



Technical/Regulatory Guidance

Risk Communication Training (RCT)

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Prepared by

The Interstate Technology & Regulatory Council (ITRC)

Risk Communication Training (RCT) Team



This Interstate Technology and Regulatory Council (ITRC) online document includes a brief overview of risk communication ([Section 1](#)), walks through the steps in developing a communication plan and stakeholder outreach activities ([Section 4](#)), presents an overview of risk communication concepts ([Section 2](#)), and applies these principles in case studies ([Section 5](#)) to facilitate risk communication plan development. [Section 3.2](#) includes a summary of the tools included in the appendices (See Section 6 Additional Information) to facilitate risk communication plan development and stakeholder outreach activities. This toolkit is applicable to current, immediate, and emerging environmental issues and concerns. Examples of various tools, as presented in this toolkit, were developed by issue-specific ITRC teams; however, they are generally applicable to environmental issues and concerns. Additional examples will be developed by ITRC teams going forward and linked to the web document in the future. This toolkit will be updated with links to case studies published by future ITRC teams.

A short [Risk Communication Toolkit fact sheet](#) summarizing the information in this online document is available. As part of the PFAS team training videos, a Risk Communication video has been developed. It is posted on ITRC's YouTube channel. <https://www.youtube.com/watch?v=HqOaPip-z5g&feature=youtu.be> Document navigation is provided with the menu on the left, or above on a mobile device. Publication Date: June 2020

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Introduction

The USEPA defines “risk communication” as the process of informing people about potential hazards to their person, property, or community. Risk communication is a science-based approach for communicating effectively in situations of high stress, high concern, or controversy ([USEPA 2019c](#)). Effective risk communication provides people the best available scientific, public health, and environmental information about potential hazards so that they can make informed choices. This is best delivered in language easily understood from trusted sources. Risk communication projects can address a wide variety of issues ranging in scale and complexity. The tools provided in this document are intended to be sufficiently diverse and flexible to cover the development and implementation of a wide range of communication plans regardless of their size, complexity, or timeline. The toolkit should be used by parties (for example, responsible parties, regulatory or site managers, risk assessors, or stakeholders) tasked with community engagement while facing an issue of potential public concern.

This document includes a brief overview of risk communication, walks through the steps in developing a communication plan, presents an overview of risk communication concepts, applies these principles in case studies, and includes various tools (as appendices) to facilitate risk communication plan development. This toolkit is applicable to current, immediate, and emerging environmental issues and concerns. Examples of various tools, as presented in this toolkit, were developed by issue-specific ITRC teams; however, they are generally applicable to environmental issues and concerns. Additional examples will be developed by ITRC teams going forward and linked to the web document in the future. This toolkit will be updated with links to case studies published by future ITRC teams.

Risk communication can be particularly challenging when dealing with contaminants of emerging concern where science is rapidly evolving. Communicators must grapple with competing interpretations of uncertain science and risk management strategies, while earning community trust and promoting meaningful engagement. Other environmental concerns that pose an immediate risk to public health are also challenging, such as the detection of harmful cyanobacteria in a recreational waterbody. The ability to communicate potential and immediate risks to human health and the environment is a vital component in facilitating community participation and decision making.

A common misconception among environmental professionals is that risk communication occurs only after a crisis or emergency. In fact, it requires consistent communication through multiple avenues well before public concern develops. It is often in the form of a dialogue between the risk managers and the affected community. The heart of good risk communication is building trust among all participants by providing the best available scientific, public health, and environmental information about current and emerging environmental issues and their hazards in a manner that is easily understandable for the public to make informed choices.

The following toolkit sections provide guidance to perform the risk communication planning process for both simple and complex risk management public outreach. Review of risk communication fundamentals, the planning process, and examples of engagement tools will aid in communication strategy development. The type of hazard and severity of the risk may dictate the level of effort needed to complete the risk communication planning process. However, this toolkit can be used for both general and specific risk communication activities that encompass immediate to long-term environmental issues and concerns. Throughout this document, examples, tips, and links to issue-specific information are provided as good starting points to communicate risk.

The discipline of community engagement is interwoven with risk communication and associated planning. Therefore, this toolkit touches upon community engagement and techniques, providing some examples, but is not all-encompassing. Some resources on community engagement are provided in this document.

Approaches to Risk Communication

From [Lundgren and McMakin \(2013\)](#):

“No one approach to risk communication can be applied equally well to all the purposes, audiences, and situations for which risk is being communicated. Instead approaches to risk communication come from a variety of disciplines, each of which can provide insight to those who are communicating the risk. Understanding the various approaches and their implications can provide us with a repertoire of ways to develop our risk communication efforts, giving us a greater chance of success than if we were communicating without this knowledge.” (pg. 21)

[Lundgren and McMakin \(2013\)](#) provides summaries of the following approaches in chapter 2:

- communication process approach
- National Research Council's approach
- mental models approach
- crisis communication approach
- convergence communication approach
- three-challenge approach
- social constructionist approach
- hazard plus outrage approach
- mental noise approach
- social network contagion approach
- social amplification of risk approach
- social trust approach
- evolutionary theory approach
- extended parallel process model approach

Section 2: Introduction

Risk communication is a process that involves the following steps ([Covello and Allen 1988](#)):

- Identifying, understanding, and engaging your audience and stakeholders
- Defining clear messages that provide the information you want to convey with an understanding of, and respect for, the concerns and perceptions of the audience and stakeholders
- Selecting the appropriate communication methods to deliver those messages

The term “stakeholder” is defined broadly by ITRC as members of environmental organizations, community advocacy groups, tribal entities, or other groups that are concerned or involved with environmental issues, or concerned citizens who are not a members of any organization or group. Public stakeholders, such as advocacy groups, often speak for the communities that are affected by environmental issues. In this document, a differentiation is made between the public, stakeholders, and interested parties (which may include state regulators and past or current owners or operators of or contributors to contaminated sites). Understanding stakeholder context (demographics, affiliations, perception, and concerns) and identifying various opportunities for involvement and participation is a vital and important first step to developing a risk communication strategy.

Additional information on levels for public involvement are provided in [Appendix H – Communication Methods Summary Table](#) and International Association for Public Participation (IAP2) spectrum of public involvement accessed at: <http://ncdd.org/rc/item/1426/>

Stakeholders share greater ownership of outcomes when they can participate in the remedial action process, as illustrated in [USEPA \(2019a\)](#) Region 7 Leading Environmentalism and Forwarding Sustainability (L.E.A.F.S.) Awards. Environmental regulators and responsible parties also benefit from informed, constructive stakeholder involvement because it can help them make better decisions, reduce the likelihood of costly and time-consuming repetitive work, and allow those in affected communities to have a voice in governing the long-term use of land, water, and other resources. Stakeholders, such as long-time residents, often have unique local knowledge as well as a major stake in the environmental management decision outcome.

To learn more about stakeholder perspective, see the individual Stakeholder Perspectives section of the ITRC Technical and Regulatory Guidance documents, for example:

- PFAS Technical and Regulatory Guidance Document, [Section 13](#), Stakeholder Perspectives.

The fundamentals of risk communication discussed in this section include stakeholder engagement, understanding risk perspectives and earning trust in a community, timing of information sharing, and methods for interacting with and explaining risk in a community. Additionally, this section describes challenges unique to risk communication.

2.1 Stakeholder Engagement

Developing site or project-specific characterization, mitigation, and remediation strategies for communities and tribal organizations can be controversial. This is understandable as issues of health and safety are of deep importance to communities. How a community and the stakeholders within that community view risk management efforts proposed by an outside agency will depend on myriad factors including the stakeholder's trust in the agency, the nature of the hazard itself, and a range of stakeholder characteristics such as numeracy and scientific literacy. Therefore, early and effective stakeholder engagement is important. Stakeholder engagement should emphasize timely access to data, transparency, and responsiveness to stakeholder questions and concerns.

Effective stakeholder engagement not only reduces impediments to the completion of projects according to schedule, but also helps responsible parties and regulators make more informed decisions. One of the best ways for regulators and responsible parties to reach stakeholders is to identify members of the stakeholder groups who are willing to act as liaisons between the community and the regulators. There are five key components to establishing dialogues with communities ([Hance, Chess, and Sandman 1991](#)):

1. How communities see risk
2. Earning trust and credibility
3. Considering when and how to release information
4. Interacting with communities
5. Explaining risk

Attention to each of these components is critical to successful stakeholder engagement. In addition, it is essential for decision makers to understand stakeholder needs and risk perceptions to effectively communicate the potential risks, exposure pathways, and mitigation strategies of emerging issues and concerns, such as **Per- and polyfluoroalkyl substances (PFAS)**, **1,4-Dioxane**, and **Harmful cyanobacterial blooms (HCBs)**.

2.2 How Communities See Risk

People evaluate and understand risk differently, depending on the inherent characteristics of the risk itself. Table 2-1 shows how different characteristics of the risk can affect how acceptable the risk is to people ([Slovic, Fischhoff, and Lichtenstein 1982](#)). These characteristics are interrelated to individual risk perception factors discussed in [Section 2.8](#). Communications can help people frame the risk and address issues that are of greatest concern to communities. The more you understand the view or perceptions of the affected people and communities, the better you will be able to address their needs.

Table 2-1. Risk characteristics that influence level of acceptance

Source (Adapted from: [USEPA 2007a](#))

<u>More Acceptable</u>	<u>Less Acceptable</u>
Voluntary	Involuntary
Controlled by individual	Controlled by others
Clear benefits	Little or no clear benefit
Fairly distributed	Unfairly distributed
Natural	Human-made
Generated by a trusted source	Generated by an untrusted source
Familiar	Exotic
Affects adults	Affects children

Stakeholders who perceive a risk as unacceptable or less acceptable are more likely to express emotional outrage when confronted with news about a hazard in their community. Practitioners need to acknowledge, honor, and address this emotion to facilitate constructive and meaningful dialogue.

2.3 Earning Trust and Credibility

Trust is a major factor in effective stakeholder engagement and risk communication. Continuing engagement and transparency from the start sets the stage for successful trust building. Distrust can easily form due to, but not limited to, lack of information, inability to reach decision makers, inconsistency among several site risk management strategies, and inconsistent or contradictory media. In addition, practitioners should keep in mind that trust is influenced by history and previous interactions with regulatory agencies and potential responsible parties. Engagement and partnership with a community representative group or liaison, local health practitioners, and academic institutions can assist with building trust among the public and community stakeholders ([NJDEP 2014](#); [Council of Australian Governments 2018](#); [ATSDR 2011](#))

Trust building is an underlying theme that is discussed throughout this document. These are some general considerations for building trust:

- Involve the public early in the process, to enhance transparency and better engage the community.
- Express shared goals with stakeholders, even if they are just on the most basic mission level.
- Listen to stakeholders – their concerns are legitimate and important.
- Pay attention to the process: keep to established timelines and proposed milestones to the extent feasible. Aside from managing the regulatory and technical components, ensure that your organization keeps abreast of perceptions and circulating information in the community.
- Establish or identify a community liaison to assist with communication and enhance the sense of alliance.
- Use locally recognized support when possible.
- Explain regulatory procedures and document review times with stakeholders, and be explicit about where and when their input is requested.
- Deliver on recommendations and actions within the time frame communicated.
- Provide information to meet both the lead organization's and stakeholders' needs, and follow up when information is promised.
- Provide clear action steps for the community as needed (for example, switch to bottled water; talk with a medical professional).

2.4 Considering When and How to Release Information

If people are at risk, don't wait to release information. If the lead organizations are exploring a potential risk, explain this to the public. Release information before sharing it with the media. Impacted individuals and families want to hear directly from decision makers about environmental concerns and hazards in their community prior to learning about it through media channels. Practitioners should make an effort to inform the community and other impacted stakeholders directly and periodically to facilitate trust building. Taking these actions helps maintain control of the message and interpretation of the data. If you don't trust the data, discuss procedures and what's being done.

With respect to presentation of information, consider the stakeholders who will be receiving it; keep content simple and streamlined. When feasible, authors should provide summaries and roadmaps pointing to key findings or recommendations. Additionally, technical documents should be easily accessible and offered in both printed and, if possible, searchable standard electronic formats. Many facilities have dedicated websites, which stakeholders can visit to download current documents, as well as earlier site documents referenced in current documents.

2.5 Interacting with Communities

Involving stakeholders early in decision-making can support better decisions. If stakeholder groups are present, determine how they may play a role in stakeholder engagement. Recognize that people's values and feelings are a legitimate aspect of an issue and listen and acknowledge such feelings.

Ensure that risk communicators are adept at interacting with stakeholders in a public forum, and that the communication team has staff with a sound technical basis and credibility in the subject matter. If possible, agency and responsible party representatives should be consistent throughout the life of the project.

Stakeholders often do not distinguish among government agencies, and few understand how agencies are organized. Consequently, they may not understand lines of decision-making authority. Designate time to provide an overview of the process, including policy document requirements and timeframes, best opportunities and milestones to provide stakeholder feedback, and organizational structures and interagency relationships.

Providing the opportunity or funding for independent scientific, technical, and health consultants to support affected stakeholder groups can foster better understanding of technical information and further engagement and empowerment. Stakeholders are more trusting of independent consultants that they help direct. In addition, agencies and responsible parties can engage third party academic institutions to assist with stakeholder outreach. A case study presents an example of this approach in response to groundwater contamination in the PFAS Technical and Regulatory Guidance Document, see [Section 14.3.6.4](#).

2.6 Explaining Risk

Explaining risk information about any concern affecting communities is often challenging and complicated, particularly for environmental hazards, emerging contaminants and immediate public health risks. Generally, the ITRC technical and regulatory guidance documents are geared toward a technical audience, and it may take some time to educate stakeholders. Explaining scientific concepts, such as potentially complex chemistry, data and knowledge gaps, and current knowledge of health effects is fundamental to building trust. Stakeholders want to know if an exposure will cause or has caused a health impact(s). Thus, risk communication must inform on the basics of the risk assessment process so that stakeholders understand that health effects can be caused by multiple environmental and anthropogenic factors. Education on risk assessment basics can also inform stakeholders on how unacceptable risk can be reduced by risk mitigation activities.

When explaining risk assessment, the entire process must be discussed, including complicated formulas and assumptions. Key concepts such as excess lifetime cancer risk and noncancer health effects, the foundations of risk assessment, and environmental pathways should be presented. Sometimes it is easier to explain risk reduction than quantitative risk. Stakeholders may be confused by or not trust numerical projections of risk, such as excess lifetime cancer risk, but they easily understand when an exposure pathway is blocked.

Take into account stakeholders' concerns; give them as much consideration as you do the numbers. Realize that stakeholders determine what an acceptable voluntary risk is, not the lead organization. It is also important that stakeholders are informed that regulatory agencies do determine "acceptable" risk levels upon which decisions to clean up or not clean up a site are based. Keep in mind that different people see risk in different ways. Avoid risk comparisons especially if the risk is unknown and being imposed on stakeholders. They want control and choices. They want to feel safe and they want a role in decision making on issues that affect them.

[Section 4.5](#) and [Section 4.6.1](#) provide resources to help simplify technical content and complex processes or regulations into

laymen's terms so that these concepts are clear to the public. Most stakeholders will not have the background to easily grasp these concepts, and it may take multiple modes and mediums of communication over a period of time to effectively communicate the associated risks.

Academia can also serve a role in public education. Bennington College decided to open the doors of its science classrooms to the problem of PFAS contamination impacting the Hoosick Falls, New York, community. The college developed and offered a new introductory class on perfluorooctanoic acid (PFOA) to local communities free of charge. More information about this case study is presented in the PFAS Technical and Regulatory Guidance Document, see [Section 15.4.1](#).

2.7 Challenges to Risk Communication

Many general challenges to risk communication are applicable to any environmental situation. Some are highlighted in this section:

- Risk communicators need to develop and deliver key messages that adequately respond to stakeholder concerns and communicate how data gaps are being addressed.
- The regulatory agency is obligated to take actions in accordance with statutes. These actions may not be consistent with the stakeholders' preferred choice and expectations.
- Stakeholders have diverse backgrounds, education, needs, and interests and thus filter information through different lenses, yielding different results. Relevant social factors include level of understanding, primary language, preference in communication mode, accessibility of information and engagement events, socioeconomic status, environmental justice and other community vulnerabilities, and prioritization of basic needs versus potential hazards.
- It is important to establish trust in the agency or entity addressing the issue or concern. Distrust in either can result in stakeholders not accepting proposed risk management activities and time frames. Unique community histories, such as those of tribal nations and environmental justice communities, may result in complex relationships with government and site owners. Misunderstanding and lack of acknowledgment of community values and/or implications of risk management activities can exacerbate poor stakeholder relationships.
- Community history with the polluted property and owners/operators can play an important role in stakeholder sentiment. A site may have cultural value and/or have been a major employer in the region for generations. Communities, including workers, sometimes tend to accept environmental costs if the source of pollution is an entity that provides jobs or other economic benefits. Once the employer closes, neighbors and former employees tend to resent closure, so they elevate their environmental concerns: "The polluter left town, leaving behind only pollution."
- Stakeholders may be affected by consideration of cultural commitments and mitigation of detrimental impacts due to site actions. Risk communications must account for cultural diversity and differences in spiritual relationships with the environment.
- Given the complexity of the uncertainties for any specific project, it may be difficult to evaluate and quantify risk reduction.
- Stakeholders may learn that they have been unknowingly exposed to an environmental hazard for what could be a long period of time before the hazard was identified. This involuntary risk can result in outrage and distrust felt by the affected stakeholders.
- Determination of the severity of potential risks to human and ecological health from exposure to anthropogenic background versus localized sources in affected stakeholders.
- A specific individual's health conditions may not be definitively attributable to chemical exposures.
- Evolving scientific research and understanding of risk assessment can lead to changes of toxicity values over time, requiring recalculation of risks.
- Exposure pathways, extent of contamination, and contaminated media (including drinking and irrigation water from a potable source, surface soil, dust, agriculture, and aquatic biota) are complex and vary among sites and projects.
- Estimation of cumulative and aggregate exposures and risk are complex and vary among sites and projects.
- It is challenging to clearly and concisely communicate scientific factors and parameters used to develop risk-based standards and maximum contaminant level (MCLs), including site-specific receptors, exposure factors, and uncertainty

factors, as well as the legal and statutory requirements for standard setting and rulemaking.

2.7.1 Emerging Concerns: Additional Risk Communication Challenges

Emerging concerns and issues, such as PFAS, 1,4-dioxane, and HCBs, pose unique challenges to implementing risk communication in a meaningful and effective manner. Different sources often put forth divergent information about the potential severity and uncertainty associated with exposure and adverse health impacts and the need for treatment or response actions. For example, people will do their own research that may result in conflicting information. Communicators need to be prepared to explain the choices and decisions made regardless of the conflicting information.

Some additional issues may include:

- “An emerging concern” implies that it is the subject of intensive investigation and the amount of relevant information is increasing. Thus, our understanding and information about hazard, exposure, and risk are emerging and evolving. This can challenge us to rethink determinations of protective approaches within very short time frames.
- A project team has to summarize information in the face of disagreements among experts over the interpretation of available science and the magnitude of uncertainty in the risk assessment; the project team is communicating about risks when the risks are not fully known or characterized.
- For some groups of chemicals and mixtures—for example, PFAS ([ITRC 2020](#)) and petroleum hydrocarbons ([ITRC 2018](#))—numerous compounds exist, yet not all can be measured, and there is reliable toxicological information only for a small subset of these chemicals that have been studied in sufficient detail to support risk assessment and remedial decision making.
- Federal and state standards, guidance, and policies are not uniform and may not be available for the emerging environmental issue or concern.
- Identification of responsible parties may be difficult, depending on the specific emerging environmental issue or concern, because data and information collection may not be complete.
- Depending on the specific environmental issue or concern, effective mitigation by established treatment or response technologies may be available or may still be in development.
- There may not be consensus between responsible parties and federal and state regulatory agencies on health risks or on the risk assessment and management strategy. Consistent messaging is essential for successful risk communication and to best help those in need. Section 4.5 includes guidance on message development.
- If stakeholders are in debate about the level of risk, then communicate by informing the public that all parties are striving to get the risk estimate “right” but that there may be a delay in taking action until parties have agreed upon the best “right number” that is appropriate for the hazard and exposure scenario of concern.
- Communities that may be impacted will likely request an interim measure, such as an alternate water source, to alleviate concerns of potential continuing exposure. Interim measures coupled with public outreach and community involvement can be a cost-effective risk management strategy in the short term.
- Public outreach should include information on measures being taken as well as associated milestones for future actions toward making a more informed risk management decision that reduces risk to an acceptable level while using limited resources efficiently and integrating stakeholder values and community needs.

2.8 Risk Perception Factors

It is essential for decision makers to learn and understand the risk perception of stakeholders in order to effectively communicate the potential risks, exposure pathways, and mitigation strategies of emerging and persistent contaminants, such as 1,4-dioxane, or immediate public health risks, such as HCBs.

Perceived risk related to a hazard can be either amplified (heightened) or attenuated (diminished) relative to the current scientific understanding of the risk. The degree of risk attenuation or risk amplification influences how stakeholders view the

legitimacy of experts and affects their compliance with policies and protective measures. Risk amplification can also influence or be caused by a stakeholder's level of outrage ([Sandman 2013](#)). The type and degree of stakeholder risk perception is shaped by site-specific physical, psychological, and sociological factors. These risk perception factors contribute to the manner by which the public perceives a risk, which include voluntariness, controllability, familiarity, fairness, catastrophic potential, reversibility, equity, and effects on vulnerable populations (for example, children and pregnant women). [Table 2-2](#) present the three key dimensions of risk perception factors ([Bickerstaff 2004](#)).

Table 2-2. Risk perception factors*

Place and Locality	Trust and Communication	Agency and Power
Knowledge of sources and site history Cultural commitments Stigmatized community Sense of a personal safe place Presence of other hazards	Accountability and interest of stakeholders Role of information transfer Complexity of subject matter Differences in understanding Presence of vulnerable populations	Demographics Capability to respond to hazard Sense of hopelessness and powerlessness Social distrust Stakeholder history with proponent

* These factors are interrelated to risk characteristics that influence acceptance, as discussed in [Section 2.2](#).

Consideration of risk perception factors among stakeholders can assist decision makers in refining public education and outreach material and modes of delivery to promote understanding, maximize knowledge transfer, and meet the specific needs of the stakeholders ([Bickerstaff 2004](#); [Kasperson and Kasperson 1996](#); [USEPA 2005](#)). Risk perception factors relating to the hazard can be identified by conducting surveys, interviews, and focus groups ([Botzen, Aerts, and Van Den Bergh 2009](#); [Burger and Gochfeld 1991](#); [Chappells et al. 2014](#); [Harclerode, Lal, et al. 2016](#); [Weber et al. 2001](#)) [Vandermoere \(Vandermoere 2008\)](#). These engagement methods can also be used to conduct a risk hazard analysis to evaluate perceived severity of the risk to a hazard(s) and applicable risk management strategy(ies). As a first step, publicly available databases can be used to perform an initial community assessment of basic demographic information, including number of single-parent homes and families with preschool children, number of young and elderly adults, disposable incomes, and primary and secondary languages. Focus groups can also inform practitioners on where, what, when, and with whom they need to communicate.

The environmental management community is acting largely on the basis of growing evidence of health risks and general precaution as our understanding of exposure and associated risk is continuously redefined. Determination of community-specific risk amplification and attenuation factors can help practitioners better understand stakeholder context and site-specific factors contributing to stakeholders' perceived risk of proposed risk management strategies. Practitioners, responsible parties, community members, and other stakeholders should be cognizant that their statements, actions, and behaviors can unknowingly amplify or attenuate perceived risk. Furthermore, individuals, and sometimes stakeholder groups, may have their own agendas and knowingly amplify or attenuate perceived risk. These parties and organizations often use disruptive tactics as partially discussed in [Section 4.5.1.3](#)

2.8.1 Role of Risk Perception for Stakeholders

In a scenario of risk amplification, stakeholders perceive their risk to a hazard as a major concern although experts assess the hazard as carrying a lesser degree of risk (for example, low or moderate) ([Kasperson and Kasperson 1996](#)). Most of the time, risk perception is heightened by uncertainties and variability among policies and standards due to developing sampling methodologies, analytical procedures, new scientific information on health effects, risk assessment evaluations, and treatment technologies ([NGWA 2017](#)), and regulatory changes, as well as overall confidence/trust in the proponent or agency that is communicating risk. Additional human health and exposure factors that may influence risk perception are summarized in [Section 2.7](#).

A heightened sense of risk may result in opposition to proposed risk management strategies, such as source control (in which there is scientific uncertainty pertaining to the “safe” level of exposure if any without risk). To address risk amplification challenges, it is important to build trust within the community by maintaining transparent communication of uncertainties and variabilities early in the project life cycle ([USEPA 2005, 2007](#)). New data, findings, and research on emerging environmental issues and concerns should be shared regularly with impacted stakeholders. Current knowledge, including uncertainties and information about variability of potential susceptibility to health effects in individuals with the same exposures, should be conveyed accurately in an understandable manner.

Risk assessment factors selected and how they may differ among other state and federal standards should be clearly communicated to the public, as this is often a point of confusion and concern. In [Section 8.3](#) of the PFAS Technical and Regulatory Guidance Document, differences in available regulatory and guidance values for PFOA and PFOS are discussed, including a summary of risk assessment factors (for example, critical effect, study exposure duration, reference dose, receptor, ingestion rate, and normalization factors).

Uncertainties in individual exposure and susceptibility and variability in regulatory guidance can cause the affected individuals to lose confidence in current scientific knowledge. Therefore, a risk communication project team (see [Section 4.1.1.3](#)) should communicate these uncertainties and variabilities to the affected individuals in collaboration with risk assessors, project managers, community involvement coordinators, and community leaders/active members to develop site-specific messaging. It is important to understand that standards for the same chemical often differ depending on the entity setting them. This is not unexpected, because standard setting guidance is not simply a mathematical formula. Risk assessment approaches used in standard-setting processes include best professional judgment in the selection of the factors involved.

In addition, a collaborative effort can be made to develop performance metrics, supplemental to cleanup standards, that evaluate how the risk management action will lead to measurable increased protection for public health and the environment, thus leading to the development of targets or objectives ([Hadley, Arulanantham, and Gandhi 2015](#)) that offer reductions in risk. These metrics are referred to as secondary risk management performance metrics and can be used to communicate and evaluate success of a proposed risk management strategy, as well as assist with alleviating stakeholder concerns associated with uncertainty. For example, applicable secondary risk management performance metrics that could be applied are reduction in contaminant bioavailability/loading, source control/removal, and mitigation of exposure pathways ([NGWA 2017](#); [Harclerode, Macbeth, et al. 2016](#); [Hadley, Arulanantham, and Gandhi 2015](#)).

Risk amplification can be heightened when stakeholders perceive that they have limited control over risk. Explicit efforts of site managers and regulators to share control reduces outrage and risk amplification ([Sandman 2013](#)). Therefore, public participation is essential to create an atmosphere of collaboration. In situations where an open public forum is met by public outrage, it is important to be compassionate and lend a listening ear. Acknowledgement and documentation of questions that cannot be answered communicates transparency and can be a first step toward building trust. In contrast, in a risk attenuation scenario, experts judge hazards as relatively serious although stakeholders do not pay, or pay comparatively little, attention to that risk event ([Kasperson and Kasperson 1996](#)). This diminished sense of risk results in challenges in stakeholder participation in risk assessment and management activities (for example, “Why do we need to spend money/do testing, etc., for this?”). To address risk attenuation challenges, site-specific risk perception factors related to inaction can be identified via stakeholder engagement and integrated into a communication plan ([NGWA 2017](#); [Harclerode et al. 2015](#); [Harclerode, Macbeth, et al. 2016](#)). See also the PFAS Technical and Regulatory Guidance Document, [Section 14.1](#).

2.8.2 Role of Risk Perception for Decision Makers

Due to the evolving science of diverse emerging environmental issues and concerns, project managers, risk assessors, and risk communicators can also get caught in between those who amplify risk and those who deny risk. As noted, uncertainty in the

toxicity and exposure can lead to lack of consensus on how to evaluate risk and proposed risk management strategies. Due to risk amplification, there may be an elevated demand to take action to reduce potential risks beyond what is even technically, operationally, and/or financially feasible. However, the underlying uncertainty feeding this risk amplification may also lead to opposition to proposed risk management strategies from some decision makers prior to establishment of the “right number” to dictate such action. When communicating with the public, it is essential to avoid or minimize downplaying or embellishing risk due to lack of consensus on risk levels among decision makers. Strategies should be implemented to navigate disagreements and craft an approach to communicate a risk management plan that is most likely to be reasonable and protective. One strategy is to consider and incorporate stakeholder needs and values, placing greater weight on them when risk management is considered. A second strategy is to develop secondary risk management objectives as mentioned in [Section 2.8.1](#). These highlight the importance of formulating a robust risk communication plan, as well as consideration of stakeholder risk perception as part of the risk communication process.

Section 3: Introduction

This risk communication toolkit is a document intended to be updated regularly by existing and future ITRC teams as significant information, new technology, and additional resources become available for emerging environmental issues and concerns. Potential updates may include additional resources, engagement tools and links to examples and case studies, as well as integrating new section topics to update the risk communication toolkit. The risk communication planning process shown in [Figure 4-1](#) is designed generally to cover a range of current, immediate, and emerging environmental issues and concerns. The initial toolkit version was a collaboration among the following ITRC technical teams:

- Per- and Polyfluoroalkyl Substances
- (PFAS) 1,4-dioxane
- Harmful Cyanobacterial Blooms (HCBs)

3.1 Caution Statement About Using the Toolkit

Methods and tools presented should be used as guidance to assist practitioners in performing meaningful and effective risk communication. It is essential to choose appropriate and applicable tools that are in alignment with project-specific communication plan goals and objectives ([Section 4.2.1](#)). Environmental issues and concerns could require immediate, short-term, and/or long-term responses. Practitioners should be aware and flexible in their communications planning efforts, particularly in time-critical situations (such as during a cyanobacterial bloom or impacted drinking water supply).

The contents presented are not fill-in-the-blank documents; rather, the text and materials should be used for general reference only. This document should not be construed as definitive guidance for any specific site or project and is not a substitute for consultation with qualified professional advisors to develop project-specific communication plans.

3.2 Risk Communication Toolkit Contents

This toolkit is applicable to current, immediate, and emerging environmental issues and concerns. Examples presented in this toolkit were developed by issue-specific guidance teams but may be applicable to any environmental concern. This risk communication toolkit contains the following elements:

- Risk Communication Plan Description and Template ([Appendix A](#))
- Sample SMART Goals (with PFAS-Specific Example) ([Appendix B](#))
- Audience/Stakeholder Identification Guide (with PFAS Example) ([Appendix C](#))
- Key Message Mapping Guide (with PFAS-Specific Example) ([Appendix D](#))
- Guidance for Writing Press Releases (with PFAS-Specific Examples) ([Appendix E](#))
- Guidance for Writing Analytical Results Letters ([Appendix F](#))
- Social Factors Vision Board (with PFAS-Specific Example) ([Appendix G](#))
- Communication Methods Summary Table ([Appendix H](#))
- Analytical Data Package Public Information Fact Sheet (with PFAS-Specific Example) ([Appendix I](#))
- Tracking Form for Media Correspondence ([Appendix J](#))

The tables presented in the communication plan serve as examples or templates for documenting site-specific activities. [Appendix A](#) presents the record keeping tables for the generic Risk Communication Plan. Subsequent appendices provide issue-specific examples to illustrate and inform practitioners of the risk communication planning process. Users can update the toolkit's planning template and example tools to develop and document a risk communication project that is specific to the site characteristics and community context and needs. For emergency response situations, the user of this document should contact the applicable agency or lead organization's incident management or office of emergency management to determine the short-term risk communication action plan. Going forward, ITRC teams may develop additional examples, case studies, and tools that will be offered for external review with their teams' documents, finalized, and then linked to this risk communication document. As team documents are published, there will be links across the final web documents.

Section 4: Introduction

Communication plans can be simple or complex depending on the requirements of the site or project. Not all situations will require implementing all of the steps at the same level of detail. The tools included in this communication plan template are examples to be considered and used as applicable for different situations. Document users should consider what aspects of the plan template could be useful for their project. A complete and robust plan is more likely to result in effectively communicating a message. Consider the communication plan to be a living document; as situations or projects change, update the plan and share with the project team.

Establishing a communications plan can accomplish the following:

- Develop shared goals and objectives for the issue or problem at hand.
- Clarify the relationships between stakeholders, messages, methods, activities and materials.
- Define staff members, stakeholders and others' roles and responsibilities in the process.
- Develop effective messages using stakeholder input.
- Promote consistent use of messages by staff and stakeholders.
- Identify applicable engagement methodologies and tools to meet objectives.
- Evaluate the success of your efforts and determine follow-up action items.

This plan template, adapted from the work of [NJDEP \(2014\)](#), facilitates development of project-specific communication plans to be developed at each stakeholder engagement and/or outreach phase of a project. Of note, the NJDEP 2014 document relied on the work of Caron Chess, Billie Jo Hance, and Peter Sandman, Environmental Communication Research Program, Cook College, Rutgers University, as published by the New Jersey Department of Environmental Protection. Having a communication plan supports an ongoing stakeholder engagement process, identifies communication methods and tools, and acts as a record keeping form to achieve meaningful and effective risk communication. A communication plan supports the five principles of risk communication: building trust and credibility, explaining risk, interacting with communities, understanding how communities see risk, and understanding when to release information. Communication planning also supports reassessment of communication methods and approaches to improve or help craft better, more effective messages. Figure 4-1 presents the iterative eight step process of risk communication. In addition, the communication plan incorporates ways to ensure effective stakeholder engagement. The success of a risk communication plan depends on building a working relationship between stakeholders and those conducting and overseeing the project. [Appendix A](#) provides a risk communication plan template that users may find helpful to download and fill-in as they developed their own risk communication plan. The template includes a brief description of each risk communication planning step.

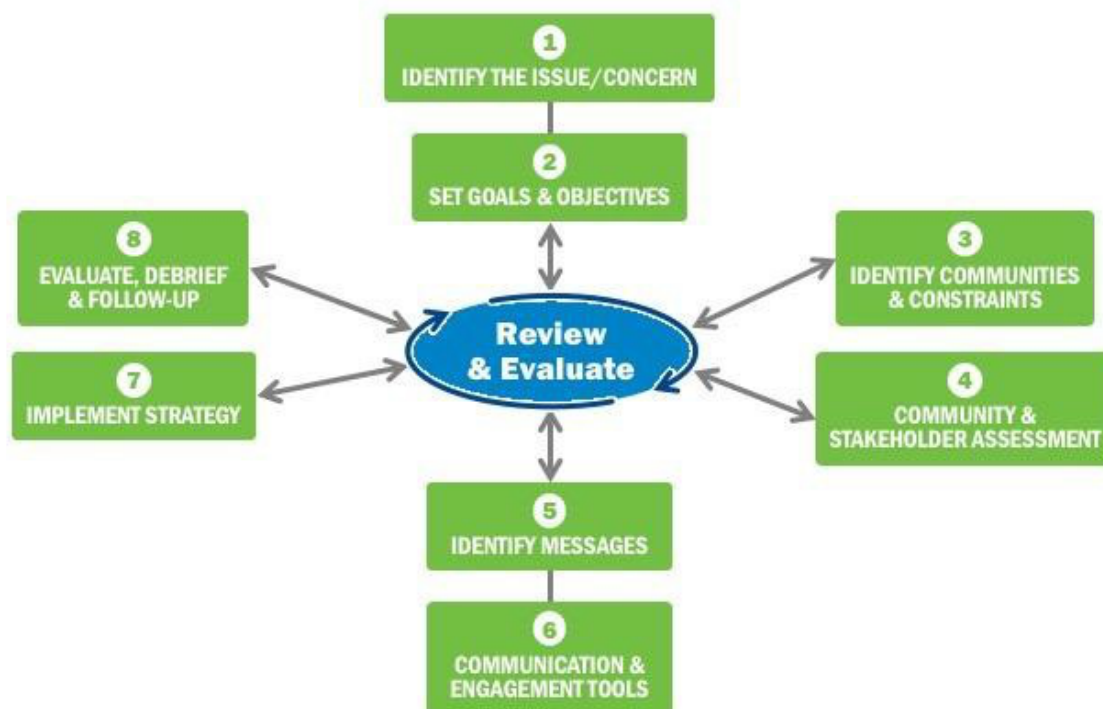


Figure 4-1. Communication plan process diagram

Source: Modified from ([NJDEP 2014](#))

4.1 Step 1: Identify the Issue/Concern

Communication planning begins when an issue or concern involving an agency or organization and the public emerges. The lead organization's management identifies a communication coordinator. Subsequently, management and the coordinator discuss the nature of the issue, the roles and responsibilities of the communication team, and identify those people in the organization who may need to be involved in the issue. Internal work groups may consist of people across different programs or functions, press or public relations groups, or in state agencies or organizations, depending on the circumstances.

The first step is to understand the regulatory requirements, relevant policy and science-based perspective on the issue and the community context. Community context can be understood based on the project team's knowledge and publicly available information, including media sources, community forums, interactions between staff and stakeholders (email, calls) and municipal demographic data.

Follow these steps as the issue is identified:

- Briefly describe why you need to communicate about a specific issue, concern, or about specific information.
- Define the problem you are trying to solve with communication.
- Summarize context, facts, and events surrounding the issue including:
 - site characteristics (for example, new release/source, existing source/site, contaminated media, exposure routes, potential acute and chronic exposures, location near residential properties, remote location) and assessment of affected community(s) including exposed sensitive populations (for example, schools, daycare)
 - scientific and health information (what is known or not known)
 - political/local government information (what is known or not known)
 - geographic information system (GIS) information (for example, geospatial data on sources and potential receptors)

4.1.1 Tools

Several different tools are available to identify the issue or concern. Document users should consider which tools will be valuable to their specific issue or concern.

4.1.1.1 Issue List Template

It is important to document the information described in the bullets above for a specific site. Throughout the risk communication process, additional issues may be identified. Keeping an ongoing issues list helps to track and prioritize the open issues and concerns for a site. The new issues are added into the risk communication planning process. The issues list should include characterization of the community, environmental issue(s) of concern, and unique challenges of performing risk communication and public outreach due to emerging and/or immediate public health risk(s). The communication plan template, provided in [Appendix A](#), includes a table to summarize the environmental issue/concern.

4.1.1.2 Develop an Issue Profile

The profile should include the characteristics of the community as well as the characteristics of the environmental concern (for example, drinking water contaminant). The lead organization is likely to know this information. It may not be comprehensive. Below is a list of sample questions to assist with creating a comprehensive profile of the environmental issue and developing the risk communication plan. In the case of emerging contaminants, because the risk is typically unknown and uncertain, imposed upon the community, and exotic in nature, the community will likely view this as a greater risk, and the public is likely to be more fearful, outraged, and demanding of immediate solutions. Additional or different questions may be relevant for a particular site or situation. The environmental issue profile can be in any form – narrative, bullets, or table, as in the communication plan template presented in [Appendix A](#).

Information for the issue profile can be developed based on different sets of factors, adapted from [NJDEP \(2014\)](#):

Environmental/Regulatory Factors:

- Is this an emerging contaminant?
- What environmental media are impacted?
- What other projects is the regulator/responsible party working on in the area?
- What other environmental problems exist in the area or occurred previously?
- How did the agency, organization or responsible party respond to these other problems?
- What were the community's or stakeholders' perceptions of how the agency, organization or responsible party responded?
- Are the health impacts known?
- Is the source known?
- Is it a long-term or short-term issue?
- Can immediate protective measures that can be taken?
- What is the extent of the contamination? And how long has the problem been present?

Community/Socioeconomic Factors:

- How big is the community?
- What is its economic base?
- What are its social networks?
- What is its political structure?
- What are the demographic characteristics?
- Who are the key leaders?
- Who are the affected stakeholders?
- What are the priorities of key leaders?
- What are the concerns of residents?
- What groups or individuals are already involved?
- Who are their leaders?
- What is the scientific literacy of the community?

4.1.1.3 Form a Communication Team

Communication is best accomplished through a team approach. The team will consist of anyone in the lead organization who would contribute to the development of an outreach plan. This will include technical personnel, communication experts, and project managers who may be familiar with the community or the environmental issue or concern. It is beneficial to also include the following decision makers and impacted parties as part of the communication team: a representative of each regulatory agency, responsible party, property owner, and stakeholder group (for example, a water purveyor and a community liaison).

The team will vary from situation to situation depending on the issues and the community affected. Select a communications lead to coordinate with the technical experts, decision makers, and other key personnel. Identify roles and responsibilities for communication team members and the communication lead. Identify an approval process and chain of command for group actions.

Communications lead tasks may include, adapted from [NJDEP 2014](#):

- Develop and track the communication strategy.
- Coordinate information gathering, development, and review of communication activities and products.
- Participate in all internal and external meetings on the site.

- Consult on communication best practices throughout planning, development, implementation, and evaluation processes.
- Help technical staff present technical information clearly and in plain language.
- Be a liaison between community/stakeholders and leadership/project manager
- Incorporate audience concerns into the process.
- Develop appropriate communication methods as identified in the audience assessment to meet the needs of stakeholders.
- Implement and evaluate the agreed upon strategy.
- Follow up on remaining stakeholder questions or concerns identified through evaluations.

When building a team, consider including other stakeholder agencies and departments from the beginning that could be directly and indirectly affected by the communication strategy and community input, for example, local and regional health departments, water purveyors, fish and wildlife representatives, local and state government officials, toxicologists or other scientists specializing in a particular environmental issue or remedial activities, water enforcement and permitting programs, and local public health professionals. In addition, a trained facilitator or someone assigned to work with the public may be an appropriate team member to assist with capacity building among decision makers and with audiences. Including the broad range of participants in your team will facilitate building relationships and collaborative work with your partner agencies, stakeholders, and community. This ensures that other points of view are represented in your communication and contributes shared intellectual and physical resources to the project. It also builds support for common communication objectives and consistent use of messages across disciplines, contributing to a unified voice. Partners can then develop complementary agency, stakeholder, or community-specific communication plans as well.

A team list table is provided in the communication plan template in [Appendix A](#).

4.1.1.4 Agenda for First Communication Team Planning Meeting

It is important that when the communication team meets for the first time, there is a clear road map on how the team will work together and what needs to be accomplished. This introductory meeting will likely not address all the issues associated with the problem. As such, be prepared for the items from the first meeting to carry over into subsequent meetings. Assignments on who will be responsible for what tasks should be determined.

Below is a suggestion for an agenda for a first meeting ([NJDEP 2014](#)):

- Present and clearly identify the issue (science and technical matters that are relevant to the particular immediate/emerging environmental concern or issue).
- Define roles and responsibilities of communication team.
- Have group members share their knowledge of the issue.
- Decide if others should be part of the work group.
- Identify communication goals.
- Acknowledge regulatory program requirements and policies, and identify constraints.
- Try to identify the stakeholders and assess their concerns.
- Discuss actions stakeholders can take to improve their engagement, knowledge and safety.
- Discuss the messages you want to send to audiences.
- Discuss the best methods to send these messages.
- Decide who will coordinate the communication activities.
- Assign whatever tasks you feel are needed at this time, with deadlines for doing them.
- Plan how you will evaluate whether the strategy achieved the goal.
- Identify gaps in the communication team and actions to address them.

4.2 Step 2: Set Goals and Objectives

In establishing a risk communication plan, it is essential to create measurable goals and objectives for the risk communication outreach effort based on what needs to be fulfilled as an agency or organization, as well as the needs of the public. During this step, consider possible methods for how the team will evaluate whether communication was effective.

Working through the issue identification step will help begin goals formulation. Goals are general guidelines that explain what you want to achieve. Goals are brief and clear statements of outcomes to be reached within a measurable and achievable time frame. Examples of goals may include raising awareness, increasing knowledge, and promoting an action or intention. Goals do not state how to do something, but rather what the results will look like.

Objectives are the specific strategies or steps taken to reach your goal. They are specific, measurable, and have a defined completion date; they are the “who, what, when, where, and how” of reaching the goal. Different contexts sometimes use goals and objectives interchangeably, based on a specific project; users may choose to use one or the other, or both.

The communication team uses goals to develop messages and materials. Goals that relate to how stakeholders will be involved in the process should reflect core values for public participation, such as those set by the International Association of Public Participation (IAP2) (<https://www.iap2.org/page/corevalues>). The IAP2 has established the following core values for the practice of public participation:

- The public should have a say in decisions about actions that could affect their lives.
- Public participation includes the promise that the public's contribution will influence the decision.
- Public participation promotes sustainable decisions by recognizing and communicating the needs and interests of all participants, including decision makers.
- Public participation seeks out and facilitates the involvement of those potentially affected by or interested in a decision.
- Public participation seeks input from participants in designing how they participate.
- Public participation provides participants with the information they need to participate in a meaningful way.

Public participation communicates to participants how their input affects the decisions. In scenarios where trust between the community and decision makers is broken, inclusion of a third, neutral party to facilitate and assist with public engagement can help address and potentially overcome distrust. Examples of relevant neutral third parties include academic institutions, public health professionals, and community interest groups. Engagement of community leaders, such as tribal council leaders and local organizations, also assist with building a unified front among stakeholder groups and regulatory agencies to maximize public trust. Additional resources on community engagement include ATSDR *Principles of Community Engagement* (ATSDR 2011) and the International Association of Public Participation spectrum of public involvement (<http://ncdd.org/rc/item/1426/>).

The PFAS Little Hocking Case Study (PFAS Technical and Regulatory Guidance Document, [Section 15.4.1](#)) provides an example of general principles set up by the community advisory group.

4.2.1 SMART Goals and Objectives

Types of goals and objectives to consider include the standard communication goals presented in the following bullet list. Goals and objectives should be developed using the SMART (specific, measurable, attainable, relevant and timely) approach. [ITRC \(2011\)](#) includes additional information about SMART objectives. Examples of SMART Goals and Objectives are presented in [Appendix B](#)

The following sections provide information about communication goals are adapted from [NJDEP 2014](#) and [Hance, Chess and](#)

[Sandman 1991](#).

4.2.1.1 Universal Goals and Objectives

- Establish and maintain dialogue with affected stakeholders.
- Build and maintain agency, organization or responsible party credibility with affected stakeholders.
- Coordinate actions within and between agencies and responsible parties so that messaging to stakeholders is consistent by all communicators from the various agencies.
- Avoid unnecessary conflicts with stakeholders.

4.2.1.2 Process Goals and Objectives

- Involve affected stakeholders as early and as often as possible.
- Provide opportunities for stakeholder input, and involvement in the decision-making process on decisions that affect them.
- Seek input from stakeholders in designing how they participate.
- Provide stakeholders with the information they need to participate in a meaningful way.
- Follow through on commitments and communicate to stakeholders how their input affected the decision.

4.2.1.3 Information Goals and Objectives

Adapted from [NJDEP \(2014\)](#):

- Provide stakeholders with the data they need to understand the issue.
- Explain what the agency, organization or responsible party has done, is doing, and plans to do about the problem, and what it cannot do, and why.
- Answer stakeholder questions and concerns.
- Provide a summary of the project's sequence of events and regulatory or statutory milestones.
- Solicit feedback to ensure that the lead organization is responding to stakeholder concerns.

4.2.1.4 Legally Mandated Goals

- Provide appropriate advance notice and explain the process for stakeholder input and agency, organization or responsible party response.

The communication plan template in [Appendix A](#) includes a table to identify SMART goals and possible evaluation methods

4.3 Step 3: Identify Communities & Constraints

Learn who will be most affected by the information and their level of interest, knowledge and concern. Some of this may already be known through the issue profile step. This step will help provide any missing information. Additionally, don't assume that the communication team knows what people are concerned about; community stakeholders may not be concerned with the actual risk, but the perceived risk. Recognize that people may be skeptical that the lead organization is telling the truth, cares about them, and is willing to work with them. Research the full range of opinions and concerns including general attitude, knowledge and perceptions about the issue, the message and the messenger. This can be accomplished by regularly asking community leaders and the stakeholders you are working with if there are other groups of individuals who are missing from the outreach and who should be involved. For contaminant- or issue-specific information on stakeholders, see the associated section on Stakeholder Perspectives for example:

- PFAS Technical and Regulatory Guidance Document, [Section 13](#), Stakeholder Perspectives.

Also, identify and develop solutions to address constraints that may hinder stakeholders or communities from participating in the communication process. Examples of constraints include travel to remote locations, limited access to the internet, and inability to attend community engagement events.

Include people from various groups, such as residents, academia, government, and non-profits. Be sure to consider internal organization/agency stakeholders and external communities. Consider cultural diversity, including language diversity (non-English speakers), socioeconomic diversity, and vulnerable populations. Determine if sensitive populations are present, such as children or pregnant women.

Academic institutions can serve as a liaison to the community and assist with data collection and interpretation to address a community's immediate needs. This third-party relationship also serves as a platform for the community to participate in citizen science and answer questions encouraged by curiosity and interest (such as fluctuations in well contaminant concentrations and presence in local foods). Academic institutions can also assist with providing data in situations where, for example, the regulatory authority cannot disclose information due to pending litigation.

A technical advisor is another form of third party that can assist with relaying the community's perspective to decision makers in addition to relaying the technical information to the community. All third parties should attend site information sessions and partake in advisory boards to keep well-informed and facilitate continuous dialogue with decision makers.

4.3.1 Audience/Stakeholder Assessment Tools

[Appendix C](#) includes an audience/stakeholder identification and mapping tool. In addition, there are publicly available data-driven tools to assist with audience/stakeholder assessment, including the following from USEPA and ArcGIS:

- EPA EnviroMapper: <https://enviro.epa.gov/enviro/em4ef.home>
- EPA Environmental Justice Screening and Mapping Tool (EJScreen): <https://www.epa.gov/ejscreen>
- ArcGIS (or other global information system [GIS] system) in conjunction with demographic data from US Census and state/municipal entities, for example:
 - <https://www.usa.gov/statistics>
 - <https://www.maryland-demographics.com/>
 - <https://bniajfi.org/>
- ESRI Tapestry: <https://doc.arcgis.com/en/esri-demographics/data/tapestry-segmentation.htm>

These tools provide information that may assist with understanding stakeholders, including:

- identifying additional vulnerabilities that may influence communication and response
determining the most effective outreach strategies
- considering the timing and location of outreach (for example, if most families in the target community are led by a single parent, it may be useful to consider using schools for outreach)
- considering if there is a role for a community advisory group for the issue

Once stakeholders are identified, determine individuals who can serve as stakeholder leads or affected community liaisons. Consider if a third party, such as a technical advisory group or local academic institution, is relevant and applicable.

4.3.1.1 Questions to Help Identify Target Communities

Below is a set of questions that may help you to identify stakeholders with whom you will be communicating. Once you have the answers to these questions, the information can be used to develop a targeted outreach plan that addresses the specific concerns of specific stakeholders. Adapted from [NJDEP 2014](#):

- Who is likely to be affected directly by agency, organization, or responsible party action?
- Who was previously involved in this issue?
- Who might have important ideas, information or opinions?
- Has the agency, organization or responsible party heard the full range of opinions on the issue?
- Who wants to know what the agency, organization or responsible party is doing without commenting on their proposals or actions?
- Who are important community leaders?
- Who is likely to be angry if not consulted or alerted to the issue?
- Are there sensitive populations that may be affected? (for example, adjacent schools, day care facilities, hospitals, environmental justice communities)

4.3.1.2 Examples of Stakeholders

The following list of potential stakeholders is adapted from [Hance, Chess, and Sandman \(1991\)](#):

GOVERNMENT

- Federal or state agencies and associated divisions
County agencies
- Municipal agencies
- Federal, state, tribal, or local elected officials
Sewerage authorities
- Regional planning commissions
Emergency responders
- Agency advisory committees

ENVIRONMENTALISTS

- National groups
- Statewide groups
- County groups
- Municipal groups
- Groups for specific issues (for example, Superfund, siting, hiking, fishing, watersheds, natural resources)
- Groups with specific functions (for example, legal, research, lobbying, organizing)

EDUCATION

- Colleges
- Agricultural extension Public and private schools
- Students and student organizations
Preschool-age programs

GEOGRAPHICAL NEIGHBORS

- Local residents
- Local businesses
- Neighboring townships
- International border communities

CIVIC

- League of Women Voters
- Associations and clubs (for example, Kiwanis, Elks)
Environmental commissions
- Senior citizen groups
Ethnic groups

PROFESSIONAL AND TRADE

- Health: health officers, doctors, and nurses
- Technical: laboratories, sanitarians, engineers, biologists, and chemists
- Business: real estate professionals, planners, water purveyors, chamber of commerce, industry and small business
- Agriculture

MEDIA

- Press
- Radio
- TV/Cable
- Social media
- Project website

4.3.1.3 Stakeholder and Communities Communications Worksheet

A list of people who are part of the communication landscape should be developed and maintained throughout the project. The communication plan template, provided in [Appendix A](#), includes a table to identify and track specific messages or anticipated communication activities for each stakeholder group.

4.4 Step 4: Assess Stakeholders/Communities

Stakeholder engagement should not be an afterthought, but rather integrated into the project staff requirements, budgets, and timetables from the beginning of the project. Project managers and their technical and legal teams should communicate with the public early on, and community involvement specialists—for organizations that have them—should be included in internal technical meetings so they are able to provide timely, accurate information about the public to the communication team.

Assess the needs of the targeted groups by learning what information they want, how they are likely to react to the information you share, what their potential interests/concerns are, how they will likely expect to be involved in the decision-making process, and what methods of communication are used in each community. Learn the technical literacy and knowledge of the community, and its cultural traditions and priorities. Focus your assessment for each group to help prioritize concerns relevant to risk exposure and management.

Individual stakeholder groups and individuals themselves process information in a variety of modes and mediums. An effective risk communication strategy takes this factor into consideration and encompasses multiple forms of outreach. In addition to informative materials, such as fact sheets, stakeholder meetings and interactive sessions (such as poster presentations, question and answer sessions) can be held to involve individuals in the learning and understanding process. Prior to selection of method, an audience/stakeholder assessment should be conducted to determine how a community communicates and to learn what tool is the most effective to use.

Agencies and other responsible parties sometimes prematurely conclude that there is minimal stakeholder interest at a site because of low attendance at official public meetings or open houses. Audience/stakeholder assessment can help determine strategies for reaching people who may be unaware of the issue. This assessment may also identify areas where residents have limited English-language capability so that translation needs can be included in the communication plan.

Audience/stakeholder assessment can be used to identify where funding may be needed for community relations, advisory boards, and independent technical assistance. Investing in audience assessment pays off in better decisions and smoother progress, and potentially positive public recognition of the project. Finally, audience/stakeholder assessment supports identifying environmental justice communities potentially affected by the site or project.

Community education about the science of the issue or concern may be part of the assessment. The PFAS document includes information about Bennington College's program to provide community education about PFAS (see PFAS Technical and Regulatory Guidance Document, [Section 15.4.1](#)). In addition, the case studies linked in [Section 5](#) provide illustrations of different communication approaches to meet stakeholder needs and concerns.

4.4.1 Tools

4.4.1.1 Ways to Identify Community Concerns

Initial outreach to identify concerns can take the form of one-on-one meetings with community leaders and elected officials, a discussion with existing community groups, meetings, a survey, a site visit to better understand the community, or some combination of activities. This level of engagement lends itself to learning the concerns, knowledge and needs of the community and how they communicate, and identifying the trusted leaders.

4.4.1.2 Questions to Ask Communities

The following list of questions to ask communities was adapted from a [Hance, Chess, and Sandman.\(1991\)](#):

- What type of interaction would you like with the agency, organization or responsible party?
- How do you feel about interactions so far?
- What answers do you want?
- What technical information do you need?
- Do you have comments for the record?
- How can the agency, organization or responsible party respond better to your concerns?
- How do you get your information?
- What kinds of risks do you think you are exposed to?
- What health and lifestyle concerns do you have?
- What questions do you have about the data relating to the site or issue?
- What information on agency, organization, or responsible party procedures do you need?
- What information about risk management do you need?
- Is there information already available that you wonder if it is true or accurate?
- Are there rumors spreading that you are not sure about?

4.4.1.3 Questions Communities May Ask You

Interactions with the people of an affected community can provide you with background information about the community and their potential concerns. Although this is useful in preparing for interaction with people and ultimately preparing answers to questions you know will be asked, it is important to be genuine and not appear as though you have pat answers or prepared statements. In the case of emerging contaminants there are often many unknowns, therefore you may not have answers for all questions. The purpose of understanding community concerns is to be able to convey uncertainty as well as what is known. This is a critical component in establishing trust and credibility with that community. This is a dialogue. The following list of questions communities may ask you was adapted from [Hance, Chess, and Sandman.\(1991\)](#):

Health and Lifestyle Concerns

- Will you provide drinking water?
- What is the danger to my health and that of my family? Can I drink my water, eat produce from my garden?
- What can I do to find out if my health has been affected?
What can I do to reduce the impact of past exposure?
- What can I do to prevent further exposure?
- What effects could there be on my children or my/my partner's ability to become pregnant? We are already at risk because of X. Will Y increase our risk?
- How will we be protected in an accident/release?
- How will this affect our quality of life, property values?

- How will we be compensated for the loss of property value or losses due to interruptions of our homes/businesses?
- What is the danger to my pets and/or livestock?

Process Concerns

- How will we be involved in decision making?
- How and how often will you communicate with us?
- Why should we trust you?
- How and when can we reach you?
- Who else is involved in this situation?
- When will we hear from you?
- When and how can we get more information?

Risk Management

- When will the problem be corrected?
- Why did you let this happen and what will you do about it?
- Why do you favor the selected cleanup method?
- What are other options for correcting the problem?
- Why are you moving so slowly to correct the problem?
- What other agencies are involved and what are their roles?
- What kind of oversight will we have?

Data Concerns

- What is the worst-case scenario?
- What do the risk assessment numbers mean and how did you get them?
- How are you sure of the risk
- What documentation or support for your conclusions do you have?
- What other opinions on this issue exist?

4.5 Step 5: Identify Messages

A message is information you want or need to share with stakeholders about the issue or concern, a question that you need them to answer, or both. It is linked to the case- or project-specific SMART goals and objectives to help build trust and facilitate a shared understanding and experience in the risk management strategy (refer to [Section 4.2](#)). A message addresses key points about the issue that were learned through the audience/stakeholder assessment. You start with the stakeholders and their concerns. Effective messages reflect what your target group needs are, as well as what you need to communicate.

In the case of emerging contaminants, elements of a message are likely to include what is known and unknown about a contaminant; acknowledgement of uncertainty; commitment to share new information when it is learned; explanation of how decisions will be made with respect to protecting public health and remediating the problem.

A key message may encompass saying “no” to a stakeholder request that may be financially or technically infeasible. Working collaboratively with stakeholders will inform practitioners on information and data needed to support decisions. In addition, if engaged early, stakeholders will be informed of project limitations and likely have a better understanding of constraints.

4.5.1 Tools

Various communication tools are described in the following sections.

4.5.1.1 Message Map Tool

Message mapping is a process for conveying the critical information concisely. The objective is that the message is simple, yet comprehensive enough, and includes the most pertinent information relevant to your issue.

The team should collaborate on message mapping so they can agree on the contents of the main message and ensure that the science is accurate and the information is presented in a way that is most useful and responsive to stakeholder needs. When developing messages, we should take into account that when people are stressed, they may have difficulty hearing, understanding, and remembering information. They may lose as much as 80% of the information communicated to them, become distrustful, and focus more on the negative aspects of the risk than the potential for a positive outcome. There are a few key templates to consider when developing a mapped message ([Covello, Minamyer, and Clayton 2007](#)).

Twenty-seven words is the average length of an opening paragraph in print media, both hardcopy (for example a newspaper) and electronic (for example a web-based news site). Nine seconds is the average duration of a sound bite in broadcast media. On average, the opening paragraph of a news story or a sound bite on broadcast media contains three messages ([Covello, Minamyer, and Clayton 2007](#)). This is explained further below.

Everything in Threes

- Rule of Three Template
- Primacy/Recency Template
- 27/9/3 Template

Rule of Three Template

- Three key messages

- Key message repeated three times
- Each message supported by three supporting messages

Primacy/Recency Template

- State the most important messages first and last
- In high stress situations, listeners tend to remember that which they hear first and last
- Messages in the middle of a list are often not heard or remembered.

27/9/3 Template

- 27 words – the average length of the opening paragraph in the print media
- 9 seconds – the average duration of a sound bite in the broadcast media
- 3 messages – the average number of messages reported in both print and broadcast media

4.5.1.2 Message Development Questions

The following are questions for the communication team to consider as you develop messages and answer questions from the communities, adapted from [Hance, Chess, and Sandman.\(1991\)](#):

What information must be conveyed?

- Does the message convey agency, organization or responsible party views?
- Does the message answer stakeholders' questions?
- Does the message reflect the audience/stakeholder assessment?
- Are technical terms explained?
- Can graphics help explain points?
- Are graphics clear and simple or do they need explanation?
- Was the message pre-tested with members of the intended stakeholders?
- Are you prepared for questions that may arise? If not, have you identified appropriate experts to assist you?

An example, Key Message Mapping for PFAS, can be found in [Appendix D](#). A blank worksheet to assist in constructing mapped messages is presented here.

Message Mapping Worksheet

Message development starts with a question, responds with three key ideas, is no more than 27 words, and takes no longer than 9 seconds to deliver. The goal of a mapped message is to provide focused, targeted information immediately that can then be expanded upon as communication continues.

Message Map Worksheet Source: ([Covello, Minamyer, and Clayton 2007](#); [USEPA 2007](#))

<u>Stakeholder:</u>	<u>Question/Concern/Issue:</u>	
Key Message/Fact 1:	Key Message/Fact 2:	Key Message/Fact 3:
Keywords: Supporting Facts 1.1	Keywords: Supporting Facts 2.1	Keywords: Supporting Facts 3.1
Keywords: Supporting Facts 1.2	Keywords: Supporting Facts 2.2	Keywords: Supporting Facts 3.2
Keywords: Supporting Facts 1.3	Keywords: Supporting Facts 2.3	Keywords: Supporting Fact 3.3

See also this website for a template of the message mapping worksheet:

https://www.orau.gov/cdcynergy/erc/content/activeinformation/resources/Covello_message_mapping.pdf

4.5.1.3 Messaging to Address Rumors and Inaccurate or Misleading Information in the Public Sphere

Good planning and communication activities can help you prepare for the potential need to counteract misleading information, inaccurate information, or rumors. Risk communicators need to be aware of this misleading information and respond when necessary. These are strategies and actions ([Lundgren and McMakin 2018](#)) that may be helpful:

- Invest time in building a network of support to help counter inaccurate claims and disseminate accurate information.
- Identify key people who can use credible outlets to disseminate consistent messages. For instance, ask trusted local officials or community members to be the conduit for credible information to counter rumors.
- When forming messages, avoid repeating or acknowledging the fake news content.

Communication activities include making information available in a variety of formats and delivering high-quality information as early as possible.

Sensationalized media can be a challenge to successful risk communication. Additional strategies that can be implemented to mitigate such a scenario are:

- Host press conferences to control messaging and reward media that report fairly and accurately by providing access to scientists.
- Share with media that distorted or sensationalized the content provided through the lead organization point of contact.
- Develop and share schedule and protocol for releasing information to impacted parties and the public. Develop a social media presence with stakeholders to provide accurate information.

4.6 Step 6: Select Communication and Engagement Methods

When selecting communication and engagement methods, consider how you will connect your message to your stakeholders or communities. Include who it will go to (community members, neighborhood groups, city officials) and the type of communication (email, print, social media). Choose your communication and engagement tool based on how stakeholders receive information in their community. The best tool depends on what information you need to share, the information needs of the targeted group like formats that are accessible (for example, various languages, braille, audio, large print), and how fast the message needs to get out.

More than one communication and engagement tool may be useful in delivering messages. An assessment of how the stakeholders or communities communicate can help you choose a suitable method to send your message. Use your audience/stakeholder assessment to inform your choice. For example, if the target group is a neighborhood association with a newsletter or regular meetings, an article in their newsletter or a presentation at their meeting might work. If these forums are not available, you may need to set up a special meeting through association leaders, go door to door, or mail a notification ([NJDEP 2014](#)).

Once the communication and engagement tools are chosen, the communication team may form a subteam can be formed to facilitate the development and implementation of communication and engagement products or projects. This subteam is an optional addition to the communication team that can provide issue-specific technical support and direct contact and collaboration within the community.

The subteam may include public information officers, local government administrators, website managers/owners, graphic designers, a communication facilitator, and other support roles, depending on the tools chosen. If a subteam can't be formed, a community liaison is another approach to provide connection for ongoing communication between the community and the project team.

It is essential to keep in mind that engagement and communication is collaborative. Stakeholders are informed while simultaneously informing decision makers of their needs and concerns and providing input that contributes to more sustainable risk management. Stakeholder engagement methods, such as surveys, design charrettes, workshops, focus groups, multicriteria decision analysis, and vision boarding, can aid in capturing and evaluating audience input.

It should be noted that although traditional written and mass communication methods are effective for communication information, techniques that include the opportunity for stakeholders to interact in-person and one-on-one are often more effective at building trust and working through outrage and emotion.

4.6.1 Tools

Guidance is included in this toolkit for press releases and summary letters:

[Appendix E](#) – Guidance for Writing Press Releases

[Appendix F](#) – Guidance for Writing Analytical Results Summary Letters

[Appendix I](#) Analytical Data Package Public Information Fact Sheet

[Appendix J](#) – Tracking Form of Media Correspondence

Vermont Department of Environmental Protection staff complete an email form whenever they are contacted by the media ([Appendix J](#)). This form is filled out as soon as possible after responding to reporters and media inquiries, and the form is emailed to agency supervisors, upper management, and anyone else who may be involved with the project. A main goal of the form is to maintain consistent messaging if multiple people are interviewed by the media, so that the same messages are reinforced and not contradicted.

Additional information about communication methods, such as Fact Sheets, Frequently Asked Questions, Active Repositories, and Social Factors Vision Boards are included in this section.

4.6.1.1 Fact Sheets and Frequently Asked Questions (FAQs)

To achieve effective risk communication, it is essential for public education materials to be presented in a clear and simple manner that is understandable by nonscientists and speaks to a broad audience. Common rules of thumb include writing at a sixth-grade comprehension level, using simple terminology, and providing materials in multiple languages for nonnative speakers. Over the past few years, environmental and public health agencies, nonprofit advisory groups, trade associations, and regulatory agencies have prepared numerous fact sheets and frequently asked questions (FAQ) documents on diverse emerging and immediate environmental issues and concerns to inform stakeholders, including concerned residents, agricultural and recreational entities, water purveyors, end users, public health professionals, and others. These public education materials are typically available on the organization's website. Examples include:

- *Agency for Toxic Substances and Disease Registry (ATSDR) FAQs*
 - PFAS <https://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=1116&tid=237>
 - 1,4-Dioxane <https://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=954&tid=199> Centers for Disease Control and Prevention (CDC), Harmful Algal Bloom–Associated Illness <https://www.cdc.gov/habs/general.html>
- USEPA, Basic Information on PFAS <https://www.epa.gov/pfas/basic-information-pfas> USEPA, Communicating about Cyanobacterial Blooms and Toxins in Recreational Waters
- <https://www.epa.gov/cyanohabs/communicating-about-cyanobacterial-blooms-and-toxins-recreational-waters> California Water Quality Monitoring Council Pets, Livestock and Harmful Algal Blooms FAQs https://mywaterquality.ca.gov/habs/resources/domestic_animals.html

Fact sheets, FAQs, and other public outreach material should be distributed in multiple modes to maximize audience reach and increase opportunity for engagement. Recommended modes of distribution include mailings, websites, local municipal health departments, public health professional offices, public libraries, and information booths at community events.

4.6.1.2 Active Centralized Information Repository

Unlike a “passive” repository of site documentation at a central location, an “active” repository refers to a platform that remains up to date on site findings and enables two-way exchange of information among decision makers and the impacted community. A common platform for an active repository is a centralized website that contains a complete compilation of site documentation (among all agencies), frequent updates on site activities, health information and regulatory policy, and a depiction of the conceptual site model (such as a source-exposure pathway graphic and geologic maps). Web-based GIS tools and other forms of data visualization can be used to help communicate about the site, including the conceptual site model. The website should also contain a platform to facilitate stakeholder involvement by providing an opportunity for them to ask questions, submit information, and join a listserv (an application that distributes messages to subscribers on an electronic mailing list).

Examples of a centralized website for emerging or immediate environmental issues and concerns such as PFAS and HCBs include:

- Michigan Department of Environment, Great Lakes and Energy, *Michigan PFAS Action Response Team (MPART)*: <https://www.michigan.gov/pfasresponse/>

Michigan agencies representing health, environment, and other branches of state government have joined together to

investigate sources and locations of PFAS contamination, to take action to protect people's drinking water, and to keep the public informed as we learn more about this emerging contaminant.

- Vermont Department of Environmental Conservation (VDEC), *Vermont PFOA Contamination Response*: <https://dec.vermont.gov/pfas/pfoa>

Numerous Vermont agencies, including VDEC, Department of Health (VDH), Emergency Management, Agency of Agriculture, and Agency of Education, have joined together to investigate and address PFAS contamination in Vermont. VDEC and VDH have created and maintained web pages to push information out to the public as it becomes available.

- California State Water Resources Control Board, *Per- and Polyfluoroalkyl Substances*, waterboards.ca.gov/pfas

Various California agencies, including, but not limited to, the State and Regional Water Resources Control Boards, the Department of Toxic Substances Control, and the Office of Environmental Health Hazard Assessment, are working together to investigate sources and locations of PFAS contamination and to take action to ensure the protection of drinking water supplies. The California State Water Resources Control Board maintains a public webpage and listserv to ensure that public information is efficiently shared with all interested parties.

- California Water Quality Monitoring Council, *California Harmful Algal Blooms (HABs) Portal*: <https://mywaterquality.ca.gov/habs/index.html>

The California HABs Portal is the central resource for freshwater and estuarine HABs for the state. HABs can pose a health risk to people and animals, harm aquatic ecosystems, and limit the use of drinking and recreational water bodies due to the toxins, odors, and scums or mats they can produce. The portal is an informational resource for the public and also functions as a tool to support coordination with statewide partners to address HABs. The content is developed by the California Cyanobacteria and HAB Network and participating state agencies.

- Florida Department of Health, *HABs: Harmful Algal Blooms* <http://www.floridahealth.gov/environmental-health/aquatic-toxins/harmful-algae-blooms/index.html>

Florida's Department of Health website provides information for other agencies and the public about HABs, their health symptoms, information regarding red tide and shellfish consumption, in-depth blue-green algae (HCB) information, updates, and mapping tools.

But be aware, not all community members have access to the internet, and depending upon the project, it may be appropriate to hold regular meetings and/or office hours to provide more than one mode for stakeholders to obtain information and engage with decision makers.

4.6.1.3 Social Factors Vision Board

A vision board can be used as a medium for stakeholders to rate their level of importance and/or interest on applicable social factors. Identified factors can then be used in further development of SMART goals and key messages, and selection of engagement methods as part of the communication process. The overall objective is to gain deeper insight into stakeholder concerns, values, and preferred communication methods to facilitate knowledge transfer and capacity building toward a successful risk management strategy.

A basic guide to the tool and PFAS-specific examples of vision boards is provided in [Appendix G](#).

4.6.1.1 Methods to Consider for Communication

The following list of various communication methods is adapted from [Hance, Chess, and Sandman \(1991\)](#):

Written or audio/visual materials	Informal meetings
• Pamphlets	• “Open” work meetings
• Letters	• Workshops
• Postcards	• Advisory committees
• Newsletters	• Special events
• Periodic updates	• Conferences
• Displays	• Courses
• Fact sheets	• Door to door
• Flyers	• Brainstorming
• Door-hangers	• Suggestion boxes
• Educational materials	• Telephone/conference calls
• Webinars	• Open house with experts at the table
• Question and answer sheets	Mass media
• Placards in mass transit	• News conferences
• Videos	• News releases
• Slide shows	• Letters to the editor
• Audio tapes	• Talk shows
• Articles in organizations’ Newsletters	• Call-in shows
• Inserts in mass mailings	• Feature articles
• Polls	• Press briefings

Person to person	<ul style="list-style-type: none"> Public service announcements
<ul style="list-style-type: none"> Presentations at meetings 	<ul style="list-style-type: none"> Display advertisements in newspapers
<ul style="list-style-type: none"> Drop in or availability sessions 	<ul style="list-style-type: none"> Legal notices
<ul style="list-style-type: none"> Public hearings.meetings 	<ul style="list-style-type: none"> Social media
<ul style="list-style-type: none"> Project office open to the public 	
<ul style="list-style-type: none"> Site visits or site tours 	
<ul style="list-style-type: none"> 24/7 hotline 	

4.6.1.5 Communication Method List Template

A communication methods summary table ([Appendix H](#)) aids method selection based on the target stakeholder groups and the purpose of communication. Use this table to plan and document methods and specific details to manage development of materials. This is particularly helpful when multiple developers are using multiple methods.

The communication plan template provided in [Appendix A](#) includes a communication and engagement tools table to document the target group, message, type of communication, cost, material development lead person, and evaluation.

4.7 Step 7: Implement Strategies

Plan the tasks needed to develop and disseminate communication products. Arrange the tasks on a timeline and assign responsibility for each task. Communicate the strategy and timeline to the communication team and partners.

Coordinating action for simple and complex strategies can be challenging. The communication plan template in [Appendix A](#) provides a framework for organizing all the tasks in the order they are due. This is intended to be a living document that is updated and customized throughout implementation of the risk communication plan for any site-specific situation.

4.8 Step 8: Evaluate, Debrief, and Follow Up

Communication efforts are almost never “done.” There may be periods of time when there is not a need for active communication efforts, depending on community concerns and ongoing site activities. By setting up a long-term communication plan, you have a clear path for follow-up, as needed.

Throughout the risk communication effort, interim evaluation and insights can be gained by confirming messages and methods with internal and external target groups. Outcome evaluation, done at the conclusion of the effort, answers the following questions, adapted from ([NJDEP 2014](#)):

- Did the strategy used meet the goals and objectives?
- Were the needs of the communities met?

- Was the intended message received and understood?
- Was the method used appropriate for this case and community?
- Are there questions that require follow-up?

In addition to interim evaluation as the project progresses, the internal communication team should reconvene at the conclusion of the risk communication effort and debrief.

Determining success can be challenging. The following examples give some guidance on how to identify successes.

Plan: Consider how you will know if your communication efforts were successful. Use the SMART goals developed in Step 2 to guide your evaluation plan development.

Follow Up: Gather and review information from evaluations to inform follow-up tasks. Examples of items that may need follow-up include possible policy changes, additional communication needs identified through the evaluation process, or a new audience that has been identified. Assign a leader to each follow-up item.

Long-term Communication Efforts: Determine and communicate to communities and stakeholders how new information and monitoring or remediation site progress will be disseminated to the affected community. Communicate successes and case studies that will help inform improvements to communication activities.

- Identify data you might already be gathering that can be used to evaluate effectiveness (for example, number of phone calls, social media engagement, website traffic, percentage of answered questions, percentage of community subgroups engaged)
- Review process used to develop communication activities—what went well, what did not, how to improve for current and future projects
- Decide how often to evaluate communication efforts
- Assign responsibility for evaluation design, completion, and response/follow-up
- Determine how to use and share results of the evaluation(s)
- Document and maintain engagement with portions of the community that are not benefiting from the risk communication strategy

Evaluate whether trust and capacity building were accomplished and how they will be maintained.

4.8.1 Tools

4.8.1.1 Evaluation Plan Template

The communication plan template provided in [Appendix A](#), can be used, along with the information developed throughout the communication planning process, to understand if you were able to reach your communication goals.

4.8.1.2 Evaluation Follow-up Task Template

The communication plan template provided in [Appendix A](#), along with the information developed through the evaluation above, can help determine whether you were able to reach your communication goals and to identify follow-up actions.

4.8.1.3 Long-term Communication Efforts

For some sites it will be important to implement long-term communication efforts. Some examples of those efforts are:

- Community succession training to facilitate knowledge transfer and communication of long-term community needs and identification of future community liaisons.
- Identification of opportunities for community education and empowerment.

Integrate follow-up to stakeholder concerns in the project's long-term monitoring plan. Examples of applicable concerns to follow up on include property value loss, loss of sense of safe place, and paying homage to historic relics of former industry.

4.9 Training for Practitioners

It is important for the communication and project teams to be informed on the best available information or state of the science on the particular environmental issue or concern so they can properly plan and implement risk communication. ITRC documents, workshops, and webinars are available resources. Current information about training is available on the ITRC website <https://www.itrcweb.org/Training>.

Section 5: Introduction

Risk communication case studies have been prepared by various ITRC teams and will be published as part of their technical and regulatory guidance documents. Links to the published case studies are provided in [Table 5-1](#).

Table 5-1. Risk communication case studies

Case Study Name	State	Issue	Environmental Issue/Concern
Little Hocking Water Association (LHWA) PFAS Tech Reg Section 15.4.1	OH	PFAS	The LHWA is a rural water authority that serves several small communities with a total population of approximately 12,000 residents in 4,000 households. The water intake wells for the LHWA are located directly across the Ohio River from a Teflon production plant that used ammonium perfluorooctanoate (APFO, the ammonium salt of PFOA). The community-first strategy used produced effective results in motivating actions by individuals, government, and industry which led to a significant, measurable reduction in residents' blood PFOA levels.
Washington County PFAS Tech Reg Section 15.4.3	MN	PFAS	The most widespread PFAS compound found in the region is PFBA. Additional prominent compounds include PFOS, PFOA, and PFHxS, PFPeA, PFHxA, and PFBS, which were always present as a mixture. More than 1,800 private wells, four major aquifers, eight municipal water supply systems, and more than 150 square miles of groundwater were affected by the contamination. This impacted the drinking water supply of more than 140,000 residents.
Bennington College Community Education PFAS Tech Reg Section 14.3.6.4	VT	PFAS	Academia can serve a role in public education. Bennington College decided to open the doors of its science classrooms to the problem of PFAS contamination impacting the Hoosick Falls, NY community. The college developed and offered a new introductory class on PFOA to local communities free of charge.

Appendix A: Risk Communication Model

This communication planning model, adapted from the work of [NJDEP \(2014\)](#), has eight components or spokes on the wheel ([Figure 4-1](#)). At the center is review and evaluate. This suggests that communication is two-way, ongoing and continuous, allowing for review of where you are in your outreach efforts and where you may need to go.

The model is interactive, which allows for new information to be incorporated into the plan so that the outreach can be modified accordingly. This approach encourages establishing ongoing dialogue between the lead organization and stakeholders so that the resulting outreach plan reflects stakeholder concerns and your organization's priorities on an issue. This will help you develop a robust risk communication plan.

This risk communication planning process advocates a team approach by recommending that an internal project team be created. A communications coordinator is selected and becomes the lead in developing the plan in concert with the internal team.

Specifically, the steps of the risk communication planning process are presented in the following template. This template can be used for general and specific risk communication activities that encompass current, immediate, and emerging environmental issues and concerns. Subsequent appendices provide additional tools and resources for implementing each step and completing the template.

Template for Risk Communication Plan

[Site or Issue]

[Date originated]/[Date updated]

[Communication Coordinator]

Step 1: Identify the Issue/Concern

Issue identification and profiling is the first step in the planning process. It helps you to clearly understand the situation so you can develop a responsive and effective risk communication plan. Issue profiling establishes the case record by compiling all the necessary information on the issue.

Identify the Issue
<i>insert issue(s)</i>
<i>insert issue(s)</i>

Communication Team

Identify and develop the communication team, including a representative of each regulatory agency, responsible party, property owner, and stakeholder group (for example, water purveyors and a community liaisons).

Contact Name	Contact Info	Organization	Role

Step 2: Set SMART Goals and Objectives

A SMART goal is the big picture or ultimate impact that is desired for a project, issue, or situation. As you develop your project goal, keep in mind your organization's procedures, policies, and processes; maintain ongoing dialogue with citizens; and coordinate between the various parties involved in the case. Make sure that you provide needed information in a form that is readily accessible to stakeholders.

<u>Identify SMART Goals & Possible Evaluation Method</u>	
<i><u>SMART Goal</u></i>	<i>Potential Evaluation Method</i>

Steps 3 and 4: Identify Communities and Constraints and Assess Stakeholders/Communities

The overall objective of stakeholder assessment is to gain a deeper insight into stakeholder concerns and values that facilitate the development of a dialogue. Knowing the stakeholders with whom you are speaking helps you craft targeted messages delivered through the local channels used by your community. Key communities are those stakeholders with whom you need to establish a dialogue and those who wish to talk with your organization. They include those who are aware of or must be made aware of the issue/problem, and those affected by the solution.

Stakeholder name	Communication approach (e.g., web site, newsletters, emails)	Key interests and issues	Role (e.g., observer, meeting participant, active in feedback)

Step 5: Identify Messages

Once you know with whom you will be communicating you need to develop your message or messages. A message is information you want/need to share with stakeholders about the issue or case, a question that you need them to answer, or both. It is linked to your goal and addresses all key points about the issue and concerns of the public that you learned in the audience/stakeholder assessment step.

Message Map Worksheet

Source: [\(Covello, Minamyer, and Clayton 2007\)](#)

Stakeholder:	Question/Concern/Issue:	
Key Message/Fact 1:	Key Message/Fact 2:	Key Message/Fact 3:
Keywords: Supporting Facts 1.1	Keywords: Supporting Facts 2.1	Keywords: Supporting Facts 3.1
Stakeholder:	Question/Concern/Issue:	
Keywords: Supporting Facts 1.2	Keywords: Supporting Facts 2.2	Keywords: Supporting Facts 3.2
Keywords: Supporting Facts 1.3	Keywords: Supporting Facts 2.3	Keywords: Supporting Facts 3.3

Step 6: Select Communication and Engagement Methods

A communication method is the means by which you communicate with your stakeholders. A number of methods can be used. Your goal and how your stakeholders communicate, as well as the nature of the issue, help dictate the best method of communication. Each method has its strengths and weaknesses. Methods generally fall into one of five categories: you seek to receive information from stakeholders; you want to share information with stakeholders; you want to establish a dialogue; you are summarizing or updating progress on an issue; or you want to build consensus. It helps to think about your goal—what you want to accomplish—when determining which communication method to use.

Identify Communication and Engagement Tools		
SMART Goal (from Step 2)	Evaluation Method/Tool	Roles/Responsibilities

Step 7: Implement Strategies

Once you have a clear goal, understand stakeholder concerns, know your message and have selected your method, it is time to lay out the strategy you will use to implement the plan. The best way to do this is with a timeline that outlines the tasks, and the roles and responsibilities of each member of the communication team. The timeline includes: your budget and schedule; who your speakers will be; who the contact in your organization will be for the community, and it identifies potential resource constraints you may encounter and how those will be addressed. Finally, it includes how your strategy will be evaluated.

Task/Method	Date Due	Speakers and Organization Contacts	Notes (include potential resource constraints)	Budget	Status (Not started, In Process, Complete)

Step 8: Evaluate, Debrief, and Follow Up

Evaluation is the systematic collection of information about activities, characteristics, and outcomes of projects to make judgments about the project, improve effectiveness, or inform decisions about future programming. This is the opportunity to review the strategy that was put in place and determine if further action or communication is required. Many risk communication efforts require an ongoing presence or outreach in the community. A debrief meeting is an opportunity for you to review the results of the evaluation and will identify what follow-up, if any is needed.

Evaluation Plan		
SMART Goal (from Step 2)	Roles/Responsibilities	Evaluation Method/Outcome

Follow Up			
SMART Goal (from Step 2)	Evaluation Method	Debrief	Follow-up

Appendix B: Communication Plan Step 2: Set Goals and Objectives

This section includes some examples of SMART goals, including PFAS-specific examples.

Example SMART Goals

Example: Communication of goals

Issue: The governor established an independent PFAS science advisory panel of national experts to provide guidance to the state on protectiveness of criteria and develop science-based recommendations that will guide the administration and legislature on the best regulatory policy moving forward.

Goal: The PFAS science advisory panel will complete a report within 6 months that will provide a general understanding of human health risks associated with PFAS in the environment. These science-based data will be used to develop a regulatory response that the administration and legislature will implement by X date.

Example: Assessing stakeholder concerns

Issue: Due to public health concerns, the state environmental agency will conduct a statewide study of PFAS levels in X public water supplies at X schools that operate their own wells by X date.

Goal: By X date, the state environmental agency will develop an inventory and location map of sites where PFAS has been used or disposed; prioritize sites for further investigation based upon the potential to impact drinking water supplies (using information from state groundwater maps, site history, and site ownership); incorporate data into a GIS-based data management system; and develop and implement a plan to sample school private and or public water wells to assess potential impacts to drinking water supplies from prioritized sites.

For this example:

- Specific: develop an inventory and location map
- Measurable: testing water from wells
- Attainable: implement a plan to sample private and public water supplies
- Relevant: testing at prioritized sites will define impact
- Timely: by July 1

Example: Short-term SMART goal (from the Little Hocking Water Association case study, PFAS Tech Reg Document, [Section 15.4.1](#)).

- By (date), the community is informed via the municipal website, flyers, and canvassing that bottled water is available as an alternate water source and utilized by 85% of the population.
- After (months), the extent of the impacted water supply is known via well testing and communicated to the community via a public meeting, municipal website, and newsletter

Example: SMART goal (from the Little Hocking Water Association case study)

- By (date) or after (months), using a community-first strategy that includes the establishment of a community advisory committee, and uses multiple methods of communication – media, social media, internet, and meetings – determine whether blood PFOA levels were elevated and provide actions that 12,000 residents can take to produce a measurable reduction of PFOA blood levels.

Appendix C: Communication Plan [Step 3: Identify Stakeholders and Constraints](#)

Target Audience: For use by the communication team to layout, track, and update stakeholder roles and relationships.

Relevance/Importance to PFAS Site: Due to the persistent nature of PFAS and its presence in the public drinking water supply, numerous and variant federal, state, private, and public stakeholders can be impacted. Actor mapping is a tool to assist practitioners in learning who is most affected by site information and decisions, as well as their level of interest and influence. The outcome of the tool will assist in identification of unengaged/disinterested stakeholder populations, identify needs for relationship and/or capacity building, develop a site-specific communication team, and target outreach resources toward affected and unengaged/disinterested stakeholder populations. In the context of PFAS, it is particularly important to identify and address affected groups that may not be participating in preventative and mitigation measures (such as an interim drinking water supply and a fishing ban) and/or at sites for which stakeholder groups are facing conflict resolution.

Community Identification and Mapping Tools

Social science methodologies can help practitioners to understand and identify (1) the social factors that may work in favor of or against risk management strategies, and (2) the social factors and stakeholders that are affected by cleanup actions. Actor mapping tools aid in understanding roles and relationships among stakeholders by defining the stakeholder network and measuring relational ties. A more comprehensive understanding of stakeholder roles and relationships can help practitioners:

- *characterize stakeholder populations*, including those that are and are not engaged, disinterested parties, and sensitive populations (such as disenfranchised communities, non-English speakers, and end users), that may need a more refined, focused engagement strategy;
- *facilitate relationship/capacity building*, such as restoring disconnected relationships, reestablishing trust, and moving toward consensus
- *identify and develop the communication team* to coordinate actions within and between stakeholders and ensure consistent messaging
- *target communication strategy resources* to stakeholder groups that play a role and/or are affected by individual SMART goals (see [Step 2](#)); affected groups include those impacted by preventative and mitigation measures (such as an interim drinking water supply and a fishing ban), those responsible for communicating preventative and mitigation measures, and/or those involved in conflict resolution.

The overall objective is to aid practitioners in audience/stakeholder assessment under [Step 4](#) of the communication plan template. Simplified **examples** of an actor-linkage matrix and interest-influence matrix are presented below ([Figures C-1](#) and [C-2](#)), followed by resources to perform complex actor mapping, such as social network analysis. The examples provided are not representative of an existing project; stakeholder roles and relationships vary on a project-specific basis.

Example Context: A PFAS site with a groundwater plume that has impacted drinking water supply wells and has identified contaminants in the local fish population.

Example 1: Actor-Linkage Matrix: A tool that assists practitioners in describing relationships among stakeholders through codes ([Reed et al. 2009](#)).

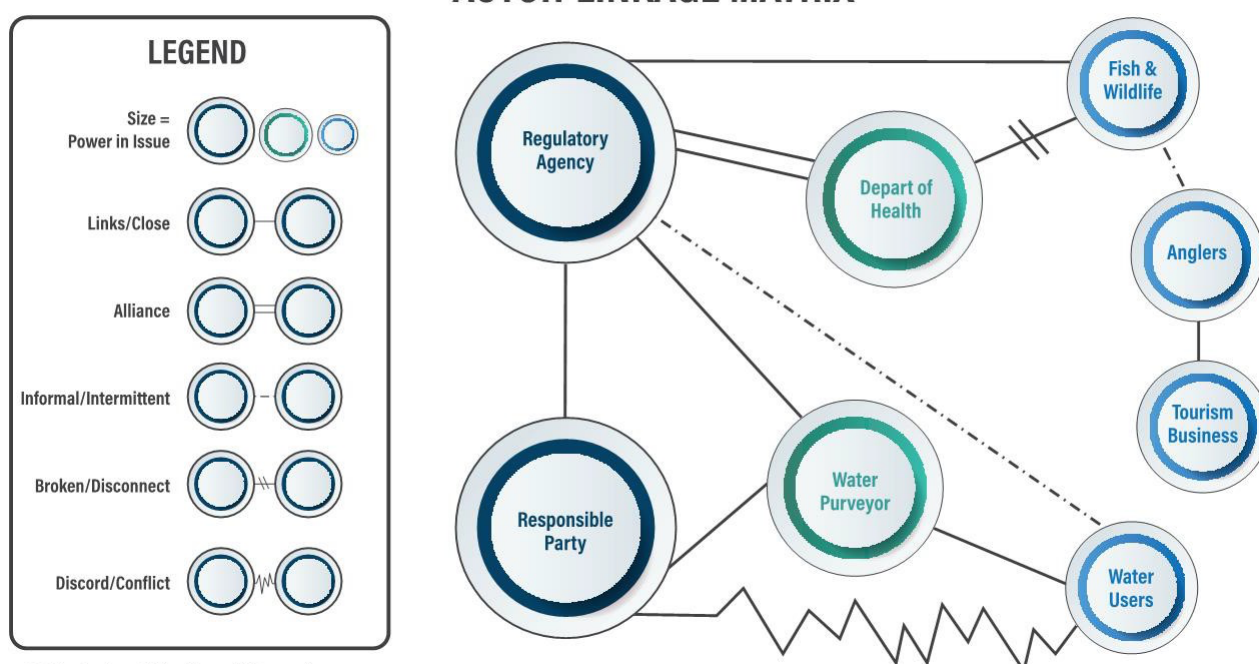


Figure C-1. Example actor-linkage matrix.

Example 1: Actor-Linkage Matrix Evaluation

- Identify unengaged stakeholder populations: potentially anglers and tourism business operators
- Facilitate relationship/capacity building: use the relationship between the responsible party and water purveyor to restore relationship between the responsible party and water users
- Identify and develop the communication team: team consisting of a representative of each regulatory agency, responsible party, water purveyor, and a representative of each low-power stakeholder group
- Target communication strategy resources: increase information transfer to unengaged stakeholder populations and rebuild intermittent and conflicted relationships with water users in alignment with risk communication strategy SMART goals

Example Context: A PFAS site with a groundwater plume that has impacted drinking water supply wells and has identified contaminants in the local fish population.

Example 2: Interest-Influence Matrix: A tool that assists practitioners in identifying the stakes that social actors (stakeholders) have in a cleanup project. Identified stakeholders are placed in a matrix according to their relative interest and influence ([Reed et al. 2009](#)).

INTEREST-INFLUENCE MATRIX

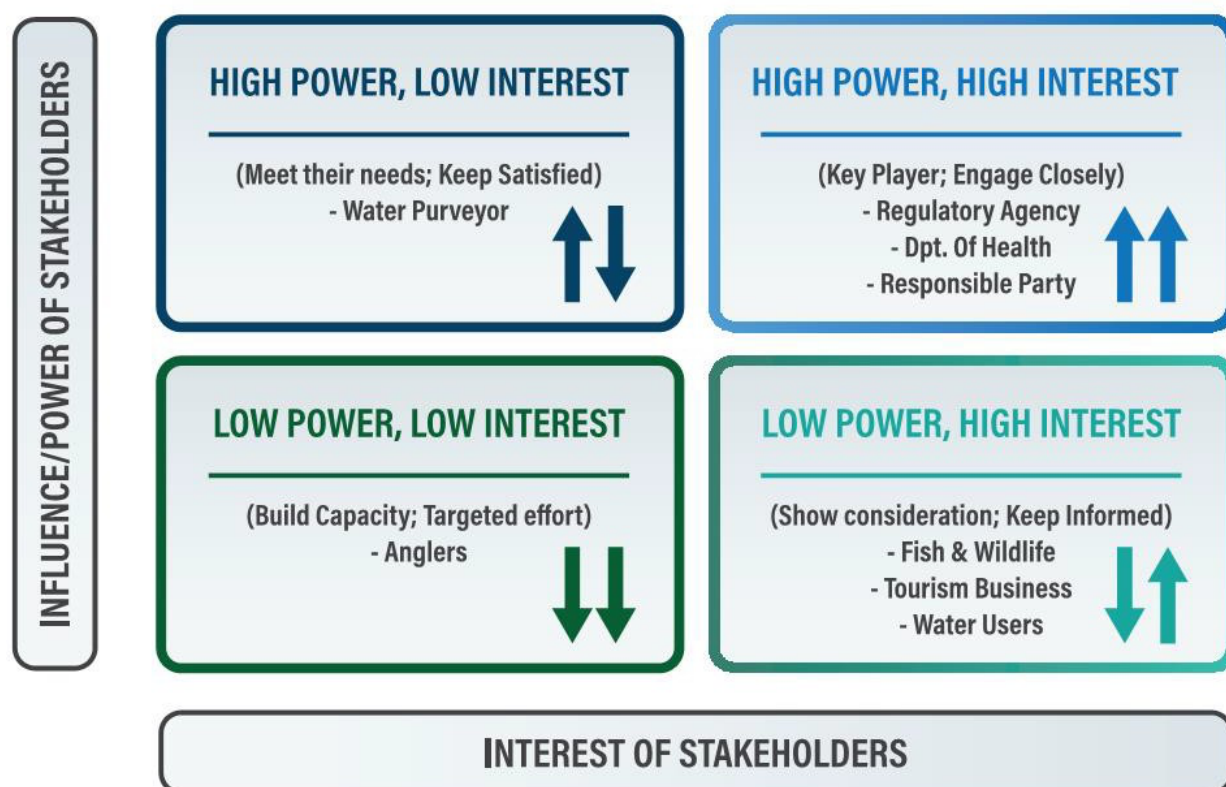


Figure C-2. Example interest-influence matrix.

Example 2: Interest-Influence Matrix Evaluation

- Identify unengaged stakeholder populations: agency and responsible party (high power) stakeholders have the role to engage lower power stakeholders that may not be currently engaged or are disengaged
- Facilitate relationship/capacity building: use high interest stakeholders to build relationships with lower interest stakeholder, particularly ones with low power (such as the anglers)
- Identify and develop the communication team: team consisting of a representative of each regulatory agency, responsible party, water purveyor, and low-power stakeholder group
- Target communication strategy resources: increase information transfer to unengaged stakeholder populations and rebuild relationships with low-interest stakeholders in alignment with risk communication strategy SMART goals.

Additional information and resources are available from [Alexandrescu et al. \(2015\)](#); [Bodin and Prell \(2011\)](#); [\(Bodin et al. 2011\)](#); [Harclerode et al. \(2015\)](#); [Prell \(2011\)](#); [Prell, Hubacek, and Reed \(2009\)](#) and [Reed et al. \(2009\)](#).

Appendix D: Communication Plan Step 5: Identify Messages

Message Mapping Worksheet, Source: ([Covello, Minamyer, and Clayton 2007](#))

See also this website for a template of the message mapping worksheet:

https://www.orau.gov/cdcynergy/erc/content/activeinformation/resources/Covello_message_mapping.pdf

Stakeholder: Community Member	Question/Concern/Issue: What are PFAS and why is the state concerned about them?	
Key Message/Fact 1: PFAS are a family of human-made chemicals in many products used by consumers and industry.	Key Message/Fact 2: PFAS are emerging contaminants of concern.	Key Message/Fact 3: PFAS may adversely impact human health.
Keywords: Supporting Facts 1.1 PFAS are a large group of thousands of manufactured compounds, produced and used for over 60 years.	Keywords: Supporting Facts 2.1 PFAS are contaminants of active scientific research. Scientific knowledge is changing rapidly.	Keywords: Supporting Facts 3.1 Some PFAS can build up in the body (bioaccumulate) and take a long time to leave the body.
Keywords: Supporting Facts 1.2 PFAS has been used in coatings for textiles, paper products, and cookware and to formulate some firefighting foams, and have a range of applications in the aerospace, photographic imaging, semiconductor, automotive, construction, electronics, and aviation industries	Keywords: Supporting Facts 2.2 Laboratory methods may or may not exist to detect all the PFAS contaminants that we know about; methods are developing and evolving with the emerging science.	Keywords: Supporting Facts 3.2 Some PFAS have been found to impact fetal development and are passed to babies through nursing and bottles.
Keywords: Supporting Facts 1.3 PFAS are found throughout the environment, in people, and in animals and fish.	Keywords: Supporting Facts 2.3 Federal and state regulations are changing as the scientific knowledge evolves; this leads to guidance and recommendations that may vary across the country.	Keywords: Supporting Facts 3.3 Studies in exposed humans suggest that some PFAS may cause high cholesterol, higher liver enzymes in blood, decreased response to vaccines, decreased birth weight, and testicular and kidney cancer.

Appendix E: Communication Plan Step 5: Identify Messages

Tool: Guidance for Writing Press Releases

Target Audience: For use by the communication team to plan for and write press releases.

Purpose: Press releases are a common tool used to communicate information about PFAS, for example, to a broad audience via the media. They might be used to introduce a PFAS investigation, communicate results of an investigation, or provide information on remedial measures.

General Guidelines for Writing Press Releases

Additional guidance on developing issue-specific key messages is provided in [Section 4.5](#).

- The primary message/purpose is included in the first paragraph of the press release. Success occurs when the story can be understood by reading just the first paragraph. That is also the basis for the headline.
- Give the press release a title that grabs attention and makes the press want to read more, while not sensationalizing the subject.
- Provide timing information. Date the press release itself and note whether it is for immediate release or to be held – “embargoed” – until a specific date and time.
- Use as few paragraphs as you need to get your points across. Write tightly, using the fewest words possible. But better to have more short paragraphs than fewer very long paragraphs.
- The main target group for press releases is the press (print, TV, web), but the information they contain is meant to reach further to inform larger target audiences. Tailor the style, level and content to suit the needs of the press while keeping the target groups in mind.

Press releases should present the most important information first. Use an “inverted pyramid” structure so press and target audiences can scan information and get to most important points quickly (see [Figure E-1](#))



Figure E-1. Inverted pyramid structure for press releases

Tips on Mechanics of Press Releases

- Use plain language, no jargon.
- Sentences should be 25 words or less. A press release should be between 400 and 500 words (about one page long).
- Use letterhead if you have it, plain white paper otherwise.
- Provide facts, not spin or opinion. Keep it objective.
- If the project is multiagency, it's critical to include all agency logos on the press release to identify cooperators and to visualize unity.
- Be sure it is "newsworthy." How do you decide?
 - Timing: Did it just happen? Old news isn't news.
 - Relevance: Does it directly influence people's lives? Is it important to your target audience?
 - Proximity: Is it local or does it have local impact?
 - Implications: What are possible consequences? Is it really good or really bad news?
 - Conflict: Is there controversy? Is it a debated topic?
 - Scientific news: Is it about new information people should know about?
 - Crosslinking: Is it related to other news on a related topic?

A few other points on writing successful press releases...

- Know whom to send a press release to and when to send it. Understand that weekly/local papers may have a certain day as a deadline for later publication. Give them time to use your press release and get follow-up information, especially if your information is time-sensitive (for example, a notice of a meeting before the next week's publication date).
- Research the press and other audiences being targeted. Tailor your press release to their style and needs if you can. For example, the local shopper weekly paper has different needs for content, amount of information, level of detail and ability to do follow-up than a large national circulation newspaper like the *New York Times*.
- Every news story has many "angles" that help determine how you write and to whom you send the press release. Consider targeting local and, if warranted, national press or specialist press (to reach another audience that would be interested in your story, for example, local newsletters, professional organization publications).
- Write in third person. Unless in a direct quote, don't use "I" or "we".
- Write to your target audience. Understand their perspectives and concerns.
- Keep adjectives to a minimum. Adjectives are distracting.
- Keep it objective.
- Edit and proofread carefully. Use spellcheckers, but don't depend on them. Proofread again. Then have another person proofread.
- Prepare properly, structure your thoughts, set limits on the topic, length and target group. It's better to write two separate press releases to reach two different audiences or send two different messages than to write an overly long press release.
- Make writing as simple as possible or it won't be read.
- When writing, consider how much your audience knows. To reach the largest the audience, assume you must inform them.
- Minimize use of acronyms.

Press releases should go through several drafts. Address key points clearly and succinctly.

Organization

First Paragraph (Main Facts)

Answer the 5Ws:

Who? Who are key people; who does this information help or hurt? Is anyone else involved? Also, who is your audience?

What? What is it that's new? What has happened that's newsworthy? What are the reasons for communicating via a press release? What is your goal in doing this? What issues require the release of information?

Why? Why is this important? What does it tell people that they need to know?

Where? Where is this happening? In most cases of an environmental issue, the news reach and the audience will be local.

When? When did or will something happen that you want to communicate? Does timing make it more important? Old news is no longer news.

And, if important, tell readers **How** – How did this happen?

Choose the most important of these facts to include in your first paragraph and get across your main message up front.

Examples of Main Message Sentences

- *[Agency] is continuing its detailed environmental investigation to understand the nature and extent of per- and polyfluoroalkyl substances (PFAS) on [receptor(s) and/or media], and the surrounding location.*
- *[Agency] has begun an investigation to determine the extent of pollution at sites and manage the potential impacts of PFAS at and near sites where firefighting foams containing PFAS have been used in the past.*
- *[Agency] today released the results of its site investigation into PFAS contamination. Investigation findings identified the following compounds [specific PFAS] at [location].*
- *[Agency] recently completed a targeted PFAS investigation at [location] to better understand potential impacts that may be directly related to [description of PFAS use].*
- *The findings identified potential PFAS sources and transport pathways.*
- *To date, no PFAS has been found in [location's] potable drinking water supplied to residents and businesses.*
- *Results have identified elevated levels of PFAS [list specific PFAS compounds] in seafood collected from [locations].*
- *These results are being evaluated as part of the Human Health Risk Assessment and the Ecological Risk Assessment. These assessments will provide a better understanding of PFAS exposure risks to people and the environment, and will be used to develop a plan to manage potential elevated risks.*
- *The investigation concluded that although PFAS contamination was found at [location], the risk to residents is low.*
- *The investigation concluded that the health risk associated with the use of groundwater for recreational and irrigation use was low.*

Second, Third, and Fourth Paragraphs (More detail)

The second paragraph expands on the story, including more detail. For example, this may include:

- history of PFAS use in the area and when PFAS use stopped (this answers the “why”)
- next steps (for example future studies, community sessions, what is being done with this information)
- who this information is shared with?
- commitments made by the agency
- additional background on investigations

The third and fourth paragraphs (if needed) provide other related but less important information to round out the story and encourage follow-up by the press. The third paragraph typically provides a quote, which is important to most stories. Look to officials, researchers, witnesses, or impacted residents for interesting quotes.

Examples of Text from the Middle of a Press Release

[Agency] is committed to being open and transparent about these investigations. We will update the stakeholders as investigation reports are released. We will maintain the currency of information on the website and provide information sessions as required. Phone contact through the 800 number, direct mail, and fact sheets will provide further support to assist with information access as the investigation progresses.

The investigations included a desktop review of available information and an environmental sampling program.

The study was conducted by independent environmental consultants from [consultant].

The investigation area includes [description of locations/boundaries]. [Include map]

The investigations are being undertaken in accordance with the [specify regs or guidelines].

[Agency's] investigations have included, sampling and testing of soil, sediment, surface water, groundwater, animals, and plants

Environmental testing takes time, and it is important that we work closely with communities while we investigate the possible nature and extent of PFAS.

Closing Paragraph and Boilerplate

End of the press release with three pound signs (###) in **bold** font.

After that, include contact information ("For further information, please contact X") and list contact information. Be accessible.

If any further information is needed, it can go in "Notes to editors" under the contact information. Examples might include background information ("boilerplate") on the history of the issue or group sending the press release.

Press Release Template

For Immediate Release (or Embargoed until Date/Time)

Name of Press Contact:

Date:

Phone: Of contact person who can answer any questions about the press release

Email: Of contact person

[HEADLINE] -Brief summary of your news story.

[Dateline – CITY, STATE]

First paragraph – Providing the most important facts of who, what, when, where and why of your story.

[QUOTE] – One or more quotes that provide interest or important detail.

[Second and additional paragraphs] – Providing supporting material and details (for example, direct quotes, relevant background information, statistics) of your story.

Closing paragraph – Where to go for more information, notes to editor.

[BOILERPLATE] – Provide information about the organization issuing the press release

###

Additional information is available from [MDH \(2019\)](#) and [ITRC \(2020\)](#)

Appendix F: Communication Plan Step 6: Select Communication and Engagement Tools

Tool: Guidance for Writing Analytical Results Summary Letters

Target Audience: For use by the communication team to prepare analytical result summary letters for the general public.

Purpose: Communication of analytical results is an important aspect of sampling

Given the current impetus for evaluating PFAS impacts on drinking water supplies, it is often necessary to provide residents, business owners and other stakeholders with information regarding drinking water results pertinent to their property. Because oftentimes these stakeholders will not have a technical background, or any experience with PFAS or environmental sampling, it is important to convey analytical results and necessary response actions in a simple, clear and concise manner. This document thus provides guidance for the practitioner in developing a summary letter of PFAS analytical results geared toward a nontechnical audience.

Guidance for Writing Analytical Results Summary Letters

Introduction

This risk communication tool is intended for technical practitioners in the environmental field to use when providing analytical results for the nontechnical audience.

Analytical results for environmental samples are commonly conveyed to the public through letters. For the non-technical stakeholder, environmental data can be confusing to understand, or even incomprehensible, and oftentimes can be quite alarming to them given their concern for potential adverse health effects.

Questions the reader will likely ask while reading such a letter include:

- Is this a good or a bad result?
- What does this mean for me?
- Now what do I do?
- Where can I get more information/whom can I contact if I have questions or want to discuss my results?

Because the target audience is likely to be nontechnical, it is important to ensure that the letter provides the results and a clear and meaningful interpretation of the results in a sensitive manner. This document provides guidance on the overall structure and content of the results letter as well as key points on the language and format used in communicating results.

5 Key Points for Communicating Results

Keep it simple

- provide a simple letter structure
- use ordinary words
- limit use of acronyms

Keep it short

- use simple, short sentences limit the number of pages

Keep it factual

- state the facts
- provide simple interpretation
- avoid 'spin'

Keep it relevant

- relate results to the stakeholder
- provide actions that need to be taken
- provide contact information

Keep it respectful

- watch your tone
- provide in alternative languages if needed

Organization

Overall, an analytical results letter should follow the basic business letter format, but as a technical document, it needs to include the main components of a typical technical document. The challenge in putting technical information into a short, accessible letter is to convey the information in a simple and concise manner that is geared toward a nontechnical audience. The letter should include the following components:

1. Key message
2. Introduction/background
3. Methods
4. Results/discussion
5. Summary/conclusion

Although these components should all be included in the letter, and are presented above in a simple and logical order, there is certainly flexibility on how the various components may be grouped and organized as needed. However, keep in mind that it is easiest to digest information when one topic or idea is presented at a time (one topic per paragraph). Include informative section headers in the letter. Individuals typically read the material more effectively when it is clearly labeled so they know what they are getting. These headings could also be posed as questions (for example, “*Why was the testing conducted?*”), similar to what you might use in a Frequently Asked Questions format.

Key Message

A message is information you want/need to share with communities about the issue or concern, a question that you need them to answer, or both. Effective messages reflect what your target groups’ needs as well as what you need to communicate. Refer to Section 4.5.1.

Introduction/Background

The introduction statement should clearly state the purpose of the letter. Why are you writing this letter, and what do you want to tell them? (For example, clearly state that the letter is in regard to sampling conducted at a person’s property.) Additional language in the introductory paragraph should provide the important facts:

- What test results (for example, water, blood serum) are being presented
- Who conducted the testing
- When the testing was conducted
- Why the testing was conducted

It is also helpful to include a brief conclusory statement within the introduction (in addition to a separate section of the letter discussing results). Present one main takeaway that your message needs to convey, in case the first paragraph is the only part of the letter that the addressee reads.

Methods

Briefly describe what tests were conducted and how. Remember that your audience/stakeholders may not have any technical background. Although it is necessary to be factual, it is not always necessary to provide the minute details that may not be directly of interest to the stakeholders. For example, rather than writing in the body of the letter that a sample was “*submitted for analysis of PFAS via EPA Method 537.1,*” you can write that the sample was sent to a laboratory “*to be analyzed for 21 different PFAS chemicals.*” Details on analytical methodology could either then be footnoted if needed or included within a copy of the laboratory report, if that is provided in conjunction with the letter.

Results/Discussion

The results section should clearly provide the analytical data, and if required to do so, should reference a copy of the laboratory report provided with the letter. It is helpful to provide a benchmark or screening level with which to understand the results. Where there is more than one result (for example, multiple samples per property), consider putting results in a simple table within the body of the letter, and describe in the letter if results are over or under the benchmark. Also clearly state the units of measure used to express results. It can be difficult for general audiences to comprehend what exactly a “nanogram per liter” means, so provide a brief layman’s description of units. Where multiple results are presented in different units (for example, ng/L; ng/dL), explain how the different results should be compared to their specific medium benchmarks.

When discussing the results, avoid use of descriptors relative to the magnitude of the benchmark (for example, their result is “just below” the benchmark or is “slightly higher” than the benchmark), because this imparts a judgment about the significance of the result that may not be shared or understood by the recipient. However, it may be helpful to describe the basis of the benchmark, with respect to the need for action and with respect to potential health risk. Where no benchmark exists, it is important to point this out as well.

If there are background or reference data available with which to compare results, it may be useful for the reader to understand how the results compare to other results in the region. Therefore, include such data or links to data resources where available.

Summary/Conclusion

The conclusion of the letter should clearly state what the end result is and what happens next. Where the concentrations are above a benchmark, for example, indicate what follow up steps will be necessary, how they will be contacted, and whom they can contact if they’d like to discuss their results. Keep questions like the following in mind when writing the conclusions. Readers are likely to ask them:

- *Is it safe to keep using my water?*
- *Where will we get an alternate water source?*
- *Should I see my doctor?*
- *Will there be additional testing?*
- *Whom can I contact to talk about my results?*

Even if results are nondetect or are not above the benchmarks, it is important to mention if there will (or will not) be any follow-up testing or information seeking, and to provide contact information if the recipient wishes to discuss the results. It is also helpful to include a separate fact sheet (or provide a link to a website) on the chemicals for the recipient so they can review other sources of information on their own if they wish.

Guiding Principles for Letter Writing

The above sections provided overall guidance on the structure and content of the analytical results letter. This section focuses on key communication concepts for the language used within the letter. These concepts fall into the following five key principles:

Keep it simple

Analytical results letters contain technical information to be provided to an audience of varied reading levels, ages, backgrounds and cultures. It is important that the subject matter is conveyed in simple and concise language that is easy to understand. General rules of thumb when writing simply are as follows:

- use short, simple and ordinary words
- use short, simple sentences
- keep technical jargon to a minimum
- limit the use of acronyms
- use easy-to-read fonts and adequate character spacing (margins, kerning, lines)

As discussed above, individuals read material more effectively when it is clearly labeled and they know what they are getting, so include section headers and limit topics to one per paragraph to the extent practical. Additional writing guidance may be found at the website Plainlanguage.gov

(<https://www.plainlanguage.gov/resources/content-types/writing-effective-letters/>).

Although several readability assessment tools are available to evaluate text, it is often most helpful to have the draft letter reviewed by a few nontechnical staff or friends to ensure the letter's clarity.

Keep it short

To best communicate results, keep the letter short, with the goal of *briefing* the reader on their results. Remember that this is a letter, not a technical report, and that the recipient wants to know the basic information – what the results are, what needs to happen, and whom they can contact for follow-up. Try to keep the letter to no more than two pages if possible.

Keep it factual

State the basic facts (*the results are X*), along with a simple interpretation of the results (*and this concentration is above/below this benchmark or screening level*). Avoid “spin” – downplaying or amplifying the magnitude of a concentration. Also avoid any unnecessary risk comparisons to other chemicals or issues (for example, cigarette smoking risks) unrelated to the contaminant release. Remember that environmental issues are *involuntary* risks for stakeholders, and their perception (or reality) is that they have little to no control over these risks, unlike voluntary risks that the reader can choose to take.

Keep it relevant

Once the reader has their results, they will want to know how the results will impact them. Inform the reader of any actions that they need to take, and what additional actions, if any, are expected to be undertaken by the consultant or agency. Provide contact information (including a name, phone number, and email address) for the reader if they have follow-up questions or need to communicate with the project contact about any required actions.

Keep it respectful

Although the wording in the letter should be simple, ensure that it is not written in a condescending tone. Remember that although the letter author has experience and education in the subject matter, it is possible that the letter recipient may not, but that does not mean they can't or shouldn't understand difficult concepts. Also remember that environmental information (for example, their drinking water is impacted by a contaminant) is often frightening to the public, so a high level of compassion is required when crafting language. Where possible, use pronouns (you/your, we/our) and active voice to better engage the reader.

Also, always consider your audience's demographics, and whether the letters should be provided in languages besides English.

The Second Draft

Once the letter is drafted, *proof it to ensure there are no typographical or numerical errors*, that it includes all relevant information, and that it is easy to understand. It can be very helpful to have a non-technical person review the letter and provide feedback on its clarity before the letter is sent out to the recipients. Simple typos can cause the reader to assume that the writer is careless and that the reader or the issue is not important. Larger errors such as use of incorrect units or providing erroneous values can obviously have a major impact on the reader, and a later correction/retraction of results can result in loss of trust between the writer and reader. Trust is a crucial component of risk communication as well as the project's ultimate success.

Additional Resources

Additional resources for successful letter writing are provided at Plainlanguage.gov

(<https://www.plainlanguage.gov/resources/content-types/writing-effective-letters/>) and [Dunagan et al. \(2013\)](#).

Appendix G: Communication Plan Step 6: Select Communication and Engagement Tools

Tool: Social Factors Vision Board (PFAS example)

Target Audience: An established community advisory group or a periodic outreach meeting, focus groups, or decision maker stakeholder group. The vision boards can also be used as starting materials for an engagement survey and interview.

Relevance/Importance to PFAS Sites: The success of public outreach in terms of exerting a positive influence on community stakeholders, in preventing and mitigating their exposure to a risk, is based on site-specific physical, psychological, sociological, and demographic characteristics or “social factors.” Identification of these social factors among individual stakeholder groups can assist practitioners in refining engagement methods and outreach material to maximize benefits to the community and meet specific needs of the targeted public sector. The vision boards developed for this toolkit incorporate social factors identified from presentations by public and community stakeholders during the USEPA PFAS [community meetings](https://www.epa.gov/pfas/pfas-community-engagement) (<https://www.epa.gov/pfas/pfas-community-engagement>) held in 2018. Thus, the social factors represent one set of community meetings and concerns. Broadly applicable conclusions cannot be derived from this information. The information presented should be considered an example and provides a starting point for practitioners to understand the stakeholder context of a PFAS-affected community. This example provides a guide for performing engagement on site-specific community concerns.

Social Factors Vision Board

Stakeholder risk perception and associated social factors, shapes individuals' attitudes toward management of hazards that affect personal safety and public health, and play an important roles in supporting legitimacy and compliance with policies and protection measures. Due to the evolving state of the science of PFAS, including appropriate risk management strategies and relevant public policy, the present public attitude toward legitimacy and acceptance of proposed policies and strategies is hindered. Therefore, it is essential for practitioners to identify site-specific social factors within an affected community to effectively communicate risk and the proposed management strategy, as well as address misperceptions and respond to stakeholder needs.

Social science methodologies, provided under Resources below, can help practitioners to understand and identify (1) the social factors that may work in favor of or hinder risk management strategies; and (2) the social factors and stakeholders that are affected by cleanup actions. A vision board can be used as a medium for stakeholders to rate their level of importance and/or interest on applicable social factors. Identified factors can then be used to further develop SMART goals and key messages, develop public outreach materials, and select engagement methods. The overall objective is to gain deeper insight into stakeholder concerns, values, and preferred communication method to facilitate a two-way street knowledge transfer and capacity building toward a successful risk management strategy.

The vision boards, ITRC RC Social Factors Vision Board attachment, ([ITRC_RC_Social_Factors_Vision_Board_AttachmentApr2020.pdf](#)), present a series of boards, each focused on a specific topic of concern and associated social factors identified from presentations by public and community stakeholders during the USEPA PFAS community meetings held in 2018.

Note that vision boards for a specific project are living documents. The statements/questions and social factors should be updated to represent project-specific conditions and stakeholder concerns. Social factors presented on the toolkit vision boards are representative of affected communities' perceptions as opposed to expert opinion based on scientific studies.

The attachment was prepared as an example to provide a starting point for practitioners to understand the present needs and concerns of a PFAS affected community. In addition, the rating system presented in each board is interchangeable to any social factor topic.

Instructions for Vision Boarding

1. Review findings from Steps 1 through 4 of the risk communication planning process to determine board topic(s) applicable for the engagement event.
2. Revise question/statement wording and update social factors to represent site-specific findings and conditions.
3. Display the board on a sturdy structure, such as an easel, cork/white board, or wall.
4. Provide a handout explaining the exercise and definition for the social factors. Include the following:
 - a. *Purpose of exercise* – The purpose of the vision board exercise is to identify factors that represent the community values pertaining to your neighborhood (place and loyalty), ability to bring about change (agency and power), and role of information (trust and communication) about managing risk of PFAS at the site. The feedback will assist the cleanup team with developing a risk management strategy and outreach activities that best meet the community's needs and values.
 - b. *Feedback method* – see list items 6 – 8 below
 - c. *Define topics and social factors* displayed on the vision boards to ensure each participant and the practitioner has a common understanding of the factors being evaluated.
5. Describe the purpose of the exercise and review each question/statement and social factor with the participants.
6. Provide sticky notes, stickers or writing implements (markers preferred) for participants to provide their feedback on each board. Common methods to capture feedback include:
 1. Participants rate each category based on level of importance/severity.
 2. Participants have a set number of factors on which they can provide feedback. For example, they may each have three stickers to post under a set of factors to communicate their preference of prioritization/importance.
 3. Participants have one sticky note per factor to write feedback.
7. Color coding of sticky notes, sticker, and writing implements can be used to categorize stakeholder groups, level of prioritization/importance, and subcategories.
8. Provide a medium for participants to provide feedback on additional social factors not listed. For example, an open/blank category or a feedback form.

Collect stakeholder role and demographic data from the participants to record who provided feedback.

Appendix H: Communication Plan Step 6: Select Communication and Engagement Tools

The communication methods summary table, see [Communication Methods Table\(1992\).PDF](#) ([Kirk Pflugh and Shannon 1992](#)) aides method selection based on the target audience/stakeholder group(s) and purpose of communication.

The communication plan template, provided in [Appendix A](#), includes a table to document the target group, message, type of communication, cost, material development lead person, and evaluation.

Appendix I: Communication Plan Step 6: Select Communication and Engagement Tools

The [Initial Factsheet_DataPackages_Enc3.pdf](#) fact sheet was developed by the Department of the Navy, USEPA, Washington State Department of Health, and Island County Public Health. The fact sheet discusses common terms and data qualifier flags identified in laboratory data sheets to aid in the review and understanding of data packages received from laboratories accredited under the Department of Defense Environmental Laboratory Accredited Program (ELAP). PFAS analytes are used in the example of a laboratory analysis data sheet to walk the reader through the meaning of a reported result in comparison to the Limit of Quantification (LOQ), Limit of Detection (LOD), and Detection Limit (DL).

Appendix J: Communication Plan [Step 6](#): Select Communication and Engagement Tools

The [Vermont Email Form.pdf](#) provides an example of a form that can support consistent messaging by agencies that receive multiple media inquiries. The form is completed in a timely manner after responding to a reporter or media inquiry and shared with others involved in the project. A media correspondence form like this one supports consistent messaging across an agency and provides an archive of media correspondence.

Appendix K: Team Contacts

Bob Mueller, PFAS Team Leader

NJ Department of Environmental Protection

bob.mueller@dep.nj.gov

Ben Holcomb, HCBs Team Leader

Utah Department of Environmental Quality

bholcomb@utah.gov

Virginia Yingling, PFAS Team LeaderMN

Department of Health

Virginia.yingling@state.mn.us

Angela Shambaugh, HCBs Team Leader

Vermont Department of Environmental Conservation

angela.shambaugh@vermont.gov

Lesley Hay Wilson, PFAS Team Program Advisor

Sage Risk Solutions LLC

Lhay_wilson@sagerisk.com

Cherri Baysinger, HCBs Program Advisor

Cymbella Consulting LLC

cbaysinger@socket.net

Heather Barbare, 1,4-Dioxane Team Leader

Colorado Department of Public Health and Environment

heather.barbare@state.co.us

Gladys A. Liehr, 1,4-Dioxane Team Leader

Florida Department of Health

Gladys.liehr@flhealth.gov

Matt Placky, 1,4-Dioxane Team Program Advisor

GDIT

Matt.placky@gdit.com

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State and Local Government

Rachel Blomberg

Colorado DPHE

Jeff Biggs

City of Tuscan Wat Department

Randy Chapman

Virginia DEQ

Jesseka Forbes

Florida DOH

Julie Kadrie

Minnesota DOH

Dan Kendall

Iowa DNR

Annalisa Kihara

California State Water Resources Board

Kevin Lund

Michigan EGLE

Mike Murphy

Virginia DEQ

Christine Osborne

UT DEQ

Daniel Pena

Minnesota DOH

Kerry Kirk Pflugh

New Jersey DEP

Victor Poretti

New Jersey DEP

Gloria Post

New Jersey DEP

Brian Reese

Idaho DEQ

Divinia Ries

Michigan EGLE

Tadbir Singh

ITRC/ECOS

Matt Smith

Orange County Sanitation District

Richard Spiese

Vermont DEC

Rebecca Stanton

California OEHHA

Lanita Walker

City of Tallahassee

Federal Government

Caroline Baier-Anderson

USEPA

Melissa Forrest

US DOD NMCPHC

Hannah Holsinger

USEPA

Patsy Kerr

US DOD NMCPHC

Kendra Leibman US DOD Navy **Yvette Lowney**

SERDP-ESTCP

Academia, and Emeritus, Public, and Tribal Stakeholders

David Bond

Bennington College

Lenny Seigel

Center for Public Environmental Oversight

Edward (Ted) Emmett

University of Pennsylvania

Peter Strauss

PM Strauss & Associates

Industry Affiliates

Melissa Harclerode

CDM Smith

Katrina McCullough

GHD

Lisa McIntosh

Woodard & Curran

Francis Ramacciotti

GHD

Dan Schneider

Terracon

Glossary

A

Acceptable risk

The acceptability of a risk depending on scientific data, social, economic, and political factors, and the perceived benefits or threat arising from exposure to an agent ([IPCS/OECD 2004](#)). Also, the likelihood of suffering disease or injury that will be tolerated by an individual, group, or society ([USEPA 2019e](#)).

Aggregate risk

Risk resulting from a combined risk aggregate exposure (multipathway exposure) to a single agent. The combined risk from aggregate exposures to multiple agents or stressors is called cumulative risk. A stressor is any physical, chemical, or biological entity that can induce an adverse response ([USEPA 2003](#)).

Anthropogenic background

Natural and human-made substances that are present in the environment as a result of human activities but not specifically related to the substances of concern at the site ([USEPA 2018a](#)). Anthropogenic background is differentiated from naturally occurring background as the latter are substances present in the environment in forms that have not been influenced by human activity.

Aquatic biota

Creatures of all genera and species that reside in, on, or near an aquatic environment.

Audience

Specific members of the broader public who are impacted by the risk. These may include technically trained academics, residents, business owners, elected officials, students, parents, etc.

B

Bioavailability

The individual physical, chemical, and biological interactions that determine the exposure of plants and animals to chemicals associated with soils and sediments ([ITRC 2018](#)). Bioavailability is the portion of the total quantity of a chemical present in a medium (air, soil, water, diet) that is absorbed by a living organism ([Klassen 2013](#)) and reaches the central (blood) compartment, whether exposure occurs via the gastrointestinal tract, skin, or lungs ([NEPI 2000](#)).

C

Carcinogen

A substance or agent that produces or incites cancerous growth.

Conceptual site model (CSM)

A representation of the site that summarizes and helps project planners visualize and understand available information.

The CSM is the primary planning and decision-making tool used to identify the key issues and the data necessary to transition a project from characterization through post-remedy. It documents current site conditions and serves to conceptualize the relationships among chemicals in environmental media, sources, and receptors through consideration of potential or actual migration and exposure pathways ([ITRC 2019](#)).

Cumulative risk

The combined risks to human health from the environment from multiple agents or stressors. The combined risks from aggregate exposures (combined exposure of an individual (or defined population) to a single chemical via relevant exposure routes, exposure pathways, and exposure media) to multiple chemicals.

Cyanobacteria

Sometimes incorrectly referred to as blue-green algae, cyanobacteria are frequently found in freshwater systems. Some

produce cyanotoxins. The release of these toxins in an algal bloom into the surrounding water produces harmful effects, including health effects ([USEPA 2019d](#)).

D

1,4-Dioxane

A clear volatile liquid used primarily as a solvent. It is subject to federal and state regulations. [USEPA \(2013\)](#) has found that 1,4-dioxane is a likely human carcinogen. Several federal government agencies have identified or regulated 1,4-dioxane as a hazardous substance since the early 1980s. However, 1,4-dioxane became an environmental contaminant of emerging concern only in the early 2000s after EPA reassessed the toxicity of 1,4-dioxane and began developing cleanup guidelines for various media. In 2008, EPA included 1,4-dioxane in the Safe Drinking Water Act Candidate Contaminant List ([USEPA 2008](#), [2009](#), [2017](#))

E

Emerging chemicals

Chemicals in the environment and biota that have been identified by chemists and toxicologists through improved detection and may pose a human health risk.

Emerging concern

An issue that is the subject of intensive investigation. The available information is increasing, so our understanding about hazard, exposure, and risk is emerging and evolving.

Emerging contaminant or concern

Pollutants that have been detected in the environment and may cause ecological or human health impacts, and typically are not regulated under current environmental laws. Refers to many different kinds of chemicals, including medicines, personal care or household cleaning products, lawn care and agricultural products, among others.

Emerging environmental concern

An environmental issue that is the subject of intensive investigation. The available information is increasing, so our understanding and information of hazard, exposure, and risk is emerging and evolving.

Emerging issues

A variety of concerns that encompass the spectrum of contaminants, their behavior, and techniques to manage them, including regulatory limitations.

Environmental professional

A practitioner in the environmental remediation or risk management discipline, with a focus on environmental hazards of concern. Can include scientists, engineers, geologists, community outreach specialists, regulatory representatives, researchers, and technical liaisons.

Excess lifetime cancer risk

The additional or extra risk of developing cancer due to exposure to a toxic substance incurred over the lifetime of an individual ([US DOE 2020](#))

Exposure pathway

The physical course or path that a chemical or pollutant takes from the source, via air, soil, water, and food to humans, animals, and the environment ([USEPA 2003](#)). Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route.

Exposure route

The way a chemical or pollutant enters an organism after contact, for example, by ingestion, inhalation, or dermal absorption.

Exposure scenario

Exposures and risks are defined by the exposure scenario of interest and describe exposed populations' activities that may affect exposure and the duration (time frame) over which exposure may occur. Exposure scenario is a set of

facts, data, assumptions, and professional judgment about how an exposure occurs or does not occur. An exposure scenario includes the (1) chemicals in environmental media and their sources; (2) exposed populations (or receptors); (3) migration of chemicals in environmental media from sources to receptors; and (4) routes of exposure (ingestion, dermal contact, inhalation). ([ITRC 2015](#); [USEPA 2020](#))

H

Harmful cyanobacterial blooms (HCBs)

Algal blooms with the potential to harm human health or aquatic ecosystems are also referred to as harmful algal blooms or HABs. Cyanobacterial HABs or HCBs that produce toxins are emerging environmental concerns and can harm people, animals, aquatic ecosystems, the economy, drinking water supplies, property values, and recreational activities, including swimming and commercial and recreational fishing. See definition of cyanobacteria above ([USEPA 2019d](#)).

Hazard

A condition or physical situation with a potential for an undesirable consequence, such as harm to life or limb ([ITRC 2005](#)). For a single chemical in environmental medium, the hazard is estimated by a hazard level (hazard quotient, HQ). The hazard level represents the ratio of an exposure level by a chemical (e.g., maximum concentration) to a toxicity reference value (RfV), generally a noncancer RfV (e.g., oral reference dose or inhalation reference concentration), or a screening value selected for the risk assessment for that substance (e.g., lowest-observed-adverse-effect level [LOAEL] or no-observed-adverse-effect-level [NOAEL]). If the exposure level is higher than the toxicity value ($HQ > 1$), then there is the potential for risk to the receptor. The hazard level for a group of multiple contaminants is estimated using a hazard index.

Health risk

Risk in which an adverse event or substance affects human health ([ITRC 2005](#)).

Human health risk analysis

Analysis to determine the effects of chemical contamination on human health to understand whether current or future chemical exposures will pose a health risk to a broad population such as a city or community ([ITRC 2011](#)).

Human health risk assessment (HHRA)

The process of characterizing the nature and magnitude of health risks to humans from exposure to chemicals and other stressors that may be present in the environment ([USEPA 2012](#)).

Individual susceptibility

The marked variability in the manner in which individuals will respond to a given exposure to a toxic agent ([US DOE 2020](#)).

Interested parties

Responsible parties, state regulators, and owners and operators of contaminated site who have a vested interest or are impacted in some way by a situation or issue.

L

LC50

The concentration of a material in an environmental medium that causes 50% mortality of a group of test organisms after a certain period of exposure. This measurement end point is most often used in acute laboratory toxicity tests. For example, in fish LC50 is the acute fish toxicity expressed as the concentration in water that kills 50% of a test batch of fish within a continuous period of exposure (hours).

Liaison

An individual or go-between who is a link between groups of people and serves as a conduit for communication of information.

M

Maximum contaminant level (MCL)

The maximum amount of a chemical that is allowed before a health effect occurs. MCLs are drinking water standards established under the Safe Drinking Water Act. “MCLs are set at levels that are protective of human health and are set as close to MCLGs as is feasible taking into account available treatment technologies and the costs to large public water systems.” Consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), MCLs typically are relevant and appropriate when establishing remediation objectives for contaminated groundwater that is or may be used as drinking water ([USEPA 1988](#)).

Maximum contaminant level goals (MCLG)

Strictly health-based levels established under the Safe Drinking Water Act that do not take cost or feasibility into account. As health goals, MCLGs are established at levels at which no known or anticipated adverse effects on the health of persons occur and which allow an adequate margin of safety ([USEPA 1988](#)).

Mitigation

Corrective actions taken to minimize or reduce harm that has been caused to the environment.

Mitigation strategies

Techniques that are employed to reduce negative impact to the environment.

N

Noncancer health effect

Health impacts from exposure to a chemical or substance that does not result in a cancer outcome but can cause other health impacts such as neurological damage.

P

Per- and polyfluoroalkyl substances (PFAS)

A family of chemicals largely characterized as having a molecule that has a non-fluorine atom (typically hydrogen or oxygen) attached to at least one, but not all, carbon atoms, while at least two of the remaining carbon atoms in the carbon chain tail are fully fluorinated ([ITRC 2020](#)).

Perceptions

Interpretation of a circumstance or event not necessarily based on facts, but rather based on fears, preconceived notions, or other unfounded beliefs.

Perfluorinated chemical

A subset of PFAS. These chemicals have carbon chain atoms that are totally fluorinated. Examples are perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) ([Buck et al. 2011](#)).

Petroleum hydrocarbons

Any mixture of hydrocarbons found in crude oil. There are several hundred of these compounds, but not all occur in any one sample.

Public

A people as a whole; a populace having common interests.

Public health

“The science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals.” – CEA Winslow ([CDC 2018](#)). Public health is concerned with threats to health based on population health analysis. Public health incorporates the interdisciplinary approaches of epidemiology, biostatistics and health services, environmental health, community health, behavioral health, health economics, public policy, insurance medicine and occupational health (occupational medicine).

R

Receptor

An individual, plant, or animal that has the potential to be exposed to a contaminant in the environment media ([ITRC 2019](#)).

Regulatory agencies

Agencies are part of the executive branch of state and federal governments that are tasked with and have authority to execute the law through regulations and statutes. Regulations usually must be authorized by a statute and are subordinate to statutes; however, regulations have the same legal force as statutes.

Regulatory framework and variability

The laws and regulations that outline the legal requirements to be met in a particular program such as CERCLA, commonly known as Superfund, Resource Conservation and Recovery Act (RCRA), underground storage tanks (USTs), brownfields, state cleanup programs, etc. Each of these programs outlines requirements and guidance.

Remedial action

Those actions consistent with permanent remedy taken instead of, or in addition to, removal action in the event of a release or threatened release of a hazardous substance into the environment to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health and welfare or the environment (40 CFR 300.50).

Remediation

The act or process of abating, cleaning up, containing, or removing a substance (usually hazardous or infectious) from an environment.

Responsible parties

Owners and operators responsible for environmental contamination.

Risk

The potential for realization of unwanted, adverse consequences to human life, health, property, or the environment. Estimation of risk is usually based on the expected value of the conditional probability of the event occurring multiplied by the consequence of the event, given that it has occurred ([ITRC 2005](#)).

Risk amplification or social amplification of risk

Distortion of the seriousness of a risk caused by public concern about the risk and/or about an activity contributing to the risk ([DHS 2010](#); [USEPA 2018b](#)).

Risk analysis

The scientific process of defining and analyzing the dangers to human health and ecology as well as other risks associated with a site of contamination or remediation project. Once they are quantified, it is easy to compare with existing action levels, and appropriate actions can be conducted to manage the risk ([ITRC 2011](#)).

Risk assessment

An organized process used to describe and estimate the likelihood of adverse health outcomes from environmental exposures to chemicals. The four steps are hazard identification, dose-response assessment, exposure assessment, and risk characterization ([Presidential/Congressional Commission 1997](#)). Also, the process of defining and analyzing the dangers to human health and ecology as well as other risks associated with a remediation project.

Risk-based corrective action (RBCA)

A streamlined approach through which exposure and risk assessment practices are integrated with traditional components of the corrective action process to ensure that appropriate and cost-effective remedies are selected and that limited resources are allocated properly ([ASTM 2015](#)).

Risk-based criteria

Default or site-specific cleanup values that have been derived from available human health or ecological risk-based data.

Risk-based screening level (RSL)

Risk-based concentrations derived from standardized equations combining exposure information assumptions with USEPA toxicity data. The agency considers them to be protective for humans (including sensitive groups) over a lifetime. They are calculated without site-specific information. They may be recalculated using site-specific data ([USEPA 2019b](#)).

Risk-based standards

Risk-based levels or criteria that are promulgated and enforceable at contaminated sites.

Risk communication

The means by which a communicator establishes dialogues with communities and provides a mechanism for stakeholders to participate in the process of decision making about potential hazards to their person, property, or community. The purpose of risk communication is to give people good information about potential hazards that allows them to make sound choices ([USEPA 2019c](#)).

Risk management

The process that evaluates how to protect public health by deciding whether and how to manage risks. This process requires legal, economic, and behavioral factors, and consideration of human health and welfare effects of each management action and alternatives ([USEPA 2000](#)).

Risk management performance metrics

Quantifies how an action will lead to measurable increased protection for public health and the environment, thus leading to the development of targets or objectives that offer reductions in risk and unsustainable impacts.

Risk perception or perceived risk

Involves the influence of subjective factors on how risks are understood and valued. Characteristics of a hazard and the subjective context of the perceiver (qualitative personal views) are as important as the objective (quantified) risk in influencing an individual's perception of risk ([ITRC 2015](#)).

Route of exposure (aka exposure route)

The way that a human or ecological receptor comes into contact with a chemical. In environmental contexts, the routes are most commonly ingestion (oral), inhalation, or dermal, or for aquatic organisms, direct contact.

S

Site or project-specific characterization

Before cleanup decisions can be made, some level of characterization is necessary to ascertain the nature and extent of contamination at a site and to gather information necessary to support selection and implementation of appropriate remedies. Tools to support good site characterization include conceptual site models, innovative site characterization technologies, tailored data quality objectives, and use of existing information to streamline each investigation ([USEPA 2019e](#)).

Social distrust

A belief that others (for example, individuals, government, business) will not accept their own responsibility and act to alleviate pollution problems.

Social factors

Include level of understanding, primary language, preference in communication mode, accessibility of information and engagement events by specific groups of people.

Social network or group

A collection of people or groups of people who interact with one another and share a certain feeling of unity.

Source control

Refers to a range of actions (e.g., removal, treatment in place, containment) designed to protect human health and the environment by eliminating or minimizing migration of or exposure to significant contamination ([USEPA 2019e](#)).

Stakeholder

A person, group, or organization that is affected, potentially affected, or has any interest in a project or a project's outcome, either directly or indirectly ([Presidential/Congressional Commission 1997](#)).

Stakeholder engagement

The way an organization involves people or organizations who may be affected by its decisions or who can influence how decisions are (or can be) carried out ([FEMA 2019](#)).

Statutes

Laws enacted by the legislative branch of a government; law or body of laws promulgated by a state legislature.

T

Toolkit

A process to plan and implement a risk communication strategy that starts with goal setting and carries through to implementation and evaluation. The process includes engagement tools and examples, resources, and case studies for emerging environmental issues and concerns.

Toxicity values or toxicity reference value (TRV)

A reference point (generally a dose or concentration) below which exposures are not likely to result in an adverse event/effect given a specific range of time ([ITRC 2018](#)).

U

Uncertainty factors

In predicting toxicity reference values, uncertainty factors are used to extrapolate toxicological data from animal experiments to humans, interindividual variability, and high-to low-dose exposures and to compensate for a deficiency in knowledge ([Institute of Medicine 2013](#)).

V

Vulnerable populations

Social groups that experience health disparities as a result of a lack of resources and increased exposure to risk due to their financial circumstances, place of residence, health, age, or personal characteristics. This may also include racial and ethnic minorities, the economically disadvantaged, and those with chronic health conditions.

([CDC 2020](#)) defines vulnerable populations as including anyone who:

- has difficulty communicating
- has difficulty accessing medical care
- may need help maintaining independence
- requires constant supervision
- may need help accessing transportation

Acronyms

CERCLA

Comprehensive Environmental Response, Compensation, and Liability Act

SCM

Conceptual site model

DNAPL

Dense nonaqueous phase liquid

FAQ

Frequently asked questions

GIS

Geographic information system

HAB

Harmful algal blooms

HCBS

Harmful cyanobacterial blooms

ITRC

Interstate Technology and Regulatory Council

L.E.A.F.S.

Leading Environmentalism and Forwarding Sustainability

LNAPL

Light nonaqueous phase liquid

LOAEL

Lowest-observed-adverse-effect level

MCL

Maximum contaminant level

MCLG

Maximum contaminant level goal

PFAS

Per- and Polyfluoroalkyl substances

RCRA

Resource Conservation and Recovery Act

RfV

Reference value

SMART

Specific, measurable, attainable, relevant, and timely

USEPA

United States Environmental Protection Agency

UST

Underground storage tanks

VEDC

Vermont Department of Environmental Conservation

VDH

Vermont Department of Health