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Applicable Response To Comments received during external review of the Draft Final

Section	Comment	Response
General Comments	Overall, the document is well written and should be useful for providing guidance on conducting vapor investigations. However, the discussions of NAPLs (both LNAPL and DNAPL) are inadequate. If the methods are not intended to be applied to NAPL sites, then a statement should be added. If only portions apply to NAPLs, these should be explicit. For instance, the methods may be applicable to DNAPLs because as discussed, the concentrations at the top of the water table have the greatest influence on soil vapor.	language has been added.
General Comments	After reviewing the ITRC Vapor Intrusion Technical and Regulatory Guidance Document, our Utah Department of Environmental Quality LUST program manager remarked to me that it was the best document he had ever read on the subject and "right on the mark" technically.	Thank you
General Comments	Wyoming DEQ conducted a review of the Vapor Intrusion Guideline, and found that the information is not in conflict with Wyoming's current perspectives/policies on this issue.	Thank you
General Comments	To avoid the confounding of the indoor air contaminant sampling data, it is recommended that the intermittent background sources of indoor air contaminants be fully controlled. Some background sources will occur on a fairly constant basis. This might include: off-gassing from furniture, volatiles produced by microorganisms, or volatiles released from long-term stored chemicals. However, other sources are intermittent and have the potential to skew the data if the samples are taken during the time period of their emission. The most important might be the off gassing of volatiles from routine hot showers. The combination of high water temperatures and the atomization of the water particles makes for a high potential for the stripping of volatiles from the water. This could produce a spike in the concentrations of these volatiles (including trihalomethanes). In addition, if the water comes from a well contaminated by the subject plume, this should be considered during the evaluation of the impact of the plume. Should the resident park their car in an attached garage, then there would be a related	Section 1.6.1 on Background Air Concentrations has been modified to address these points.
General Comments	Both the background and the target sampling should take into account the ventilation of the areas sampled. Sampling should only be performed on areas where windows and doors haven't been opened, or air-handling systems used, for several hours. Sampling periods may also need to be increased to assure representative samples.	Section 8 of Appendix D (Toolbox) has been modified to address these points.
General Comments	There is very good remediation information in this document. The section on the Sub-Slab (Active) Depressurization appears mostly complete, with the sections on their construction and price especially useful. In addition, it would be useful to include the fact that many radon remediation companies install such devices on a routine basis. Seeking out these companies could lead the resident to a number of experienced installers, and because there is significant competition in this area, the costs should be significantly less.	Language has been added to the document.
General Comments	Great document. This will be a very useful document. Wish I had had something like this to draw from four years ago when addressing vapors in a basement area of a large commercial building that housed prisoners in its lower levels. Would have been a great resource to draw from when reviewing the mitigation plan, which ended up being a commercial system that operated with the HVAC to pressurize the lower portions of the building.	Thank you
General Comments	PA has developed generic screening values for both soils and groundwater, while this document only recommends such development for groundwater. It would be a useful guide for someone evaluating vapor intrusion under our site-specific standard. Our screening guidance under our Statewide health standard is more generic and uses values in our tables of standards to evaluate the potential for vapor intrusion. This guidance provides an investigator with information on the considerations and methodologies necessary to assess the potential for vapor intrusion, and appropriately refers to individual State regulations and policies for specific requirements.	Language has been added to the document.
General Comments	The discussions tend to give the impression that the VI soil gas plume/cloud is directly above or follows the contaminated ground water plume. ITRC should provide discussion relative to cases where the soil gas is trapped within the soil matrix or spreads away in directions other than the groundwater flow direction.	Language has been added to the document.
General Comments	Some discussion should be included relative to safety and security considerations for indoor air sampling events since residents' availability and sampling schedule may require late evening sampling.	Language has been added to the document.

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General Comments	In a previous email I contacted you about including the url for DTSC's vapor intrusion guidance document. The document is already listed in the references for your report, but there is no website/address included. Try this as a link: http://www.dtsc.ca.gov/AssessingRisk/upload/HERD_POL_Eval_Subsurface_Vapor_Intrusion_interim_final.pdf . Otherwise, the link to the publications page is: http://www.dtsc.ca.gov/PublicationsForms/pubs_index.cfm	The link has been added.
General Comments	Our staff at the Oklahoma DEQ has reviewed the Draft Vapor Intrusion Pathway: A Practical Guide ITRC guidance document and we have no comments. We feel that this will be a very useful guidance for us to use. Thank you for giving us the opportunity to review and comment.	Thank you
General Comments	I have completed review of the Technical/Regulatory Guideline, Vapor Intrusion Pathway: A Practical guideline, January 2007 document put together by the Interstate Technology & Regulatory Council Vapor Intrusion Team. The subject document was well written and I did not have any comments.	Thank you
General Comments	More discussion on how to make remedial decisions at sites of future development would be very helpful, particularly the reliability of "picture in time" soil gas analysis from areas of currently no structures that may later contain structures, roads, etc. How do you give a go-ahead for redevelopment on a property while maintaining that the vapor intrusion pathway is addressed? Presumptive remedy only? I look forward to reviewing the scenario document on the vacant lot redevelopment.	Language has been added to the document.
General Comments	The document of necessity discusses the subject in generalizations, and provides a conceptual approach. This is not meant as a criticism, any review of this magnitude is required to do so. However, a short addition of one or two case studies would illustrate the 'typical' investigation and resultant data. Reading over real examples provides perspective for the inexperienced reader, and as a result, they retain more of the considerable detail that otherwise might be glossed over.	The purpose of the Scenario companion document is to illustrate the application of the various tools and lessons in the Practical Guide.
General Comments	The section on building remediation would benefit from a number of simplified building plans or cross sections. Again, the detail is here in the text, but retention by the new reader would greatly benefit by schematics of the modified building discussed in each section. Typical building components important to vapor intrusion such as interior and exterior drain tile, sumps, sill plates, sewer hookups, etc are much easier to conceptualize for the less experienced reader when provided with a diagram. The different remediation systems may seem obvious, but again, cross sections of various sub floor membrane options can greatly add to the understanding of system operations.	The purpose of the Scenario companion document is to illustrate the application of the various tools and lessons in the Practical Guide.
General Comments	The Vapor Intrusion Committee commends the ITRC on their comprehensive and timely effort in the evaluation of this complex pathway. The ITRC guidance provides a good general overview of the vapor intrusion (VI) pathway and indicates in portions of the text that the document user should check with the applicable regulatory agency regarding requirements that may be appropriate at a site. It is recommended that the document and the ITRC web site further emphasize that requirements may vary throughout the states and the importance of working with the regulatory agency when conducting site-specific evaluations.	Noted
General Comments	I have reviewed the document and find it to be very thorough and of generally high technical quality. I have no technical comments or edits to recommend.	Thank you
General Comments	New Hampshire does not have a general preference for sub-slab versus exterior near-slab sampling. We recognize the reluctance of PRPs to conduct work within off-site structures and the reluctance of off-site property owners to allow intrusive interior work. Accordingly, New Hampshire allows consultants/PRPs to proceed with a phased investigation approach proceeding from exterior investigations to interior investigations.	Noted
General Comments	This document provides a comprehensive review of the methodologies applied to evaluate the vapor intrusion (VI) pathway and is the culmination of years of hard work by a lot of people. Since it is intentionally not prescriptive in its approach, it lacks a strong framework for developing an approach. As such the target audience (investigators) must be knowledgeable with respect to VI to develop and justify their own site-specific approach.	Precisely. The ITRC Team expects to develop and deliver a classroom training on the subject to provide the additional detail and structure to the process.

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General Comments	Although we are sure this is already planned, we recommend that the document be reviewed by a professional, technical editor before it is finalized. There are multiple locations where Tables/Figures are not called out in the text, acronyms are not spelled out on first use in the text, references are omitted, and paragraphs run together. We have identified some of the instances in the text where edits should be made but have not identified all of them.	Yes thank you
General Comments	Section 1.6 of this document does a good job of introducing the reader to several factors that can influence a vapor intrusion assessment. Although it may seem implicit, we recommend adding an additional section about site-specific geology. Particularly for sites where the subsurface between the building foundation and the vapor source is heterogeneous, being aware of how that can impact vapor migration and investigations is important. The reader should be introduced to this concept early in the document.	See section 2.1 Developing a Conceptual Site Model
General Comments	The document currently includes several references to the “investigator” as the person performing the entire vapor intrusion analysis. It may help the reader to understand that the “investigator” is never really one single person, but rather a team of professionals with different specialties. We have included several specific comments below related to this comment, but it may be useful to incorporate this type of information in other sections that we did not specifically comment on. Therefore we recommend that the group considers performing a holistic view of the guideline and incorporating this type of information throughout the guideline.	good point
General Comments	G-6. Considering that the appropriate consideration and evaluation of background sources can play an important role in vapor intrusion investigations, this document includes only a rather superficial discussion about evaluation of background sources. There are several areas throughout the document that would benefit from additional discussion and information regarding how to account for, investigate, and quantify background contributions to indoor air.	good point
General Comments	The appropriateness of evaluating the vapor intrusion pathway for sites contaminated with petroleum hydrocarbons is an area that is somewhat debated in the scientific community. In fact, according to the ITRC’s vapor intrusion regulatory survey, petroleum hydrocarbons are handled differently by state agencies (e.g., whether vapor intrusion needs to be evaluated for petroleum UST sites, whether biodegradation is evaluated differently for petroleum sites, etc.). This version of the document barely mentions this rather wide discrepancy in which chemicals should be evaluated for vapor intrusion. We recommend updating the guideline so that it includes information in this guideline that will help the reader better understand this issue.	The team feels this issue is already addressed. Language about variations among regulatory agencies (intra and inter agency) has been added
General Comments	The Executive Summary refers to five topics that are still under debate. Our guidance and policy indicate a clear preference for soil gas sampling over indoor air sampling, particularly because of the uncertainty potentially caused by background sources within a building. We have no preference for either field or fixed laboratory analysis, as long as the performance criteria are met. Whenever OSHA has jurisdiction over a property, meaning its regulations are being implemented including the presence of MSDS sheets onsite, our guidance defers to the OSHA PEL levels for evaluating protectiveness. Our program specifically allows for institutional controls to achieve a standard under the site-specific standard, or to maintain a Statewide health standard after it has been achieved. This relates to the last issue of whether we can walk away from a site after mitigation. In any instance where institutional or engineering controls are used to attain or maintain a standard, a postremediation care plan is required to	The section has been rewritten

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Section	Executive Summary	Response
Ex Sum	A commenter thought the use of the words "fear and anxiety" was overly dramatic and somewhat misleading. The commenter was concerned that the statement gives the impression that VI is "scariest" than other contaminants, for example DNAPL in drinking groundwater.	In reality it may not be more harmful however the exposure pathway does in fact cause greater concern.
Ex Sum	A commenter was concerned issues 3, 4, and 5 would touch too much on policy issues. They don't think ITRC should state what cleanup levels should be. Document could list alternatives for determining cleanup levels, but should not make any recommendations in this regard. Commenter thought that institutional controls were more a policy issue.	The document especially the executive summary does not imply preferences. We simply realize that the subject causes confusion and further dialogue might prove helpful.
Ex Sum	When defining "vapor intrusion," consider noting that the focus of the document is on SOIL vapor intrusion to avoid expectations that the document will also extensively address the off-gassing of volatile chemicals from contaminated groundwater used in the household (e.g., shower, tap, etc.) or from contaminated groundwater that may enter a household via flooding or reside in a sump.	Addressed in the body of the guidance
Ex Sum	Define "site." This is important for understanding the intent of statements in the document. For example, does the term include buildings on-site and off-site? How does "screening a site from further consideration" relate to screening on-site or off-site buildings from further consideration? How does the conceptual model [p.2, Section 1.2] consider a "site?" [Also applicable to p.15, Section 2.3: assessing a contaminated site.]	Addressed in the body of the guidance
Ex Sum	Consider noting that the document is primarily focused on the investigation and mitigation of the exposure pathway, not on the investigation and remediation of the source (e.g., contaminated soil, groundwater, or soil vapor). [Also applicable to p.1, Section 1.0.]	Addressed in the body of the guidance
Ex Sum	The location of "VI documents and related information from the various states, federal government, ..." on the referenced website is not clear. Some of the information appears to be provided in Question 26 of the ITRC state survey, but this is not an obvious location to a web user. Is the ITRC website going to be updated? [Also applicable to p.12, Section 1.9.]	Addressed in the body of the guidance
Ex Sum	Consider introducing ITRC's companion document on typical scenarios in the Executive Summary rather than waiting until the discussion on page 24 (i.e., explain that the guideline is one of two ITRC documents on soil vapor intrusion).	Language has been added as suggested.

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	Section 1.0	
1	A commenter asked to consider whether radon be added to the list of potential contaminants provided in blow-out box.	we only included a few as examples
1	The text refers to "hot button" issues and building occupant "fear and anxiety" driving the strategy that regulators take in addressing vapor intrusion. This has not been our experience. On the whole, the public have been neither fearful nor overly concerned; and furthermore, our approach is driven by data and not by homeowner reaction/emotion.	The first paragraph has been modified to remove the concept of "fear." However, experience in many states is that vapor intrusion has become a "hot button" issue that is redefining typical remedial approaches.
1.1	When discussing why this has become such a significant issue, consider adding a discussion about how previous assumptions about the pathway have been shown to be erroneous (e.g., attenuation factors, what was considered a potential source, etc.). Also consider adding a discussion about how going back to old sites where these assumptions were made may affect communities that thought all was said and done.	A paragraph has been added.
1.2	Reference the basis (such as the article/publication or site-work) for the following statement: "The distance of the 'building zone of influence' on soil gas flow is usually less than a few feet." [Also applies to p.40, Section 3.7.2.]	Add EPA 2002 or the J7E model
1.2	In the text following "houses, and commercial/industrial buildings, other structures also can be a concern," please clarify with examples, what other structures are important to this thought.	We tried to convey that any structure can be of concern. General examples do little to clarify this.
1.3	"Defining the Pathway" should refer to or define the "stack effect" in the fourth paragraph. An adequate description is provided, but it simply doesn't refer to it as the stack effect.	Language has been added
1.4	The term unacceptable risk is used. The term unacceptable is subjective. Perhaps "significant risk as determined by the regulatory agency" should be used.	Language has been added to the document to clarify unacceptable risk "while erring on the side of caution when there is uncertainty"
1.1	Discussion indicates the testing method is the concern and does not make it clear that the primary public concern for addressing VI is potential health impacts.	Language has been added to correct the inference.
1.2	The document's use of "upwards" in the 2 nd sentence should be revised. While "upwards" is the predominant direction of movement, diffusion is based on a concentration gradient and therefore can be in any direction. It is suggested that the document indicate that chemicals diffuse <u>toward</u> (rather than upwards to) regions of lower chemical concentration	The language has been modified to correct the sentence
1.2	Last sentence "The distance of the building zone of influence" on soil gas flow is usually less than a few feet." Is this vertical or horizontal?	The language has been modified.
1.2	"Soil gas can flow into a building due to barometric pressure changes, wind load, thermal currents, or depressurization from building exhaust fans. The rate of movement of the vapors into the building is a difficult value to quantify and is dependent upon soil type, chemical properties, building design and condition, and the pressure differential." When listing items, care should be made that it does not imply that it is an inclusive list of items and rather it is a set of examples.	Language has been added to the document.
1.3	Wording suggestion for first sentence in this section, " <u>Define the vapor intrusion pathway as a complete exposure pathway</u> , a "source", "migration route", and "receptor" must be identified."	The language has been modified.
1.3	"The physical source of the contamination should be determined. The initial or primary sources (e.g., a leaking tank or a surface spill), or secondary sources (e.g., contaminated soil or groundwater), may assist in the vapor intrusion investigation." - Need to include vapor as a potential source.	The language has been modified and vapor is implied but not specifically called out
1.3	Maybe a discussion could be included here about assessing a "complete pathway", including scenarios where no building is present but could be in the future, or the use or installation of institutional controls (e.g., vapor barrier) = not complete pathway.	That point is discussed elsewhere in the document.
1.3	"Receptors are the people that may be exposed to the site related contaminants. Typical receptors include adults and children exposed in a residential setting; adults exposed in an occupational environment; and adults and children exposed in a non-residential setting." - Should expand this section a little, to aid in potential later discussion or issues that identify that receptors are different and that there exposure assumptions may also need to be different. (i.e. school v. work v. home). I know that is what it is intended to say, but maybe some e.g. might be useful here.	Language has been added to the document.

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Figure 1-2	Change the figure showing the terms "Source" Pathway" Receptor" along the bottom of the graphic to present "Source" Pathway" Receptor" in a vertical orientation. Migration is bottom to top and the illustration should be designed similarly.	See comment for redoing the figure. Ask Battelle to redraw this figure.
1.4	The term "Foundation Air" should be clarified and included in the glossary. The text does not indicate if this term refers to sub-slab or near foundation soil gas.	Table deleted
	second line: what are the units of "l per hour"?	Done
1.4	Table 1-1 (and Section 3.7.3 of the document) reference limiting analytical parameters to chemicals of concern for the VI pathway. The document should clarify that the limiting of analytical parameters must be approved by the applicable regulatory agency. The Department requires that the initial sampling phase/round include the full suite of analytical parameters (i.e., method TO-15) when evaluating a site. The inclusion of all method analytes in the evaluation allows complete disclosure of the analytical results to the building occupants/receptors that are readily available from the laboratory. This information has also facilitated the Department's discovery of additional sources of VI related contamination that can then be evaluated and addressed	Table deleted
Table 1-1	Recommend comparing the 13 steps described in Chapter 2 and Chapter 3 to the topics in Table 1-1. Table 1-1 is a clear and useful list. Recommend the guidance be organized and presented consistent with the table (Table 1-1 should look like the table of contents and outline how to investigate vapor intrusion). The first section could be labeled Planning and Preliminary Screening. Concern about vapor intrusion typically starts with information about site history, soil data or groundwater data. This information may lead to additional investigation and analysis. A third section may be useful to identify key considerations in deciding whether remediation is warranted. Recommend the revised table (list of steps) be coordinated for consensus before revising the document.	Table deleted
Table 1-1	Terminology in the document should be consistent throughout the text e.g., "foundation air should be changed to "sub slab soil vapor." "Get buy-in" should be discussed in the "Planning and Preliminary Screening" section along with regulatory context and "policy." Overall the table represents an opportunity to organize steps necessary to address how to reconcile technical constraints, positions of regulatory agencies and stakeholder concerns.	Table deleted
1.4	Planning, Item 6: Not all states use "target risk levels" or "risk-based screening concentrations." This should be noted in the table.	Table deleted
1.4	Sampling & Evaluation, Item 1: The cost of mitigation should not only include the costs associated with installing the system, but also the costs associated with its operation, maintenance and monitoring.	Table deleted
1.4	Sampling & Evaluation, Item 2: Revise as "...necessary detection or minimum reporting limits...". Note that some states refer to detection limits while others refer to minimum reporting limits. A side box discussing the difference would also be helpful. [Also applicable to p.32, Section 3.5.5, paragraph 2.]	Table deleted
1.4	Sampling & Evaluation, Item 3: Define the term "background samples." Are these outdoor air samples? Are these samples from unaffected buildings?	Table deleted
1.4	Sampling & Evaluation, Item 5: Define "zone of influence." Is this an area determined on a site-by-site basis? If so, how is it determined? Is this a prescribed distance? Other?	Table deleted
1.4	Sampling & Evaluation, Item 6: The analyte list should also include degradation products (as discussed elsewhere in the document, such as p.17, Section 2.3.3).	Table deleted
1.4	Sampling & Evaluation, Items 7 and 8: Define "foundation air sampling" and "foundation air." Is this referring to sub-slab sampling or soil vapor sampling at a depth comparable to the building's foundation?	Table deleted
1.4	Sampling & Evaluation, Item 8: Consider noting that while the collection of co-located groundwater samples is not usually done (often not practical), it could provide additional information that may assist in the data evaluation process.	Table deleted
1.4	Sampling & Evaluation, Item 10: The item should reflect that the role of modeling in the process should be understood. For example, is modeling to be used to make final decisions regarding vapor intrusion or will it be used as a tool to focus initial structure sampling efforts?	Table deleted

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1.4	The reference cited in the following sentence should be updated: "The table was developed by the Naval Facilities Engineering Command Risk Assessment Working Group in their Draft White Paper: Evaluating the Vapor Intrusion Pathway." The Navy now plans to release a Vapor Intrusion Guidance Document instead of a White Paper.	The reference has been eliminated
	In addition, the "Risk Assessment Working Group" should be changed to "Risk Assessment Work Group."	Thank you
Table 1-1	Foundation air has not been defined.	Table deleted
Table 1-1	We recommend reviewing this table for consistency with the rest of the document. For example, the first box in the "Sampling and Evaluation" section includes a reference to the tiered investigation process described in the Navy's Vapor Intrusion Guidance. Since the rest of this document does not discuss a 'tiered process', and since the reader could be confused by the use of 'tiered' and 'phased', we recommend deleting the first sentence in this box.	Table deleted
	The seventh and eighth boxes in the "Sampling and Evaluation" section include the phrase "foundation air." In order to make the terminology in this table consistent with the terminology in the rest of the document, we recommend replacing "foundation air" with "sub-slab soil gas."	Table deleted
	The table also emphasizes co-located and co-collected multi-media sampling, but this approach is not emphasized in Section 3 of this document.	Table deleted
1.4	8th key principles bullet: Note that not all states use screening levels or screening levels based on the "appropriate exposure scenario." [Also applicable to p.11, Section 1.9, paragraphs 1 and 3.]	"consistent with the regulatory agency" has been added to the document.
1.4	The list of bullets at the end of Section 1.4 should be incorporated into Table 1-1. Recommend the last bullet, "Review qualifications and experience of consultants" be clarified and expanded or deleted. If review of qualifications is included, the guidance should add a discussion of criteria that would be used to support a credentials review and include review of qualification of regulatory staff and decision makers.	Table 1-1 has been deleted. The bulleted list are principles and the detailed criteria providing judgment within those principles is left to the agency/site owner.
1.4	We recommend that the bulleted list of key principles should include co-located and co-collected multi-media sampling to help target investigations on chemicals of potential concern.	This is already covered in lines of evidence
1.4	The last bulleted item in this section says that "Review of the qualifications and experience of consultants" is a key principle that guides the framework presented in this document. This bullet is confusing, and does not seem to relate to the other bulleted items in the list. Additionally, we did not notice any other mention of this topic anywhere in the guideline, including the appendices. We recommend either explaining what is meant in this bulleted item more clearly, or deleting it from the	Thank you it has been deleted
	Italics at top of page is a repeat from language preceding Table 1-1.	Table deleted
	First sentence after bullet #3: It is unclear to what "this argument" refers. Does this mean, alternative 1?	Unclear
1.5	"Full" lines of evidence may not be applicable for all states as regulatory framework may limit the ability to collect some or all of these lines.	Other lines of evidence may be available depending on the site-specific circumstances. Conversely, regulatory frameworks of individual states may limit the ability to use some or all of these lines. Has been added to the document.
1.5	First bullet, define the term "exterior soil vapor". Terms such as exterior soil vapor, sub slab, foundation, deep, etc., should be clearly defined in beginning of document. It should also be recognized that some states have defined these terms differently.	Qualifying language has been added to the document.
Box	Attenuation from groundwater through the vadose zone differs for each chemical based on chemical-specific properties and partitioning. Is the expectation of equal proportions really true in most cases? Is this supported in literature? If so, should cite. Also, this statement would only be true if no background source of a contaminant was found indoors. We need to be careful not to mislead the reader into thinking some sort of fingerprinting is possible.	Language has been added to the document.
1.5	3rd lines of evidence bullet: Define "background (internal and external) sources."	The section which explains it more fully is cited.
1.5	Recommend adding cross references to the section of text in the guidance where each bullet topic is discussed. The discussion of background should be expanded to include mention of literature based values, site studies and monitoring program data.	The proper references will be included. Further discussion on background levels is rejected due to the variability among state authorities. In section 1.6.1 we have added additional examples of background studies. Steve

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1.5	Define "phased approach" in terms of both investigating the site and identifying and addressing affected buildings.	This point is discussed elsewhere in the document.
1.5	Last paragraph, last sentence. This sentence does not seem to follow the logic of the previous sentences 1) How are acute risks addressed (point to a relevant Section) and 2) Why is indoor air sampling recommended for only those buildings most likely to be impacted when the paragraph just described so many confounding factors to indoor air sampling? Logic follows - why any building?	Thus, indoor air sampling is generally recommended only after identifying the buildings most likely to be impacted to limit the difficult task of evaluating the data and avoiding false positive results. Has been added to the document.
1.5	"Decisions should be made based on what professional judgment deems to be reasonable and logical for the specific site." a comment should be added that the appropriate regulatory agency should also be included in the decision on what is "reasonable"	Language has been added to the document.
1.5	We recommend that the bullet for "Background Sources" be more specific in terms of the data that should be used to assess background. Include outdoor air sampling and use of indoor air literature values (i.e., current studies of indoor air, such as performed for NJDEP, MADEP, NYDOH) as a line of evidence. This is referenced in Section 1.6.1.	See section 1.6.1
1.5	The text refers to "concern of acute risk". Please clarify by adding examples of acute risk such as risk of explosion, immediately dangerous to life and health or other intended meaning. In general the guidance does not adequately discuss how to evaluate acute risks.	This is beyond the scope of this document
	The development of an accurate conceptual model, noted in the third bullet, can also improve the investigational strategy at a site.	Language has been added to the document.
1.6	This section could be broadened to include conditions other than preferential pathways that may be important in the evaluation of the VI pathway. Proposed modifications to the text are noted below:	See below
1.6	Define incremental cancer risk. Michigan defines as "the 95% upper bound on the calculated risk of 1 additional cancer above the background cancer rate per 100,000 individuals continuously exposed to a carcinogen at a given average daily dose for a 70-year lifetime."	A definition is not necessary since it would not add anything to the discussion. The point being made is that background contamination is often at a level that meets or exceeds the risk-based screening levels of many regulatory agencies.
1.6	May be useful to talk about the use of surveys or the need for surveys to homeowners to assist in distinguishing between contamination and indigenous chemicals. Appendix G?	Language has been added to the document.
1.6	Is the title correct? Should it be "background volatile chemical (not vapor) concentrations" or "background air (not vapor) concentrations?" Is this what bullet 3, lines of evidence (p.6) was referring to? If so, the title should be consistent with the language used in the bullet.	Language has been added to the document.
1.6	The document states that several states (including New York) are currently conducting studies of indoor air quality in unaffected homes. The NYSDOH has completed two such studies and the data for the most recent is found on the NYSDOH's website. Additional information about these two studies, as well as for three other studies, is provided in the NYSDOH's guidance for evaluating vapor intrusion. Consideration should be given to referencing these resources in a manner similar to referencing New Jersey's guidance for additional information on the conceptual site model [p.3, Section 1.2].	Language has been added to the document.
1.6	The importance of completing a building questionnaire and product inventory, which includes the identification of potential indoor and outdoor air sources and reading from field equipment, should be discussed.	Language has been added to the document.
1.6	We agree with statement that "It is generally advisable to obtain outdoor ambient air samples when collecting indoor air samples. In this way, outdoor air quality can act as a baseline, to which interior and subsurface sources are additive." This should be more clearly emphasized in Section 3.4 (Step 8: Choosing an Investigative Strategy).	This is potentially conflicting with various regulatory agencies and we feel we do not have the justification to dictate this.
1.6	Please clarify the discussion of biodegradation of chlorinated solvents compared to petroleum hydrocarbons. In general retardation and biodegradation of petroleum constituents is substantially different than chlorinated compounds in the vadose zone. It is not likely that degradation of chlorinated compounds would produce significant degradation products outside of a "source zone." Please revise the discussion for clarity.	The rate of degradation of Petroleum hydrocarbons and Chlorinated compound differ between one another and according to the geochemical conditions. Chlorinated compounds can result in significant degradation products away from the source are depending on the rate of migration, and the geochemical and biochemical conditions. (See ITRC BioDNAPL-1, 2005; ISB -3, 1999; and ISB-6 1998)

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1.6	For less knowledgeable readers, this section may not provide sufficient detail to explain the factors and environments that promote biodegradation versus cases where biodegradation might be insignificant. The text box for "Important Factors" does not provide clear guidance to assist the user to determine whether biodegradation may be significant.	Deleted the text box; this is discussed later in the document
1.6	Utility penetrations are not considered "preferential" when assessing this pathway. Would such penetrations be considered preferential and an "increased component of soil gas flow" for application of the J&E model?	Most buildings have subsurface utility penetrations, so their presence alone is not considered "preferential." For this guidance (consistent with the vapor intrusion pathway in general and the Johnson and Ettinger [J&E] model specifically), some increased component of soil gas flow into the building is usually required to consider the pathway to be preferential. Anthropogenic preferential pathways include building sumps or drainage pits (that can serve as conduits for soil gas to enter buildings) or subsurface utility conduits or drains (that intersect vapor sources or soil gas migration routes and a building foundation). Natural preferential pathways include vertically fractured bedrock where the fractures are interconnected and in direct contact with the building foundation and the vapor contaminant source. Interestingly, the Georgia Environmental Protection Division had a case where rodent tracks or tunnels up to a building foundation allowed vapors to migrate into a basement. - has been added to the document
	"1.6.3 Heterogeneity and Preferential Pathways in the Subsurface. Heterogeneity in subsurface conditions and in contaminant distribution can influence contaminant migration near receptors in ways that are difficult to predict. Heterogeneities in soils or geology can control soil gas or ground water contaminant migration (e.g. presence of a bedrock channel). Location of a site in a ground water recharge or discharge area can significantly affect vertical contaminant distribution in shallow ground water (e.g. diving plumes). Characteristics of the original source of contamination (e.g. dry well vs. UST leak below the water table or large NAPL release vs. relatively dilute wastewater) may also affect contaminant distribution in soil or ground water, which can significantly influence the potential for vapor intrusion.	Noted
	<u>Spatially</u> , the permeability of subsurface materials can be highly variable. Conditions such as, fractured geologic media <u>or a gravel lens or channel</u> , may allow atypical preferential soil gas <u>and/or ground water flow through high permeability pathways</u> . If such a migration route connects a source directly to a building, <u>or allows higher levels of ground water contaminants to migrate under a building</u> , subsurface vapor intrusion may be exacerbated "	Language has been added to the document.
	The second sentence in the third paragraph could include establishing notification requirements for property owners/developers as part of the institutional controls used to address parcels impacted by VI.	Language has been added to the document.
1.6	Consider giving examples of when "institutional controls are not appropriate."	Language has been added to the document.
1.6	Consider adding a discussion about other notification processes (such as notification from a town or village to the agencies of an application to build).	Language has been added to the document.
1.6	The text refers to the "perceived carcinogenicity" of daughter products of PCE and TCE degradation. I suggest replacing this terminology with "increased toxicity". Determination of carcinogenicity of compounds are not based on perception. Vinyl chloride (a daughter product) is a confirmed human carcinogen.	The language has been modified.
1.6	The document refers to an "oxygen shadow" - I suggest elaborating on this term for those not familiar with biodegradation processes.	A Reference has been included
1.6	We suggest providing a clearer framework for evaluating undeveloped property and determining whether institutional controls are appropriate. Controls/Deed restrictions as a proactive approach may not be an option if the land is off-site. This section should be tied into Topic #4 in the Executive Summary (page iv) – are institutional controls feasible for off-site contamination?	Not within the scope of this document.

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Section	Comment	Response
1.6	It would be useful to have more discussion on alternatives for addressing undeveloped property, rather than listing different sampling techniques that may not be feasible or may not provide sufficient data to justify no-further-action. Assessment of a well-characterized groundwater plume, for example, might include groundwater sampling using a conservative modeling approach and active soil gas sampling within the zone of influence to provide weight of evidence that unrestricted future land use is plausible.	See Chapter 3
1.4 Table 1-1	The planning approach presented sounds reasonable if you are approaching a scenario in a state that doesn't have any VI guidelines. However, many states have set criteria on what should be sampled when, what values are considered a risk, etc. Pulling in risk assessors and industrial hygienists may not be warranted in all cases. I can understand why this guidance might be helpful to a Naval facility trying to ensure the appropriate procedures are being followed in all of the states they might have to work with. But, some states have already put together technical advisory committees with toxicologists/industrial hygienists to set their action levels. Would like to see more emphasis placed on consulting the applicable state's criteria to see what their action levels are.	Table deleted
	In addition, you are likely going to be addressing other pathways and exposure routes than just VI and the steps described in here seem to imply you only have a VI problem. In the context of a guidance document being used by technical professionals, this would be more helpful if it were in a broader context: When your site has been identified as having potential health concerns, you need to evaluate all pathways per those state's criteria. I did see a sentence to this fact later in the document, but would like to see more emphasis on this early. If VI is suspected to be occurring, you need to have a good understanding of the state's specific requirements on that issue. Work with a professional familiar with the requirements of that specific state.	Table deleted
1.4 Table 1-1	"Get buy-in from the agency". This sounds like you're trying to sell me something. As a state regulator I would prefer this to say, "Work with the state agency to determine an acceptable approach." "Get buy-in from the agency on sampling techniques and screening criteria to determine necessary detection limits and subsequent analytical choices"? Our state has specified criteria we would expect for sampling, which were created using a Technical Advisory Committee with stakeholders. We would not likely entertain for every VI project that came in negotiations on which action limits and choices to use. Again, this is more appropriate for a large facility trying to work in numerous states than for a guidance for specific site's to use in actually addressing occurrences in that site.	Table deleted
1.6.3	Natural preferential pathways might also include animal tracks, or tunnels. We actually had a vapor issue come up at a soil vapor extraction/air sparging site when rodent tracks up to a building foundation allowed vapors to migrate into a basement.	Language has been added to the document.
1.6.4	Use of institutional controls. Our state now uses environmental covenants under UECA, Uniform Environmental Covenants Act. An environmental covenant is an institutional control, but you may want to allude to the use of some of that new terminology here.	Language has been added to the document.
1.7	Third paragraph, recommend replacing the term "requires extensive education" with the term "merits effective education." The objective should be on effective communication rather than and involved process. In paragraph 4, recommend deletion of the phrase "they have no decision-making authority, but they often prove influential."	Extensive has been replaced with Effective. The phrase in Paragraph 4 is accurate and will remain.
1.7	The sentence, "They (CAGs) have no decision-making authority, but they often prove influential," could be misleading since CAGs can have decision-making authority in some contexts. We recommend deleting this sentence.	The phrase in Paragraph 4 is accurate and will remain.
1.8	Remedies v. Mitigations - these terms have significantly different regulatory implications (definitions are correct) and though they are utilized "interchangeably" through out the document, they should not be, and every attempt made to distinguish a difference between the two.	Noted
1.8	Chapter4 - small typo in the second paragraph.	The language has been modified.
1.8	1.9 Regulatory Considerations/Drivers - this section should be brought more forward and stressed at the beginning of the document in order to address several underlying issues/concerns that are present with this type of a document and the regulatory framework for each state.	Noted

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1.8	The emphasis of the discussion is on taking actions in response to levels of contamination entering the building, with mitigation (remediation) being the action. This section should note that some states also take action based on the potential for future exposure even in the absence of indoor air impacts. Furthermore, the fact that some states may recommend actions other than mitigation (such as resampling or monitoring) should also be noted.	The language has been modified.
1.8	Stay Ahead of the Curve Box: Consider including a brief description of how someone can do this in the box rather than in the text alone.	Language has been added to the document.
1.8	“Remediation” is defined as an action that reduces “the threat in the media.” This language is confusing and incorrectly refers to the “threat” being inherently present in an environmental medium. We recommend changing this definition so it more accurately refers to “an action that reduces the level of contamination in the environmental medium (e.g., groundwater) that is acting as the source of the indoor air vapors.”	Suggested changes have been made
1.9	The first sentence in the second paragraph currently reads, “The agency with oversight responsibility will dictate what regulatory guidance is applicable for a given investigation,” (emphasis added). This implies a dictatorial attitude from the regulators. We recommend editing this text.	Done
1.9	The text states “The agency with oversight responsibility will dictate what regulatory guidance is applicable for a given investigation.” the following paragraph states “Since various states express a wide range of comfort about data types that are acceptable” This discussion implies that applicable guidance is arbitrary. Recommend editing the guidance to provide positive and constructive steps to achieved vapor intrusion investigation in a manner to achieve regulatory objectives.	See comment above
Section 2.0		
2	Recommend changing the title of Chapter 2 to <i>Planning and Preliminary Screening</i> consistent with recommendations for Table 1-1. Content of the chapter should be re-organized consisted with Table 1-1 (revised). Following this approach, defining risk management decisions, identifying specific regulations and communication strategies would be describe before developing a CMS an planning preliminary screening approaches.	Table 1-1 has been deleted. Thank you for the suggestion but no.
2	The first two sentences in this section are about developing conceptual site models (CSMs) and seem better fitted for Section 2.2, Developing a CSM. Regardless of where in the text these sentences end up (either where they are currently or in Section 2.2), it seems to be a disconnect in the phased approach to state that developing a CSM should be the initial step of a vapor intrusion investigation, yet it is not actually listed as Step 1 in the 13 step process presented in this guideline. In order to ensure the readers understand the importance of developing a CSM, we recommend updating the 13 step process presented in this guideline by adding a new Step 1 – Develop a CSM.	Thank you NO
2	The last sentence in this section is confusing. We recommend replacing this sentence, which currently reads: “Given that target concentrations are often close to background levels for many compounds, and possible spatial/temporal variability and sampling bias, the ultimate risk management decisions should often be based upon multiple lines of evidence rather than upon a single line of evidence (Section 1.4),” with the following sentence: “This section also presents a framework that helps ensure risk management decisions are based on multiple lines of evidence rather than a single consideration.”	Thank you NO
2	Since the 3 bullets in this section summarize the basis for the preliminary screening, we suggest preceding them with: “The preliminary screening is based on determining if:”, after deleting “if it is demonstrated that:”.	Sentence will remain
2	In the third bullet, regulatory risk thresholds should be replaced with generic screening levels, since not all generic screening levels are risk based (e.g. TCE concentrations in groundwater capped at the MCL).	change has been made
2	Beginning of 3rd sentence, change “Chapter 2” to “This chapter”.	The language has been modified
2.0	Consider mentioning how the conceptual site model presented and discussed in this section differs from and/or relates to the conceptual model for vapor intrusion (Section 1.2) for those readers unfamiliar with CSMs.	thank you
2.1	Define “target concentrations,” “background levels” and “regulatory risk thresholds.”	The language has been modified

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2.1	Define "sufficiently volatile."	Language has been added to the document.
2.1	Recommend moving the second paragraph (three bullets) to the first paragraph in section 2.1. Revise the first bullet to state "the exposure pathway is incomplete" Discussion of the level of concern for "remaining incomplete" should be in the site specific evaluation report. In the second bullet, recommend adding reference to and providing a list of chemicals in an appendix that are sufficiently toxic and volatile to represent a hazard. In the third bullet, recommend changing "regulatory thresholds" to "generic screening levels" AND adding a range of screening values for each constituent of concern. Reliance on highly conservative assumptions and a "low" screening value virtually guarantees that most sites will require further investigation. This is not consistent with effective screening and provokes needless remedial action.	Moving the bullet is not appropriate. The list of chemicals can be specific to an individual state as this is not a reference manual for lists of contaminants. Regulatory thresholds have been changed to generic screening levels.
2.1	The statement "Given that target concentrations are often close to background levels of many compounds, and possible spatial temporal variability and sampling biases, the ultimate risk management decisions should often be based upon multiple lines of evidence." Recommend the text should be clarified by cross referencing discussions in other sections of the guidance that describe how to address each of these issues. Recommend the word "often" be deleted so that the revised text states "risk management decisions should be made on multiple lines of evidence."	Changes made as suggested
2.2	An additional insert box highlighting potential sources of existing regional information/data could be included in this section. The sources could include: 1) county soil surveys, 2) state or federal water supply or geologic reports/maps, 3) USGS topographic maps, 4) Geographic Information Systems, 5) federal, state and local government or quasi-government agency records and 6) employees and local well drillers, water purveyors, and utility companies (records and personnel interviews).	Language has been added to the document as suggested.
2.2	The main text could clarify that these sources can provide sound general information on: soils; geology; hydrogeology; the relative amount of heterogeneity; ground water quality data; regional ground water flow direction; well records; boring logs; and surficial features suggestive of whether the area is in a ground water recharge or discharge area (e.g. ground cover, surface water bodies). Interviews of those involved in maintenance, installation, or inspection of subsurface utilities or sewer lines may provide information regarding the presence of volatile contaminants near those lines.	Language has been added to the document.
2.2	7th CSM information bullet: The type of foundation should be included in the list. Are these features specific to on-site buildings, off-site buildings or both? Many of the construction features listed will not be known without entering the building, which (primarily in the case of off-site buildings) will occur once the building has been selected for sampling. This does not seem likely to be the situation for the preliminary screening step as described in the section.	The CSM is a dynamic feature that is updated as new information is discovered. Thus, as building inspections occur (at whatever stage of the investigation), the CSM should be updated. The CSM is not simply for the preliminary screening phase.
2.2	We recommend adding text to this section that discusses <i>who</i> should develop the CSM. Vapor intrusion is a complex process to understand, and to develop a comprehensive CSM and vapor intrusion investigation, requires the expertise of geologists, engineers, chemists, risk assessors, and risk communicators.	we are not looking for such a comprehensive CSM and cannot dictate the personnel required.
2.2	The second bullet is confusing. We suggest replacing the text with the following sentence, "Information necessary to determine appropriate laboratory analytical methods including: chemicals of concern and their concentrations in soil and groundwater, the future use of the data, and the regulatory requirements that will be applied to the data."	Thank you the language remains
2.2	The seventh bullet should include the following key construction features: slab, basement, or crawl space.	Thank you the language remains
2.2	The eighth bullet is confusing. We suggest rephrase to include current use as follows: "Use of buildings in current proximity to source and potential future uses for undeveloped lands based on municipal zoning laws."	Thank you the language remains
na	This figure is not referenced in the text. Furthermore, the source (reference = NYSDEC?) of the figure is not noted.	this a team member's figure as modified by the team.
2.3	Should note that not all states follow the preliminary screening process described in the document and that the reader should consult any applicable guidance for additional information.	The document repeatedly refers the reader to the applicable regulatory agency for further guidance on the appropriate procedures.

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2.3	Steps 5 and 6: Are the screening levels referenced in Step 5 the same as the <i>generic</i> screening levels referenced in Step 6?	The language has been modified
	First paragraph, verify the location of the discussion of the DQO process, the current draft places the DQO discussion in Appendix D instead of Appendix B.	Thank you
2.3	Define "source vapor concentrations."	The language has been modified
2.3	In step one of preliminary screening steps, recommend adding or referencing an appropriate discussion of "acute exposure concern" and in step five, identify appropriate sources of screening values such as OSHA ceiling limits or ATSDR maximum recommended exposure levels.	The basis for defining acute exposure can be specific to the agency overseeing the resolution of the problem.
2.3	The section cites "odors and "symptoms" in the context of an emergency. The situations described are more appropriate to HAZMET response. Recommend describing how to achieve prompt evaluation. Also, reference to sub slab depressurization or similar remedial systems in the third paragraph is inappropriate to the context until appropriate evaluation is accomplished. A table of acute screening levels for volatile chemicals should be provided to support evaluation of "acute hazards." It is not appropriate to use chronic e.g., lifetime exposure screening values for acute exposure decisions.	This is detail the team feels beyond the scope of this document and is too state specific to warrant standardization.
2.3	Most of the text in this section is targeted toward actions <i>after</i> the determination is made that an acute exposure concern may exist. We recommend adding text to this section that would help the reader know how to make this assessment. For example, it might be useful to point out in this section that assistance from a site safety officer, risk assessor, and/or an industrial hygienist might be needed to make this determination.	This is detail the team feels beyond the scope of this document and is too state specific to warrant standardization.
2.3	Unless the indicators are qualitative in nature (odors, physiological symptoms, etc.), it is unlikely that a significant decision such as evacuation could be made without interior measurements (sub-slab soil gas and/or indoor air samples). I suggest substituting the words obvious or unambiguous for qualitative in this sentence. Qualitative does not seem to fit.	The language has been modified
2.3	It is not clear by reading the text in Section 2.3.2 that if the available data are insufficient to evaluate this pathway that the investigation should put Steps 3 thru 7 "on hold" and proceed immediately to "Step 8" and the Site Investigation Phase. Since this is the path that is clearly outlined in Figure 2-3, the text should be updated to more clearly explain this to the reader.	Text was modified
2.3	The fourth sentence in the first paragraph reads, "In situations where source vapor concentrations pose no risk via the VI pathway, no further action is required." This sentence is inconsistent with the rest of the section, and suggests a level of evaluation has been performed already, although assessment of risk is not mentioned until later in the process. Since this conclusion would not be reached until later steps in the phased approach presented in this document, we recommend deleting this sentence.	Text has been modified for consistency and sentence has been deleted
2.3	This section does not include information that would help the reader understand where they could look for the available information. Please see related Specific Comment #20 below, as we recommend moving the first paragraph from Section 2.3.3 to this section.	Changes have been made
2.3.2	The text states "determine whether adequate investigation has been conducted to identify all contaminants of concern and at their highest concentrations likely to be present (worst case pathway or receptor) at the site." The objective of risk assessment is reasonable, relevant, and representative assessment of risk. "Worst case" is not an appropriate objective beyond preliminary screening. Recommend relocating Step 2 to follow Step 5 because other information must be evaluated before determining if further investigation is warranted and to identify what are the specific criteria that merit additional investigation.	Narrative has been clarified and the sequence remains
2.3	In the box: Michigan defines volatiles in the same way as USEPA (2002). The volatilization to indoor air pathway is relevant for any hazardous substance with a Henry's Law Constant > or = 0.00001 atm-m ³ /mol. Correct the units in the document, remove the (-) from m ³ .	The language has been modified
2.3	Define "sufficient volatility" and "sufficient toxicity." Also, note in the text that states/agencies may define these terms differently (as noted in the side box for the definitions of volatile chemical). Therefore, applicable guidance should be consulted for additional information.	The document repeatedly refers the reader to the applicable regulatory agency for further guidance on the appropriate procedures.

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2.3	The text appropriately notes that some VOCs can degrade into other toxic compounds using trichloroethylene degradation to vinyl chloride as an example. However, the text should be clarified to indicate that secondary VOCs are not likely to be risk drivers unless identified in source area samples of soil or groundwater.	See section 1.9
2.3	Step 4: Are Buildings Located in Close Proximity to Volatile Chemicals in Soil , Soil Vapor or Groundwater?" Recommend replacing "Soil Vapor " with "Soil Gas" to be clear and consistent with other parts of the text. Recommend additional discussion about how to determine lateral influence and describe differences between petroleum vapor and chlorinated solvent vapor sources. Please clarify whether "vapor" in the statement "Concentration data may be available for vapor, soil gas, or groundwater." refers to contaminants in soil samples or indoor air samples.	Text replacement made. General language added regarding the potential lateral influence and petroleum vs. Solvents.
2.3	The first paragraph of this section actually relates better in Step 2, when reviewing the available data. We recommend moving this entire paragraph to the previous section on Step 2.	Section has been rewritten
2.3	We recommend that this is another section of the document where it might be useful to point out that risk assessors should be consulted to help make the determination about the volatility and toxicity of the COCs.	Language added.
2.3	Including some additional guidance in this section may be useful, such as: "Answering the Step 4 question requires a judgment call based on confidence in the accuracy of the data and the CSM versus the potential risk to the receptors. Investigators should consider the likely level of heterogeneity and whether the applicable distance criteria is conservative, or not, given the site-specific conditions."	Language has been added to the document.
2.3	The last two paragraphs of this section and Section 2.0 of Appendix I reference the possible use of OSHA standards in the evaluation of a site and the need to check with the applicable regulatory agency for guidance on this issue. Future changes in the use of a site need to be considered and addressed when applying OSHA standards	Language has been added to the document.
2.3.7	Does an exceedance of the generic screening level warrant further investigation?" I suggest substituting remediation or mitigation for investigation. The figure will need revised as well. I can't think of any situation, and none is discussed in the text, where an exceedance of the screening level would not require further investigation.	Language has been added to the document.
2.3	Paragraph 3: The difference between "vapor" and "soil gas" should be explained.	The language has been modified
2.3	Paragraph 3 states "each will be discussed separately." Adding a reference to the appropriate section of the document would be helpful here.	Language has been added to the document.
2.3	The need for structure sampling may extend beyond prescribed distance criteria. Therefore, note that while a prescribed distance may assist in focusing initial structure sampling efforts, structure data (along with other environmental data) will ultimately guide the course of the sampling. [Also applies to p.12, Appendix C, Preferential Pathways.]	Language has been added to the document.
2.3	The second to last sentence in the second full paragraph on this page reads, "Concentration data may be available for vapor, soil gas, or groundwater." It is not clear why vapor and soil gas are listed separately here. If 'vapor' was intended to mean 'indoor air', this should be specified.	Language has been clarified
2.3	Recommend adding discussion about how to locate or develop appropriate screening levels. The discussion of risk to general public in public buildings could be strengthened by describing short or consequential exposure compared to people working or living the building. The discussion about evaluating occupation setting under OSHA or a risk-based screening approach should be clarified by recommending a rationale to determine the appropriate approach.	This document cannot include the complex process of developing a universally accepted screening levels. State may vary on this methodology and subject. Additional language has been added to explain risk to the general public. Also see Appendix H
2.3	This section does not provide the reader with any guidance about identifying screening levels. We recommend moving the first two paragraphs from Section 2.3.6 and presenting that information in section 2.3.5 after the first paragraph since it is more relevant here.	changes have been made
2.3	We recommend that this is another section of the document where it might be useful to point out that risk assessors should be consulted to help make the determination about occupant exposure and identifying screening levels.	changes have been made

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Section	Comment	Response
2.3	In the first paragraph, second sentence, we recommend replacing the phrase “ultimate risk decisions” with “selection of generic screening levels” so that the sentence reads, “For sites that have measurable sources of volatile chemicals and a viable migration route to the building, the selection of generic screening levels may depend on the use of the buildings under current conditions.”	changes have been made
2.3	Define “risk based screening approach.”	The language has been modified
2.3	Explain the difference between generic screening levels and screening levels.	Language has been added to the document. Also see appendix H
2.3	Paragraph 2: References to “remediation levels” do appear to be applicable to the discussion on generic screening levels.	Definitions of these terms are included
2.3	Paragraph 3: The last sentence about modeling seems misplaced. The goal of modeling should be identified.	Language has been added to the document.
2.3	The second full paragraph on this page currently reads, “It is important to note that exposure to the “general public” in public buildings is usually not the most significant risk driver if there are any full-time workers in the building.” We recommend expanding on this concept so that the reader understands the distinction between the “general public” and “full-time workers” and why this distinction is important.	We believe the distinction is documented and the use of OSHA vs. Risk based values vary state to state
2.3	The third full paragraph on this page mentions the EPA’s consideration of OSHA standards. We recommend that this section be updated to include information that will help the reader understand/define an occupational setting versus a commercial setting and what information is needed to make this determination.	We believe the distinction is documented and the use of OSHA vs. Risk based values vary state to state
2.3.6	Note as previously recommended, Step 2 should follow Step 5.	See previous comment
2.3	Note that mitigation may be selected at any point in the process, not just when “there is enough information to confirm VI at a concentration that adversely impacts human health” or after extensive investigation.	Language has been added to the document.
2.3	Following evaluation of site data and comparison to appropriate screening values, a decision following Step 7” to accomplish further site investigation or mitigation is not appropriate unless site characterization is clearly inadequate or exposure levels are clearly much above screening values. Recommend comparing the levels of exposure to a range of risk based values to address uncertainty about potential exposure. Less than perfect data may be sufficient to support appropriate decision about risk to public health.	Generally our text is true. Exceptions can be made, however, the data has to support it. i.e. statement like “clearly inadequate” and “clearly much above screening values” require reliable data/information.
2.4	Add a discussion or reference to a discussion of criteria to evaluate the sufficiency of data, particularly soil vapor data, in order to support a basis for the decision in this step.	Sufficient data and Quality data are going to be determined for the site by the investigator and the oversight agency.
Flowchart	Rapid Action - this should be footnoted to indicate that states may have different accepted procedures at this point. If soil gas is identified with significant concentrations, indoor air sampling may not be appropriate for some states (i.e. Michigan). Of course this depends on several factors.	Section 2.3.1 discusses the variability in actions that state and federal agencies may take and the importance of checking with regulators.
Figure 2-3	Please verify the figure number and revise consistent with changes to the number and sequence of steps in earlier recommendations. Also recommend adding a no action option following the Step 7 “diamond”. Small exceedance of generic screening levels should not automatically drive additional investigation or mitigation when technically supportable based on site information.	Figure # has been corrected
Figure 2-3	Step 4 seems to oversimplify the exit criteria needed for future use. Exiting the process for undeveloped land would require site-specific evaluation of land use restrictions and institutional controls. It may be sufficient to expand on the text in Step 4 (Section 2.3.4, page 17).	Language has been added at the end of Step 4.
2	Section heading accidentally labeled Section 1.0	The language has been modified
2.3	Note that investigation or mitigation may be delayed for undeveloped parcels.	Agreed
2.3	Step 6: Are these generic screening levels or screening levels?	The language has been modified
	Section 3.0	
General Comments	Most of the discussion is in general terms as to what should be considered, however, there is not much guidance as to actual decision criteria or performance standards (e.g. determining / suggesting specific action levels for a PID/total VOC assessment). What are the range of risk values for different use categories across the states and as compared to US EPA guidelines. Should discuss “quantified” vs. “qualified” decision criteria.	This is too variable to attempt and providing a range only presents uncertainty of the process to establish them. Confer with each state agency as appropriate to your state

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3.1	The first statement in this section comes across in a negative sense. It would be better to rephrase so that it doesn't sound like you are trying to dismiss investigating Vapor Intrusion by screening, but rather indicate that you are screening to determine those situation with potentially complete VI pathways.	language has been modified.
3.1	The first paragraph on page 23 references an "initial exterior assessment". This term is not defined and the associated paragraph is unclear as to whether this assessment includes near-slab or only exterior soil gas samples.	reworded
3.1	Please add discussion to describe how to establish an "acceptable" level of uncertainty as part of the DQO process.	This is specific to the regulatory agency and problem holder.
3.2	The guidance indicates that a companion document entitled the ITRC Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios has been developed. The availability of this document should be clarified in the final guidance or on the web site.	scenario document done
3.1	Note that not all states make decisions based on indoor air concentrations (either actual or predicted) alone, as is emphasized in the table. For example, sub-slab vapor results may be used both to assist in the data evaluation process (as part of a multiple-lines-of-evidence approach) and to identify the need to take actions to address the potential for future exposures (even in the absence of indoor air impacts).	added sentence to paragraph that introduces the table and addresses this comment.
3.1	Outdoor air is often sampled concurrently with indoor air to assist in the data evaluation process.	discussed later in the chapter and included in appendix D.
3.1	The use of soil gas results as a tool to guide structure sampling (as discussed in paragraph 4) may not be dependent on the results modeling or on the application of conservative attenuation factors. Consider adding "For example, if conservative..." at the beginning of sentence 4 to make the discussion applicable to the approach of other states.	Incorporated into document - good comment
Table 3.1	Different formatting was used for the title of Table 1-1 (dash not period). It would be helpful to define soil vapor as occurring at a specified depth outside the footprint of a building.	Done and consistent use of the terms has been reviewed.
Table 3.1	Recommend using consistent terminology e.g., soil gas instead of soil vapor and adding a list of advantages in addition to "Principal Issues". The level of conservatism may compromise the usefulness of the process. In the following two paragraphs, recommend adding discussion of screening in view of a "risk range" (consistent with OMB risk assessment guidance) to buffer negative effects of overly conservative exposure assumptions.	See above
table 3-1	We recommend adding soil, outdoor air, and crawlspace to this table since they are discussed later in this section. In addition, we recommend changing "vapor" in this table to "soil gas" in order to present consistent terminology in the entire document.	no
3.4	We agree that the approach will be based on site-specific factors. However, we suggest reiterating up front that the process is phased and iterative, and that because of the difficulties associated with background air contamination, indoor air is generally the last step of the VI pathway investigation. We would also emphasize that co-located, co-collected multi-media sampling provides important weight of evidence including focusing the investigation on chemicals of potential concern that are related to the source.	Indoor air is not the last step in the process.
3.4	The second paragraph of this section incorrectly refers to Section 3.5.9 of the document for a discussion about delineation of the nature and extent. This should refer to Section 3.5.10.	Done
3.4	Soil gas data do allow for real-time results. Real-time results (i.e., picture in time) do not lend themselves to evaluation of future land use, particularly at sites of redevelopment. Michigan has developed draft guidance document on methods and requirements for soil gas and indoor air sampling (Op Memo #4, Attachment #4, Soil Gas and Indoor Air, Peer Review Draft, 2006). Michigan uses groundwater and soil data to determine whether the vapor intrusion pathway is relevant at a site and to determine compliance with promulgated criteria (final remedy/closure). At this time, compliance with soil gas screening levels may be used to assist in selecting remediation options but may not be used as a demonstration of closure. How are other States/Agencies making "walk away" determinations protective of future land usage based on soil gas evaluation?	Soil gas data are more reliable than soil matrix data and are not usually affected by temporal variability. Many states will not use these data to walk away from a site and sample the buildings once they are constructed.

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3.4	Sentence: "Risk based screening levels for soil gas are also higher than indoor air screening levels, so there is less chance of false positives due to sampling and analytical constraints." There is less chance of a detection limit exceeding the screening level. You would still be detecting the chemical at the same concentration regardless of whether it's a soil gas or indoor air sample, for example. I don't understand the "chance of false positives", unless it specifically means a lesser chance of a detection limit exceeding the screening level. I would prefer it just say that. The "false positives" leads me to believe there's something flawed in the methodology for indoor air sampling. The detection limits would be the same, the analytical the same. It's confusing using terminology (false positive) that typically indicates detection and combining with criteria exceedances.	Changed the text. Analytical methods are not the same for all air samples. Samples can be analyzed by TO-14, TO-15 and TO-15 SIM. The method detection for each of these methods is different for various chemicals. The detection limits will vary depending on concentration of VOCs in the sample, also.
box	It is not clear how this text box relates to both this section and the 13 step investigative process. We recommend either including text in the guidance that describes what is meant by building triage, or deleting this text box from the document.	The box has been deleted
3.4	This section states that, "Soil gas data are recommended over other data, such as soil matrix and groundwater data, because soil gas data represent a direct measurement of the contaminant that can potentially migrate into indoor air." We recommend balancing this statement or at least softening the advocacy that soil gas samples are always preferable over soil and groundwater. There are certain states, such as New York, that do not interpret exterior soil gas results as definitive evidence that the vapor intrusion pathway does not need to be evaluated any further. The sentence above could give the reader a false sense of security in how their soil gas samples can be used and interpreted by state agencies.	text modified
	The meaning of the text in the insert box entitled "Building Triage" should be clarified. The following language is suggested in the second paragraph of the soil gas subsection:	moved the building triage box to later in the chapter
3.4	"At some sites these drawbacks could potentially be balanced by obtaining vertical profiles, a high number and density of soil gas samples, and ongoing soil gas monitoring over a sufficient time span to evaluate the effects of events likely to cause temporal variations. Significant heterogeneity in soils and geology would most likely reduce the acceptability of such an approach to regulators."	Vertical profiling soil gas in the applicable depth is not practical in the investigation
3.4	The following could be added to the first paragraph:	
	"The conceptual site model (CSM) as discussed in Section 2.2 should be considered in the preparation of the vapor intrusion investigative work plan. In addition, any deficiencies in the CSM should be identified as data gaps and incorporated in the work plan. For example, consider whether any geophysical investigative techniques are feasible and if they would be useful to evaluate site lithology and stratigraphic features prior to additional invasive investigations."	Added the proposed language
3.4	The third paragraph of this section states, "However, if sub-slab soil gas concentration are more than about 1,000 -10,000 times the target indoor air levels, the probability of unacceptable vapor intrusion is likely sufficient to warrant proactive mitigation. Conversely, if the concentrations in the sub-slab soil gas are not higher than the regulatory soil gas screening levels (if available), there may be no further need for assessment." This text gives the impression that even with high sub-slab soil gas concentrations that the investigator may "walk-away" from the site if the indoor air concentrations are below screening levels. This may be true, but a long-term monitoring program may be required to ensure that vapor intrusion at these locations doesn't change over time (e.g., due to construction/re-modeling or introduction of new cracks in the foundation), which might result in indoor air concentrations that are greater than screening levels. We recommend expanding on this statement to include these types of considerations.	Text will remain
3.4	We recommend adding a sentence to this section about the importance of communicating with residents/occupants of a building prior to performing the indoor air sampling about actions that will be required on their part before and during the indoor air sampling (e.g., refrain from smoking and using certain consumer products, etc.). This is a vital step and if not done, could make the indoor air analytical results difficult to interpret or even unusable for the assessment.	text modified

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3.4	We also recommend adding text in this section that discusses the importance of the background assessment when sampling indoor air. In addition to the building evaluation that is briefly mentioned, this should mention coincidental outdoor air sampling (refer to section on ambient air).	Already discussed
3.4.2	Recommend adding a discussion about the importance of establishing background levels and methods and sources for indoor air background concentrations of constituents of concern. Also recommend using a range of background and screening levels to evaluate indoor air concentrations when indoor air sampling is accomplished.	see previous comment and is beyond the intent of this document.
3.4	This section includes the first mention of the attenuation factor, alpha. Readers that are not very familiar with this term may be confused. We recommend including a definition of the attenuation factor in this section, either in the text or as a footnote. Alternatively, these terms could be included in the glossary (currently only 'attenuation' is listed) and the entire document could identify all words included in the glossary by using boldface text.	Alpha factor is discussed elsewhere
3.4	Building Triage Side Box: This appears to be misplaced. It would be more appropriate on p.36, Section 3.5.10.	good comment - moved the side box
3.4	Soil Gas: Consider adding "exterior" before "soil gas" in the first sentence to distinguish from sub-slab vapor.	this section falls under the exterior measurement section, so it is implied.
3.4	Soil Gas: Consider adding "debate over how many samples to collect" to the list of drawbacks.	added a comment regarding number of samples to collect to paragraph.
3.4	Soil Gas: Consider defining or the describing the difference between active and passive soil gas sampling in this section as well as in Appendix D.	Don't want to get into this much detail this early in the document
3.4	Soil Gas: Consider including a side box providing examples of how soil gas data may or may not correlate to adjacent sub-slab vapor data.	This is included in the Tool Box Appendix
3.4	Indoor Air: The document, both in this section and elsewhere, is very negative when discussing indoor air sampling. The benefits of indoor air sampling should also be discussed (e.g., making decisions based on real information rather than predicted or assumed, meeting the community's needs, etc.). In our experience, most people want to have their indoor tested and are willing to put up with the "intrusive" aspects of this approach. More people are hesitant about having a hole drilled in their floor (especially in finished basements) to collect sub-slab vapor samples.	text was revised, several sentences were added.
3.4	Crawlspace: Not all states would agree that a crawlspace could be sampled "as a substitute for both sub-slab soil gas and indoor air sampling." Recommendations to obtain representative samples from each part of a building with a different type of foundation are more likely.	deleted first sentence -
3.4	Interior Measurements - another category should be made here. Soil-gas sampling beneath the slab (greater than immediately below the slab) as there may be great utility to these types of samples being collected are being considered by Michigan as part of a "line of evidence". This may allow for someone to get to a more stable analytical result that is uninfluenced by source location, foundation designs, or other issues (as identified by modeling scenarios by others).	added text to soil gas section regarding collecting soil gas from below the building.
3.4	"Air within a crawlspace can be sampled as a substitute for both sub-slab soil gas and indoor air sampling" - this is not true for all states. Michigan would not accept it as a full and only substitute. It could be utilized (in limited circumstances) as an additional "line" of evidence, but it's results alone, would not eliminate the need for mitigation.	deleted first sentence -
3.4	This section implies that conservative sub slab attenuation factors for screening purposes are 0.001 to 0.0001. However, empirical studies by USEPA indicate that conservative sub slab attenuation factors are 0.1 - 0.01.	It is not implied that screening use these attenuation factors. The statement if concentrations are 1000-10,000 times higher than the IA value, then proactive mitigation may be warranted. We did add a qualifier to the text to help with this.
3.4	It should be noted that, in addition to benzene, TCE and PCE outdoor air concentrations may exceed allowable indoor air risk based levels.	added
3.4.2	Indoor air section should include a discussion of the literature which indicates 1,1 - DCE can be found in ambient air and products.	it is not commonly found
3.4.2	Crawlspace – include discussion relative to the uncertainty of ambient air contribution.	added comment to crawlspace section
3.4.2	The text does not describe or reference what basic meteorological data should be collected.	included in Appendix D

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3.4	Ambient Air - considerations should also be made for the collection of samples at multiple elevations. For instance, multi-story building, next-door to a factory or drycleaners with vents on the roof. . . May not be impacted at ground surface but, in locations directly across from the structure.	No change
3.4	More information would be helpful on ambient air sampling (or if found somewhere else in the document, it should be noted here). What do you compare ambient air sample data to? How many perimeter monitoring points are necessary? Are summa canisters preferred? If so, how do you account for peak concentrations that would be expected with changes in temperature, pressures, wind speed and direction? Why not use a PID, FID, or OVA? We're just beginning to tackle this issue at sites in Michigan, and clear guidance is needed.	thank you no.
3.4	Crawlspace: Consider deleting the last sentence since a discussion of specific attenuation factors in this section and not in others is inconsistent.	deleted reference to attenuation factors. Not needed in the paragraph
3.4	Ambient: Explain why it is important to characterize outdoor air conditions at the time of sampling (e.g., because of the exchange of indoor and outdoor air within a building).	modified the text slightly to incorporate this idea.
3.4	Ambient: Provide the basis or reference(s) for the statement that benzene and TCE can often exceed indoor risk based screening levels (especially for TCE).	pervasive and volatility
3.5	This text seems similar, but not exactly consistent with, the CSM components discussed in Section 2.2. We recommend making one comprehensive list of the CSM components and referring back to it throughout the document, as needed.	Thank you NO
3.5	The first sentence in the second paragraph in this section incorrectly refers to Step 9. This should refer to Step 8.	Step 9 is the correct reference
3.5	The last sentence in the second paragraph does not capture the key data gaps associated with interior measurements, which include an assessment of background sources and the data and information needed to make this assessment. We recommend editing this text to include these additional considerations.	Language has been modified
3.5.2	The conclusion that interior measurement may require less specific site information and data is incorrect. The complications with interpreting indoor air levels requires specific information about indoor background levels and other site specific data related to soil gas distribution and sub slab or sub floor concentrations. Recommend editing the text to add discussions of other key data requirements.	correct as written
3.5	We recommend including a reference to the Indoor Air Building Survey and Sampling Form in Appendix H as an important component of the background assessment.	A reference to Appendix G has been added
3.5	In the last full paragraph, please clarify the basis for stating products should not be used inside the building at least 24-48 hours before and during the indoor sampling. For example cite a study or other supporting basis supporting the time needed to clear home-use product vapors.	Language has been added to clarify that this is based on professional judgment as a rule of thumb.
3.5.5	Sampling and Analysis Plan. The text does not discuss the number of samples required or the decision process that will be followed to evaluate data collected. Recommend describing how to determine the number of samples needed and also describe how decisions will be made using the data collected.	Beyond the scope of this document
3.5	We recommend adding text to this section that emphasizes that sampling should be coordinated to allow co-located and co-collected multi-media samples, as necessary.	There is no reason not to consider this but does not need to be included in this section
3.5	To provide a more apt description, the second sentence of this section could be worded: "Surficial recharge that occurs along the predominantly horizontal flow path of a groundwater plume will tend to establish a downward vertical hydraulic gradient and cause the affected groundwater plume to also migrate downward in proportion to the amount of recharge and in relation to total flow in the hydraulic unit."	Included
3.5	In the third sentence, "diving" instead of "sinking" plume is suggested. This is consistent with common EPA and NJDEP terminology. The sentence could be reworked as follows. "This has been referred to as a "diving plume". While a diving plume is most apparent in situations where a groundwater plume has migrated over a significant lateral distance, in some situations plumes may start to dive relatively close to their source area."	included

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3.5	The last sentence of the first paragraph is misleading because diving plumes can also occur in relatively arid regions. EPA's James Weaver and John Wilson state (in "Diving Plumes and Vertical Migration at Petroleum Hydrocarbon Release Sites" at http://www.epa.gov/nerl/mtbe/plume_diving.pdf): "... even in dry climates, recharge-driven diving can occur because of irrigation, leaking water or sewer pipes, or recharge from ephemeral surface water features." Also, an EPA web page entitled "Plume Diving Result" (http://www.epa.gov/athens/learn2model/part-two/onsite/i21_onsite.htm) includes the warning "Don't be fooled by a low annual precipitation value,..."	Added a qualifier regarding arid climates.
3.5	The use of "sinking plumes" and "floaters" in the sentence above may help perpetuate a common misconception concerning dense non-aqueous phase liquids (DNAPL) versus the density of dissolved-phase ground water contamination. It is well known that the density of DNAPL will cause it to sink in the saturated zone, but it is often not understood that the density of groundwater contaminated by DNAPL usually has a minor to non-existent effect on the movement of dissolved contaminants and on over all plume movement [see Schwille(1988) Dense Chlorinated Solvents in Porous and Fractured Media, pages 100-103]. The wording of the sentence should not give credence to that misconception.	Language has been adjusted
3.5	As done in other parts of the document, a reference could be included in this section to the discussions of the diving plume, clean water lens, and water table elevation fluctuation in the NJDEP Vapor Intrusion Guidance (VIG) document, Chapters 2 and 6.	added reference
3.5	The wording in the second sentence should clarify that purging and sampling from such wells can result in either overestimating or underestimating the VI risk. The USGS User's Guide for PDB samplers, Part I, page 11, includes information on this issue.	modified the text slightly to incorporate this idea.
3.5	The last sentence states the "Dilution of dissolved constituents by mixing with unaffected groundwater recharge is also commonly observed in unconfined aquifers." The diving plume phenomena and the common detection of large vertical changes in ground water contaminant concentrations within short vertical intervals (within 10 feet and less) are both evidence that <i>in-situ</i> dilution of dissolved constituents by mixing with clean recharge is not a dominant mechanism influencing contaminant distribution. This statement should be backed-up by references if it is to be retained in the document. What appears to be dilution of dissolved constituents by mixing with clean recharge is more likely the result of vertical fluctuation in the water table elevation and the phase-transfer of volatile contaminants between vapor and dissolved phases. This complex phenomena is discussed in Section 2.4.4 of the NJDEP VIG which includes references for more detailed information.	deleted last two sentences, didn't hurt the paragraph and no additional qualifiers are needed.
3.5	Suggest elaborating on the significance of recharge leading to a "clean groundwater lens" at the water table. I also question the rate of recharge that would be required to create a significant "clean" lens and whether this is a common occurrence or noteworthy in the context of this document.	No change
3.5	A key component of the work plan is clearly stating the objectives of specific proposed actions (e.g., soil gas samples will be collected in Areas A, B and C to help prioritize structure sampling, if necessary). [Also applies to p.46, Figure "3-3," Step 9.]	Added sentence to 3.5.5 Sampling and Analysis Plan that encompasses this concept.
3.5	Some states recommend, at a minimum, starting at the source and moving outward. As discussed elsewhere in the document, soil gas data may also be used to guide the initial structure sampling.	Appendix D
3.5	Both in this section and elsewhere in the document, statements include words such as "must" (e.g., the investigator <i>must work</i> with the community outreach coordinator...). Consider revising to indicate these are recommendations, in keeping with the guidance nature of the document.	changed the must to "should"
3.5	Third paragraph, used the phrase "it may be appropriate" in first two sentences. Last sentence, this concept should be elaborated on. The fact that there may be buildings in areas of lesser contamination that are more at risk based on structure, utilities, sumps, home size, etc., is extremely important for any investigator to understand. This is key in identifying the "worst case scenario". More discussion on things to consider would be useful.	Text box adjusted.
3.5	Background: Really liked these two sentences.	Thanks

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3.5	The text states that "background sources" should be removed prior to indoor air sampling. Question - Shouldn't background ambient concentrations be included in the overall health risk along w/ vapor intrusion? They need to be considered b/c they collectively contribute to the actual health risk. Also, what would you do if the background sources could not be removed?	This comment really weighs too much on policy. Whether a state chooses to deduct background or include it as part of the overall risk evaluation is left to the states.
3.5	Some states rely on field measurements, product inventories and building questionnaires, not just product removals, when doing indoor air sampling. They also evaluate sub-slab vapor conditions as part of a multiple-lines-of-evidence approach. This should be reflected in the discussion.	added a sentence that included a comment regarding sub-slab to aid with background determinations.
3.5	Provide the basis/reference for the statement that TCE is a commonly emitted solvent.	generalized the comment, no need for reference.
3.5	The text states that, "In practice, many groundwater wells are screened across relatively large portions of the aquifer." This is incorrect. The vast majority of monitoring wells are installed with a screen length of 10 feet or less. Situations where a longer screen is necessary are generally limited to instances where the investigator is trying to intercept the groundwater table in a setting where significant water level fluctuations occur.	Text has been modified
3.5.7	Community outreach should also include local public officials, such as mayors, city council members, and county supervisors. Additionally, parents can be notified through information sent home with school children.	We assumed that "Community" meant all of these individuals. Each state will deal with community outreach in their own specific ways.
3.7	The document states that data may be used in a predictive model to determine whether indoor air samples should be collected or mitigation measures implemented. The use of modeling in this capacity may not be acceptable to the regulatory agency and/or appropriate at all sites. The document should reinforce that the use of models in a VI evaluation will need to be approved by the regulatory agency.	added sentence to the end of the paragraph, restating working with the regulatory agency.
3.5	One important aspect of community outreach that should be included in the discussion is the transmittal of results, both to the homeowners/tenants who had sampling done and to the general public.	added
3.5	Another question that homeowners/tenants frequently ask is how long and how will I get my results?	added
3.5	Paragraph 3: Consider including the following topics: sampling personnel should be polite and considerate of the assistance that the homeowner/tenant is providing; landlord-tenant situations may present unique circumstances (e.g., access, reporting of results, etc.); and timeframes (both known and unknown) should be discussed with the homeowner/tenant.	Good point, however, I feel that this is assumed when doing these types of activities. Added a sentence at the end of the paragraph
3.5	The discussion focuses on the occurrence of vapor intrusion. To be more reflective of multiple states, the discussion should be more general. For example, emphasize the identification of vapor intrusion concerns, not just impacts, to account for states that look at not only current exposures related to vapor intrusion but also the potential for future exposures.	Future use covered in section 3.5.1. The primary intent of the document is investigating vapor intrusion. Future use is a regulatory agency decision. It is impossible to write a document that covers all the variations in state guidance and policy and keeping the text general make the suggestions and recommendations useless.
3.5	The first paragraph on this page begins with the sentence, "When vapor intrusion impacts are discovered, there is usually significant pressure from the community and other stakeholders to test and mitigate...as quickly as possible." This sentence and the next couple present topics that are more related to risk communication and community involvement, rather than delineating the nature and extent of contamination. Although balancing the desires of the community with the investigative strategy is an important consideration, it seems inappropriate to discuss this in the 'nature and extent' section of the guideline. We recommend that this information be presented in a different section of the document (e.g., Section 1.7).	it is Appropriate to be repeated in this section
3.5.	In the first paragraph, response to community pressure should be addressed in the DQO process and included as part of the identification of key risk management decisions in earlier steps. The plan for making those decisions should be followed and communicated as needed. The discussion of spatial patterns suggests a potential need for an additional step or sub step. The approach is to first characterize the spatial distribution of VOCs in soil gas in order to determine where sufficient exposure merits intervention. Second, the discussion of building type suggests that evaluation of buildings subject to a particular contaminant level in soil gas should be semi-independent and deliberate based on building attributes. Recommend evaluation of such an approach to leverage information collected as the investigation progresses. The last paragraph speaks to knowledge gained during investigation. The guidance would be more useful if "how-to" suggestions are added.	uncertain

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text box	The text here relates to building design, not spatial patterns. We recommend either changing the name of the text box or replacing the text.	The text box has been deleted
3.6	Consider mentioning that sampling personnel should be polite and considerate of the assistance that the homeowner/tenant is providing.	added
3.6	Section 3 provides a good overview of the various methodologies for collecting interior and exterior samples. However, without a holistic approach, it may be difficult for the reader to establish when additional data is necessary to support a weight of evidence approach, when mitigation is appropriate, or when they can exit the VI evaluation (i.e., no further action). Section 3.7.1 (Comparison with Generic Screening Levels) states "further assessment is not required" if detected concentrations are less than generic screening levels. However, no clear exit strategy is provided for predictive modeling (Section 3.7.2) or for evaluating indoor air (Section 3.7.3). We agree that these decision-making tools require professional judgment and weight of evidence but this should be made clearer to the target audience with the emphasis that a successful exit strategy is more likely if a site-specific plan is developed and consensus reached with decision makers prior to implementing the investigation.	language has been added to the section
3.7	Some states look at addressing current and potential exposures, not just current health risks when evaluating the data. They also may not look at indoor air concentrations alone when determining the need for action. Actions may be recommended to address either current or potential exposures, not just documented vapor intrusion situations. Furthermore, actions may include no further action, resampling, monitoring, mitigation or other actions, not just mitigation or no further action. These points should be included in the document to be more inclusive of the approaches that may be encountered.	This guideline focuses on Vapor intrusion no necessarily site remediation
3.7	Screening levels address individual COC levels of concern but are not based on any cumulative impact basis. Include detailed discussion relative to the assessment of cumulative impacts and how ambient air quality should be addressed.	This comment is policy. Whether a state looks at cumulative effects or not is left to the states.
3.7	The second paragraph of this section discusses the scenario of mitigating a source based on exceedance of a generic screening level as a proactive measure. However, it does not appear that this step is shown in the process flowchart on Page 21.	added questionable text to a text box. Should not be needed in the flowchart on page 21.
3.7.1	We have seen the vapor plumes separate away from the soil and groundwater plumes. So, always using the screening values for soil and groundwater samples as a determination on if additional vapor work is necessary may not be reliable. I wasn't entirely clear which generic screening levels you were referring to. Soil, groundwater, vapor? State RBCA levels or work plan SSTLs? Field screening or analytical values. This area could be clearer.	modifier added
3.7.1	Note "that choosing to mitigate based on an exceedance of generic screening levels is acceptable as a proactive, protective measure" is not generally acceptable. Recommend deleting this statement. At federal sites, justification to commit federal funds requires technically supportable basis.	It is not uncommon that the decision to mitigate is cost effective at this point.
3.7.2	Information should be included on how to perform a sensitivity analysis on the J/E model.	I inserted a comment for Section 3.4.2.
3.7.2	Provide a list of other models that can be used to evaluate vapor intrusion, along with a summary of their strengths and weaknesses.	there is nothing else
3.7.2	Fourth bullet from top: The current USEPA J/E spreadsheets cannot address a building with a crawl space.	added comment and removed reference to crawlspace
3.7	Where can the various types of models (J&E, one-dimensional analytical models) be found?	See Section 3.7.2
	The document discusses the use of predictive modeling that includes site-specific data and conditions. The guidance should also discuss the need to consider verification of the representativeness of the model and how to address possible future changes in site conditions that could affect vapor intrusion related risks.	did not address - The discussion on sensitivity analysis addresses this request see section 3.7.2 2nd paragraph.
3.7	The section states that the use of models should be approved by the regulatory agency. Is this a recommendation to the reader to speak with the regulatory agencies about the use of modeling at a site before using the model? Or is it a recommendation to the regulatory authorities to approve of the use of modeling at sites?	The intent was for individuals check with the regulatory agency to see if models can be employed first and then work with the agency to determine the model(s) to be used and how they will be used. I moved the check with regulatory agency sentence to the second paragraph to aid with this distinction.

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3.7	Note that not all states make decisions about the need to take actions to address exposures related to soil vapor intrusion based on indoor air concentrations alone.	The language has been edited out previously
3.7	Note that not all states may agree with the defaults used to assess health risk in the J&E model.	The J&E process is the most commonly used model but we have not attempted to evaluator equate it to State requirements. Users should always check with the appropriate regulatory agency before proceeding with any model.
3.7	Note that some states may request structure sampling to verify the model predictions even if the predictions are below "action levels" or if "the cumulative health risk for an existing building scenario is considered unacceptable."	covered by statement, "check with regulatory agency prior to using models"
3.7	We recommend that additional lines of evidence should also include 1) co-located and coincidental outdoor air concentrations, 2) literature values (recent studies of indoor air concentrations), and 3) building evaluation prior to investigation (could incorporate building construction and condition) (reference Appendix H).	reference added to building survey form.
3.7	We recommend expanding the discussion of indoor air background sources and outdoor air background sources and potential approaches for how to consider their impacts on indoor air samples in this section and/or in the Toolbox. The approach(es) for determining contribution from background often have a significant impact on whether or not a location requires mitigation.	Refer to ambient air in Appendix D. add new section on Background in 3.7.3
3.7.3	The use of constituent indoor air vs. soil gas concentration ratios should be discussed in greater detail including the uncertainty associated with applying the ratio of one constituent to the others.	Greater detail added
3.7	The document indicates in the Building Construction and Current Condition section that it may be reasonable to conclude that a positive air pressure system within the structure will minimize or prevent vapor from migrating into the building. The document should also clarify that future changes in the building (such as a loss of positive pressure) must be considered and addressed to avoid possible increased risk from VI at a later date.	added reference to chapter 4.3.1.6. This section deals with positive pressure being the remedy for VI.
3.7	Sub-slab Data: Consider adding a side box that provides examples of the variability of sub-slab vapor data that may be observed in one house.	This type of side box is very prejudicial. Since the degree of variability is unknown from structure to structure. A note has been added regarding variability of sub-slab concentrations.
	1st full paragraph: The box on page 6 is confusing when compared with this paragraph. I think the meaning of (once adjusted by the chemical specific Henry's Law Constant) in the box is not evident, but made more clear on page 43.	we have addressed the variation in the boxes and language.
3.7	Constituent Ratios: Note that some states do not automatically default to the conclusion presented in the side box and walk away. The data may be questioned, other factors may be considered (product inventory and building questionnaire, data quality, etc.), and resampling may be recommended.	added "check with regulatory agency when using constituent ratios" to the side box
3.7	Note that some states look at addressing current and potential exposures, not just current health risks or completed exposure pathways when evaluating the data and making recommendations for action.	See previous comment 3.5.3 and additional language
3.7	Not all states agree with the statement that "each potentially completed pathway...must be assessed in a risk assessment prior to determining whether and what remediation may be warranted." For example, if exposures to contaminated drinking water (private well) and to soil vapor intrusion are identified, actions to mitigate those exposures (e.g., filter on the well and sub-slab depressurization system on the house) can be recommended and taken in the absence of a risk assessment.	I agree. I added a statement to the end of paragraph one that talks about mitigation in lieu of risk assessment.
3.7	Add "if completed" or "if done" or "if appropriate" when discussing the site-specific risk assessment in the last sentence of paragraph 2.	change the wording in the second chapter and should take care of this issue
3.7	Last sentence of the section: Clarify whether this sentence is referring to soil vapor guidance documents or guidance documents on completing a risk assessment.	moved the last sentence to the previous paragraph. The intent was guidance on risk assessments. Much clearer now.
3.7	We recommend adding a statement to this section that specifies the human health risk assessment should be performed by a risk assessor.	thank you no.

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3.7	The second paragraph includes the sentence, "These estimates are then compared to USEPA and/or states defined risk thresholds or are evaluated on a case-by-case basis by the regulatory agency to make as risk management decision to determine whether mitigation measures are needed." This sentence is misleading since: (1) it implies that the regulatory agency is the only party responsible for making risk management decisions, (2) if the step approach were followed, there were be an assessment to determine if additional investigation is warranted before decisions would be made about mitigation, and (3) the phrase "risk thresholds" has not been used or defined previously in the document. We recommend replacing the sentence with the following: "These estimates are then compared to screening levels."	Thank you suggestion accepted
3.7	Finally, the last two sentences in this paragraph are repetitious and almost verbatim from the last two sentences in the first paragraph. We recommend deleting these sentences from the second paragraph.	thank you
3.7.4	In the third paragraph, recommend adding "Evaluation of site risk assessment and interpretation of potential human health risk should be evaluated by a risk assessor. The sufficiency of site characterization, reasonableness and relevancy of exposure assumptions and analysis of uncertainty in the risk characterization should be fully evaluated." Recommend considering expansion of the discussion of risk. The guidance points out that issues of background and preferential pathways add complexity and uncertainty to the site evaluation. Also the level of risk appears to be based on highly conservative screening levels rather than site specific assessments. The issue of "acceptable risk" is not discussed and can have substantial impact on when and how many structures may represent unacceptable risk. Recommend the emphasis toward mitigation be balanced by discussion of attributes of risk.	Thank you No
3.7	The first paragraph on this page does not provide any new information that is not already presented in the previous paragraph. We recommend deleting this one-sentence paragraph which reads, "The individual state agencies should be consulted to identify any state-specific guidance and/or regulations that should be addressed."	thank you
3.9	Unless this entire document assumes that the "investigator" is always a regulatory agency, this paragraph presents conflicting information regarding who should determine if mitigation is warranted.	The final decision is left with the regulatory agency
3.9	Note that some states may recommend actions to address either current or potential exposures, not just documented vapor intrusion situations.	See previous comment 3.5.3
na	Add statements such as "if appropriate" to make more reflective of the approach of states that may not rely on "generic screening levels," "target concentrations," "predictive modeling," etc.	This is a guidance not a law. If an element is inappropriate there should be further considerations made.
Figure 3.3	Note that some states may recommend actions other than "no further action" or "mitigation" (e.g., monitoring or resampling) -- or would these actions be considered part of the "additional investigation" loop?	language has been added to the section
Figure 3.3	The box that relates to "Step 9: Design VI Investigative Work Plan" includes "Determine target/screening levels" as something that is done in Step 9. We recommend deleting this since the corresponding text about Step 9 does not include a specific task of determining target/screening levels. This process seems to have been discussed in Step 5.	Thank you
3	The document references the use of exposure point concentrations (or average contaminant concentrations) when determining appropriate actions at a site. The Department does not average analytical data when comparing the data to the applicable vapor intrusion based criteria. The user should again be encouraged to check with their regulatory agency to determine what requirements are applicable.	There are any number of time this is pointed out. Remember this is only a guidance.
3	This section is very thorough and provides good information. We suggest including more discussion on the effort and cost of post-mitigation monitoring.	Thank you
	Section 4.0	
4	Section 4 provides a good generic overview.	Thanks

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	More discussion on how to make remedial decisions at sites of future development would be very helpful, particularly the reliability of "picture in time" soil gas analysis from areas of currently no structures that may later contain structures, roads, etc. How do you give a go-ahead for redevelopment on a property while maintaining that the vapor intrusion pathway is addressed? Presumptive remedy only? I look forward to reviewing the scenario document on the vacant lot redevelopment.	The "picture in time" comment is more a site characterization issue than a mitigation issue
	The document of necessity discusses the subject in generalizations, and provides a conceptual approach. This in not meant as a criticism, any review of this magnitude is required to do so. However, a short addition of one or two case studies would illustrate the 'typical' investigation and resultant data. Reading over real examples provides perspective for the inexperienced reader, and as a result, they retain more of the considerable detail that otherwise might be glossed over.	We have developed a Scenarios document to familiar the users with vapor intrusion situations. It is referenced earlier and should be used in conjunction with the guideline
	The section on building remediation would benefit from a number of simplified building plans or cross sections. Again, the detail is here in the text, but retention by the new reader would greatly benefit by schematics of the modified building discussed in each section. Typical building components important to vapor intrusion such as interior and exterior drain tile, sumps, sill plates, sewer hookups, etc are much easier to conceptualize for the less experienced reader when provided with a diagram. The different remediation systems may seem obvious, but again, cross sections of various sub floor membrane options can greatly add to the understanding of system operations.	EPA (1993) (radon guidance) has some good graphics that could be considered.
na	Add statements such as "if appropriate" to make more reflective of the approach of states that may not rely on "generic screening levels," "target concentrations," "predictive modeling," etc.	Section 3 figure
na	Note that some states may recommend actions other than "no further action" or "mitigation" (e.g., monitoring or resampling) -- or would these actions be considered part of the "additional investigation" loop?	Addressed previously
4.0	Consider adding a homeowner/tenant/community perspective to the discussions included in this section.	there is a section 1.7 on community concerns
4.0	Note that some states may recommend actions to address either current or potential exposures, not just documented vapor intrusion situations.	previously addressed
4.2	Consider including a discussion on other notification processes that may be considered if institutional controls are not possible.	This seems to be a semantics questions, since any notification process could be considered an institutional control. However, if institutional controls lack legal basis, they may not achieve the desired exposure "control".
	Since the information on this table focuses only on building control mitigation methods, we recommend changing the title of the table to "Comparison of Building Control Mitigation Methods."	Done
4.3	When providing cost estimates in this section, consider mentioning that asbestos or other abatement needs may significantly alter the estimate provided.	Text has been added
4.3	Explain the difference between "passive barriers" and "vapor barriers" (p.10, Appendix C).	Text added to 4.3.1.1 explaining that passive barriers are sometimes called "vapor barriers", although this term is often used to refer to very thin plastic sheets used for moisture control behind dry wall, which are not suitable as passive barriers for vapor intrusion control.
Table 4-2	The table states "even small holes can render ineffective" and text on page 51 states "in most cases, however, passive barriers without venting layers are not likely to be effective." Please cite the basis for these conclusions. In general, given the uncertainty about building effects and the inherent lack of precision (\pm one order of magnitude) in risk assessment methods, is the level of precision with regard to vapor barriers warranted? The emphasis on mitigation appears out of proportion to the "known" level of risk.	Depending on the hole density, size and configuration it can render a passive barrier ineffective based on the team experience. Passive barriers may not withstand pressure from unvented locations.
4.3	Figure 4-2 does not illustrate the point made in the text. Is there a different figure that could be used or is this figure in misplaced in the document?	adjustments have been made.
	Second paragraph, the discussion of passive venting systems cites a 1993 EPA reference. The following pages discuss various mitigation approaches and state capitol cost and operating costs. Are more recent references available, particularly regarding cost, effectiveness and O&M requirements?	No
na	Other advantages of SSDs and SMDs include the following: the system can be checked by the building's occupant and the system can indicate system failure.	The system can be checked by anyone qualified

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4.3	The discussion should also address inaccessible crawlspaces.	Good point. This is a common situation. Options include ventilation of the crawlspace with outside air (in suitable climates), crawlspace pressurization, and horizontal soil vapor extraction pipes installed under the crawl space. Other solutions may require more structural work (e.g., digging out the crawl space to allow access). Text has been added
4.3	The document should recommend that the user verify with the applicable regulatory agency whether any air permits are required when a depressurization system (or other remedial system) is being used to address VI.	This is mentioned at the end of Section 4.4, but has been stated more clearly.
4.3	The section states that "...is frequently employed at a commercial building when no amount of vapor intrusion is deemed acceptable (e.g., daycare center)." The example provided may not apply in all states.	The daycare example has been removed, as it isn't really needed to make the point.
4.3	Is the statement (e.g., less than 0.00 inches H2O) correct?	Must be a typo. Correct number is 0.001 inches. I will fix.
4.3	You state that only small increases in building pressure (e.g., less than 0.00 inches H2O) are required to prevent vapor intrusion. A source for this number is Michael Geyer, KERNTec Industries, Bakersfield CA at (661) 873-7277.	EPA (1994b) is already referenced.
4.3.1.6	The part of this section prior to Table 4-7 discusses small increases in building pressure and provides an example stating less than 0.00 inches H2O. This value appears to be incorrect.	See above
4.3.1.6	The first line on this page indicates a cost range of \$00 to \$00 per square foot per year. Please assure that values are provided in this statement.	This text should have been deleted because of the very site-specific nature of these costs.
4.3	Another disadvantage includes the following: residents often find indoor filter units to be loud so they turn them off.	This will depend on the unit, and can also apply to SSD and SMD systems if not well installed or located.
4.3	Note that not all states may develop risk-based indoor air action levels in buildings that are occupied only for short periods.	state specific
4.3	Foundations may also include bedrock and dirt floors.	True. This is addressed in Section 4.3.2.4 when we talk about "areas where expanses of soil are exposed". However, additional discussion of dug out basements and field stone foundations is warranted and added.
4.3	Consider adding a picture of a laid stone foundation wall that has been purged.	No
4.3	The second paragraph of this section includes the following sentence, "The Radon Mitigator chosen for the project should have experience installing..." We recommend replacing "radon mitigator" with "mitigation contractor."	Language modified
4.3	Note that not all states have "indoor air action levels."	Done
4.3	Last sentence of the section: This seems to be an understatement; data are available.	More data are available all the time; however, there is still a lack of published data indicating potential concentration reductions (at the high end).
4.3	The need for post-mitigation chemical testing varies from state to state, as does the timing of the sampling. Therefore, include a recommendation to consult applicable state guidance.	This applies to almost everything in the guidance, so I think the general up front recommendation is more appropriate.
4.3	The last sentence of paragraph 2 is incorrect. NYS's guidance recommends that post-mitigation indoor and outdoor air sampling be conducted in buildings where pre-mitigation samples were collected and in buildings where physical data suggest possible impediments to comprehensive sub-slab communication of the depressurization system (i.e., locations with wet or oily sub-slab soils, multiple foundations and footings, minimal pressure differentials between the interior and sub-slab). In cases of widespread contamination, a representative number of structures may be considered for chemical testing.	Since the purpose of the paragraph is to point out that, in some circumstances, not all homes require post-mitigation testing, the sentence has been modified to indicate that under certain circumstances when a number of buildings have been mitigated, NYS may allow testing of a representative number of buildings.
4.3.3.6	Lead-based Paint/Asbestos. This topic appears out of place and should be contained within waste management procedures associated with mitigation when accomplished.	the chapter is discussing installation and it is appropriately located
4.3.3.7	The guidance identifies risk attributable to mitigation (back draft of combustion appliances AND risk attributable to exhaust gas from mitigation systems, Section 4.4) but does not discuss evaluation of the risk of mitigation compared to the risk of vapor intrusion. Recommend evaluation of this gap.	global and not specific to VI
4.4	Second paragraph in section: How is the air sampling discussed in this section related to the post-mitigation testing discussed in Section 4.3.3.4? Are these sections consistent with one another?	Section 4.3.3.4 is addressing post-mitigation diagnostics rather than on-going monitoring to make sure the systems continue to perform, but in states where only one or two post-mitigation tests are required, the difference is moot. Some editing has been done to make sure this is clear.

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4.4	Operation Maintenance and Monitoring. These activities represent substantial cost and impact upon building occupants over time. Recommend adding discussion of criteria to determine when O&M is warranted and appropriate levels and frequency of monitoring.	State specific
4.4	Paragraph 4 in section: Note that some states may recommend inspections at frequencies greater than a year (e.g., 18 months) to allow for inspections in different seasons. Consider including a range rather than simply stating "annually."	The section has been revised to indicate that inspections should be conducted on a periodic basis, such as annually or at other intervals as appropriate.
4.4	Last paragraph of section: Provide more emphasis on the fact that data collected do not indicate a need for emission controls on the systems -- even in areas with many systems installed.	More emphasis would require more data or published studies supporting this conclusion.
4.5	We recommend adding a sentence to this section about transferring responsibility of a system if building owner chooses to continue to operate the mitigation system.	beyond the scope of the document and state specific
4.5	A sentence indicating the potential usefulness of vertical profiling could be inserted before the last sentence of the first full paragraph on page 73. If vertical profiling of ground water contaminant concentrations within the top 6 to 10 feet of the plume was done at about the same time initial (pre-mitigation) indoor air sampling was done, the data may be useful in developing a more accurate site-specific attenuation factor. This attenuation factor may then be useful in determining a screening level that indicates when active mitigation systems can be turned off.	Soil vapor attenuation factors seem to be more uncertain than sub-slab attenuation factors, based on information provided at EPA workshops to date. Nevertheless, soil vapor data may provide a reasonable line of evidence, when combined with other factors, for turning a system off. Some text reflecting this has been added.
4.5	First sentence in section: Actions may be recommended to address either current or potential exposures not just documented vapor intrusion situations. Furthermore, actions may include no further action, resampling, monitoring, mitigation or other actions, not just mitigation or no further action.	This comment does not seem to be applicable to Section 4.5 (first sentence). This section is addressing closure of sites with mitigation systems and/or institutional controls.
4.5	Passive systems may have piping that should be removed by a responsible party if requested by the homeowner.	The second sentence states that mitigation system piping may be removed - it doesn't confine this to active systems.
4.5	Note that some states may request the same suite of structure samples that were collected pre-mitigation when considering system shut-down or site close-out.	The number and locations of indoor air tests for "confirmation" purposes is not discussed in this section. However, we could point out that this is one of the decisions that will have to be made. I will add text.
4.5	Paragraph 3 in the section: Note that not all states may agree with the approach presented.	OK, although this paragraph merely points out that various lines of evidence may be used for initiating closure tests, whatever these may be. In all cases, some basis will be needed for triggering the closure process. Changes have been made to the text to more clearly provide suggestions not mandates.
4.5	Consider discussing what is known about the time expected for residual contamination in soil vapor to dissipate after groundwater or soil sources have been addressed.	Good point. Johnson has a paper addressing this to some degree. Reference provided in the text.
4.5	Closure. Recommend adding a discussion of criteria for determining when to shut down active systems. Particular concern is warranted for circumstances when systems were preemptively installed without full evaluation of parameters that would be required to support a decision about when to stop.	This is very global and state specific
4.5	Last sentence in section: If a responsible party can demonstrate that the system is no longer needed to address exposures related to contamination related to the site, they probably will not be held responsible for the system under the regulatory program (not that "no longer want to be responsible").	Good wording. Change has been made.
4.5	NYSDOH 2005: Note that the referenced document is a Public Comment Draft.	OK.
	Appendix A	
Appendix A	Consider moving the acronyms and abbreviations to the front of the document so the reader knows it is available before they begin reading the text.	We will use the ITRC format As prescribed to all teams
Appendix A	Please define "TAGA"	Trace Atmospheric Gas Analyzer
	Appendix B	
Appendix B	Geology/Hydrogeology Section: Seems too brief. Should probably include a list of geotechnical analytical parameters for soil characterization.	Language has been improved by including additional parameters
Appendix B	The document states that the CSM checklist may be useful in planning the soil gas sampling. However, much of the information is not easily obtained when planning a soil vapor sampling event -- structure-specific information that is hard to gather simply by looking at the outside of a building.	added a statement that an interview with the building occupants may be needed to answer some of the building specific items in the checklist.
Appendix B	We recommend that the CSM checklist include background sources and outdoor air quality, land use, receptors, target risk values. It is not clear if the focus of this CSM checklist is for soil gas sampling only.	We have added "nearby potential sources" to the text.
	Appendix C	

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Appendix C	Provide the reference(s) for the studies in Holland and Australia.	Craig will send this reference
Appendix C	Explain the difference between "passive barriers" and "vapor barriers (p.10)" and "vapor barriers (p.12)."	added reference back to chapter 4.3.1.1.
Appendix C	Some buildings do not have obvious preferential pathways. Consider adding a discussion on the presence of dry wells.	added a sentence pointing out that drywells, cisterns, etc. may exist
Appendix C	The section pertaining to Preferential Pathways contains a incomplete reference "XXX". Please make sure this is amended.	Done
Appendix C	Basements. Please add a short discussion describing how walls built with vapor barriers are a "red flag concern."	Language has been modified
Appendix D		
Appendix D	Figure D-2 shows a well cluster, and not nested wells.	Figure has been changed for clarity
Appendix D	Include discussion relative to the tracer gas purity and the ability to have a known start concentration to determine the 5% threshold / provide detailed steps to insure correct quantification. Discuss the merits of using tracer gas concentration limits such as 1.0 ug/l or 0.1 ug/l which have been used in previous sampling events.	We have added clarifying text on starting concentration.
Appendix D	The "starting" concentration for a leak compound is not known. The starting concentration is the concentration of the compound at the point of entry into the sampling device. The point of entry can be a location down hole or a connection at the surface. The entry point concentration or starting point concentration is a function of the distance between the leak compound at the surface and the point of entry into the sampling device. During the compound's travel between the source and entry point, dispersion will reduce the leak compound concentration. Hence, an acceptable concentration of the leak compound in a sample is difficult to determine. Thus, a five percent "breakthrough" of the leak compound may not a reliable indicator of data acceptability.	This is a qualitative indicator and it cannot be measured. All this is true, but there is no way to solve this issue.
Appendix D	Literature citation should be provided for the precipitation information.	Text has been revised
Appendix D	Temperature paragraph: This section states : "The radon literature suggests that temporal variations in the soil gas are typically less than a factor of two and seasonal effects less than a factor of 5. If soil gas values are more than a factor of 5 below acceptable levels, repeated sampling is likely not necessary regardless of the season." This is a critical statement and needs more supporting documentation. Please provide more specific references regarding the "radon literature". Please clarify - is the term "seasonal effects" strictly limited to temporal effects of temperature, or does it also include barometric pressure?	Text has been edited in the document
Appendix D	This section states "Barometric pressure variations are unlikely to have significant effect on soil gas concentrations at depths exceeding 3 to 5 feet bgs and only a minor effect (less than factor of 2) at shallow depths unless a major storm front is passing by." Please provide references to support the "less than factor of 2" statement. Please define what a "major storm front passing by" means in terms of barometric pressure. Does it have to deal with the rate and magnitude of change in barometric pressure? This seems to be an important concept to understand, especially for locations that experience major storms. Please include an explanation as to the need for wet season sampling in context of this issue.	Text has been revised in the document
Appendix D	First paragraph "Unless under extreme conditions, it is generally considered that temporal effects are not significant at depths of 3 to 5 feet or more below ground surface or building foundation." Please define the nature and magnitude of conditions that would be considered "extreme". Most readers will not likely not be aware of the nature and magnitude of conditions that are considered "extreme".	Text has been revised in the document
Appendix D	Recommend additional discussion of the value of on-site analysis at detection limits as low as 10 to 100 µg/m ³ when the level of concern for TCE is 0.016 µg/m ³ . Stated detection limits should be fully adequate for assessing acute risk, but further discussion is warranted for chlorinated solvents with low target concentration of interest.	The method for evaluating acute risk is left to individual states. Our ability to collect lower and lower concentration using on site analysis is continually improving.
Appendix D	Recommend adding discussion describing how to estimate the number of samples or sample density adequate to support the stated objectives. The guidance could be substantially improved by addressing the issue of adequate sampling.	This Is best left to the investigation and dependent upon the DQOs and investigation objectives.

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Appendix D 4.17	Please describe or cite the reference providing the basis for the conclusion that effect of atmospheric and building effects are minimized at depths of 3 to 5 feet. This conclusion is potentially quite important and argues that the range of influence is substantially less than 30 to 100 feet stated earlier in the guidance document.	30 - 100 is the lateral distance vs. vertical depth of 3-5 feet.
Appendix D	This section is a bit confusing. Earlier in the main body of text, the guidance indicates that sub slab samples would be collected from just below the slab. This Appendix, however, indicates that conservative sub slab concentrations can be estimated using soil vapor samples collected just above the source or about 10 feet below the lowest floor of the slab. Isn't it possible that vapors could accumulate just below the slab at shallow depths? This should be clarified.	Text has been revised in the document
Appendix D	Literature citation should be provided for the statement that sub slab vapor concentrations have little variability. This statement appears to contradict the box of page 24 concerning Endicott.	The information is from the references immediately follow the bullets
Appendix D 4.18	Note the discussion of passive soil gas sampling methods described on page 30 may be under developed. Recommend considering expanding the discussion in the text or sponsoring work independent of this guidance document to determine whether less expensive sampling techniques offer advantages over active sampling methods in terms of characterizing the distribution of contaminants in soil gas	Recommending or supporting additional research is not within the scope of this document.
Appendix D	Recommend adding a discussion describing the importance of both volatility and toxicity in selecting target analytes as an alternative to full suite analysis.	This is a state specific regulatory determination
Appendix D	Recommend adding emphasis upon the importance of conducting thorough and consistent indoor surveys as well as establishing appropriate background indoor levels for constituents of concern. The cited check list was not present in this review copy of the guidance document.	covered in the text and we will not be establishing background indoor air levels.
Appendix D	Indoor air should always be sampled twice before no further action is granted for a building. A second indoor sampling event is always necessary to evaluate seasonal variation in data collection, regardless of the outcome to the first sampling event, even if the first sampling event is "order of magnitude below the appropriate screening levels".	this statement is a policy issue determined by the regulatory agency. We can point out that there may seasonal variations and multiple sampling events can show temporal variability but we will not say "should" take any number of samples.
Appendix D	This section implies that open field flux chamber measurements can be used to evaluate indoor air quality. The statement that, "an effective room concentration is easily calculated from the measured flux" is misleading. There are no established protocols for determining an indoor air concentration from an outdoor flux chamber measurement and flux chamber validation studies have yet to be published.	Additional text has been added to clarify the statement
Appendix D	Please provide references regarding the appropriate duration for collecting samples with the flux chamber.	Text added and reference to San Diego county added also.
Appendix D	The forensic analysis should be discussed in more specific detail relative to approach and decision making. Any stakeholder involved in indoor air sampling will ultimately conduct forensic analysis.	I think a lengthy discussion is beyond the scope of our document. We do address this topic in the main text on pages 4-6. We added another paragraph and a reference in this section.
Appendix D	The evidence necessary for quantified vs. qualified connection between contamination source and VI indoor air should be discussed in more detail, especially relative to the distinction between of ambient air vs. contamination contribution to VI. RPs usually are interested in what portion of the VI they are responsible for or alternatively they want to point to ambient air & household products as sources.	This is covered earlier in the document .
Appendix D	Specify the length of time needed before collecting soil gas samples after a rainfall event.	It depends on the site (i.e.. Soil type, moisture content, rainfall amount, etc.) We can't give an exact time to wait.
Appendix D	The reference concerning barometric pressure effects on fractured rock (Parker) needs proper citation and the full reference should be provided at the end of Appendix.	done
Appendix D	Flux chambers cannot be used to evaluate the future building scenario. Flux chambers measure the diffusional contaminant flux but not the advective / conductive contaminant flux. Hence, flux chambers will under predict the flux into a future building.	Our flux chamber expert says that if the slab acts as a barrier then the flux chamber will overpredict VI. (leave the table as is)
Appendix D	Some discussion indicates depth of soil gas sampling should be 10 ft and other sections indicate 3-5 ft. Need consistency or explanation of what criteria determines if 10 vs. 3-5 ft is appropriate.	Team consensus considers 3 - 5 feet adequate. Do a universal scan of the document to assure consistency.
Appendix D	Include discussion of the approach where indoor air sampling is done concurrently with near foundation soil gas sampling (is concurrent sampling needed to generate site-specific attenuation factors?).	If you going indoors, then sub-slab would be more applicable.

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Appendix D	Include the reference/credit to the NYSDOH in the figure, not just in the text.	Done
Appendix D	IBM Endicott box: Delete the statement about sub-slab vapor variations. The statement is not accurate and the accompanying discussion is focused on soil vapor, not sub-slab vapor.	deleted the statement regarding sub-slab
Appendix D	Performing a building survey before collecting indoor air samples is an important part of developing an appropriate indoor air sampling event. However, this section does not remind the reader that it is also important to meet with building occupants prior to conducting indoor air sampling and informing them of any restrictions on their activities (e.g., smoking) or specific requirements (e.g., not opening windows) that might be required immediately before and during the indoor air sampling. We recommend adding this information to this section.	Done
8.1	This text refers the reader to Appendix H for an example of a building survey form. However, the Table of Contents lists this information as being in Appendix G. Whichever is the correct citation should be listed here.	Language has been modified
8.6	The first paragraph refers the reader to Table D-5 for examples of available analytical methods for VOCs and SVOCs. Please check this reference, as it appears that Table D-3 is the table that actually includes this information. .	This section has been revised significantly
	Also, the text should clarify that TO-17 is used for analysis of sorbents, not TO-15.	This section has been revised significantly
Appendix D Table D-5	For Groundwater data, Relative Disadvantages, Please clarify the basis for stating data are a more expensive assessment method than soil gas. Does the conclusion assume additional wells would be constructed?	Strike the disadvantage.
	Appendix E	
Appendix E	A definition is needed for "reporting limit". Is the reporting limit the method detection limit (MDL), the method reporting limit (MRL), or the practical quantitation limit (PQL)? For indoor air sampling, many laboratories will only certify summa canisters to the MRL, hence indoor air sample results below the MRL are J flagged, and it is unknown if the J flagged value is an actual indoor contaminant result or a measure of a laboratory's inability to clean a summa canister.	NO
Appendix E	Guidance should be provided for method and trip blanks, specifically on how these samples are taken during an indoor air sampling event.	They serve no purpose with canisters. Additional information has been included for passive sampling.
	Appendix F	
Appendix F	Does barometric pumping effect soil gas samples? If so, ITRC should provide guidance on this issue.	this is covered previously in the document
Appendix F	Specify the length of time needed before collecting soil gas samples after a rainfall event.	I do not believe there is a general consensus on how long you should wait. We added text to the rainfall bullet.
Appendix F Box	The following comments were apparently labeled incorrectly as Appendix I (Stakeholder concerns) <i>Source Area</i>	
Appendix F	Consider including items in the checklist that may result in obtaining more detailed information, such	The team does not consider these are appropriate for the intent of the checklist
Appendix F	q Indicate whether free flowing or residual LNAPL/DNAPL is found above or near the water table, and if any data indicate the quantity of NAPL released to the source area.	
Appendix F	q Identify any soil or ground water data suggestive of the presence of NAPL in the vadose zone source area.	
Appendix F	q Describe any information on how the contaminants originally entered the subsurface including: 1) if the entry point is known to be above or below the water table (e.g., release to a dry well or from the bottom of an UST within the saturated zone) or 2) was significant NAPL discharged or was a relatively dilute source released.	
Appendix F		
Appendix F	<i>Geology/Hydrogeology</i>	
Appendix F	Suggested modifications are noted below:	
Appendix F	q Review relevant existing literature and maps, boring logs, monitoring well construction, soil sampling and ground water data to understand the known or suspected locations of:	
Appendix F	· Higher-permeability layers or features that may facilitate vapor or ground water migration.	

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Appendix F	q Describe distinct soil or rock strata or deposits in the vadose zone (soil/rock type and moisture content; e.g., "moist," "wet," "dry") and their thickness/depth intervals between the vapor source and ground surface	
Appendix F	q Describe the depth to groundwater (regional water table or perched zones)	
Appendix F	q Describe groundwater characteristics (e.g., seasonal fluctuation, hydraulic gradient, recharge and discharge areas).	
Appendix F		
Appendix F	<i>Site Characteristics</i>	
Appendix F	The distance between buildings at risk and the original source area(s) for the groundwater plume, and the surface cover within that distance, could be included in these items.	
	Appendix G	
Appendix G	The document is missing and could not be reviewed.	Questionnaire is under development and will be in the final document. Mainly as an example of the type of information that should be used when performing indoor air sampling.
Appendix G	Since the questionnaire was not included in the document, it was not reviewed. Also, the Table of Contents lists that this should be Appendix G. Please update as appropriate.	
	Appendix H	
Appendix H	The document is missing and could not be reviewed.	Questionnaire is under development and will be in the final document. Mainly as an example of the type of information that should be used when performing indoor air sampling.
Appendix H	Since the questionnaire was not included in the document, it was not reviewed. Also, the Table of Contents lists that this should be Appendix G. Please update as appropriate.	
Appendix H	The first sentence is confusing since it refers to development of vapor intrusion guidance. We recommend deleting the first sentence in this section.	Agreed
Appendix H	The first paragraph includes the following two sentences, "Generic screening levels are used to determine if the vapor intrusion pathway is complete and if there is a potential for risk associated with the inhalation of vapors from contaminated subsurface media. In general, if the screening levels for the selected medium are not exceeded, then the pathway is deemed incomplete , and no further evaluation of the pathway is necessary" (emphasis added). Technically this is incorrect. If the site data do not exceed the generic screening values, this does not correlate to an incomplete exposure pathway. Rather, it means that even though the exposure pathway may be complete, the exposure is not expected to result in adverse health effects to exposed receptors. To clarify this point, we recommend updating these two sentences so they read, "In general, generic screening levels are used to determine if the potential exists for subsurface vapors to be present in indoor air at levels that could result in adverse health effects to exposed receptors. If the screening levels for the selected medium are not exceeded, then it is possible th	Done
Appendix H	ITRC should render an opinion if OSHA PELs are appropriate endpoints for industrial vapor intrusion exposure rather than state that they "may" apply. ITRC should obtain a legal opinion otherwise the reference to OSHA endpoints should be dropped.	NO
Appendix H	Last sentence on page: Michigan also uses more "realistic", Michigan-specific assumptions in the development of risk-based cleanup standards. Cite MDEQ, 1998.	Citation Added
Appendix H	First paragraph, last sentence: Michigan also allows for modification of the J&E model as a site-specific approach. Cite MDEQ, 1998.	Citation Added
Appendix H	Sentence, "It was found that the groundwater attenuation factor of 1,000 produces a conservative estimate of actual indoor air concentrations from groundwater contamination." Is this for all chemical classes (e.g., chlorinated vs. BTEX)? Was there a limit on depth to groundwater (groundwater must be at least x depth)? Seems that to be a "conservative estimate" there would be certain limitations.	Based on the database created by Helen Dawson and is primarily for chlorinated compounds and groundwater was relatively shallow < 50 ft. We verified and added qualifiers to text.

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Appendix H	Other key differences, at least those that may be impacting States like Michigan and Pennsylvania, are 1) the hierarchy of media preference based on promulgation of screening criteria and 2) inability to update or modify promulgated screening criteria without formal legislative rule change. Priority in Michigan is given to soil and groundwater data for making remedial decisions, therefore the driving media (and associated criteria) may be different than what it would be in another state. We are limited in how and when to apply our screening levels. Regulatory constraints may be listed as a key difference.	inserted a text box with these differences pointed out. I would like the team to see if this is an acceptable addition before making it a permanent addition.
1.2	The key differences listed in the first paragraph of this section should be elaborated on, specifically modeled vs. empirical data and hypothetical future buildings.	Additional information added.
2	Top of page, the last sentence of this partial paragraph beginning with "Consideration of background concentrations..." does not seem to belong with this paragraph. Would be better in next paragraph.	good suggestion, made the change.
2.1	Having difficulty understanding the difference between indoor air target values (2.0) and risk-based indoor air concentrations (2.1). Seems that the risk-based are simply a subset of target values. This is not clear. Also, the intro to risk-based indoor air concentrations (Section 2.1) should follow with methods (Section 3.0), but why separate sections (2 vs. 3).	Revision made to address comment.
Appendix H	Unit Risk Factor (URF) should be defined as in IRIS: "The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/m3 in air." Last paragraph needs clarification. I do not understand what mechanism is being referred to and why it is not commonly used in cleanup programs. Do not understand "one or the other" statement in last sentence. Concepts in this section should be better developed and refined. The equations were also missing. It would be more useful to provide the algorithms, discuss those factors that will not be discussed later in the document, and point the reader to sources for further information, including consultation with a staff or contract toxicologist. It should be noted that States may conduct de novo toxicity assessments and develop screening levels even in the absence of an RfC or URF in IRIS. Discussion of acceptable risk ranges for back-calculation to solve for risk is needed. This could also be identified as a "Key Difference" under Section 1.2. Some States/Agencies differ in risk level or acceptable range.	Discussion limited and clarified to reduce confusion.
7	Second paragraph, first sentence: Groundwater screening levels are applicable to groundwater concentrations throughout the affected aquifer in Michigan. It is stated that data from deeper aquifers or well screen intervals should not be used for purposes of site screening. Is this true for all cases? Are there exceptions? How deep is "deeper". More discussion should be included somewhere in this document.	language added
Appendix H	Michigan models the attenuation coefficient using J&E. Add citation MDEQ, 1998 to second paragraph, second sentence. Including a section providing a short introduction to the J&E model (where to find it, how it's applied, limitations) would be useful.	Team needs to decide how to address this one - references added.
8	Could you replace "overburden" with "vadose zone" or other equivalent term?	change to vadose Zone
General	This appendix provides a good overview of criteria development, but not necessarily useful for developing criteria. Assuming the intent of this Appendix was not to be a "how to", more information should be provided on things to consider when developing screening levels and where to go for information. As someone responsible for criteria development, it would be useful to have more discussion on fundamental risk assessment concepts. This would assist in reminding the reader that screening levels are human health-based and to understand the limitations of their application. As examples, occupational standards can be as high as a 1 in 100 cancer risk and for appropriate application can be associated with severe limitations in exposure frequency and duration - consideration of the exposed population is very important. Also, when using the J&E for generating alphas, the assumptions of the model must match site conditions. Inclusion of the algorithms and maybe just a short discussion of the exposure assumptions and their origins. Repeating the language on page 44 regarding	Although this guidance is not considered a "how to" guide, the general equations to derive target indoor air concentrations and a reference to standard risk assessment guidance was added to Section 2.0.
Appendix H	Sections 3.0 and 3.1:	

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Appendix H	Due to the different policies/procedures used by the various states and regulatory agencies, this section should also emphasize the importance of checking with the applicable regulatory agency concerning the basis and use of the vapor intrusion criteria. Potential change in the use of a site in relation to the application of the criteria should also be considered and addressed.	I added a comment to Section of this appendix that should cover this for the entire appendix. Also mentioned in text box added to this appendix.
Appendix H	A commenter stated that this document provides a very thorough discussion of the issue with some good practical advice on how to conduct and respond to a vapor intrusion investigation.	Thanks
Appendix H	Whether or not New York State's position is being accurately referenced cannot be determined without more information. Specifically, how is "target indoor air concentration" defined and how is it used in the evaluation process?	Will check on this point, possibly have Jim Harrington look at and make sure we have the facts right
Appendix H	typically the slope factor is in (mg/kg-d) ¹ , not (g/kg-d) ¹	fixed, thank you
Appendix H	should an explanation be provided as to why EPA is advocating the use of the RFC and inhalation Unit Risk instead of the inhalation Slope Factor and inhalation RfD.	Clarification added regarding the differences between these values.
Appendix H	The last paragraph indicates that work place standards apply to industrial site. I believe the sentence should be adjust to reflect that the regulatory agency should determine the standards to use on a site specific basis. For example, if an environmental release occurs and the building occupant does not use the released material-OSHA PELs may not apply.	added a sentence with this information
Appendix H	The second paragraph states for industrial sites OSHA acceptable work place levels may be acceptable. Recommend use of OSHA values be expanded to address acute exposure risk in non work-place settings. Also recommend describing industrial and commercial situations where OSHA guidance would be appropriate. Further, on page A-4 recommend editing the discussion of point by point comparison of maximum site data during screening to include provision for comparing representative concentrations as well. Restricting screening to sample by sample comparison unnecessarily reduces opportunities for establishing a supportable decisions without unnecessary investigation.	This is a state specific policy issue. Language has been altered
Appendix H	The text states "Statistical values used to represent "typical" indoor air background range from 25th to 75th percentile values. Recommend deleting the statement because the appropriate background levels can reasonably include a wider range of data and the range should not be truncated at the 75th percentile.	The sentence has been struck from the text
Appendix H	When providing conversions between mcg/L and mcg/m3, it should be clear that this is referring to L of air and m3 of air otherwise misapplication of the conversion to groundwater concentrations (mcg/L) and air concentrations (mcg/m3) is common.	will make sure that the table reflects this comment. The table is to be moved to the inside one of the covers (front or back)
Appendix H	I assume the following references will be addressed in the editing process:	
Appendix H	p.15, Section 2.3: preliminary screening flowchart should be Figure 2-2, not 2-3	Thank you
Appendix H	p.24, Section 3.2: preliminary screening flowchart should be Figure 2-2, not 2-3	Thank you
Appendix H	p.25, Section 3.3: site investigation flowchart should be Figure 3.1, not 3.3	Thank you
Appendix H	p.25, Section 3.3: delineation of the nature and extent... is discussed in Section 3.5.10, not 3.5.9	Thank you
Appendix H	p.54, Section 4.3.1.3: is Figure 4-3 referenced in the text?	Added reference after 3rd sentence in the 1st paragraph
Appendix H	Many references cited in the text are not included in the References Section (e.g., Kurz and Folkes, 2002; USEPA, 2003; Prill and Fisk, 2002; Henschel, 1993; Folkes, 2002).	Steve these are for you.
Appendix H	Stakeholder Concerns. The summary is a useful perspective of stakeholder issues that should be considered in vapor intrusion investigation planning. However, the summary should not be presented as an example of how to address these concerns. The document advocates when and how to remediate "potential" vapor intrusion and is not consistent with a risk-based or a regulation-based approach. Recommend removing or revising Appendix I	NO!
	Scenarios Document	
Scenarios	Right around "Step 8" it might be helpful to direct the reader to Figure 3-3 in Appendix A	Done
Scenarios	first bulleted item: the bolded text could be qualified with a statement that assumes the same geologic/hdrogeologic conditions	This is located in the site summary in all scenarios
Scenarios	second line: what are the units of "1 per hour"?	The volume of air in the room is exchanged each hour

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Scenarios	First sentence after bullet #3: It is unclear to what "this argument" refers. Does this mean, alternative 1?	done
Scenarios	Item C - Key Issues: consider deleting "what was unique about this scenario." The executive summary indicates that these scenarios are "common." So, IMO, I did not see the uniqueness of the bulleted items.	The scenarios are common to the industry as examples but each contain some unique attributes in the investigative process.
Scenarios	Under Rationale: what does "the air permit was already regulated" mean?	Language changed for clarification
Scenarios	The Alternatives listed in the table should be consistently worded with what is stated in the "Decision" narrative. For example, soil gas sampling may not be read as the same as external soil gas investigation (this is actually a global suggestion).	No change
Scenarios	Second paragraph/third line: in this scenario, should a qualifying statement follow "5' intervals" that describes how deep to collect samples?	This is a companion document to the Practical Guide. Please refer to the guide for such descriptions
Scenarios	Actually, a global statement: Seasonal fluctuations may not be determined if sampling (and subsequent decisions made) is based on a single sampling event. For example, does indoor testing results from one season indicating that action levels are not exceeded, necessarily mean they wouldn't be in another season (and vice versa)?	It is likely that specific states will recommend sampling periods and populations required to validate that 1. a site does not pose an unacceptable risk or 2. mitigation has lowered the risk to an acceptable level.
Scenarios	Earlier ITRC documents I've seen had disclaimers that stated people should consult with individual states for their requirements etc., but this one does not seem to. It should be added.	This is a companion document to the Practical guide and the Practical guide does provide the recommended language.
Last bullet	They have selected 0.01 as the sub slab attenuation factor with no justification. 0.01 is the typical attenuation factor for soil gas >5' bgs.	Language added in Parenthesis.
1st scenario	It is difficult to agree with their conclusions about the data because I cannot agree with their techniques and/or assumptions.	A decrease in Benzene upward may indicate Bioattenuation however the oxygen level increase upward questions either the rate of bioattenuation, or the source of oxygen as you move up the column. Oxygen should be consumed during the bioattenuation process.
middle of page	The recommend a flux chamber approach for the crawl space. Currently DEQ (based on discussions with EPA) believes this is not a proper application for flux chambers.	a previous clarification for the application of flux chambers has been include in the Guideline
1st scenario	Concern is expressed only for benzene and its associated health risks. What about other fuel constituents such as MTBE and 1,3-TCP?	Each state will approach the risk evaluation according to their state standards and rules
Scenarios	Fuel hydrocarbons by themselves can pose an adverse health risk and or nuisance issue.	Correct
Scenarios	There is a difficulty in obtaining shallow soil gas samples, particularly at 5 feet bgs and less. With sandy soils at this site there could easily be a problem with ambient air intrusion into the sample. However, most gas stations have the pavement extend all the way to the property line and so shallow soil gas samples may work in this case. Having said that, there could be, depending on the soil structure, migration of hydrocarbons and constituents through the vadose zone laterally from the source area towards the houses. Concentrations from the source area may be higher than those associated with concentrations off of the groundwater. Concentrations may be greatest just below the asphalt in some places. The logic of investigation assumes that the soils in the vadose zone do not vary from the gas station to the residences. That assumption should be stated.	The assumption is implied in the investigation
Scenarios	It should be stated that further investigation and remediation of the fuel pollution may be necessary even if there is not an imminent threat to the health of the people at the convenience store or residences.	This is a state specific consideration based on factors other than risk.
Scenario 2.	If PCE was discharged to sewer line, leakage from the sewer line could occur down the line. The integrity of the sewer line could be checked. This has occurred at several sites in our Region.	Second paragraph reads" The new dry-cleaning equipment has apparently eliminated any waste discharge, so there is no current release of PCE to the subsurface soil environment."
Scenario 2.	Remediation may be warranted to protect water quality. Should state that the evaluation of whether remediation is warranted is strictly based on indoor air risk and not risk to groundwater or surface water quality.	Groundwater can provide the pathway.
Scenario 3.	In California, groundwater remediation would be required. This document only proposes monitoring. It should be stated that remediation of the groundwater pollution may be required, not only to protect down gradient facilities not currently impacted, but to restore the groundwater to its beneficial uses.	Each state may require additional or even less according to their state-specific rules.
Scenario 4.	Groundwater sampling needs to be performed to asses gradient and potential impacts to groundwater.	Agreed language added on page 31 section titled next steps

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Scenario 6.	If there is a question of fuels entering from the subsurface, why is there only a discussion of benzene? Benzene could be long gone and remaining fuel hydrocarbons could still pose a problem – a least a nuisance issue	In this case benzene is considered the indicator parameter.