



Questions & Answers

In Situ Burning as an Oil Spill Response Tool

Please note: This document was originally written by the Northwest Area Committee's workgroup on in-situ burning. The Committee is comprised of representatives from the Federal Government and state and local agencies in Washington, Oregon, and Idaho.

By their very nature, oil spills are emergencies requiring quick, decisive action. One threat that has to be contended with is an oil spill that can damage the physical environment, birds, fish, and other wildlife, and socioeconomic resources.

State, Federal, and local officials, as well as people in the oil and transportation industries work hard to prevent spills but they still happen sometimes. We have to be prepared to respond to them. Those who respond to spills, both in the government and private sector, pull out all the stops and use all available tools to respond. Responders must decide how best to minimize the effects of a spill. Mounting the best response often requires making tradeoffs between damage to different parts of the environment.

One promising response tool is controlled “in situ” burning, which, if successful, is very efficient. Oil response planners in your area are closely looking at this method, its advantages and disadvantages. The following document, in a question and answer format, should provide you with the basic information you need in order to become more educated on this important issue.

Q. What is in situ burning?

A. In situ burning involves controlled burning of oil that has spilled from a vessel or a facility. Typically the oil is contained within a boom and ignited using a hand held igniter, or an igniter from a helicopter. The burn will continue only as long as the oil is thick enough—usually about 1/10 of an inch or 2 to 3 millimeters—so containment is important. When conducted properly, in situ burning significantly decreases the amount of oil on the water thereby preventing that oil from reaching the shore. Burning can be a useful tool in oil spill response.

Q. Does the policy compare the potential harm to the air versus the water and surrounding environment?

A. Yes. The goal of the policy is to protect the environment to the maximum degree possible while ensuring that air pollution impacts do not jeopardize human health. Uncollected oil can adversely affect wildlife, fish, recreational beaches, and the rest of the marine environment for a long time. Usually air pollution impacts are short-lived but may be substantial. Also, a smoke plume caused by the burning of oil will usually be confined to a relatively

narrow band that may stretch many miles, while uncontained oil will likely be taken by the currents to a wide geographic area.

Q. Why do we have to burn the oil? Why not just clean it up?

A. Spill responders virtually always start mechanical recovery immediately, using booms, skimmers, and other equipment. Unfortunately, mechanical recovery is not always very efficient. In many cases, an average of only 15 percent of the spilled oil can be recovered mechanically. In contrast, in situ burning can remove up to 99 percent of the oil contained in the boom, and if the burn is efficient, storage and disposal are not a problem. When it is safe and environmentally wise to use in situ burning, the environment benefits because more oil will be removed from the water.

Q. Under what circumstances can in situ burning occur?

A. There are a number of physical limitations that restrict the feasibility of burning including wind speed, wave height, oil type, and the degree of emulsification of the oil (How much it has mixed with water). The basic criteria are that:

- human populations will not be exposed to smoke that exceeds state and federal health standards
- the burn must be monitored for the safety of cleanup crews and potentially affected populations and will be stopped if safety standards cannot be maintained
- sea and weather conditions must allow for an effective burn.

Q. What if the weather changes? Can the fire be put out?

A. Monitoring will be conducted to ensure conditions remain appropriate for a burn. If not, a burn can be extinguished very quickly simply by releasing the end of the boom containing the oil. This allows the oil to spread to its natural thickness that is ordinarily too thin to sustain combustion.

Q. Can the smoke plume ever reach the ground?

A. It is possible for a plume that has been in the air to dip down. Because of this, the policy establishes “safe distance” from populated areas to make sure people’s health is protected. The burn will be monitored to ensure it can continue to be conducted safely and appropriately. This will give responders information so they can decide if it’s necessary to stop the burn.

Q. How soon does the decision to burn have to be made?

A. The decision should be made within several hours following the spill. Because spilled oil rapidly emulsifies, it becomes more difficult to ignite with time. If the weather and sea conditions are very calm, this time frame may be extended. But no matter what the weather conditions are, spill responders must decide very soon after the spill occurs whether to use in situ burning, because it takes time to assemble the personnel and equipment necessary to conduct a burn.

Q. Who makes the final decision whether or not to burn the oil?

A. The federal and state on-scene coordinators have the final authority in deciding what techniques, including in situ burning, to use in response to a spill. When deciding about in situ burning, the coordinators consult with air quality experts, meteorologists, response contractors, and experts on burning.

Q. Can the burn be stopped if conditions become unfavorable?

A. Yes. An in situ burn takes place only when response personnel are able to conduct it safely and with control. Therefore, termination procedures are always developed in advance. Actually, keeping a burn of oil going is often a challenge because spilled oil tends to spread and get thinner. It is often difficult to keep the oil thick enough to maintain the burn.

Q. What does the smoke contain?

A. Burning oil produces a dense cloud of black smoke. Most of the darkness is due to very small black particles of carbon. Very fine particles can lodge inside the lungs and cause respiratory problems, mostly to individual already suffering from other respiratory diseases. Other substances can adhere to particles and be inhaled. While it is generally long-term (months or years) exposure to these small particles that impact health, short-term exposure in sufficient concentrations can cause the aggravation of symptoms in sensitive individuals with existing heart or lung disease. The fire also produces invisible gases, mainly carbon dioxide, carbon monoxide, sulfur dioxide, and oxides of nitrogen. Oil is composed of hundreds of hydrocarbons, some of which don't burn completely. As a result, the emissions from the fire can include hydrocarbons including very low levels (less than 0.1 parts per million) of polyaromatic hydrocarbons.

Q. Can the vapors from unburned oil also cause impacts to air quality and human health?

A. An oil spill causes air pollution whether or not burning is used. Therefore, responders must consider the relative risks of evaporating fumes against the smoke created by burning. Fumes from a large spill in a populated area could pose a significant health threat. Up to 50 percent of a light crude oil spill can evaporate fairly readily, and that 50 percent contains the acutely toxic lighter fractions, or volatiles, that move quickly into the atmosphere. The volatiles released from spilled oil may be more toxic to humans than the smoke from burned oil, depending on the concentrations. They contain volatile organic compounds including benzene, a known human carcinogen, toluene, xylene, hexane, and others. Whether the oil is burned or allowed to evaporate, air quality will be compromised for a certain period of time.

Q. What health standard will responders use when considering a burn?

A. To protect public health spill responders will use an especially stringent outdoor air quality standard to guide their burning decisions. Fine particle pollution is the major concern in evaluating health effects from smoke. These particles are defined as those less than 10 microns (thousandths of a millimeter) in diameter. Fifty 10-micron particles would stretch across the period at the end of this sentence. The current national and state health standard is a maximum concentration in a 24-hour period of 150-micrograms of fine particle per cubic meter of air. However, this policy incorporates the use of a more restrictive standard.

Q. Why are you using a particle standard that is so much more restrictive than existing law?

A. Some health professionals do not believe that the current standard of 150 micrograms per cubic meter of air averaged over a 24-hour period adequately protects the health of sensitive individuals such as children or those with existing heart or lung disease. New research has prompted a review of the existing standard that could lead to a more protective standard. The U.S. Centers for Disease Control and Prevention (CDC) has completed a preliminary review of information about in situ burning and air quality standards. The CDC has recommended to federal response officials that the interim standard be set at 150 micrograms per cubic meter of air averaged over 1 hour, which is much more stringent than the 24-hour measurement. The Northwest Area Committee will use this more stringent standard as general guidance until CDC recommends a new standard based on additional research.

Q. How will this standard be applied?

A. Air quality will usually return to normal levels one to three miles downwind of an oil spill burn. Meteorologists will use information on current weather conditions, forecasts, and sophisticated computer models to predict the path and the rate of dispersion of the fire's smoke plume. This information will enable federal and state on-scene coordinators to know whether it is likely that smoke will exceed the special standard in a populated area. Similar techniques are currently used in managing forest slash burning to keep smoke out of populated areas.

Q. Have preapproval areas been established for in situ burning?

A. If the wind blows the smoke from a controlled burn away from a populated area it is conceivable that a burn could be conducted immediately adjacent to the area. However, if the wind is blowing toward a populated area there must be reasonable assurances that people will not be exposed to excessive concentrations of pollutants. Concentrations of small particulates in the smoke plume dissipate and are generally within the standard of 150 micrograms per cubic meter of air within one to three miles from the burn. Three miles is considered a reasonably safe distance in case the plume dips down to land. The burn will be monitored to ensure it can continue to be conducted safely, and it will be stopped if it can't. Preapproval is necessary to expedite the decision-making process. While preapproval is not automatic, there are fewer steps that need to be taken before burning can occur (for example, notifications and checklist submittal must still take place).

Q. What are the impacts of spilled oil on the environment?

A. Oil is extremely toxic to the environment. An oil spill can destroy fisheries, contaminate shellfish beds, injure archeological sites, coat recreational beaches, harm or kill wildlife, and destroy coastal habitat. Oil that comes into contact with mammals and birds can destroy the insulating ability of fur and feathers, reduce buoyancy, and be ingested as the animal cleans itself. These animals can die of exposure, drowning, internal bleeding, and suffocation. Wildlife vulnerable to oil spills include shorebirds, bald eagles, sea otters, sea lions, harbor seals, and terrestrial mammals that may feed on oiled carcasses. There is also some evidence suggesting that oil spills may be linked to whale deaths.

Q. Are there long-term impacts to the environment from spilled oil?

A. Yes. Oil spills can have serious long-term impacts to the environment. The long-term impacts to birds and mammals include lower reproduction rates and physical mutations in offspring. For example, wildlife officials in Washington State are concerned that oil spills have had a measurable, adverse effect on seabird populations and their ability to recover. Oil from the 1988 *Nestucca* spill off the Washington coast killed an estimated 56,000 seabirds of various species. A significant percentage of nesting populations of common murres and marbled murrelets, listed as a state and federal threatened species, were killed by the 1991 *Tenyo Maru* spill that also occurred off the Washington coast. In addition, once oil is trapped in sediments it can be recirculated into the water and remain in the food chain for many years. Some research indicates that oil can remain in sediments for hundreds of years.

Q. Why are you considering burning an oil spill when people are not allowed to use their woodstoves on some days during the winter?

A. Woodstoves represent a continuing, persistent source of airborne pollutants that can have a detrimental effect on human health. In situ burning of accidentally spilled oil will occur very infrequently, and will last for a short time—typically a few hours. Moreover, an oil spill is an emergency that may require extraordinary measures. Sometimes those responsible for responding to a spill may conclude that a temporary source of airborne pollutants is necessary to achieve the overall goal of reducing the serious pollution caused by spilled oil.

Q. How long will the smoke stay in the air?

A. That will vary depending on the conditions at the time of the spill. Some parts of the plume may stay in the general area for several hours—and in unusual circumstances, days—but the thickest part of the plume will usually dissipate within a few hours. If the weather conditions indicate the air in the area of the spill is stagnant, the on-scene coordinators may choose not to conduct a burn.

Q. What happens to the smoke when the fire occurs?

A. Because of the intense heat, the plume usually goes up into the atmosphere several hundreds to several thousands of feet. It then levels off and is blown by the wind in a narrow, and often meandering band. After that, it moves about according to weather conditions at the time. Some parts of the plume occasionally dip back down toward the surface but the majority of the smoke usually stays well up in the air.

Q. Will I have to leave my home if a burn is conducted near where I live?

A. Ordinarily those in charge of responding to a spill would probably not approve in situ burning if it is necessary for people to leave their homes. It is possible, however, that in unusual situations burning the oil would be necessary even if it meant people need to leave their homes. If that happened, the local and state health departments would be consulted and would ensure people's safety.

Q. Will I be notified if there's going to be a burn in my area?

A. Any time oil is spilled a great effort is made to inform the public about the effects of the spill and the actions being taken to combat the spill. If burning were determined to be an appropriate response tool, officials involved in the response would make every effort to inform people about the burn.

Q. Where else in the country is burning allowed?

A. Several areas have policies that allow burning in some circumstances. For example, Alaska allows it, and in some cases prefers it, considering the *Exxon Valdez* experience. Hawaii also has a policy allowing burning in some circumstances, as do Texas and Louisiana. Several other states are considering burning, including Florida and Georgia, and are likely to adopt a policy soon.

Q. What areas are ruled out for burning categorically?

A. Some areas are unlikely to be approved for a burn because of the proximity of populated areas, weather patterns, terrain, or some other reason. However, because it is impossible to predict all the characteristics of a particular spill and because it may be more harmful, in some cases, to allow vapors from unburned oil to reach people, no area is necessarily ruled out.

Q. Shouldn't we be more worried about preventing the spill instead of burning?

A. Preventing spills is absolutely our number one priority. The oil industry and certain state and federal agencies are working hard to find ways to prevent spills from happening. It is far less costly to prevent spills than to clean them up. There are both federal and state laws and regulations that address prevention. Despite everyone's efforts, spills do sometimes happen, and the response community must be prepared to use all appropriate tools to respond effectively.