paper](#) notes, "Piles rarely conform perfectly to a geometric shape." The calculator relies first on a shape choice to describe each pile. The error band on choosing the best shape is considerably larger than the calculator's adjustment. Choosing a less-than-perfect shape overwhelms the "correction" in the biomass calculator.

Questions about what of the proffered geometric shapes is most representative arise most often for larger logging piles - perhaps 40' on a side or bigger. It's often unclear whether the closest representation of the pile's shape is an upright cylinder or an ellipsoid. We generally don't quibble among similar shapes, and err on the side of assuming the piles are small. Unless the pile leans far toward the cylinder shape, we typically use the equation for ellipsoids, and nearly every applicant makes the same choice. The difference is significant, an exact ratio of 2/3. If we are going to work toward greater accuracy, rather than worry about fine-tuned adjustments, we could pay more attention to shapes.

Using "corrected" volumes would change our emissions inventory a little. It has almost no immediate consequence for permits, but in the long run may influence the extent to which fire is understood to be an important source of particulates relative to other sources. The inventory, however, has an even larger source of inaccuracy that probably overwhelms even imprecision about shapes: packing ratios. [FOFEM](#) offers 10% or 20% or 30%. It's the user's choice - a potential for error of 300%. The biomass calculator's correction, in contrast, addresses differences on the order of 5-10%. We asked Roger Ottmar, lead author of both [FOFEM](#) and [CONSUME](#), which ratio to use when. Although sympathetic, he doesn't have any guidance about which of the 3 choices is best when, and suggests operator judgment.

The biomass calculator paper reinforces our uncomfortable awareness of uncertainty about packing ratios. "Of the 121 hand piles the researchers measured, the packing ratio of 58 piles was less than 0.10, the packing ratio of 53 piles was between 0.10 and 0.25, and the packing ratio of 10 piles was greater than 0.25." Until we can all make headway on understanding what packing ratio to use when, using corrected shapes would fine-tune a small source of potential inaccuracy while ignoring one that easily overwhelms the change.

In sum, given the very limited consequences, we don't see sufficient value in using a more complicated calculation in the interest of questionably greater accuracy.

Implementation Guidance: Use either the on-line [biomass calculator](#)'s geometric volume or the [pile volume calculator](#). They yield the same numbers.

During application review, APCD staff verify volume calculations using the pile dimensions included in the application. If the volume we calculate is more than the volume shown on the application we may call you to ask for more information. If the calculated volume is smaller than reported, and recalculating doesn't change the project's conditions category, we may simply make and mark the change.

Authority: [Reg. 9](#) IV B 1 f: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area..." and [Reg. 9](#) V D 5: "The division shall consider... the smoke risk rating for the proposed burn;"

III. Application [Form B](#), Portion for Broadcast Only

A) Smoke-sensitive areas: What's behind APCD's smoke-sensitive areas map?

Background: The smoke-sensitive areas map includes land in Colorado that meets any of three criteria:

- within 5 miles of a Census 2010 tract with population density ≥ 500 people per km²
- within 3 miles of a residential health care facility.
- within a formal or informal PM-10 maintenance areas. As an example of an informal area, in the 1990s Telluride's monitors indicated exceedances of the NAAQS sufficient to cause a non-attainment designation. The community avoided a formal designation by created a mandatory action plan that closely resembled the State Implementation Plan (SIP) that is required of any non-attainment area. As of 2015, there are no PM 2.5 non-attainment areas in the state, only maintenance areas.

Intent: The Air Commission directed APCD in [Reg. 9](#) to be especially protective of smoke-sensitive areas. The Commission's definition of a smoke-sensitive area is included in [Regulation 9](#):

“Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons.”

For smoke-sensitive areas the Commission's direction also is in [Reg. 9.V.D.3 & 8](#): “[The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit:] 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn;... 8. Whether the applicant will conduct the burn in accordance with a smoke management plan or narrative that requires:

- “a. That best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors;
- “b. That the burn will be scheduled outside times of significant visitor use in smoke-sensitive receptor areas that may be impacted by smoke and emissions from the fire;
- “c. A monitoring plan to allow appropriate evaluation of smoke impacts at smoke-sensitive receptors;
- “d. That smoke management contingency measures will be taken if unacceptable smoke impacts occur at smoke-sensitive receptors; and
- “e. That measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire.”

The health and welfare of each person matters, and is considered in every smoke permit via distance categories. Smoke-sensitive areas indicate where we believe additional

conservatism in smoke management is warranted. Where smoke complexity is higher, more protection from adverse consequences is warranted. This is reflected in [broadcast standard conditions](#).

People in hospitals and retirement homes already have compromised health. Their bodies may react poorly to smoke at lower concentrations than would affect a healthy person. In terms of burn plan complexity rating, burning near residential health care facilities may increase risk and does elevate potential consequences.

Particulate maintenance areas also have high potential consequences. Despite clean-up work, maintenance areas tend to have the dirtiest background air in the state. One reason is that many are in valleys or other topographic drivers of air pooling, where air gets trapped and inversions are more common. Heavy smoke in a maintenance area is likely to exacerbate air quality levels whose effects already may be marginally acceptable. Risk of a burn's smoke being socially unacceptable also is elevated a bit.

Finally, for urban area burns public perception of unacceptable welfare impacts tends to occur at lower concentrations of smoke. Risk of adverse impacts is increased. So are consequences, because a smoke problem will affect so many people. Finally, technical difficulty also is increased, for two reasons. (1) In a city it is hard to implement an effective pre-burn notification or smoke contingency plan. Essentially, it is no longer practical to make door-to-door contact with people who will be affected. Mass media is the only venue likely to work, and it will not be as effective at reaching nearly everyone. (2) A second reason for elevated technical difficulty of urban burns is that cities and burns close to them tend to be in valleys.

The protection of visibility in scenic/important views is another purpose behind extra care about impacts to smoke sensitive areas.

Authority: [Reg. 9](#). II.R: "Smoke Sensitive Areas or Receptors - Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons." [Reg. 9](#).V.D.3 and 8 (a-e), quoted above.

B) Annual acres: How should I count acres for which I need a permit?

Requirements: For counting both annual total acres and daily limits, include all acres potentially within any black perimeter. If land is interior to continuous blacklining, it must be covered under the current day's permit. An exception would be an interior block all of whose edges will be actively suppressed on the current day. For a discussion of 'separate unit,' see the question under Burn Operations below about stopping fire.

Background: We base permits and reporting on perimeter acres rather than black acres because it is readily verifiable. Unburned area within a burn perimeter is accounted for in other ways than through daily or annual acres.

- Standard conditions were created with recognition that most burns have some degree of mosaic, and that it is uncommon for 100% of a unit's interior to be blackened.
- The fuel description block asks expected consumption by fuel size category.

- The emission reduction techniques block has space to note what percent of acres within the fire perimeter you expect will end up black.
- Daily and annual reports' blocks for consumption by fuel type include a category for 'unburned.'

Authority: [Reg. 9](#) IV B e: "The division shall consider... the potential contribution of the proposed burning to air pollution..."

C) Smoke fuel category: What should I do if a burn's units fall in different categories?

Requirements: If units within a project warrant different smoke categories, either submit the most restrictive category or split them in the application. If you split conditions by unit, then

Include a unit map, with units labeled.

Create a name for each set of conditions or otherwise find a way to make it clear on the unit map or the narrative which units are subject to which proposed conditions.

Describe the fuel loads, piles and/or distance to homes separately for each category.

When you submit burn notification [Form D](#) and activity report [Form E](#), in the block provided, indicate which set(s) of conditions are planned to be or were used.

Implementation Guidance: Processing of your application tends to be more efficient if you call us about the project before you send us a new application for split conditions. In order to describe two broadcast fuel beds or pile sizes and show clearly the basis for multiple sets of conditions, either get creative with the application table's formatting, put unit-specific information in the narrative, or let us help you with templates we have.

Authority: [Reg. 9](#) V D 5: "The division shall consider... the smoke risk rating for the proposed burn;" [Reg. 9](#).V.C, "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public."

D) Smoke fuel category: How are permit fuel categories defined, and why?

Background: Please see the [broadcast smoke worksheet](#) for definitions of the smoke fuel categories we use for permitting.

Intent: The logic behind the categories is to segregate and condition burns according to what their smoke has the potential to do. In the interest of not unnecessarily restricting burns, there is a benefit to having a large number of categories, each at a different level of smoke risk. Each category's conditions must be reasonably protective of the high end of risk within the category. If many varied burns are lumped into one category, burns on the low-risk end of the group will have excessive constraints.

On the other hand, a large number of categories makes the program complex. Another problem with fine distinctions among burns is accuracy. The extreme would be to eliminate

categories and in effect give every burn its own category based on the site's actual specifics. But making reasonably accurate fuel load estimates is very difficult. Fuel load estimates are too inaccurate to use as the sole basis for permitting categories.

Our compromise solution is to use a small handful of fuel categories - four for broadcast, three for piles. In defining the categories, we want focus on smoke, not fuels or fire. Fuels are the cause, and smoke is the result. But for broadcast we think that the basic four fire behavior fuel groups correspond to different smoke issues. So we renamed the basic fuel groups according to their smoke issues.

- Light smoke, or grass - Grass smoke is both light and brief. The main concern is not to send the smoke directly into the closest receptors.
- Brief smoke - Shrubs - in Colorado most frequently pure stands of oak, sage and/or mountain mahogany - can put up thick black smoke. But the smoke doesn't last long. We need to be more careful than with grass about where the smoke from flaming combustion goes and to take into account receptors a little farther from the burn. But shrubs burn out very quickly. A few minutes after ignition ends, accumulated litter may still be smoldering and producing new smoke but it isn't extensive or heavy. Typically, management of fires in brush doesn't need to make allowance for drainage smoke.
- Drainage potential smoke, or timber understory - An understory burn involves much more fuel per acre than shrubs or grass. By weight, usually most of the smoke comes from combustion of duff and litter, which have densities usually in the range of 4-12 tons per acre per inch. In addition, understory burns have potential to generate smoke hours after the flaming front passes. The delay means smoke probably will be generated at night when drainage air flows prevail. Both argue for greater attention to smoke management. On the other hand typical targets for prescribed fire - mostly ponderosa, light mixed conifer, don't smolder heavily for days.
- Highest smoke risk - The last group is the only one that is different between fire behavior fuel types and Colorado's smoke categories. For fire behavior the fourth group is slash. For Colorado smoke permits the fourth group is thick timber. A fire in spruce/fir or beetle-kill are examples. In this category heavy drainage smoke is a realistic possibility.

Few Colorado prescribed burns fall in the highest smoke risk category-. Still, the highest smoke risk category is a very important part of the categorization because it prevents the need to create limitations in the standard conditions for drainage potential burns so that they fit this group of outliers.

Highest smoke risk category burns have wide variation in their fuels as well as their other smoke risk factors. Every permit application is evaluated individually, but burns in the highest smoke risk category automatically receive tailored non-standard permit conditions.

There is one more situation where the four class fire behavior fuel types and smoke concerns diverge, pinyon/juniper. Even though it is a tree fuel, P/J has such a low rate of net primary productivity and hence litter and duff that it is in the brief category along with shrubs.

E) Ignition method: Why does APCD ask how a broadcast burn will be lit?

Intent: Sometimes - and hardly always - aerial ignition burns are hotter and get better lift.

Sometimes - not always - aerial ignition burns are lit over a shorter time period. If so, their smoke disperses more toward midday than if ignition took most of the day. The short-duration smoke may also be heavier, however.

Sometimes - not always - aerial ignition burns present few options to break up units if further smoke mitigation is needed. It may mitigate for terrain where putting firefighters in on the edges of smaller units isn't possible, effective, or safe. The other reason is economic. If any of the day's ignition will be by air, there is a large sunk cost that makes sense only spread over many acres.

All of these reasons affect smoke and smoke mitigation, and we need to consider them.

F) Site fuel load: In collecting fuel load data, what is expected?

Requirements:

Fuel Component	Minimum Accuracy
Duff depth	+ ½"
Litter depth	+ ½"
Grass & forbs	+ ½ ton/acre
Woody shrub	+ 1 t/a
1-hr wood (< ¼" diam.)	+ 1 t/a
10-hr wood (¼ - 1")	+ 1 t/a
100-hr wood (1-3")	+ 1 t/a
1000(+) hr wood (>3")	+ 2 t/a
Canopy closure	+ 10 %

Background: Estimating fuel load is a challenge.

In order for randomly-located line intercept transect data to be statistically reliable in fuel as sparse as is typical of Colorado, the transects must be numerous. One compensation is to choose subjectively the transect locations that you judge are representative. But in that case the sample is no longer statistically random and you are half way through using a photo series anyway. For a more rigorous discussion, see http://www.fs.fed.us/rm/pubs_other/rmrs_2008_sikkink_p001.pdf. One of the study's conclusions is that "For the planar-intersect method... most fuel classes would be adequately sampled using 750 to 1000 m of transects." (p. 173) For 100-foot transects, that's 25-33 per site!

Implementation Guidance: While you certainly may use transects, for greater accuracy we recommend fuel photos series instead. Plus they take a lot less time than transects.

Duff can be difficult. We have found that our best guesses even for familiar places aren't very accurate. On most sites it's best to check at least a few places with a ruler. Duff depth also tends to be patchy, very unevenly distributed in space.

On a forested site one solution is to combine two estimates:

Estimate duff depth under tree driplines, then separately outside of driplines. Measure enough places that you feel you have a solid estimate of what is typical for each.

Area under driplines is essentially the same thing as canopy cover. Estimate canopy cover visually or look it up in GIS. The latter is less subjective.

Calculate the weighted average: (depth under driplines) x (percent cover) + (depth outside driplines) x (1-percent cover)

If you use this method or some other way to estimate variable cover, please make a note in the application narrative that you did.

There is a logic for putting masticated fuel in litter, or in 1-hour fuel, or in 10-hour fuel. So APCD staff know what we are looking at, please either put it in 10-hour fuel or tell us in the narrative where you included the masticated load.

Authority: [Reg. 9](#) IV B 1 e: “The division shall consider... the potential contribution of the proposed burning to air pollution in the area.” [Reg. 9](#).IV.C.11, “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9](#).V.C, “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”

G) Site fuel load: Are fuel load estimates in a permit application binding?

Requirements: Fuel load estimates in a permit are binding as an upper limit averaged for the site. If load estimates are too low, the burn is not permitted for as much smoke as it may generate. The permit is then not valid and must be revised before ignition.

On the other hand if the estimates are too high, the burn is permitted for extra smoke that won't be created, and the revised estimates can be noted on the daily activity report without notifying APCD ahead of time.

Implementation Guidance: If a site's loads are high, you may not expect as much of the total to burn as in lighter fuel. As marked on application Form B, for broadcast burns APCD requests a consumption estimate. Consumption is not binding and is simply a way to help us visualize the fire's most likely smoke impacts.

Authority: [Reg. 9](#) IV B 1 e: “The division shall consider... the potential contribution of the proposed burning to air pollution in the area.” [Reg. 9](#).IV.C.11, “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9](#).V.C, “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”

IV. Project-Specific Conditions, Forms A and B

A) My permit says to phone APCD and also to submit Form D. Why both?

Requirements: Strictly speaking, the only required notification to APCD in relation to any burn day is to submit [Form D](#) 2-48 hours before the start of ignition.

Intent: APCD staff visit and document numerous burn days a year. We attend for several purposes, above all to participate in shared learning. For more information about site visits, please see that section of our [Procedures Guide](#).

With sometimes 8 hours or more of travel, it can be very difficult to attend a burn day with as little as 2 hours notification via Form D. On the other hand, we want notification requirements not to derail a good burn day that is recognized only at the last minute, which is more common with piles than for broadcast. So rather than increase the required advance notice for all burn days, an additional provision applies only to burns we hope to attend. Immediately below the header of those permits and before other conditions, a special request is included and checked.

If feasible, [phone](#) or [email](#) APCD 36(+) hrs before ignition. Also still submit a [Notification of Ignition](#).

Giving us direct earlier notification is optional, but often determines whether we can attend a burn we want to document. So although we intend for that to be an escape clause when circumstances prevent earlier notification, we do not intend its being optional to be a reason to forget or skip calling us about any other burn day.

Implementation Guidance: Please try to maintain awareness of this notification provision for the relevant permit(s).

If, farther in advance, you tentatively see a possible window, we appreciate knowing that as well. It helps us plan travel and other work.

We can't get to all the burn days about which we request early notification. But we try. Once we have seen a project, typically we remove the early notification request from the permit.

In relation to the authority citation below, here is a note about terminology. We refer to our attendance at burns as "visits." We are there to learn, and are interested in a lot more than only permit compliance or even that particular project. However, from a legalistic perspective when we show up it is an inspection by a regulator.

Authority: [Reg. 9](#) IV C 8: "All open burning operations shall be subject to inspection by the Division and/or the local agency."

B) Ventilation: Where may I look up the day's dispersion adjectives?

Requirements: APCD does not require that a spot forecast be obtained for every burn. Any National Weather Service (NWS) forecast for the time and place of burning will suffice if it includes the relevant forecast element(s). Forecasts from sources other than NWS may not be used to establish permit compliance.

Intent: NWS is an independent third-party source of forecasts. They have a Congressionally mandated role to be the one authorized source of weather forecasts for some federal activities. NWS has access to the same models, and often more, than are used by other forecasters. Furthermore, NWS provides forecasts free to all users, is staffed 24/7, and offers a comprehensive and reliable website.

Some other states' smoke programs have one or more dedicated weather forecasters on staff year-round. That level of staffing is expensive. APCD does employ several meteorologists who specialize in air quality. They are available to advise smoke staff and occasionally burn bosses, but work primarily on programs other than smoke.

Implementation Guidance: Anyone may obtain an [NWS dispersion adjective forecast](#) from the internet without requesting a spot forecast. Our [instructions document](#) for getting an NWS forecast anywhere in Colorado was written for private landowners who do not have the option to request a spot forecast. Some land management agencies have policies that require a spot forecast for every burn. However, from APCD's perspective any permittee may use the NWS hourly fire weather table as described in the document.

To look at the spots issued for the day, go to each NWS office's spot forecast website: [Boulder](#) (Denver), [Grand Junction](#), and [Pueblo](#). On spot forecasts, ventilation index translated into a dispersion adjective is labeled 'smoke dispersal.'

Authority: [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;"

C) Ventilation: Permits list one adjective per day. The ventilation forecast varies by hour. What governs?

Requirements: The most favorable dispersion adjective that is forecasted to occur at any time during the day of ignition determines compliance with permit conditions.

Implementation Guidance: It is ideal to light only if you expect enough hours of sufficient dispersion to complete ignition before the minimum required adjective's time period ends, and to be able to start late enough not to cause unreasonable smoke impacts. That isn't always feasible. Burners may choose to accept the risk of lighting after sunrise but sooner in the day than an adequate adjective is forecasted to start ('jump the gun'). However, in that case the burn boss ought to be able and prepared to shut down the burn if smoke impacts early in the day are unreasonable, including if acceptable forecasted dispersion does not materialize.

Authority: [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;"

D) Daily acres: Must each day's units be separated and fire stopped in between?

Requirements: It is not required that burns always be controlled at the end of a day of ignition. What is required is that it be possible. That is the only way to ensure that number of acres burned each day does not exceed what is permitted.

If a following day will still meet the smoke permit conditions including forecasted

ventilation, the burn boss may let the fire continue to spread on its own into the next unit. If permit weather conditions are not met on the next day, spread must be stopped. In many situations this would not be reasonable if a fire had continued to spread on its own overnight. In those cases, do not let the fire continue to spread after the day's ignition in the first place.

Background and History: The question comes up usually in relation to one of two scenarios. First, ignition may be planned for multiple days and the burn boss does not consider it necessary for prudent smoke management or otherwise to burn each day's area as a separate unit and stop fire in-between. The second scenario in which overnight spread is apt to occur is on burns designed to mimic historic fire, allowing small initial ignitions to spread essentially unchecked across multiple days.

As long as available resources could stop fire at the end of a day if needed and under the conditions you propose for the burn, it is OK if boundaries between adjacent planning units are not secure firebreaks that will stop fire unstaffed. If at the end of Ignition Day 1 the forecast for Day 2 does not meet permit conditions, put the fire out at the unit edges. On the other hand, if at the end of the day the forecast for Day 2 does meet requirements, end active ignition by the time limit on the permit. You may allow the fire to spread on its own until the next morning.

The version that has happened, and that is not acceptable, is to do the same project by lighting one of the "units," a perimeter, say, and then, despite crummy dispersion or other smoke problems on the following day, say 'we can't put it out now.' That is a permit violation.

Implementation Guidance: If interior burnout of more acres than your permit allows per day would be your only choice once part of the fire is lit, either get a permit to burn the entire project as one unit or rethink alternative implementation options. Otherwise among the possible consequence of enforcement is to lose your permit and for that reason alone have to formally declare a wildfire. Please also see the discussion below of secondary acres. The ten percent allowance may apply to area internal to a unit as well as external to it.

Authority: [Reg. 9.IV.B.1.e](#), "The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a general open burning permit; e. The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;" [Reg. 9.IV.C.11](#).

"The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." [Reg. 9 IV D 5](#) "The Division... shall consider...Meteorological conditions on the day or days of such the proposed burning; " [Reg. 9.V.D.7](#) Whether the applicant has demonstrated... that the applicant will protect scenic and/or important vistas and visibility in class I areas, will minimize the impacts of emissions and smoke and will not cause a violation of any ambient air quality standards;"

IV C 12: "If at any time the Division or the local agency granting the permit determines that the permittee has not complied with any term or condition of the permit, the permit is subject to partial or complete suspension or revocation or imposition of additional conditions. All burning activity subject to the permit shall be terminated immediately upon notice of suspension or revocation."

E) Daily acres: How does a smoke permit apply to secondary burn area?

Requirements: If fire gets into a secondary target area and burns no more than 10% above the burn's daily permitted acres, we consider it to be within permit conditions. Include the additional acres on Form E, daily activity. Add an explanatory note if the total is over the daily permit limit.

If fire burns more than 10% over the daily acres and no special provisions have been included in the permit for secondary spread, we consider the fire to be outside of permitted conditions. We will evaluate the need for enforcement action. If no prepared fireline at all, or no line around interior secondary area like drainage bottoms, are noted in the permit application, our investigation will look for and likely make reasonable allowance for this acknowledged uncertainty.

Escaped fires are unlikely to result in significant smoke permit enforcement, especially if they are formally converted.

Background and History: Some burn plans include area that will not be ignited directly, but neither is it undesirable for the area to burn. The name of the outer area and its formal definition and requirements varies. In this manual we use the label 'secondary area.'

Secondary area is a tool to manage uncertainty. "Secondary area may be ignited intentionally to meet either project objectives or fire control needs. However, secondary area is not critical to project completion and is not expected to be the focus of ignition efforts." (USFS) Usually it is a geographic buffer around all or part of an intended burn unit.

Intent: The allowance for burning up to 110% of daily acres is intended to create leeway for secondary area. APCD may need to curtail flexibility if that seems to be a frequent effect. It is intended for secondary area only.

Implementation Guidance: For most burns we recommend that you secure your smoke permit for your intended primary target unit/acres only. On the other hand, if you want fire in secondary target areas in excess of 10% to be acceptable for smoke permitting, apply for daily acre limits that include the additional area. Allowance in the smoke permit for large secondary acres may be appropriate when:

- Secondary area is very large relative to primary. For example, you may be planning to burn relatively few acres per day, so that a small fire in a secondary target area still exceeds 10% of daily acres. We have not created a standard exception since this situation is uncommon. Smaller burns are less likely than big ones to have secondary area.
- The burn's edge is deliberately vague, including so that fuel conditions rather than constructed line will have a strong role in determining fire effects ('guerilla burning' and/or burning up against snowmelt). In this instance be sure that your permit designates all of the PLSS sections included in the designated secondary area, or that you otherwise make clear in your application where you intend to accept fire.

Whatever the situation, if it is reasonably likely that more than 10% of daily acres of secondary target area will burn, make advance arrangements in the smoke permit. You may request a permit for more daily acres. Or you may request a higher allowable secondary target percent for this burn. In either case, describe the reason.

One last note: If fire control becomes difficult to the point of impending escape, the burn's actual footprint may coincidentally overlap some the same area designated as secondary but be more than 10% of daily maximum acres. If it happens, tell us promptly. We are unlikely to take enforcement action on (quasi-)escaped fires, but we need to know about the additional burning.

Authority: [Reg. 9](#) IV B 1 e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area."

F) Daily acres: Permit conditions preclude burning big units. What can I do?

Background and History: Larger units may be more economical, reduce the amount of time both firefighters and residents breathe smoke, and make bigger dents in fuels problems. They also can generate heavier concentrations of smoke.

Intent: We understand that there are many benefits of larger units. However, big burns do pose higher smoke risks. Health responses from particulates are roughly linear with concentration; heavier smoke means more people get sicker.

Smoke duration and density - fewer days of more smoke or the other way around - are direct tradeoffs. Extremes of either are not socially or fiscally acceptable. Finding the balance sometimes involves difficult judgments. In evaluating your proposal to burn many acres on one day, we have to judge whether taking this extra risk of smoke risks also safeguards air quality. Good pre-burn smoke preparation including extensive outreach, and a strong smoke contingency plan, help.

Implementation Guidance: Send us the best responsible proposal you can make. If the permit's daily limits are still smaller than you think you can burn with responsible smoke impacts, please discuss it with us.

Following are specific suggestions if you are requesting non-standard conditions. See also [Guidance for Non-Standard Permits](#).

(1) First, please think hard about the need to burn only big blocks. You may set up big units, but if that doesn't include the possibility of burning small blocks, your decision may limit the burn to impractically tight permit constraints.

(2) Standard conditions invite you to make an array - big units if the dispersion is excellent, smaller (sub)units if it's only good, etc.

(3) If you really could shut the burn down mid-day if smoke were unexpectedly bad, we all have a better basis to think that it is possible to safeguard air quality and still burn large areas in one day. Design, map, and tell us about subunits. Be sure it's realistic to cut the fire off at subunit boundaries. Describe briefly what you will use to subdivide the unit - preconstructed handline, discontinuous fuels, wet line, snow, etc. We need to establish that the smoke contingency plan is reasonable and feasible.

(4) Include potential smoke impacts in all of the project's outreach. The better the outreach, the greater confidence we have that should smoke be worse than expected, it is unlikely to cause someone to have a health crisis. Ask smoke sensitive individuals to identify themselves to you. For example, request that anyone with special concerns phone,

or see you at the end of a public meeting. With this step we're trying to protect health even when some smoke is in the air.

Give residents realistic and specific expectations. Good two-way outreach may also reduce public concerns that can develop during a smoke incident. Include the required [health message](#) in more than the minimum of one communication and draw further attention to it when appropriate.

(5) Take the time to generate representative, accurate, and relatively precise fuel loads. Duff, litter, and heavies are particularly important for understanding smoke. Second entry burns usually generate less smoke, though the reduction sometimes is less than dramatic and the change already will be reflected in your site's fuel loads.

(6) Non-standard conditions can be more, differently, or less restrictive than standard. Especially if you are requesting less restrictive conditions, you are proposing a burn from which it is important that we all learn as much about smoke as reasonable. What monitoring and other documentation can you commit to staff so that one of the benefits of a higher risk permit is shared learning about smoke?

G) End ignition times: Why must ignition end by sunset or earlier?

Intent: An inversion usually sets up around sunset even in mid-summer. An inversion traps smoke near the ground. In consequence smoke remains concentrated. The concentrated smoke starts to flow in a drainage pattern, downhill. Human settlements tend to be in the bottoms of drainages. Smoke trapped under a slow-moving inversion may travel many miles down a drainage during the night and affect people miles from the burn site.

Implementation Guidance: Please see the next topic.

H) End ignition times: May I burn with poor ventilation or at night?

Requirements: Unless your permit has special conditions that say so, you may not burn at night nor when ventilation is forecasted to be poor all day.

A day's ignition may begin no earlier than sunrise. Virtually all permits have an end ignition time that is by sunset or earlier. To light at night, you must (1) have an option to burn at night as a special condition on the project's permit and either (2a) light on nights when the dispersion adjective is forecast to remain above poor or (2b) also have permit conditions that allow you to burn with unrestricted ventilation.

If daytime dispersion is poor all day you also may not burn without special permit conditions. The exceptions are for piles and apply only during a major snowstorm, when it is more lightly snowing, and/or with minimal wind. Please see any [permit's conditions](#) for very specific definitions of these terms as they are used in Colorado smoke permits.

Background and History: Night burning has several operational advantages, including sometimes making it easier to control of the fire. In the last decade we've agreed to a small handful of experiments with night burning. The roughly half a dozen that actually were pulled off mostly haven't gone well. They have ended up being situations with worse

impacts than we and the burn bosses expected.

Intent: 'Poor' ventilation is well named. Generally those are times when putting smoke in the air everyone breathes is a bad idea. They correspond well to particulate alert pollution days in cold months, which our meteorologist coworkers determine for the Front Range after significantly more elaborate consideration than calculating a ventilation index.

With very few exceptions, igniting prescribed fires at night is not allowed in Colorado. The exceptions are so tight they aren't likely to be useful. That is by design. Night air becomes stagnant and smoke disperses minimally at night. As for burning at night with better than poor ventilation, the most likely underlying scenario involves a strong cold front - with its potential control consequences that the burn boss must evaluate.

Snow falling during the day is one circumstance when burning under a 'poor' forecast is approved for some projects. During conditions like an upslope storm on the Front Range, the mixing layer may be very shallow and winds light. It is therefore possible to have a ventilation index of poor during a snowstorm. Nevertheless, three reasons combine to make snowstorms but not a rainstorm an ideal time for minimizing smoke impacts.

First, complexly shaped snowflakes falling through air keeps it turbulent. At whatever scale, turbulence dilutes smoke. Snowstorm turbulence occurs at a very fine scale within the air profile. Snowflakes swirling below a street light make the movement visible. Ventilation index incorporates mixing height, an indicator only of large-scale turbulence. Rain is denser. Because rain falls with less swirling, it doesn't generate as much air turbulence as snow does.

Second, snowflakes very effectively scavenge, or 'scrub', some of the minute smoke particles from the air. Rain is not nearly as effective as snow for scrubbing because a raindrop has so much less surface area than does a snowflake.

Finally, from the perspective of protecting Colorado's famous views, sight distances already are short in a snowstorm.

Implementation Guidance: In making requests to burn at night or with poor dispersion, please consider the following:

- Describe the unusual and good reason for the situation. The most frequent reasons we hear are 'otherwise I can't burn this unit safely,' 'otherwise I can't control it,' or 'otherwise I can't get the project done.' If so, are we inappropriately asking air quality to pay a price that belongs elsewhere? In other words, is the project design so unworkable that the only apparent escape from its excessive constraints is to give up on good smoke management?
- We at APCD are obliged to ask 'are we being adequately protective of air quality?' The reasons we can agree to your proposal to burn with poor ventilation probably have little to do with the reason(s) you want to do it. But the reasons we may be able to agree likely are similar to the reasons you as a fire professional expect that the smoke impacts will not be inappropriate. Explain in the non-standard application [Form C](#) why your proposal is responsible *from an air perspective*.
- Address receptors farther from the project than usual. In a short night of poor ventilation, condensed smoke riding a 2 mph drift will go a dozen miles or more. At poor ventilation, along that path neither wind nor vertical rise will dilute the smoke as much as usual.

- Time of night is key. The later ignition starts, the fewer hours the smoke is likely to remain stagnant, and the shorter a distance it can go while it hugs the ground. It is far more likely to be protective of air quality to start lighting at 4 or 5 a.m. than to start at midnight.
- If your motivation is easier control, think about exactly how much area you need to burn to achieve that purpose. Is it a blackline in grass, one for which you can commit to extinguish interior spread? Is it one dogleg? Minimize the acres you ask to burn at night as much as you reasonably can.

Following is an example of a proposal to burn at night that we approved. A small and remote subdivision of second homes was sharply uphill and close to the edge of a unit with an old mechanical fuels treatment. There were no logical holding features slightly farther back to use instead and they were concerned about control. The applicant proposed to blackline the eastern portions of two units in the early evening to take advantage of downslope winds.

They would burn less than 15 acres/evening in order to build 2-3 chains of black, only along the private property boundary.

They committed to mop up on the evening of blacklining any 1000-hour fuels or stump holes that continued to produce large amounts of smoke.

The project's particular kind of mechanically treated fuel is unusual in Colorado except in their area. They have burned extensively in it, giving them a sound basis of experience to say that "typically major smoke production is over within 2-3 hours of ignition and spread typically stops as soon as ignition stops." That degree of control over spread is a risk-reducing attribute.

They pointed out that the nearest home downdrainage is about 5 miles away, and proposed to monitor both there and a drainage road crossing.

No nearby homes were in the downslope direction, a frequent evening flow pattern they would wait for in order to do this blacklining. They did excellent outreach anyway. Finally, a majority of the subdivision's residents were likely to be absent during burning.

To the extent that dusk and dawn allowed, they would document the smoke with photos.

Authority: [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of ... the proposed burning;" [Reg. 9](#).V.E.2, "Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate:...2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare."

l) End ignition times: Why base end times on sunset, not forecasted poor dispersion?

Intent: We considered using forecasted transition to poor dispersion rather than sunset to correlate to an end ignition time. We decided it is not practical.

One reason is that not all burns even get spot forecasts, and not all spots specify the timing of changes in dispersion adjective. (In Colorado and unless requested it's routine only for

the Boulder office to include an hourly table. The table may or may not match the rest of the spot since it is derived differently.) That level of potential for confusion doesn't contribute to good smoke management.

The confusion might be worth tolerating if the results were important enough, but they seldom are. Only occasionally do the two times, sunset and transition to poor dispersion, differ by more than an hour or two. That uncertainty about when inversions will establish is built in to the standard end ignition times. If the forecasted switch is earlier than sunset, it may be because a front is moving in, information a burn boss is already taking into account.

If the forecasted switch is later than sunset, the dispersion forecast is not necessarily more indicative of smoke potential. Typically nocturnal inversions build from the surface up as the earth starts to cool. A shrinking middle layer of unstable air can remain, the base of which is still too close to the ground to show up for a while in forecasting models. So, stability of the air closest to the fire may change before the upper-level mixing height falls. The lowest air is usually what matters most for smoke. Sunset is the best indicator we have found for when air at the ground typically starts to stabilize.

Implementation Guidance: If you would prefer to use forecasted transition time and are prepared to make a special request of the National Weather Service if needed to get the relevant forecast information, we'll consider it. Using transition time may be appropriate on a large project whose air flow you have been observing closely over time, and also if the nearest downdrainage homes are at least a mile or two away.

Choose between sunset and forecasted transition before the permit is issued. Switching the permit's timing basis will not be approved on or shortly before burn day.

J) Wind direction: How do I know if I am complying with wind direction constraints?

Requirements: Permit constraints apply to transport winds.

Implementation Guidance: Forecasted transport wind direction and speed each are averages through the mixed layer. Before a morning inversion breaks, transport wind may even be 'downslope/downvalley.'

At some distance downwind the top of virtually any plume extends from the ground up to the mixing height. At that distance and usually also closer to the fire, transport wind shows in what direction smoke is forecasted to go and how extensively it will dilute.

One complication is when surface wind is strong enough to lay over a plume for a consequential distance. Then, both surface and transport wind heights may be relevant to smoke. Making adjustments that go beyond written permit conditions in the interest of good smoke management is not a permit requirement. But in the long run a pattern of applying conservative good judgment being anyway underlies public support for prescribed fire, protection of health, and much of what permissiveness and flexibility smoke permits do have.

Authority: [Reg. 9](#) IV C 6: "The authority granting the permit may impose conditions on wind direction..." [Reg. 9](#).V.D.4, "The meteorological conditions under which the applicant proposes to conduct the burn and the measures that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions, including coordination with appropriate sources of meteorological information on the day preceding ignition;"

K) Wind direction column: The day's forecast includes multiple transport wind directions. What governs?

Requirements: For the time period starting at noon and continuing through the end of ignition, forecasted wind must be within the permit's directional limits. If so, you may start ignition any time after sunrise even if forecasted transport wind direction before noon does not meet permit direction constraints.

Intent: We are trying to provide maximum reasonable flexibility. Two reasons limit the likely consequences of starting ignition with an unfavorable transport direction.

1. First, ignition usually proceeds relatively slowly until a unit's downwind edge is black. So considerably less smoke per hour tends to be generated in the morning.
2. If morning smoke does surface in an unwanted location downwind like a town or large subdivision, as long as wind direction changes in the afternoon the impacts are likely to be considerably less than forcing people to breathe smoky air all day.

Setting a simple time limit rather than, for instance, a geographic limit, is clear and therefore is potentially enforceable - a necessary attribute of any permit condition.

Implementation Guidance: Suggested considerations when morning transport wind direction is not within the permitted range are similar to 'jumping the gun' on the ventilation adjective. Please see the question above, 'Ventilation: Permits list one adjective per day. The ventilation forecast varies by hour. What governs?'

Authority: [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;"

L) Pollution alerts: What must I check about pollution alerts before burning?

Requirements: No prescribed burn permit may be implemented anywhere in Colorado if an air quality alert is in effect for the area of the burn on a day of planned ignition. If a burn's permit has one or more project-specific conditions that refer to ozone or particulate matter and includes an alert website, it is the burn boss' responsibility to check whether an alert has been issued. A few permits for low elevations in Mesa County also have special provisions related to air alerts; see those permits' conditions. Elsewhere in the state, APCD staff will contact relevant permittees if a alert is issued.

Background and History: Nearly all alerts for both particulate matter and for ozone apply to the Front Range.

An example of a permit condition specific to ozone is "This burn is in an area of special [concern for ozone](#). Reminder: Check http://www.colorado.gov/airquality/colorado_summary.aspx after 16:00 of the day before ignition. Light only if there is no air alert for the county in which this burn is located.

Implementation Guidance: You can better anticipate whether an alert will be issued for a forthcoming day on the Front Range if you are familiar with the conditions that lead to high levels of particulate matter (PM) and to ozone formation.

Both PM and ozone pollution are more common in valleys than on ridgetops, but PM much more strongly so. A PM alert may apply to a smaller area than an ozone alert, and is uncommon at elevations above 7,000’.

PM concentration tends to be high on cold days with low mixing heights and/or windspeeds (aka unfavorable ventilation). PM is primarily a winter problem and worst in the dead of winter.

Like PM, ozone pollution is associated with days that have low mixing heights and/or windspeeds (aka unfavorable ventilation). In contrast to PM, ozone needs sunshine in order to form, and thrives on heat. Pollution researchers have recently measured concentrated ground-level ozone associated with stagnant cold air over bright snow, but ozone alerts in winter have yet to be needed on the Front Range. Ozone is primarily a summer problem and worst in the dog days.

Alert forecasters consider not only weather but also current background pollution levels and expected generation. Thus alerts are less common on Saturday through Monday than later in the work week.

Authority: [Reg. 9](#) IV C 1: “... permits are not valid during periods of publicly announced air pollution emergencies or alerts in the area of the proposed burn.”

M) Pollution alerts: In addition to alerts, what constraints are added to winter burning on the Front Range?

Requirements: Abide by the conditions in the project’s permit.

Background and History: From November 1 through March 31, smoke permits for burns in metro Denver/Boulder below 7,000’ elevation have additional limitations. The limitations affect Boulder, Denver, Jefferson, Douglas, El Paso, and the western part of Arapahoe and Adams counties. For a map, see p. 3-2 of

https://www.colorado.gov/pacific/sites/default/files/AP_PO_Denver-PM10-Attainment-Maintenance-Plan.pdf.

Since 2009 APCD and experienced permittees have been carefully experimenting with some metro-area burning below 6,400’ in winter on days with no air alert. Promoting a high portion of combustion during times without inversions and documenting the smoke are two elements of the experiments.

Implementation Guidance: Depending on the project’s elevation, the smoke permit for a project in metro Denver/Boulder most likely will have one of the following sets of conditions:

This burn is in a central Front Range county and below 6,400’ elevation. Therefore:

- ◇ Do not burn between November 1 and the last day of February.
- ◇ In March:
 - Start ignition no earlier than 10:00.
 - Combustion must be substantially complete by 16:00.
 - Reminder: After 16:00 of the day before ignition, check http://www.colorado.gov/airquality/colorado_summary.aspx or call the recording at 303 758-4848. Light only if there is no air alert for the burn area.

This burn in a central Front Range county at elevation 6400'-7000'. Therefore between November 1 and March 31:

- ◇ Start ignition no earlier than 10:00.
- ◇ Combustion must be substantially complete by 16:00.
- ◇ Reminder: After 16:00 of the day before ignition, check http://www.colorado.gov/airquality/colorado_summary.aspx or call the recording at 303 758-4848. Light only if there is no air alert for the burn area.

If you have a project you would like to propose for inclusion in experiments with winter burning at low elevation in the metro area, [contact us](#).

Authority: [Reg. 9](#) IV C 1: "... permits are not valid during periods of publicly announced air pollution emergencies or alerts in the area of the proposed burn."

N) 2 in 7: How does a '2 in 7' permit condition work?

Requirements: Meet the conditions of the permit.

Background and History: We have repeatedly observed that people who live near a burn tend to tolerate smoke better for two nights than for three or more nights. The generalization is an experience-based belief among our peers in other states also. Two days in seven limitations addresses both public welfare and health.

Intent: The intent is to address APCD's responsibilities for public welfare and public health, as required by [Regulation 9](#). The people of immediate concern are those who live down-drainage.

Implementation Guidance: If a project has a 2 in 7 condition, you may still burn small areas as often as every single day.

Here is an example from a 3c rural broadcast permit:

Burn ≥ 250 acres per day on at most 2 days in any 7-day period. Days when fewer acres are burned do not count as one of the two days.

That means any days on which 249 acres or fewer are burned don't count as one of the two days in a seven day period. The threshold for counting, in this instance 250 acres, varies by the burn's condition category.

The easiest way to figure out whether 250 acres or more can be burned today is to check whether in the past week (today and the 6 days prior) there was at most one other day with 250 acres.

Here's an extra-complicated example for a 2 in 7 provision that applies when ≥ 250 acres per day are burned:

Week before example starts: No burning occurred

Day 1: 30 acres of blacklining. Does not count because less than 250 acres was burned.

Day 2: 300 acres. This day does count because more than 250 acres was burned. As a result, only one day remains out of the next 6 on which 250 acres or more may be burned.

Day 3: 200 acres. Doesn't count. Considering Day 2, for the next 5 days more than 250 acres may be burned on only one day.

Day 4: no burning

Day 5: 300 acres. Through Day 8 (7 days starting on and including day 1), the most that can be burned is 249 acres per day.

Days 6, 7, 8: about 100 acres a day, none of which count toward 2 in 7.

Day 9: In the last 7 days (days 3 through today, day 9), one of those (day 5) counts toward 2 in 7. On Day 9, 300 acres again is burned. Now the next day on which 250 acres or more may be burned is Day 12. Day 12 is just after the 7 day stretch that starts on Day 5 (day 1 in 7), includes day 9 (day 2 in 7), and ends on Day 11.

Authority: [Reg. 9.IV.A.2](#), “The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public.” [Reg. 9.IV.B.e](#), “The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;” [Reg. 9.IV.C.2](#), “In order to minimize emissions and smoke impacts, each permittee shall use the best smoke management techniques appropriate to the proposed burn.” [Reg. 9.IV.C.11](#), “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.”

(Authority, continued) [Reg. 9.V.C.](#), “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.” [Reg. 9 V D 8 a](#): “the division shall consider... whether the applicant will conduct the burn in accordance with a smoke management plan that requires that the best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors.” [Reg. 9.V.E.2](#), “Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate: 2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”

O) Share observations: Why must smoke observations for some burns be sent to APCD?

Intent: Some managers believe that APCD should permit more burning per day with fewer constraints. Changes in the permitting program in any direction will continue to be based on information, experience, and weight of evidence.

The burns that have the most potential to produce meaningful information about smoke impacts are (1) burns with standard or non-standard conditions at which at least 50% of standard acres are burned on one day and (2) burns with conditions less restrictive than standard. The more information collected, the more opportunity there is for shared learning about permit conditions and outcomes.

Many permits that are less restrictive than standard conditions require photo documentation, and may require instrumented particulate monitoring also.

We recognize that the monitoring requirements are a burden on permittees. On the other hand, requirements for shared documentation are for burns with less restrictive conditions than standard. In effect, these are experimental prescribed fire permits. The expected consequence including as requested by permittee representatives of better documentation is mutually beneficial shared learning about permit conditions.

Implementation Guidance: APCD provides guidance about both photographic and instrumented monitoring. See the back page of the example [monitoring form](#) on the smoke website.

APCD staff sometimes assist with both photographic and instrumented smoke documentation. But you must be prepared to meet your permit conditions alone in case we cannot participate. See also the topic about brands of smoke monitors and about loaned particulate monitors.

P) Consult: How does prior consultation with forecasters work?

Requirements: If a permit requires that a burn have an advance consultation, then send maps and the burn plan to the relevant NWS office's fire weather program leader prior to the consultation phone call. The fire weather program leader will decide which forecaster(s) may be NWS' representative for the consultation phone call. During the call with the forecaster(s), decide:

What forecast elements will be especially important to managing this burn's smoke?

How will on-site weather observations be collected in the days before ignition? Key point: APCD requires that at least three pre-burn days of hourly data be collected within the permitted burn area and provided to NWS.

What feedback to the Weather Service will be provided, how, and when?

If relevant, how will the forecaster develop and provide advance information about smoke for days subsequent to initial ignition?

The smoke permit will be finalized only after the advance portion of the weather consultation is complete. You may start formal consultation prior to applying for a smoke permit.

Background and History: As is detailed in the broadcast worksheet, a few burns must have a weather consultation relevant to smoke with either the National Weather Service or APCD's meteorologist. This requirement was developed after negative experiences with some high smoke risk burns in sensitive areas. It applies on average to fewer than three permits a year.

Intent: Only burns with high risk for smoke impacts must have a consultation. Within standard conditions, the requirement applies only within mapped smoke-sensitive areas. Regardless of burn location, a consultation is one of the possible mitigations for non-standard high daily acre limits.

The purpose of both the consultation and on-site weather observations is to support meteorologists in making their spot forecast as accurate as possible. The process was created in the late '90s in an open meeting for permittees and forecasters that occurred in response to an unusually bad prescribed fire smoke situation. The entire group felt that precise and accurate forecasting was invaluable. For smoke, expected times of inversion formation and break up are key. Site specifics matter for inversion timing. The conferees unanimously agreed that being able to see temperature patterns on previous days and having the option to compare those to coarser weather prognostic models is the best way to enhance forecast accuracy.

Implementation Guidance: A consultation requirement usually involves placing a weather station that has data transmission capability within the project area. The weather station does not have to be a full portable RAWS, although ordering one from the NIFC cache is one option. If you need a portable weather station or particulate monitor, see the [list](#) on our website of agency units who may be willing to loan you equipment, or [call us](#).

To facilitate an effective consultation, call the fire weather program leader weeks or months ahead of burning. The consultation requirement is specific to smoke, but it may be a good time to discuss other weather concerns too.

We recommend that burners consult with the National Weather Service rather than APCD meteorologists as a first choice, unless specific questions or problems arise. NWS forecasters know they may open a peer discussion with APCD's forecasters any time. Although in truth both groups of forecasters know parts of each other's specialties fairly well, their experience and capabilities differ. APCD forecasters understand the development and movement of polluted air. Their input can help clarify expected smoke risks, highlight which detailed forecasting information may be most important, and perhaps help an NWS forecaster to key in on certain factors. NWS, in contrast, has the staffing, currency with a broad range of weather information, and familiarity with their local area that better equips them to issue complete forecasts.

Authority: [Reg. 9.V.D.3](#), 4 & 5: "The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit: 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn; 4. the measures that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions; 5. The smoke risk rating for the proposed burn;"

Q) Consult: Collecting weather data for a burn that requires a weather consultation isn't reasonable in a particular case. What alternatives are there?

Implementation Guidance: If you have a proposal, talk to us about it. Only burns with a significant smoke risk in the first place must have a consultation. An off-site RAWS station may not be representative. APCD's forecasters must concur a NWS recommendation before it can be approved as a substitute for an instrument on site.

R) Order IMET: How does the permit condition to order an IMET work?

Requirements: If the project's permit conditions include ordering an incident meteorologist (IMET), the permittee or burn boss must place a resource order at least three days before the date of ignition, and host and pay them if one is available. The

NWS will determine from where the IMET will do their work, but the assigned meteorologist must be dedicated to this burn and not also have other duties.

Background and History: Conditions for burns that have especially high risk for smoke impacts may require that a dedicated Incident Meteorologist (IMET) be ordered.

Implementation Guidance: We recommend a site visit first with the likely IMET. NWS fire weather forecasters say that good communication before, during and after a burn can sometimes minimize or eliminate the need for an IMET to be on site on burn day(s), and we are open to consider that advice. Separately, the condition is worded so that if no IMET is available through the national ordering system the burn does not have to be cancelled as a result.

Authority: : [Reg. 9.V.D.3](#), 4 & 5: “The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit: 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn; 4. the measures that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions; 5. The smoke risk rating for the proposed burn;”

S) Heavy equipment: Why does APCD have a permit condition as operational as requiring that staffed heavy equipment be on site?

Background and History: Some heavy equipment can get within working range of piles that still are too hot for human exposure. Heavy equipment can be used for routine chunking of large piles, and for smoke contingency. If needed, heavy equipment can help extinguish a pile by moving snow, stirring in snow or water, chunking, and/or spreading out a pile. In those ways heavy equipment can minimize emissions and smoke impacts.

The requirement applies to only a couple permits a year.

Intent: By providing a realistic if still difficult smoke contingency option, heavy equipment on-site provides a way to burn piles responsibly that have been built poorly for straightforward smoke management. A permit has a heavy equipment requirement under two circumstances: The permit may be non-standard and have this as one of its conditions. Alternatively it ensures follow-through when an applicant says that heavy equipment will be on site anyway, as, for example, for some logging piles. The requirement to have heavy equipment on site is one way to manage piles that otherwise APCD might be irresponsible to permit.

Authority: [Reg. 9.IV.A.2](#), “The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public.” [Reg. 9.IV.B.e](#), “The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;” [Reg. 9.IV.C.2](#), “In order to minimize emissions and smoke impacts, each permittee shall use the best smoke management techniques appropriate to the proposed burn.” [Reg. 9.IV.C.11](#), “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.”

(*Authority, con't*) [Reg. 9.V.C.](#), “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the

burn and the impacts of the smoke on visibility and on the health and welfare of the public.” [Reg. 9 V D 8 a](#): “the division shall consider... whether the applicant will conduct the burn in accordance with a smoke management plan that requires that the best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors.” [Reg. 9.V.E.2](#), “Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate: 2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”.

T) I can't reasonably work within my permit conditions. May I have them reconsidered?

Requirements: If you believe you can't reasonably work within a project's permit conditions, [call or email](#) APCD smoke program staff. Present your alternate proposal or provide additional relevant information.

If after presenting your alternative proposal to smoke program staff you still believe the conditions in the permit including any revisions are not reasonable, you may formally appeal. Contact Gordon Pierce, APCD, Technical Services Program Manager: 303 692-3238 or gordon.pierce@state.co.us.

Background and History: An agency's regional office representative requested that we designate an appeals process less formal than approaching the Air Quality Control Commission. The intermediate appeals process would be a way to challenge a denial of a permit, or permit terms and conditions. In addition, a more formal appeal to the Commission is both allowed and governed by the [AQCC Procedural Rules](#) (5 CCR 1001-1, section VI, Procedures for Adjudications.).

Implementation Guidance: Call us to discuss unworkable permit conditions. We may ask you for additional documentation regarding your request for less stringent conditions. If we reach agreement on new conditions, we will send you a revised permit.

Please make revision requests well ahead of your expected burn date. We may not be available if you need approval in a short window. Also, we may not grant your request. Plan for both possibilities.

We don't have guidance to share about a semi-formal or formal appeal because so far neither has been used.

Authority: [Reg. 9 V E 2](#): “Planned ignition fire permits shall include but not be limited to... all permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”

V. General Conditions, Forms A and B

A) How far apart must projects be in order to burn both in one day?

Requirements: Few permits have conditions that limit separation among permitted projects. There are no implicit requirements, only what is explicitly included in project-specific conditions.

Background and History: So far in Colorado we have not yet encountered the problem situation that would make standardized separation requirements necessary. The situation that could arise and would change the need is multiple burns in an area causing unacceptable smoke impacts within the same airshed, while each contributing burn did not individually cause undue problems.

Intent: So far all our experience with problem burns has been about one project at a time. That's why we permit and condition one project at a time.

We think there is the most potential for the problem in a mountainous part of Boulder County, where lots of agencies all burn in a small geographic area. The Grand Valley also has above-average potential. So far burn bosses in those areas have made it a habit to talk among each other about forthcoming projects, and to consider the potential for cumulative smoke impacts. Until problems seem likely, and currently they seem not to be, we think voluntary efforts in which APCD does not routinely participate are best.

If we should start to see problems that involve overlap of otherwise acceptable prescribed fire smoke plumes, we would talk to the agencies involved and perhaps consider changing program parameters. One option to consider in that case would be required separation distances.

Allocation of total particulate production or acres per day by airshed is an especially large-scale solution relevant only if a problem existed at the scale of whole airsheds. Total airshed limits seems even less likely to be needed in the foreseeable future than standard separation distances.

Implementation Guidance: Please continue to apply good judgment. When you think you ought to coordinate with other burners in your agency or airshed because overlapping smoke might be a problem, it's wise to do so.

As a general guide to apply if you are in doubt, most problems can be prevented if simultaneous pile projects stay at least one air mile apart, and broadcast burns stay at least 10 miles apart. But there also are times burns this close together can work fine from a smoke perspective. Factors you may want to consider include wind and therefore plume transport direction, time of ignition, size of burn, location of key receptors, and others.

During permit review we watch for likely overlap of the application project with others that already have permits, and consider the likelihood both might be staffed on one day. Occasionally it looks like there is reasonable potential for a problem to develop if specific projects' smoke overlaps. If so, we add to one or both projects special conditions that address separation.

Authority: [Reg. 9](#) IV B e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area."

B) Monitoring: From what brands of smoke monitors will APCD accept data?

Background and History: The price for a single outdoor particulate monitoring instrument starts at about \$10,000. Packages including communication and data logging cost more.

Implementation Guidance: Like most government agencies, APCD avoids certifying or recommending brand names. Most recently in 2006, the [Missoula fire lab reviewed](#) half a dozen of the more common brands of real-time particulate monitors. Any of the models that Missoula reviewed, and probably others as well, would be accepted as potentially providing useful data.

There are about a dozen portable particulate monitors around Colorado, a small national cache of monitors based in Denver, and others based with land management agency units in Utah and elsewhere. On any one day, most monitors in the state are not in use. Owners have often been cooperative about loaning them to other burners. APCD also purchased two for special projects. They are available to loan to permittees, especially state and local agencies or private landowners who may have less access to shared federal resources. Please [contact us](#) or see the page on our website about [specific monitors you may ask to borrow](#). APCD's website also has field [users' guides](#) for some models of monitors.

Field monitors are quite different from the monitors that establish whether a city or other area is in compliance with National Ambient Air Quality Standards. Federal reference method monitors (FRMs) are used to determine attainment. FRMs are permanently located, are larger and heavier and more difficult to move, run essentially year-'round, cost many times as much as field monitors, often use volumetric filters rather than optical technology, are managed with chain of custody data tracking, and are more precise than field monitors. As for accuracy as distinguished from precision, Missoula's lab testers, we at APCD and others all sometimes run field monitors collocated with FRM instruments for comparison. We assume that when they differ it is the field-quality instrument that is off base.

All the differences from FRMs aside, field-quality particulate monitoring equipment has an important function. It can tell the approximate particulate concentration at a single point in space and time(s). In that respect, it may tell where smoke didn't go. *A monitor can't tell where the heaviest smoke did go. Therefore there is no reason to think monitor data indicates peak concentrations overall.* Even for apparently simple and obvious drainage flow, we have seldom succeeded in placing instruments in locations that end up being where the densest smoke in fact goes.

To know where the heaviest smoke went, take photographs of the smoke plume at a regular time interval. Photos taken in the early light before sunrise the morning after ignition of drainage potential fuels are usually more important than all the day's other smoke photographs combined.

C) Notify the public: What does APCD consider to be adequate notification?

Requirements: [Regulation 9](#) requires "that measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire."

In addition, you must undertake all outreach to which you definitively commit in the application. It will include public notification with a specific [health message](#).

Implementation Guidance: A press release to local papers or electronic media, a homeowner's newsletter, a phone tree, a note on your agency's website, a community meeting, or a poster at the only post office or gas pump for miles - we can imagine circumstances under which any of these notification vehicles would suffice. What works well in Colorado Springs isn't what works well in Maybell. Health messaging has similar but slightly narrower options, as described on the [webpage](#) about it.

Required last-minute one-way notification of the public differs from advance notification and from outreach conversations. We encourage permittees to use the same test we use. Would a person with health sensitivity to smoke have a reasonable opportunity to make themselves known in time to be individually notified about what day(s) burning will occur? For the test we assume that someone with, for example, severe asthma pays basic attention to readily-available information about their environs. If the outreach works for them, we believe it is good enough for the rest of us. Last minute notification as required by [Regulation 9](#) generally does not meet this more meaningful test.

The best outreach we see involves some form of two-way conversation. Telling someone what will happen - one-way communication - amounts to advance notification. Discussing - two-way communication about - real options to modify even minor aspects of an operation builds public support. We realize this is demanding, expensive, and not always reasonable.

Two-way outreach and more thorough one-way notification often increase public acceptance of smoke, both from a specific project and more generally over the longer term. Further, our experience suggests that if unexpectedly heavy smoke is generated, public response is more measured when prior outreach was interactive.

From a more formal perspective, APCD's responsibilities include safeguarding acceptable visibility. Scientists say in the end that visibility judgments always have a subjective component. Good outreach may contribute toward people believing that visibility was not compromised inappropriately. In short, outreach can help to both mitigate some smoke impacts directly and also minimize their likely health consequences.

For projects with little smoke potential, like many remote pile burns, required notification and minimal outreach such as a seasonal press release may be all that is needed. At the other extreme, for a large broadcast unit near a subdivision, considerably more outreach pays off.

In summary, we check that a person with concerns should have a reasonable opportunity to know what burning is planned and when it will occur. That is required. More, including giving residents an opportunity to respond, is not required but will help nearly everyone involved.

Authority: [Reg. 9](#) IV D 8 e. Text quoted above.

D) Unmilled tree waste: Why can't I burn unpainted lumber or wood fences?

Requirement: Comply with the general permit condition that says 'This permit is for burning only the unmilled forest fuel shown in the description of fuel above. No milled or treated lumber may be burned.' Even if wood appears untreated, you may not burn any dimension lumber, unwanted fencing, or parts of old buildings on a prescribed fire permit.

Background and History: Wood stains can fade to invisibility. Pressure-treated wood used to be

pretty easy to spot. It was a sickly green and there were staple-like marks parallel to the grain where the preservatives were injected. Neither is still necessarily true. Now an advertised attribute of some lumber is the invisibility of its pressure treatment. As one indicator of the severity of the problem, there are research projects whose goal is to develop easy, low-cost field tests for pressure treatment of lumber to help landfill operators separate arriving loads.

Intent: Paints, preservatives, coatings, and other chemicals that sometimes are applied to wood may release toxins and other pollutants when they are burned. The smoke can harm both the firefighters doing the work and the public that both land managers and APCD are charged to protect. Prescribed fire permit conditions are not designed to address these complex pollutants.

Permit conditions have to be objective and verifiable. We have no reasonable way to ensure lumber that looks untreated really is. Neither sometimes do burn bosses, such as when they are asked to burn a pile of waste that has accumulated at an agency administrative site.

Implementation Guidance: Keeping agency and site piles clean of material that may not be burned on a prescribed fire permit takes considerable effort and attention.

If you want to burn lumber that appears to be or that you are sure is untreated, apply for or call to discuss a [general open burn permit](#) instead. Cabins, including trespass cabins on public land, also sometimes may be burned on a general open burn permit but never on a smoke management permit. Because the considerations, alternatives to burning, and potential pollutants all are different between general open burning and prescribed fires, a significant portion of general open burn applications are denied even though this rarely occurs with prescribed fire permits. Every structure that is burned on a general open burn smoke permit must first have certified asbestos clearance.

Sometimes there are a few wood fence posts in a broadcast burn unit. Where it is reasonably feasible to keep them from burning, please do so. (Maybe you are anyway for reasons unrelated to smoke.) Burning a couple fence posts in the woods is not what we are trying to prevent by this condition. Their minimal presence does not invalidate the whole permit. It is prudent and responsible to document the presence of standing wood fences on the broadcast permit application, either in the description of fuel or in the space for notes.

Authority: [Reg. 9](#) II N (definitions): A “planned ignition fire [is]... intended for the purpose of grassland or forest management” and [Reg. 9](#) V C 7: “Precautions shall be taken to ensure that the burn is restricted to items... identified in the permit.” Re internal fences, [Reg. 9](#) IV B 1 d: “The division shall consider... whether there is any practical alternative” [Reg. 9.V.E.2](#), “All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”

E) Transportation safety: What is APCD’s responsibility for traffic safety?

Requirements: APCD does not review transportation safety. At best, permits may provide for it coincidentally.

Background and History: A since-retired BLM State Fire Management Officer for Colorado who also was a top-notch burn boss strongly requested that we make explicit in smoke permits their lack of transportation safety review. He noted that if even one junior burn boss saw the reminder once at the right time and thereby averted one traffic problem, it was

worthwhile. General permit conditions now say “This project has not been reviewed for fire safety or road or other transportation safety.”

Implementation Guidance: Independently of smoke permits, the burn boss must plan and provide for road and other transportation safety.

Concern for transportation safety affects burn operations. It may influence receptors considered during planning, acceptable wind directions, pre-burn notifications, and smoke contingency, all of which are addressed in our application as they pertain to health, welfare and visibility. We are interested in transportation safety decisions you make that affect permit conditions, so we can picture the project and understand your application.

To use an example, you might submit an application with a wind direction constraint request that protects a nearby interstate or airport with no homes nearby. Being reminded of the interstate nearby helps us understand the request. The simplest way you can help us to know is to list the highway as a receptor on the application. More often there are homes along the relevant stretch of road, in which case the road is a convenient label that includes the homes. We review how residents along a stretch of road will be protected from undue impacts, and definitely want it listed as a receptor.

A notification or smoke contingency plan that addresses only traffic safety and/or coordination with law enforcement is not sufficient. We need to know how health, welfare and visibility will be protected also.

Authority: This is an area where [Reg. 9](#), as originally drafted in 2001, is apparently at odds with what was intended at the time the overall Regulation was adopted. The issue was not discovered until some years later. APCD plans to address this with the Commission in the future. For the time being, SMP staff has received guidance that they do not have authority to condition permits for fire escape concerns or transportation safety. Staff have been advised that they have discretion in how consideration of smoke sensitive areas occurs during permitting. Within this discretion, staff are instructed to ignore traffic safety. The problem is [Reg. 9.II.R](#), the definition of Smoke Sensitive Areas or Receptors as “ Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons.”

VI. Form C, Non-standard Supplement

A) Why does APCD have both standard and non-standard conditions?

Background and History: For as long as Colorado has had a smoke management program, every permit has been reviewed and conditioned individually. Our standard conditions are a predictable and consistent set of permitting constraints that are relevant for most but not all burns. “Standard conditions” exist for both [piles](#) and [broadcast](#) burns.

Which set of standard conditions apply to a particular project depends on pile size or broadcast fuel type, distance to the nearest home, and, for broadcast, whether the burn is in or very close to a town. Standard conditions reflect near-upper limits of what had successfully been burned in the past in Colorado without known undue smoke impacts. One reason we make a lot of field visits is to see whether a weight of evidence is accumulating to support changes to standard conditions. We have adjusted some aspect of standard conditions on average about once every two years since we started using them in 2009.

Non-standard permits may be looser, tighter, or otherwise different from standard. Variances range from almost trivial to the state’s most experimental smoke management.

Standard conditions would be considerably more conservative if they had been designed not for the range of typical projects, but instead to be protective for every possible project that fit within each category’s criteria. So some projects’ permit conditions are *more* restrictive than standard. Even when people apply for standard conditions, we sometimes tighten the permit terms depending on the unique characteristics of the project. For example, burn bosses who are not [NWCG-qualified](#) typically receive conditions with fewer weather options and/or fewer piles per day than standard.

Other tightening we usually discuss with the applicant before finalizing the permit. A past example is handpiles immediately adjacent to homes in the bottom of Vail Valley. The valley is high (read ‘cold’), narrow, steep, and backs up to the even-higher Continental Divide. Each of these characteristics discourages smoke dispersion. People likely to be in Vail when the piles were burned included drivers in winter weather on the immediately adjacent interstate, people entirely unfamiliar with wildland smoke, patients of a large hospital, fresh out-of-state visitors whose blood has not yet adjusted to high elevation, and many retirees. Finally, all of the agencies involved in the burn project were very eager to maintain the high level of project acceptance they had worked hard to earn. APCD staff and the permittee both felt tighter conditions than standard were warranted.

Intent: In the sense that the worksheets reflect the real world of what has happened rather than a theoretical upper limit of what could be done responsibly, it’s been known from the start that one possibility is that the worksheets are too conservative. Absent a credible smoke impacts model, only experience can reveal discrepancies.

So a second reason for non-standard conditions reflects APCD’s continuing willingness to participate in experiments that may help identify opportunities to loosen standard conditions in the future. Experimental projects are chosen carefully, represent incremental change, have permits whose terms reflect the review and input of multiple people, and are monitored closely in order to learn as much from them as is possible. (Change to standard conditions is possible in any direction, and any set of burns could indicate a need.)

A third group of non-standard permits is the most common. For an open-ended list of reasons, for some burns what is most appropriate are conditions different than standards built from the high end of prior experience. The non-standard terms may represent a trade-off among constraints in which the net smoke risk is essentially unchanged, or they may be looser than standard. Permits that exchange constraints usually begin with a burn boss' professional opinion that for a particular project or unit, what is best is a trade in either direction between daily acres and end ignition times. Another, usually for burns surrounded by homes, trades an option to burn at fair ventilation plus fewer daily acres/piles for unlimited wind direction

The standard/non-standard framework of our permitting program adds complexity to the program. Some degree of uniformity among permits for typical burns through "standard conditions" has many advantages. But so does the ability to be flexible, respond to unique site characteristics and situations, and push the envelope with experiments.

Implementation Guidance: The next few topics in this manual address making requests for non-standard conditions. Also we are available to [discuss](#) smoke plans for any burn project.

B) Who invents a project's non-standard conditions?

Implementation Guidance: If you want non-standard conditions, you should propose your own and fill out the appropriate version of [Form C](#). In that case it is APCD's job to ensure the final conditions are consistent with [Regulation 9](#). We may end up refining your proposal together. APCD staff also may initiate the change from standard to non-standard conditions.

You should create the initial proposal because you are more likely to end up with effective constraints that work well for your project by taking into account the particulars of your situation. For example, you know whether reducing acres or constraining wind direction is a more severe operational limitation for your burn. Finally, APCD can more quickly review whether proposed conditions are acceptable than generate them.

The standard conditions described on the [pile](#) and [broadcast](#) worksheets are a starting point. Proposals for less stringent conditions need especially strong justification. Explain your reasons on the non-standard application form.

We do not as a matter of course deny applications, standard or otherwise. The main reason is that most applications come from experienced, responsible fire professionals and it shows. If we disagree that proposed conditions are appropriate, typically we talk with applicants to revise the original proposal.

At least two APCD staff members approve each permit with non-standard conditions. Committee review is intended to ensure reasonable parity and thoughtful review from a variety of perspectives on the most challenging projects. The committee is required as part of its review to consider appropriate monitoring requirements, and means and opportunities to share information subsequently collected. Committee review increases turnaround times somewhat on high-risk projects, but does not change the 30-day deadline APCD uses for determination of approval or denial of a completed permit application.

C) How can I get the widest permit conditions that are consistent with responsible smoke management?

Implementation Guidance: First, we expect every applicant to ask themselves rigorously ‘what is responsible?’ If any aspect of a proposal doesn’t meet this test, go no further.

If your proposal passes your gut test, submit it. Include a solid description and justification. Note what additional offsetting mitigations you may be proposing. We are available to [discuss](#) your possible request for non-standard conditions, and often find those early conversations useful. Please see also the next topic.

To a very limited degree, in setting conditions we may consider local history. How professionally have burn bosses on previous projects within the administrative unit managed both permit conditions and smoke? Also, what is the history of burns in that airshed? Has there been a burn of the proposed size or reasonably close to it? What happened?

Over time the best ways to get wide permit conditions are (1) to work responsibly with existing permits; (2) to continue to improve skills to picture smoke possibilities for future projects accurately and in detail, and to figure out how best to manage the smoke; and (3) work with us to figure out how to responsibly and incrementally increase the size and/or smoke risk for specific projects.

For more detail about this subject please see [Guidance for Non-Standard Permits](#).

D) Request standard conditions: Our responsible proposal looks bad on paper. What should we consider in preparing the permit application?

Implementation Guidance: There are some legitimate ways to justify a challenging proposal on an application. Also, call us. We’ll want to talk to you about a project like this anyway, including to really ground our understanding of why your proposed conditions might be a good idea.

Think individually and creatively about receptor mitigations. For example, impacts on a Class I airshed or a view are more important during periods of high visitor use, typically summer and weekends.

Think individually and creatively about permit conditions. Examples: If you want to do aerial ignition of hundreds of acres a day, how early do you expect to finish? How early can you *commit* to finish ignition? Or if dilution is a key mitigation, should you restrict the project to days with good or better ventilation, or limit fair days to a low acre cap that allows for some blacklining? If drainage smoke is a critical concern and therefore so is NWS’ ability to accurately predict inversion timing, how about putting a weather station within the project area a month or two before ignition?

Think carefully about the tonnage of fuel you expect will be consumed.

Think about working with residents. For smoke impacts, two-way outreach can go a long way. For example, WUI (wildland-urban interface) fuels projects often create piles right in backyards. If everyone or almost everyone who lives nearby has a good opportunity to know what burning is proposed, to comment and discuss their concerns, to receive notification shortly before ignition, and especially to bring to burners’ attention people with health sensitivities, then APCD is more likely to consider that smoke impacts are mitigated.

VII. Maps

A) Smoke map: What area should a smoke map cover?

Requirements: On a smoke planning map show potentially affected receptors up to 15-25 miles out from the burn. Center the map on the burn, or show a little more of the direction where smoke is most likely to go.

Draw drainage flow from the burn, indicating by the length of the arrow(s) how far you think the smoke can be smelled the first night after ignition. Draw a wedge or polygon for the most likely (range of) paths for lofted smoke. As needed for clarity, highlight key receptors.

For requests to burn with unrestricted ventilation, see the [broadcast worksheet](#) for more detailed requirements of what to map.

Implementation Guidance: A good scale is ½-inch = 1 mile, which matches most full-Forest and some BLM maps. Feel free to send a .pdf, .jpg, a GIS export or photo of a paper map, Google Earth .kmz, or other electronic format. We also can accept hard copy maps.

Unit maps do not replace smoke planning maps. Even though we seldom require unit and/or general vicinity maps we always welcome them. They are especially helpful for large multi-unit burns. If you are requesting split conditions in which different units have different permit constraints, a unit map is required.

Authority: [Reg. 9](#) V D 3: “The division shall consider... the location of the burn and smoke-sensitive areas and Class I areas that might be impacted by smoke...”

VIII. Daily Notification, Form [D](#)

A) Local agency contact: Who is the local agency representative I must notify and how may I advise APCD?

Requirements: To identify the local agency representative who you must notify before ignition, see the [list of county air quality contacts](#). Notification may be via email, fax, phone mail, or a conversation.

Notification to APCD of intent to ignite must be in writing, whether it is fax or email. It must be on APCD's [Form D](#) and submitted 2-48 hours before ignition starts.

Implementation Guidance: One option is to email Form D to both APCD and the local air contact.

We recommend that burners find time at some point to meet their [county air quality representative](#). If there is a significant smoke incident you are likely to be working together. Also, minor issues could arise later that can be handled quickly and informally if there is a familiarity and level of comfort between the burner and the county air quality representative. These local health officials may also know of smoke-sensitive individuals and are a great source of information about local public health concerns and appropriate mitigations.

Authority: [Reg. 9.IV.C.9](#), "The permittee will notify the appropriate local agencies as required by local regulations and/or ordinances." [Reg. 9.V.D.8.e](#), "That measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire."

IX. Daily Activity Reporting, Form E

A) Burn cancelled? We ended up not burning. Do I owe APCD more paperwork?

Requirement: If you submit a notification of ignition (Form D) for a burn day, then whether or not you light anything you must submit a daily activity report (Form E).

Intent: Reported cancellations are how we know that a report of actual burning (Form E) is not late or lost instead. Also, when burns are cancelled last minute it is a demonstration that in general burners must pay thoughtful attention to weather, smoke dispersion, safety etc including at the last minute. This information is sometimes helpful when APCD staff talk to people concerned about smoke.

Authority: [Reg. 9](#) V D 10: “The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division.”

B) Spread only: If people do not actively ignite a larger perimeter on a particular day but a prescribed fire spreads on its own, is a daily activity report required?

Requirements: If the black perimeter expands at least five acres in a day then yes, report it.

Intent: Please see also the topic under annual report that describes what APCD does with activity data. Information about both active and self-sustained second day ignition is collected daily rather than only annually because an additional use is to provide the basis for responding to inquires from government officials or local residents about smoke at a particular time and place. While not frequent, those calls can be important. Everyone benefits if those conversations begin with our awareness of what ignition is or recently was underway, and quickly incorporate input from a burn boss who knows better than anyone else what is happening on site. We find that prompt, informed, professional, and detailed responses to concerns brought to us about smoke go a long way toward defusing conflict.

Implementation Guidance: It is not necessary to undertake perimeter mapping purely for purposes of reporting to APCD about creep. On the other hand, any time acres are updated we would like to know. See also the discussion of daily acres and uncontrolled fire edge under project-specific conditions.

Authority: [Reg. 9](#) V D 10: “The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division.”

C) Spread only: What must I report if the same acres burn for multiple days?

Requirements: We do not need to know about interior burn-out unless the smoke situation is unusual.

Each acre should be reported only once on an activity form, on the first day it is within or connected to a perimeter ignition. One exception is if the same piece of ground is burned long enough apart that it was out cold in between. For example, blacklining may occur in spring, and the interior burned the next fall. In that case, on the daily form report the acres twice with an explanatory note. On the annual summary report the acres once, with consumption percentages that represent the

combined effect of both ignitions. We can help draft the annual report that way if you request.

Implementation Guidance: If smoke is unusually heavy or is likely to receive atypical public attention, a phone call or email telling us roughly how many acres or piles are currently smoldering on a day with no new ignition by humans would be welcome. In that case we'd want to know your expectations about the likely amount and travel direction of smoke during the next day or two.

Authority: [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."

D) Acres burned: In a mosaic burn, at what scale should acres be assessed?

Requirements: Daily acres should include everything inside the black perimeter. Report the total acres that either were ignited, or are internal to an area that burned. If the burn resulted in a mosaic, in the fuels section of the daily and annual activity forms use the assigned block to report percent of area that is unburned.

Intent: We realize none of the numbers on Form E may match what is reported as treated for agency activity and budget targets.

The main reason we require perimeter rather than black acres to be reported is that only the former is readily verifiable.

Implementation Guidance: Example: Should a 10-acre green island be included in the total acres burned? Yes.

If the burn was very spotty and only half of every acre burned, is the total area burned the perimeter, or half of the perimeter? The total area is the perimeter. In the fuel break-out section, report 50% unburned.

Ragged edges will involve some judgment; call APCD to discuss as needed and/or make your best estimate.

Authority: [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."

E) End ignition time: ... but lighting into the evening may be unanticipated.

Requirements: Late ignition and the reason(s) for it must be reported on Form D. Please see also the question about enforcement of end times, and the one about secondary burn area.

Background and History: Very rarely, unplanned night ignition is going to occur despite permit conditions. An example could be that the day's anticipated schedule was ruined because the burn crew is struggling to hang on to the fire. In that case continued ignition could be part of the adapted control strategy.

Intent: In terms of your report on the reason ignition ended late, we want to know why the initial anticipation that ignition could be finished in time didn't hold up. For example, the oak burned hotter than anticipated given the fuel moistures. Telling us only that ignition

had to continue because suddenly ending it could have had bad consequences is often obvious, and in any case does not answer our question.

Authority: [Reg. 9 V D 10](#): “The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division.”

F) End ignition time: How will APCD enforce end ignition time?

Requirements: We have built in limited leeway for rare times someone needs to ignite past the permitted end time. Specifically, we have committed that the first offense enforcement action against a district or burn boss will be limited to a warning letter provided all of the following criteria are met:

The overage (‘upset’ in permitting language) is self-reported, including on Form D.

No other permit conditions were violated on the same burn day.

Ignition ended no later than three hours past the permitted time.

Intent: End ignition times are a partial alternative to tighter daily acre limits. A larger unit can be burned with limited public impacts if its smoke dilutes before ventilation becomes unfavorable for the evening rather than if the same area is burned later in the day.

Meeting an end ignition time means biting off no more acres than one can reasonably ignite in the allotted time, even if daily acre limits allow for a larger area. It means also building in a time margin for the unexpected. Still, we recognize that the best planning may not yield desired outcomes. As one burn boss gave as an example, “maybe I provided for the possibility a power torch won’t work by having two on site. But then they both break, we’re down to hand ignition, and there’s no logical place to cut the burn off.”

We don’t intend to enforce for Murphy’s Law. Occasional late ignition may be unavoidable, but should be infrequent. We do intend to require responsible planning. That means burn bosses are accountable to accept and light using only permit conditions they can commit to meet under normal levels of uncertainty in a fire environment.

Implementation Guidance: Our typical approach to enforcement is to start with compliance assistance, not even a warning letter. What’s best is to be forthcoming about mistakes and volunteer your observations and explanations. Discuss the situation with us if a burn goes over its end ignition time.

We watch most of all for patterns of problems. If one organization or burn boss seems to be exceeding end ignition time more than rarely, that suggests we should take additional steps to ensure compliance with permit requirements.

Authority: [Reg. 9.IV.A.2](#), “The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public.” [Reg. 9.IV.B.1.e](#), “whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public” [Reg. 9.IV.C.3](#), “To the degree practical, all burning shall be conducted during periods conducive to smoke dispersal.” [Reg. 9.IV.C.7](#), “Precautions shall be taken to ensure that the burning is restricted to the items and location identified in the permit...” [Reg. 9.IV.C.11](#), “The Division

or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9.V.C](#), “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.” AQCC [Procedural Rules](#) 1.1.0: “In adjudicatory proceedings the Commission intends to enforce its rules as uniformly and equitably as possible while ensuring that the goals of the air quality program it has adopted are not compromised.”

X. Annual Activity Reporting, Form F

A) What does APCD do with annual activity data?

Background and History: We use the acreage and fuel type from annual activity reports, together with emission factors EPA has published, to calculate the amount of particulates and other pollutants that each prescribed fire generated.

The emissions estimates by location and date are collated into an annual inventory and eventually sent to EPA for incorporation into a national database. The national emissions database, including the component that represents prescribed fire, is often used during the construction of complex air quality modeling in support of plans required by EPA.

The data also has been useful for ad hoc inquiries. For example, the Fire Emissions Joint Forum of the Western Regional Air Partnership compiled emissions data from all western states as part of their efforts to project prescribed fire's contribution to regional haze. Managers, Commissioners, reporters, elected officials and even a court have occasionally asked questions like, "How many piles have you permitted so far this year?" "How many broadcast acres were burned in each year for the last 10 years in X County?" "Is the number of prescribed burns near homes increasing in Colorado?" Each piece of information you provide on a notification or activity report is entered in a database that has all these uses.

Finally, every three years staff compile recent years' activity data to determine the allocation basis for the next three years of permit [fees](#). For this purpose we make an adjustment. Some years ago we saw circumstantial but growing evidence that a couple agency units had started to underreport consumption after learning it could affect their future fees. The data for the national inventory should be as correct as reasonably possible. By legislation we have to recover our costs through fees. To accommodate both, fees are based now on standardized fuel load consumption by fuel type. In other words, if on one project 300 acres of pine understory is burned in a year, then to build the inventory we will use all of the numbers the burn boss reports about fuel types, loads and consumption. But for calculating the next round of fees, that activity will be recorded simply as 300 acres of category 3 (drainage potential) fuel.

XI. Not Related to a Specific Form

A) What requirements apply to all permit-related paperwork?

Requirements: The most basic requirement of permit paperwork is that the information be as accurate as reasonably possible. The application becomes part of the permit and is legally binding. Examples:

- 1) Fuel loads should be a best estimate, and conservative when in doubt.
- 2) Listed PLSS section numbers must include all in which burning may occur.
- 3) Total annual acres or number of piles is a binding upper limit.

Also binding are firm volunteered statements in the application, such as planned public outreach or mop up. Failure to comply with any of these permit conditions may result in enforcement.

No permit condition may be ignored or 'adjusted' in the field. At no time does a permittee have the option to unilaterally change the permit conditions because something else seems or is better. Only APCD has the authority to change permit conditions.

Intent: The intent of including this topic in the manual is to make clear the Air Division's basic expectations of the permittee, legal responsibilities of the permittee, and overall permit authority held by the Air Division.

Implementation Guidance: We consider your signature also to be an affirmation that in your judgment and based on what experience you have, you believe the requested conditions to be responsible. We take that seriously.

For the several kinds of information requested on the application, we recognize that the difficulty of accuracy and precision varies. If one fuel load category is a little off, it isn't necessarily a huge deal. We are looking for good faith, application of professional-level skill, and attention to detail that includes the person completing the application being personally familiar with the burn site.

If you want to change a permit condition or something on your application after the permit is issued, [contact us](#). For example, you may find more piles to burn than the total number listed for the year. We often review and approve requests for permit amendments like this.

There is a lot more implementation guidance in the [instructions for completing applications](#).

Authority: Colorado Air Quality Control Commission [Regulation 9](#): III.A, IV.A.1 & 2, IV.B.1, IV.C.1 - 12, V.A,B,& C, V.D.1 - 10, V.E.1 - 3.

B) Annual number of piles or acres: Does this burn even need a smoke management permit?

Requirement: Submit candid and honest applications so we can all do our best to stay within the law and give you advice/guidance based on the facts of the situation.

Campfires and other recreation, training, and agricultural burns are exempt from smoke permitting in Colorado. Please see below for caveats.

Implementation Guidance: We'll help you figure out from your phone or email description, or the application, whether a project needs a smoke permit, and if so whether it is eligible for a simpler general open burn permit. Or see the [open burn web page](#).

Definitions of the same terms used in other laws or regulations may have different meanings. For example, see the guidance document [defining agricultural](#) burns for the purposes of smoke permits.

If relevant, please see also the topic in this manual about training burns.

Authority: [Reg. 9](#) III B 2 “The following activities are exempt from the requirement to obtain an open burning permit:... Fires used for noncommercial cooking of food for human consumption, or recreational purposes; 3. Fires used for instructional or training purposes, except instructional or training wildland pile or broadcast fires larger than the de minimus thresholds... 5. Fires used for instructional or training purposes, except instructional or training wildland pile or broadcast fires larger than the de minimus thresholds” [Reg. 9](#) V B: “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planned ignition fire permit.”

C) What constitutes grounds for enforcement?

Requirements: Permittees are accountable to abide strictly by all permit conditions. Provided all permit conditions are met, smoke impacts alone do not form the basis for enforcement. The permit conditions address what is required if impacts are excessive, which starts with implementing the smoke contingency plan included in the application and permit.

Intent: We intend that permits require and enforce application of good professional judgment. They are not intended also to require perfect luck.

Colorado's smoke program has a hybrid basis, with decision-based conditions about inputs whose origin and evolution are outcome-based.

- Conditions enforce prudent burn day decisions, basically regulating inputs rather than outcomes.
- Permit design is informed by outcomes - by history. Program evolution strongly reflects evolving knowledge about smoke outcomes.

One of the reasons for the focus on permit conditions rather than impacts is that conditions are objectively verifiable, while smoke impacts usually are not.

Permits are designed to prevent excessive smoke impacts. But permits are not perfect. One of several reasons is that smoke is a natural phenomena that humans can imperfectly predict. Uncertainty is inherent to weather predictions and a burn boss faces a host of other uncertainties.

If the terms of a permit are followed but there are unacceptable smoke impacts, this is a situation for learning, not punishment. Together, we document smoke impacts, discuss them, and attempt to learn from them. Evaluating smoke impacts is a critical way we

evaluate potential program changes including standard conditions. Everyone benefits from decisions that promote good smoke outcomes. But from a formal perspective, a permittee is bound only to meet the terms of the smoke permit.

Implementation Guidance: Nearly all permittees are conscientious and careful with smoke. Most are fire professionals with substantial experience and have a career-long stake in public support of burn programs. In addition, people who plan and implement prescribed fires are subject to strong peer pressure from within the fire community to serve the public well. As a result the need for formal enforcement related to smoke permits in Colorado has been rare. Virtually everyone involved works hard to keep it that way. So our implementation guidance is simply that you remain among those who try hard to do good work.

For a description of how we typically handle apparent non-compliance we may notice at a burn, please see the section of the [procedures guide](#) about APCD site inspections.

Authority: [Reg. 9.IV.A.2](#), “The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public.” [Reg. 9.IV.B.1.e](#), “whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public” [Reg. 9.IV.C.3](#), “To the degree practical, all burning shall be conducted during periods conducive to smoke dispersal.” [Reg. 9.IV.C.7](#), “Precautions shall be taken to ensure that the burning is restricted to the items and location identified in the permit...” [Reg. 9.IV.C.11](#), “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9.V.C](#), “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.” [Procedural Rules 1.1.0](#): “In adjudicatory proceedings the Commission intends to enforce its rules as uniformly and equitably as possible while ensuring that the goals of the air quality program it has adopted are not compromised.” [CRS 25-7-123](#) Open Burning - Penalties. [CRS 18-13-109](#) - Firing Woods or Prairie.

D) May I discuss a burn, permit or policy with a real person at APCD?

Implementation Guidance: We believe informal face-to-face meetings are a great tool when there are questions about Colorado’s smoke management program. We would much rather talk about specifics about the issues and how permit conditions affect people working on the ground than hear later through the grapevine that somebody has an unaddressed issue. It’s hard for us to act on perceived problems we don’t know about. Conversations provide an opportunity to build mutual understanding.

However, an office discussion in person about a project is never required and seldom necessary. It is always an option. If you want to meet with us, let us know. Generally we will schedule a convenient time to meet at your office and/or the project area. If you think our Denver office is a better place to discuss your projects, please call first to be sure one of us will be around.

A meeting in person isn’t the only way to discuss a project or a concern with us. We do not hesitate to call you or send email when we have questions, and hope you do the same.

Possible reasons to meet with APCD staff:

- You are an agency fire management officer (FMO) at any level, assistant FMO, fuels specialist, and/or RXB1/2 new to Colorado. That's reason enough. If you don't call us, we'll be asking to meet you soon.
- You want us to know the big picture about your large or growing program, rather than us only reviewing applications one at a time. You think the best way to explain is on the ground and/or with maps everyone can see together.
- You are planning a burn that from a smoke perspective is especially complicated or risky. Maybe its permit will be significantly different from standard conditions. You think a face-to-face discussion will help understanding of the project situation, what you are proposing, and why we should agree with you that your proposal is responsible with respect to air quality. Maybe you'd like more ideas or another set of eyes at this stage, too. We may know something relevant that has worked for other burn bosses. And in any case we welcome the opportunity to be proactive.
- You have smoke management ideas or observations or complaints that other burners could benefit from. You want APCD to be able to apply and help share this productive input.

For any of these reasons and more we're happy to come to your office. Better yet, invite us to have the same conversation while walking around a project area.

On the subject of face-to-face meetings, if you haven't already, we encourage you to contact your [local air quality representative](#) and offer to meet with them concerning the projects you are planning. We have had very positive feedback from local officials when this occurs.

E) What should I expect from an APCD site inspection?

Requirements: For details please see [Regarding APCD Site Inspections](#). In an attempt to include in this manual nearly all requirements of permittees, requirements relevant to all field reviews including burn site inspections are repeated here. The detailed document but not this manual addresses requirements of APCD staff rather than of permittees. For burn bosses the site inspection section of the [procedures guide](#) also includes options for confidentiality, escorts, and cross-over between operations and smoke permits, each of which is relevant to only some site inspections.

A consequence of obtaining a prescribed fire permit is that "burning operations shall be subject to inspection by the Division." Any aspect of a permit's conditions or consequences or the veracity of the information submitted on an application may be checked. While we show up unannounced at a burn site infrequently, it is within the Division's legal right to do so and to be present.

We will make the burn boss aware of our presence at an active burn as soon as possible after we arrive. On an active burn site, an APCD representative is always accountable to the burn boss. We make an important but usually fine distinction between reporting and being accountable. We may not 'report' to the burn boss, be under their authority, nor be present only with their approval. The burn boss may not unilaterally assign us roles or tasks. We do not serve as the day's smoke monitor. Having said, nearly all the time we try hard to cooperate and help, and to fit in easily as best we can.

Intent and Implementation Guidance: Please see [Regarding APCD Site Inspections](#).

Authority: [Reg. 9](#) IV C 8: “All open burning operations shall be subject to inspection by the division.”

F) How does the modeling happen?

Background: APCD staff have spent many hundreds of hours over the last two decades examining and testing different numeric and computerized models for smoke from wildland fires. Every year we spend at least some time to learn about computerized smoke model changes and updates. We have yet to find a numeric calculation model that we believe is better than the Division’s spreadsheet model captured in the standard conditions worksheet. Put more bluntly, we believe all the numeric models currently available give significantly erroneous rankings of smoke risk among burns, to the extent that using one to inform permitting decisions would constitute a worsening of decision-making.

Most dictionary definitions of a model are some variant of ‘a simplified representation of a complex object or process that is used to analyze and solve problems or make predictions.’ The smoke model we use at APCD is professional judgment, formed largely in response to actual burns that have occurred in Colorado. The smoke worksheets are condensed and somewhat simplified versions of our experience-based smoke model.

Intent: We’d all like the convenience, simplicity and objectivity of using a good computerized smoke model. But we don’t want to succumb to delusions about the numbers the current models produce.

- Precision can wrongly imply accuracy.
- Computation can wrongly imply objectivity.

There are good reasons it is difficult to create accurate numeric models of smoke impacts. Here are some.

- Precision of baseline fuel loads is very low for all but research-scale measurements. Among others, see Roger Ottmar’s research for particulars.
- Converting particulate production into the concentrations that determine impacts means distributing a weight measurement across all 3 dimensions of space plus time.
 - Mixing height is a pretty good estimate of a y-axis measurement far enough downwind of a burn. Critically, it won’t capture impacts at the most vulnerable receptors within a couple miles of the burn. Close to the source, height is instead mostly determined by initial plume rise, in turn a function of heat. So many variables affect heat release from a prescribed fire at a moment in time that modeling accurate enough to make permit decisions is nearly impossible. Some of the variables that affect initial rise like fuel moisture can be known with reasonable certainty only near or at the start of a burn day. Others can’t even then: ignition patterns, fine-scale variations in wind and in fire front geometry, etc. Although incorporating more stochasticity is a promising research direction for smoke models, a risk is results too generalized to inform good decisions.
 - x-axis: Windspeed is the usual estimate for dispersion in the horizontal direction downwind. It varies from forecasts and throughout a day, though there are computational ways to accommodate probabilities.

- z-axis: To evaluate horizontal spread one must estimate plume expansion. Conceptually, smokestack models suffice here. How many imaginary smokestacks should be used for a line of fire, however, is a decision critical to model outputs and that lacks obvious answers.
- time dimension: Variation in timing of combustion during a burn day is also highly variable across burns, and also reflects real-time management decisions. Rate of combustion affects real lift and also model outputs through calculated “height” of the imaginary smokestack. Accurately predicting or characterizing time variance within a day is difficult.
- Complex topography matters. All but a few research weather forecasting models resolve at a scale of a kilometer or more. That is far too coarse to capture variations that can make or break smoke management efforts in Colorado’s jagged and complex landscapes.
- Problem smoke is more common at night than in the day. Except one box model inappropriate in Colorado, no numeric smoke model we’ve seen addresses drainage rather than lofted (daytime) impacts.

We hope one day to test and use a good computerized predictive model of smoke impacts. Until then, the best model we have is experience-based professional judgment. That’s one of the reasons we focus so much on learning from fires and from experienced burners, and on listening closely to permittees’ input.

As productive opportunities may arise, we likely will continue to experiment with modeling real fires. Modeling combined with monitoring lets all of us to learn more about model performance, pros/cons, size of fires v. accuracy of prediction, and so on. APCD’s intent is to continue to learn more about smoke impacts and continue to evolve its smoke program based on learning. Ongoing involvement with modeling has a role in that endeavor.

G) What is involved in the public comment process?

Requirements: Broadcast burns that rate out as highest risk for smoke impacts receive formal invitation for public comment on their smoke permit conditions.

The Division considers any comments received in determining whether to issue a permit and what different or additional conditions, if any, to apply. A commenter may request a public hearing before the Air Quality Control Commission in addition. Within 30 days after the close of the public comment period or after the public comment hearing, the Division will either grant or deny the permit.

Public comment on high smoke risk burns’ permit conditions has a different lifespan than the permit itself. Public comment is taken once every five years for the project. If the proposal changes significantly, the Division will reopen public comment sooner. The project itself still requires a renewed permit every year.

To know which projects are subject to public comment, see the [broadcast worksheet](#).

Background and History: Applicants have pointed out that most projects that need a smoke permit have already been through a formal public comment period as part of NEPA (National Environmental Protection Act) review. The APCD comment period is not redundant, however. We solicit and consider comments not about the appropriateness of the project in

general, but only about the proposed conditions of its smoke permit.

This element of [Regulation 9](#) is part of law and is not discretionary for APCD staff. One severely problematic prescribed fire led to this aspect of regulatory law. The intent is to capture only the highest smoke risk burns for public comment. Essentially, the Commission has directed the Air Division to provide public comment opportunity when, for example, a relatively large-scale burn in heavy fuel is proposed near a smoke sensitive area.

Implementation Guidance: The extent to which we publicize the public comment process varies with our evaluation of the project's smoke risks and who it may affect. Typically we post comment opportunities on the web. We also usually send specific invitation for comment via email to the Board(s) of County Commissioners in whose jurisdiction the land falls. Occasionally other special targeted outreach makes sense.

APCD currently does not issue permits for fire use under its various monikers. Previously all fire use permits were subject to public comment, due to their potential to burn much larger areas than other prescribed fire permits. More recently, no draft permits have been offered for public comment.

Authority: [Reg. 9](#) V F 2: "If the division determines that a fire poses a high smoke risk, the division will... issue a draft permit for public comment."

H) How does EPA's Exceptional Events Rule affect prescribed fire in Colorado?

Background and History: In March 2007, EPA published the Exceptional Events Rule (72 FR 13560) that addresses how EPA will review and potentially discount certain ambient air quality data. As defined in the Rule, an "exceptional event" is an emission-producing event that is not expected to occur routinely at a given location, is not reasonably controllable or preventable, but causes or significantly contributes to an exceedance or violation of the National Ambient Air Quality Standards (NAAQS)." Examples of exceptional events are stratospheric ozone intrusions, chemical spills, and clean ups after major disasters. Also included in the Rule are "natural events" that produce emissions due to non-anthropogenic sources and which either cause or significantly contribute to an exceedance or violation of the NAAQS. Examples of natural events are wildfires, high wind events, and volcanic and seismic activities.

EPA's March 2007 action brought together into a single rule three separate EPA policies: the 1986 Exceptional Events Policy, the 1996 Natural Events Policy and the 1998 Ozone Mexican Fire Policy. In its 2007 decision EPA also committed to amending their 1998 Interim Air Quality Policy on Wildland and Prescribed Fire to bring it in line with the Exceptional Events Rule. (As of 2015 this remains pending.) The focus of the Rule is to identify what ambient air quality data will be used in determining compliance with the NAAQS and thus whether or not an area will be designated as in attainment of public health standards. The rule change applies only to NAAQS attainment and does not affect compliance with state permitting requirements, regional haze programs or other state or local regulations concerning open burning.

Past policies and the Exceptional Events Rule have defined wildfires as natural events. In spring of 2007 EPA added prescribed fire and wildland fire use to the list of exceptional events. Relative to wildland fire, the 2007 Rule changed the definition of an 'exceptional event' to include additional types of wildland fire that would qualify as a potentially excused NAAQS exceedance of the PM2.5 standard.

Intent: APCD's intent is to follow the law and EPA's FAQs, guidance, and advice on interpretation and implementation of the Exceptional Events Rule. As of several years since the rule was issued, much remains uncertain about how the rule may apply to wildfire or prescribed fire smoke.

It is unlikely the Rule will ever be used in Colorado. In order to apply to EPA to exclude an exceedance, the following circumstances would need to occur:

The measured exceedance would have to take place in an airshed with an official particulate monitor. Relative to all the places in Colorado where burns happen, there are very few such monitors.

The burn's particulate smoke would have to impact the monitor on a "run" day. Many monitors do not operate every day. A typical schedule is one-out-of-three.

The burn would have to be the primary reason the exceedance occurred.

EPA says that the Division would have to demonstrate that "but for" the exceptional event, the exceedance would not have occurred.

All of these elements are unlikely to occur at the same time. Nevertheless, if this low probability situation did happen, the Division would evaluate the opportunities afforded by the Exceptional Event Rule on a case-by-case basis.

There is a large amount of technical data that must be assembled for EPA to consider whether to flag/excuse an event. For examples see http://www.colorado.gov/airquality/tech_doc_repository.aspx#exceptional_events. Should such an event occur due to a prescribed fire or a wildland fire use by any of its names, it is likely that the Division will request considerable assistance from the burn boss and/or their management agency in compiling and assembling the required information.

Also as part of the request, the state must convince EPA that it is fully implementing its Smoke Management Program, which APCD has self-certified as meeting federal requirements. Pursuing an exceptional event designation for an incident does not preclude the Division from taking enforcement action if a fire did not meet its smoke permit requirements.

XII. There is a topic or question that I'd like added to this manual.

Please [contact us](#).

XIII. Appendix: Related Documents

Basic instructions are embedded in the forms as hover hints and should suffice for most burns. The [hints are available also as a .pdf](#).

[Detailed Instructions for Smoke Application Forms](#) are available but not needed for most basic permit applications.

[Guidance for Non-Standard Permits](#) is for experienced burn bosses working with especially complex projects.

The smoke program [manual](#) (this document).

Pile Burn	Broadcast Burn
pile application	broadcast application
pile non-standard supplement	broadcast non-standard supplement
pile worksheet	broadcast worksheet

XIV. Appendix: Descriptions of Topic Headers

Requirements: This section tells what mandates apply to permittees. The manual is written as if APCD staff, 'we,' were speaking to a permittee. 'You' is the burn boss and/or landowner

Like burn plans, permits are legally binding. Changes may not be made in the field even if doing something different than a smoke permit requires seems to make more sense. Deviations require signed authorization.

Background and History: are included only if we think an explanation is relevant to implementation, now. Many permit requirements reflect one or more burn(s) whose smoke went badly. Generally we don't see much value in implying blame by rehashing. But establishing intent sometimes involved 'make this bad thing less likely to recur.' If you want to know the history of a particular requirement, ask us.

Intent: This section tells why a requirement or process exists. It sometimes describes effect(s) that we hope and usually expect the requirement will have. People ask. And the more clearly burn planners and implementers understand intent, the more likely implementation will meet not just minimum requirements but also excellent smoke management.

Implementation Guidance: Any advice given in this section is optional. We hope it is helpful.

Authority: If a topic has a section for requirements, then authority is included also.

Ultimately the smoke management program's authority is based on the federal Clean Air Act's requirements of states and tribes. The requirements are implemented through state laws and regulations. The authority cited in the manual is the lowest level of implementation rules on which we base our requirements. [Reg. 9](#) refers to the Colorado Air Quality Control Commission's "Regulation Number 9: Open Burning, Prescribed Fire and Permitting.

Authority references are given only for the convenience of permittees who are interested. References are partial sources of authority, are heavily excerpted from context, and do not represent an attorney's opinion.