Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

March 12, 2018

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Douglas Bacon
ITRC State Engagement Coordinator
State of Utah - Dept. of Environmental Quality
Div. of Environmental Response & Remediation
195 North 1950 West
Salt Lake City, UT 84114-4840

Dear Mr. Bacon,

As a member state of the Interstate Technology and Regulatory Council (ITRC; http://www.itrcweb.org) the Connecticut Department of Energy and Environmental Protection ("the Department") supports the efforts of ITRC to promote efficient remediation through the use of training and documentation in the technical and regulatory aspects of innovative technologies.

The Department has reviewed the following Technical and Regulatory Guidance (the "Documents") developed by ITRC:

> Integrated DNAPL Site Strategy (IDSS-1); November, 2011
> (at https://www.itrcweb.org/Guidance/ListDocuments?TopicID=5&SubTopicID=10)
>
> Integrated DNAPL Site Characterization and Tools Selection (ISC-1); April, 2015
> (at https://www.itrcweb.org/Guidance/ListDocuments?TopicID=5&SubTopicID=49)

The Department concurs that these Documents provide useful guidance for making site-specific decisions when investigating or remediating sites where dense non-aqueous phase liquids (DNAPLs) were released.

The Documents are viewed by the Department as describing an appropriate approach and standard of care for designing, conducting, and documenting DNAPL site characterization and remedial activity. They can serve as a useful guidance when conducting remediation of polluted sites and selecting and evaluating remedial alternatives.

The Department also considers the Documents to provide useful reference guidelines for technical staff to use when conducting site specific review(s) of projects at DNAPL sites.

The factors listed in the attached *Connecticut ITRC Concurrence Qualifications; ITRC Documents IDSS-1 (2011) and ISC-1 (2015); March 2018* should be considered when using these Documents for projects in Connecticut and applying their concepts to the

Remediation Standard Regulations (RSRs; Regulations of Connecticut State Agencies sections 22a-133k 1 through 3).

The Department looks forward to our continued participation in ITRC. If you have any questions about the Department's concurrence, please contact Kenneth Feathers, Connecticut's Point of Contact for ITRC activities, by phone at (860) 424-3770 or by e-mail at kenneth.feathers@ct.gov.

Sincerely,

/S/PATRICK F. BOWE

Patrick Bowe
Director
Remediation Division

cc: Bureau of Water Protection and Land Reuse
Remediation Division
Water Planning and Management Division
Land and Water Resources Division
Bureau of Materials Management and Compliance Assurance
Waste Engineering and Enforcement Division
Water Permitting and Enforcement Division
Emergency Response and Spill Prevention
Bureau of Air Management

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Connecticut ITRC Concurrence Qualifications

ITRC Documents IDSS-1 (2011) and ISC-1 (2015)

March 2018

These qualifications pertain to the following Technical and Regulatory Guidance (the "Documents") developed by ITRC:

> Integrated DNAPL Site Strategy (IDSS-1); November, 2011
> (at https://www.itrcweb.org/Guidance/ListDocuments?TopicID=5&SubTopicID=10)
>
> Integrated DNAPL Site Characterization and Tools Selection (ISC-1); April, 2015
> (at https://www.itrcweb.org/Guidance/ListDocuments?TopicID=5&SubTopicID=49)

These Documents provide a summary of current knowledge for Dense Non-Aqueous Phase Liquid (DNAPL) properties and site geologic and hydrogeologic characteristics that affect contaminant distribution and fate and transport. The integrated DNAPL site strategy (IDSS) builds on these fundamentals to describe a collaborative process for developing an effective and integrated strategy to manage remediation of sites contaminated with chlorinated solvents. The integrated site characterization (ISC) describes an approach to develop the conceptual site model (CSM) and to improve efficiency and effectiveness of characterization and remediation of these sites. The ISC process involves collecting data using multiple techniques at a spatial resolution appropriate to the site-specific remedial objectives, thereby capturing the effects of heterogeneities in the subsurface that direct contaminant distribution, fate and transport, and remediation effectiveness.

The Department concurs that these Documents provide useful guidance for making site-specific decisions when investigating or remediating sites where DNAPLs have been released. The factors listed in this *Connecticut ITRC Concurrence Qualifications* should be considered when using these Documents for projects in Connecticut and when applying their concepts to the Remediation Standard Regulations (RSRs; Regulations of Connecticut State Agencies sections 22a-133k 1 through 3):

Programmatic Considerations

- Use of an IDSS approach at a DNAPL site needs to be viewed in the context of resolving the remedial issues. These include identification of risks to receptors, implementing measures to reduce those risks, and ultimately achieving compliance with the RSRs, including applicable variances and alternatives.
- Concepts presented in Connecticut's Site Characterization Guidance Document (SCGD) should be included when developing the Conceptual Site Model (CSM); in addition, the CSM focus should include potential future conditions.
- The ISC process can foster developing a robust CSM and improve efficiency and effectiveness of characterization and remediation of DNAPL sites. Data acquisition to capture the effects of heterogeneities in the subsurface that direct contaminant distribution, fate and transport, and remediation effectiveness is considered critical by the Department in transitioning from the data objectives of a Phase III site characterization under the SCGD to the data objectives of a remedial design investigation.

- A thorough understanding of DNAPL plume evolution as described in the Documents is important in the development of the CSM and evaluation and implementation of remedial technologies. The Department recommends incorporating the plume stage concept in implementing RSR remediation of a DNAPL release.

Conceptual Site Model

- The Documents describe a wide variety of techniques and tools to support a complex CSM for characterization and remediation of various site settings. Although these tools are not required as part of documenting that remedial goals have been achieved, for sites where remediation of significant solvent releases or other DNAPLs is planned, it is recommended that the potential usefulness of innovative characterization techniques be evaluated to make sure that an adequate understanding of the nature of the current conditions contributing to the plume is presented in the CSM.
- A CSM for a DNAPL site should specify in detail what data gaps were considered critical to the delineation of the residual sources being addressed, including the thought process that went into its development. Key concepts are the defining of uncertainties and associated data gaps, use of multiple lines of evidence and then, after implementing the investigation, a determination if the characterization objectives were met and CSM has been validated. The Department considers the concepts in the Documents generally appropriate to incorporate in the CSM development and expects that the CSM documentation will present the rationale for how data from innovative methods supports the CSM and subsequent remedial decisions.

Characterization

- Delineation of the full extent of the dissolved groundwater plume, regardless of concentration or depth, and including potential discharge zones at a distance from the site, is necessary to ensure that there are no complete exposure pathways, especially for vapor intrusion. Characterization should also include evaluation of all possible daughter/breakdown products and associated substances.
- The Documents describe techniques and tools used for innovative approaches to site characterization that often have laboratory or field methods that are either less accurate analytical techniques or measure the physical effects of a release, rather than the chemical concentrations. Such techniques are useful for the purposes of field screening to be able to better determine where analytical samples should be collected. In many circumstances it may be possible to present a representative number of samples analyzed using both innovative and conventional methods (Collaborative Data Sets) to document the correlation between the methods. Otherwise, such data would be used as one of multiple lines of evidence in delineating a release, and may be a basis for a reduction in the number of analytical samples considered necessary.
- Sample analytical methodologies used shall provide analytical data of known and documented quality. The Connecticut Reasonable Confidence Protocols provide an approach to obtain analytical data meeting this standard, for the analytical methods that are published on the Department's website. Methodologies described in the ITRC Documents that are not equivalent to this standard may be useful in determining where conforming samples are necessary to meet an investigation's data objectives.
- The characterization objective of initially defining degree and extent of pollution may be different than an objective to gather the additional degree of detail necessary to identify fate and transport properties needed to evaluate remedial options and design the appropriate remedy. Additional remedial design investigations may be necessary, and such investigation may incorporate innovative investigative approaches.

- For the specific determination of DNAPL in soil to utilize certain options for RSR soil pollutant mobility criteria, the RSRs mandate the use of a partitioning formula found in section 22a-133k-2(c). However for determining if the site may have DNAPL present in soil or groundwater as a hypothesis to be incorporated in the CSM and further evaluated for action under RSR section 22a-133k-2(g), the Department recommends using a practical approach using multiple lines of evidence, including physical observation, rules of thumb, and remedial system performance response, as described in the Documents.
- Soil vapor samples collected outside the footprint of a building are not appropriate for evaluating the exposure pathway due to potential false negative conclusions. However, such data, especially when depth discrete profiling is used, may have applicability for field screening to determine approximately the pollution location and extent, which is then confirmed through analytical methods.

Monitoring

- The Documents recommend several objectives for a monitoring program associated with a remediation project, and the Department considers such monitoring as useful in the ongoing development of the CSM for a site and documentation of remediation. Monitoring prior to demonstrating compliance with the RSRs may be flexible and targeted as described in the Documents. However specific regulatory requirements under state law must also be met, which may include monitoring that is required under the framework of a discharge permit, compliance monitoring for remediation under the RSRs, and long term monitoring associated with RSR Engineered Control or Technical Impracticability variances.
- Anomalous trends in the monitoring data or remedial performance data may suggest that the CSM should be revisited for potential presence of undocumented interstitial NAPL or for sorbed NAPL constituents on low-permeability strata.
- Innovative sampling approaches appropriate for remedial design might not provide data of known and documented quality or otherwise suitable as representative for use in compliance monitoring under Connecticut's RSRs. It is incumbent on the environmental professional to describe how any RSR compliance monitoring using passive (no flow) groundwater monitoring sampling methods is representative of aquifer conditions. Similarly, if groundwater samples from short interval sampling horizons used for remedial design are proposed for exclusion from the representative data set, a rationale for such exclusion is necessary.

Remediation Objectives

- The absolute remedial objective under Connecticut law is to eliminate potential sources of pollution to the waters of the state. The RSRs define acceptable risk management approaches that include some concepts similar to the description of functional objectives in the Documents.
- The concept of functional objectives is useful in the management of remediation of a site, but users of the Documents in Connecticut should note that the RSRs are an end-point risk management framework that is conceptually different. In some cases a functional objective may be an acceptable end-point under the RSRs; in other cases it may be an interim goal that is not suitable for RSR compliance verification. The described site closure strategy should be carefully used in conjunction with an understanding of the RSRs.
- The RSRs include a specific requirement to remove DNAPL from soil and groundwater to the maximum extent prudent, and this must be incorporated in developing site remedial objectives. The Documents provide information on how tiered objectives can be used in developing a program to demonstrate maximum removal to the extent prudent has been accomplished.

- The Documents provide an approach to evaluate the need to address remediation of contamination, even if below the water table, as a functional objective necessary to eliminate any residual source that would otherwise cause continued groundwater pollution above RSR criteria.
- In evaluating Remedial Objectives reflecting site specific alternative risk management for RSR consistency, the Department recommends users consider life cycle costs of these alternatives in determining their appropriateness as a final goal. Remediation based on a functional objective may address RSR compliance but have associated long-term obligations and liability under the RSRs.

RSR Technical Impracticability Variance

- The Documents refer to "long-term site management," indicating that at many of these sites, even with proper characterization, it will not be technically feasible to achieve compliance with the default remedial criteria. Because of this, the achievable endpoints of a remedial approach will frequently be associated with a maximum extent prudent determination, documentation that the plume has reached a steady state condition, and that risks to current and future receptors have been addressed. In some cases, the inability to achieve groundwater criteria may ultimately need to be tied to a Technical Impracticability (TI) Variance under the RSRs.
- Concepts in the Documents are appropriate to use in determining when a DNAPL source mitigation has achieved a goal of "maximum extent prudent" as a qualifying requirement for a TI Variance demonstration under the RSRs. The Department expects that an evaluation will incorporate the effects of any partial source zone treatment on the plume extent and duration, as discussed in the Documents.
- The characterization methods described in the Documents will be extremely useful in documenting where a residual source and plume is in its life cycle to support why a remedial approach was unable to achieve remedial criteria in asserting that remediation to the maximum extent prudent has occurred or in a request for a RSR Technical Impracticability Variance.

RSR Compliance Verification

- The Department will evaluate results of non-traditional metrics and approaches, including model predictions, on a case specific basis, taking into account an appropriate sensitivity analysis. The Department considers modeling an appropriate tool to test hypotheses in a CSM, but does not at this time use predicted future conditions as a basis for RSR compliance. There is no explicit provision for final RSR cleanup to be based on trend analysis, however the Department believes that a limited modeling approach may be considered as a supporting line of evidence in any request for approval of alternative remediation criteria.
- When using innovative investigative techniques in conjunction with conventional methods, the environmental professional is expected to reach a RSR verification conclusion using all the multiple lines of evidence, and describe the rationale supporting the appropriateness of their determination. The Documents may assist in developing this rationale, resolving issues with conflicting lines of evidence, and supporting a determination that reduced conventional data density is sufficiently representative.
- The RSRs do not currently incorporate any default provision for demonstrating compliance using the concepts of mass flux and mass discharge presented in the Documents. These are valuable risk assessment and risk management tools, but are not easily compatible with achieving compliance with RSR default remedial criteria based on concentration at a point. However, they are useful in the context of presenting plume attenuation models and may be important lines of

evidence supporting a demonstration of removal to the maximum extent prudent or justifying the extent of the area encompassed by a TI variance.

Limitations

- This concurrence shall not be construed to constitute an assurance by the Commissioner that a selected remedial approach will achieve remediation goals, result in compliance, or prevent or abate pollution. A successful remediation may depend on the appropriateness of the specific selected technology for site conditions. Effectiveness may also be affected by adequacy of site characterization specific to implementation design, including microstratigraphy, soil-sorbed pollution and secondary desorption potential, 3-D flow, the potential for secondary mobilization of metals from the aquifer matrix, and other site-specific factors that should be evaluated before choosing to use any specific technology.
- This concurrence shall not be construed to constitute an assurance by the Commissioner that data generated using methods identified in the Documents will be able to successfully validate a CSM or serve to document RSR compliance.
- This concurrence does not constitute specific endorsement of any commercial products, modeling software, or other documents referenced in the ITRC document.

12 MAR 2018
Date

/S/PATRICK F. BOWE
Patrick Bowe
Director
Remediation Division