

**STATE OF CONNECTICUT
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION
BUREAU OF WATER PROTECTION AND LAND REUSE
REMEDiation DIVISION**

**TARGETED BROWNFIELD REMEDY
GUIDANCE DOCUMENT**



FEBRUARY 2012

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Targeted Brownfield Remedy Guidance Document

(Effective February 2012)

The intent of this guidance document is to facilitate a thought process that can be used by environmental professionals to: 1) design an investigation in support of a Targeted Brownfield Remedy (TBR); 2) determine which data gaps are significant; 3) identify pollution that will not be addressed by the standard TBR capping approach; and 4) determine what supplemental investigation and remediation will be required to address pollution in areas that are not subject to the TBR.

A TBR is intended to be an effective tool that will aid in the restoration of eligible contaminated sites in GB areas to productive use. This guidance document presents an alternative characterization approach for areas within a site located in a GB area that are targeted for the presumptive remedy. This alternative approach is based on the pre-determination of the remedial process at the outset of the project, and therefore, the investigation is designed to support the remedy. The basic concept and goals of the Department's Site Characterization Guidance Document (SCGD) remain valid, and this TBR guidance document is to be considered supplemental guidance for a situation-specific alternative approach only. This TBR guidance also discusses presumptive remedial approaches and expectations related to documentation of the characterization and remediation of a Brownfield site.

It is anticipated that the alternative approach for the characterization of a TBR area presented in this guidance document will reduce the cost and timeframe of the supporting investigation. For example, all stakeholders will proceed with the investigation on the premise that releases have occurred; therefore, the classic Phase II investigation may be scaled back to those areas of the site not targeted for the TBR approach. The Data Quality Objectives (DQOs) may therefore be focused on support of the remedy.

The TBR Investigation approach presented in this guidance document applies only to unsaturated soils in those portions of a site that are targeted for the TBR approach. It is expected that all other areas or releases, if any, at a site will be investigated in accordance with the standard approach in the SCGD.

The TBR approach addresses soil pollution and can be used as part of a comprehensive remedial strategy to address site-wide remediation requirements. Other issues such as groundwater pollution, non aqueous phase liquids, soil contamination below the water table and polluted sediment must be addressed through other remediation strategies. It is expected that the mobility and exposure pathways (resulting from the migration of waste, contaminated groundwater, or vapors associated with a release) that present potential risks to sensitive receptors will be addressed by the presumptive remedy or by other standard means. In light of the limited investigation of areas on a site which would be acceptable to support the TBR characterization, it is important to be able to assure the public that any risks associated with this expedited redevelopment approach will be addressed.

Characterization of Areas Subject to a Targeted Brownfield Remedy

The conceptual site modeling process, as described in the Department's SCGD, should be used for the TBR Investigation. Since the TBR is identified early as part of the site redevelopment design, the characterization process for TBR areas can be a focused, risk-based investigation. As such, it is designed to collect only the quantity and quality of data needed to support the implementation of the TBR, while still being protective of human health and the environment. Because the goal of the investigation in support of a TBR is to confirm the effectiveness of the proposed remedy, rather than to confirm there is no contamination present, the DQOs for the TBR Investigation may be different than standard site characterization DQOs.

In order to evaluate the applicability of the TBR approach at a specific site and to determine eligibility for its use, a comprehensive Phase I Environmental Site Assessment (ESA), as described in the SCGD, is essential. (Please refer to the SCGD for guidance.) It is important to know where and what activities occurred at the site.

The purpose of a standard Phase II investigation is to determine whether or not a release to the environment has occurred. For the TBR approach, it is presumed that there is existing pollution at the site. Therefore, rather than having the objective of completely delineating the pollution, the focus of a TBR Phase II Investigation is to evaluate the potential for risks to human health and the environment from contaminant pathways and constituents of concern that might not be adequately isolated by the TBR.

The number and location of samples (the sampling rationale) is related to the level of certainty needed for the TBR approach. Therefore, it is important that the investigative scope of study evaluate the initial Conceptual Site Model in light of what would be significant data gaps from the perspective of ensuring that the proposed remedy would be effective and protective. Since it would not be necessary to confirm the absence of contamination for the portion of the site targeted for the TBR, the DQOs¹ for the TBR investigation become less restrictive. This should allow a reduction in the sample density necessary to characterize the nature and extent of a release that is located in the TBR area. In some cases, where multiple and similar release areas are present (for example beneath the slab of an industrial building) characterization of each individual release area may not be necessary.

Streamlining of characterization would be most applicable for broad exterior release areas or releases beneath structures. Since the DQOs for the investigation of releases at a TBR portion of a site are not focusing on documenting the full extent and degree of a particular release, but focus on demonstrating that the presumptive remedy itself will be used to achieve compliance, field screening methods may be considered to be consistent with the site DQOs' modified level of certainty. In many cases, use of composite sampling may be appropriate within TBR area to support the presumed remedy. Impacted soil in the saturated zone represents a potential continuing source of groundwater pollution. Therefore, the environmental professional is expected to have an appropriate understanding of the distribution of the contaminants in the saturated zone in order to evaluate the remedial requirements beyond the TBR, including, but not limited to, groundwater remediation.

Since the underlying premise is that (unsaturated) soils throughout the area subject to the TBR are impacted in excess of the DEC and PMC, it is less important to fully understand the location of individual pollutant sources/releases within the targeted area. A general sense of pollutants and their distribution throughout the targeted TBR area will be sufficient. However, it is important for the environmental

¹ Data Quality Objectives: Objectives/goals of a sampling program to identify when enough information has been obtained to evaluate if the investigation is sufficient with an appropriate level of certainty.

professional to understand the lateral limits of the TBR, and therefore the extent to which release areas extend beyond the limits of the TBR and which will not be addressed by the presumptive remedy.

Because of the inherent heterogeneity of soils and the variability of release mechanisms and pathways of migration, the environmental professional will need to have some general understanding of the nature of the pollution and the fate and transport components of the contaminants of concern (COC).

While the remedy being implemented under the TBR renders the presumed contamination environmentally isolated, the potential for groundwater impacts originating under the TBR cap need to be understood and remediated, if necessary, pursuant to the RSRs. Therefore, the environmental professional should have an appropriate understanding of the hydrology of the site/region and any groundwater impacts from on-site releases.

To confirm that the TBR remedial approach will adequately address potential risks to human health and the environment, the environmental professional should have a sufficient understanding of the environmental system at the conclusion of the TBR Investigation, which requires knowledge of site geology, hydrogeology, chemistry and fate of COCs and, where appropriate, ecology.

The decreased level of certainty concerning the nature of releases and distribution of contaminants will require a greater level of certainty regarding the absence of sensitive receptors. Therefore, if groundwater is impacted at the site, a sensitive receptor survey will be necessary.

If the extent/concentrations of volatile organic compounds (VOCs) are not characterized as part of the TBR Investigation, supplemental remedial measures in the form of active treatment might need to continue indefinitely. The need for this long-term treatment can be eliminated to the extent that supplemental characterization measures are used to determine whether a source of VOCs exists, is adequately understood, and has been reduced to the maximum extent prudent.

Non-aqueous phase liquid (NAPL) that is below the seasonal high water table is considered to be a continuing source of groundwater pollution and cannot be rendered environmentally isolated through the use of a cap. Therefore, delineation and characterization of NAPL or other forms of mobile contaminants, whether within the TBR area or present on any other portion of the site, should be completed pursuant to the SCGD and addressed in accordance with the RSRs.

In order to put the concept of the TBR Investigation approach in perspective, the following table should be referenced to ensure the goals of the TBR Investigation are understood:

TBR Investigation Goals	
	There is a representative understanding of all groundwater impacts and plumes, whether associated with the area subject to the TBR or other on-site and/or upgradient releases.
	Pollution associated with the TBR will not continue to impact groundwater once the remedy is constructed.
	The extent and degree of any NAPL has been determined.
	Characterization has indicated that the TBR approach is consistent with program requirements for underground storage tanks, PCBs subject to TSCA regulations, and RCRA Units.
	The presence of sensitive human and ecological receptors has been evaluated.

	All contaminated soil above the water table in the subject areas at the site will be rendered inaccessible and environmentally isolated beneath either new or existing buildings or under a low permeability cap, unless otherwise approved.
	The potential mobility and exposure pathways that present potential risks to all sensitive receptors (resulting from the migration of waste, contaminated groundwater, or vapors associated with a release) will be addressed by the TBR or other remedial measures.
	Sub-slab vapor controls would be installed beneath every building on site to ensure that no volatile compounds migrate into the overlying buildings, unless otherwise demonstrated that exposure due to vapor intrusion is not an unacceptable risk to human health in any building which is not equipped with vapor controls.
	A validated Conceptual Site Model supports the appropriateness of the remedy.
	A monitoring program will be established to identify whether off-site migration of contaminants through groundwater or soil vapor pose a risk ² to off-site receptors.

Targeted Brownfield Remedy Remedial Approach

The TBR approach is specifically focused on pollutant mobility, direct exposure, and volatilization issues that will be addressed through engineered control variances, isolation / inaccessibility beneath buildings (or other structures), and vapor barriers (with vapor extraction systems, if appropriate). One of the assumptions of the TBR approach is that any pollution being addressed by this approach will be prevented from becoming mobile into the environment. Environmentally isolating contaminated soil beneath buildings or caps is only effective to the extent that the contaminants present would cease to be mobile. It is important to confirm that either an appropriate remedial approach can be implemented through the use of a TBR, or that additional / supplemental remedial measures will be necessary in addition to the presumptive remedy. The installation or completion of a presumptive remedy should not be compromised by any additional and/or supplemental remedial measure that may be warranted. Additional remedial measures should be implemented either prior to the construction of the TBR, or downgradient of it.

After characterization has been completed and remedial options are being evaluated/designed, stakeholders should consider the following:

Remedial Approach Checklist	
	The TBR will not prevent the proper remediation of contaminants related to NAPL or contaminated groundwater associated with releases that will be addressed by the TBR.
	The TBR will not prevent the proper remediation of contaminants resulting from other releases on the site.
	Contaminants associated with other release areas on the site will not adversely impact the integrity or operation of the TBR.

² A program for monitoring the on-going impacts to groundwater quality from the site, along with any associated remedial measures to address groundwater contamination, is necessary regardless of whether the site is subject to liability relief for groundwater contamination which had historically migrated off-site.

	Based on comprehensive Phase I ESA information (which is the minimum level of information needed to determine eligibility) and any other information that is available at the time the TBR approach is being implemented, it can be shown that the cost of remediating the polluted soil at the subject area for the TBR is significantly greater ³ than the cost of installing, maintaining and monitoring an engineered control for such soil.
	The failure of the TBR would not pose an unacceptable short-term risk to human health or the environment, or create a Significant Environmental Hazard, in the time required to identify and repair such a failure.
	Exposure risks to potential receptors from contaminants identified during site characterization will be evaluated and addressed.

Be aware that regulations of federal remedial programs may apply to the site, such as PCBs subject to TSCA, RCRA Units, or underground storage tanks.

The initial screening provided in the TBR Eligibility Checklist requirements, in combination with the concepts presented in this guidance document will ensure that the use of engineered controls is permissible for all TBR sites. Prior to construction of any engineered control, the conceptual design of the site-specific engineered control must be submitted to the Department for review and concurrence (Part 1 application), and the plans and specifications for the site-specific engineered control must be submitted to the Department for review and approval (Part 2 application). The Department will expedite the review and approval process.

Post-Implementation Obligations

Any engineered control implemented as part of a TBR will require a long-term program of inspection, maintenance, monitoring and reporting, accompanied by a financial surety mechanism.

Long-term operation and maintenance requirements may also apply to vapor protection systems implemented for on-site buildings as part of the remedy, depending on their design.

As with any remediation being performed under the RSRs, there will be a short-term obligation to monitor groundwater quality from wells that are representative of the TBR area to demonstrate the presumptive remedy mitigated mobility of COCs and any continued or potential impact to the groundwater from the unsaturated zone. This must include monitoring groundwater quality over time to determine:

- the effectiveness of soil remediation in preventing further pollution of groundwater by substances from the TBR area;
- the effectiveness of any remediation taken to eliminate or minimize identified health or safety risks associated with releases at the TBR area;
- whether surface water protection criteria and volatilization criteria have been met; and
- whether a groundwater plume interferes with any existing use of the groundwater.

³ The requirement to evaluate engineered controls from the perspective of “significantly greater” cost is not further defined in the Remediation Standard Regulations. When applying this provision of the TBR Eligibility Checklist, the developer/applicant should consider the cost of the engineered control to be “significantly greater” if the difference between the least expensive alternative remedial approach for the areas subject to the engineered control and the cost of the conceptual engineered control for the TBR, and associated long-term obligations, is more than 10% of the combined project cost for redevelopment and remediation.

As the TBR site must be located in a GB area to qualify for use of the TBR approach, post-remediation monitoring of the TBR area may be ceased after two years of completion of the engineered control, assuming compliance with the applicable groundwater criteria has been achieved. (Note: If the extent/concentrations of COCs present at or emanating from the site are not addressed with the presumptive remedy, supplemental remedial measures and monitoring may be required pursuant to the RSRs.)

Documentation

It is expected that if the property was not already in a Remediation Program, a stakeholder to the remediation and redevelopment of the Brownfield site will enter the Voluntary Remediation Program. In order to expedite the TBR approach, a licensed environmental professional will be authorized to render applicable verifications at applicable milestones. Therefore, the documentation and reporting requirements of the investigation and remediation of the site are no different than for any other remedial site. However, documentation in support of the TBR should specifically include the following items:

- If the environmental setting necessitates completion of a sensitive receptor survey (as discussed earlier), the results of the survey should be presented to the Department.
- Subsequent to the TBR Investigation and standard site characterization, if applicable, a Completion of Investigation report that documents the investigation and presents relevant information that supports the TBR should be submitted.
- The final and validated conceptual site model should describe, explain, and provide an understanding of the nature and distribution of contaminants at the TBR area and other locations of the property, if warranted. It will be necessary to evaluate all potential risks to human health and the environment.
- The conceptual site model should support the presumptive remedy. The rationale and justification for alternative characterization approaches utilized in support of the TBR and a summary of the sampling objectives should be presented. This would include:
 - Identifying assumptions used as part of formulating the alternative investigation approach - data quality objectives;
 - The logic behind determining what is an acceptable data gap in the conceptual site model; and
 - The appropriateness of the associated monitoring program and supplemental remedial actions which have been implemented or that are reserved as a contingency, as necessary.

Submission of reports should be provided digitally as well as by hard copy.