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## **SECTION V: RELATIONSHIP TO OTHER ENVIRONMENTAL STATUTES**

Remediation under Act 2 sometimes involves relationships with other environmental statutes (e.g., closure of waste management facilities, groundwater pump and treat systems which discharge to a surface water and require an NPDES permit). Although other Department programs (e.g., Bureau of Clean Water) will be involved in requests and approvals, the regional Environmental Cleanup and Brownfields Manager will coordinate these activities. Therefore, all correspondence necessary for the Act 2 cleanup should be submitted to the attention of the regional Environmental Cleanup and Brownfields Manager.

### **A. Solid Waste Facilities**

This section provides a general overview of the interface between Act 2 and the Solid Waste Management Act (SWMA) (35 P.S. §§ 6018.101-6018.1003). The sections that follow are meant to provide a broad overview of the interrelationship between these statutes and programs; they are not meant to be used as a substitute for specific regulations that apply to solid waste processing or disposal facilities. Solid waste management facilities, including those facilities that process and dispose of municipal, residual, or hazardous wastes, are primarily regulated under SWMA. The permitting, bonding and compliance requirements of SWMA are implemented through policies and regulations adopted as follows: Chapters 260(a) through 270(a) for hazardous waste, Chapters 271 through 285 for municipal waste, and Chapters 287 through 299 for residual waste.

The Management of Fill Policy (August 7, 2010 - Document Number 258-2182-773) provides the Department's procedures for determining whether material qualifies as clean fill or regulated fill under SWMA, and it provides guidance as to whether a permit is required when using fill. Also, please refer to the Management of Fill Questions and Answers page on the DEP website for additional information regarding this policy and its interaction with Act 2.

#### **1. Movement of Excavated Contaminated Media and Other Solids**

Under 25 Pa. Code § 287.101(e), the Department will not require a permit for the movement of residual waste within an Act 2 site (e.g., grading of the site, and placement back into exploratory holes) so long as the site attains the site-specific standard (SSS) of Act 2. This applies to Act 2 sites undergoing a site-specific cleanup. A permit is not required when moving regulated fill from one Act 2 site to a receiving site that is being remediated to attain an Act 2 site specific standard. Movement of regulated fill between Act 2 sites must be documented in both the sending and the receiving sites' cleanup plans and final reports (FR). Regulated fill material normally would not be moved until after DEP approves the Remedial Investigation Report (RIR) in the SSS cleanup process. The remediator is encouraged to review 25 Pa. Code § 287.101(e) determine all restrictions regarding the movement of excavated contaminated media and other solids. Regulated substances contained in the regulated fill must be incorporated into the notice of intent to remediate (NIR). This includes sites being remediated under the corrective action process (CAP) of 25 Pa. Code Chapter 245.

Excavated hazardous waste should be removed for proper disposal under the hazardous waste generator requirements of 25 Pa. Code Chapter 262(a). Movement of any contaminated media or solids offsite, other than to another Act 2 site, is the generation of

waste under 25 Pa. Code § 250.3. Under these circumstances, the remediator is subject to the generator requirements of the SWMA.

**2. Disposal Prior to September 7, 1980**

Solid waste management facilities that were permitted under the Pennsylvania SWMA of 1968 (Act 241), or had an approved closure plan or consent order and agreement, that ceased disposal activities prior to September 7, 1980, are subject to the terms and conditions of their original permit relating to closure or to the approved closure plan or consent order and agreement. The permittee may request approval from the Department for a modification of the permit or closure plan to be consistent with Act 2 standards for remediation of any release of a regulated substance to soil or groundwater.

Solid waste management areas or facilities that were not permitted or did not have an approved closure plan that ceased disposal prior to September 7, 1980, may be remediated under the provisions of Act 2 by either removing the non-media solids and using any combination of Act 2 standards, or closing in place. Closing in place may be accomplished by covering the non-media solids with a suitable cover and using pathway elimination under the SSS and any combination of Act 2 standards for soils and groundwater outside the perimeter of the cover under 25 Pa. Code § 250.9(a). Liability protection afforded under Section 501 of Act 2 would be provided upon approval of the FR by the Department. The covering, grading, revegetation, and related closure activities for waste left in place are to be consistent with best management practices (BMPs) to prevent pollution, odors, and other public nuisances.

**3. Disposal after September 7, 1980, for Residual Waste and Construction/Demolition Waste, and between September 7, 1980, and October 9, 1993, for Municipal Waste**

Municipal and residual waste disposal activities that occurred after September 7, 1980, are subject to SWMA, the terms and conditions of permits issued pursuant to SWMA, and to the municipal and residual waste regulations, including an approved closure plan. Permitted facilities that are closed (prior to October 9, 1993 for municipal waste facilities) may use any one or a combination of the remediation standards for releases into soils or groundwater under 25 Pa. Code §§ 271.113(g), 271.342(b)(4) or 287.342(c). In addition, the permitted facility may elect to proceed under Act 2 and, upon approval of the FR obtain the liability protection afforded by Section 501 of Act 2 for the release(35 P.S. 6026.501). The cause of the release or spill must be addressed in accordance with the terms and conditions of the closure plan or permit. Any relief of liability afforded under Act 2 relates only to the regulated substances identified and in no way is to supersede the terms and conditions of the closure plan or permit.

An unauthorized municipal waste landfill that ceased disposal prior to October 9, 1993, or an authorized construction/demolition waste landfill, residual waste landfill or an unauthorized disposal impoundment that ceased after September 7, 1980, where the Department has not required removal of the solid waste on the ground and use of Act 2

for the remaining contaminated media, must be remediated in accordance with the following<sup>1</sup>:

- Removal of the non-media solids and use of any one or a combination of Act 2 standards for the remaining contaminated media, or
- Closing in place by applying the applicable closure standards of the regulated facility encountered that are specified in 25 Pa. Code Chapters 271, 273, 287, 288 and 289 as required by 25 Pa. Code § 250.9(b) of the regulations (unless applicable operational standards are specifically waived by the Department under the requirements of such waivers set forth at §§ 25 Pa. Code 271.113(d), 287.117(b) of the regulations and Section 902(b) of Act 2), pathway elimination under the SSS and any one or a combination of Act 2 standards for soils and groundwater outside the perimeter of the closure area.

In addition, the unauthorized facility can elect to proceed under Act 2 and, upon approval of the FR, obtain the liability protection afforded by Section 501 of Act 2 for the release.

The Act 2 program would govern remediation at properties where solid or liquid municipal or residual wastes such as metal, brick, block or debris were disposed without permit, and became mixed with soil thereby becoming a part of the environmental media. The remediator would choose the applicable BMPs to include covering, grading, revegetation, and related activities to prevent pollution, odors and other nuisances that would apply to the remediation of mixed media. Liability relief afforded by Act 2 would only apply to the area characterized and to the contaminants identified in the Act 2 FR. If the soil/waste mixture is moved offsite, the material must be managed as waste pursuant to § 250.3 of the regulations and the municipal or residual waste regulations in accordance with 25 Pa. Code § 287.2 or § 271.2.

#### **4. Disposal of Hazardous Waste after September 7, 1980, or Municipal Waste after October 9, 1993, Subject to Federal Closure Requirements**

To ensure primacy and program authorizations under RCRA at properties where disposal of hazardous waste occurred after September 7, 1980, or municipal waste disposal occurred after October 9, 1993, regardless of whether a permit or approval was obtained, the remediation and closure of such federally regulated waste management units are governed by the appropriate SWMA regulations. Waivers of operational standards under Section 902(b) of Act 2 are generally not applicable unless approved by EPA. The Department will consult with EPA to ensure that federal closure requirements are properly applied.

Hazardous waste sites that have RCRA Subtitle C corrective action obligations may satisfy federal requirements by also participating in the voluntary cleanup process provided by Act 2. For RCRA facilities with “low” or “medium” priority corrective action obligations, Act 2 standards may be applied as described below to satisfy both

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<sup>1</sup> In each of these situations it is assumed that the Department would exercise its enforcement discretion. If the Department determines that the responsible party/property owner conducted the intentional culpable long-term practice of placing waste into the environment, Act 97 would apply.

state and federal requirements concurrently. For “high” priority RCRA corrective action facilities, application of Act 2 standards as described below may also be used, but with greater interaction with EPA.

**a) Hazardous Waste**

If hazardous waste was disposed before September 7, 1980, and continued after September 7, 1980, but before September 26, 1982 [see 40 CFR § 270.1(c) incorporated by reference in 25 Pa. Code § 270a.1], without interim status, and the Department has not required removal of the hazardous waste and use of Act 2 to remaining contaminated media, the remediator must close the “existing” facility under closure standards provided in 25 Pa. Code Chapter 265a of the hazardous waste regulations for the facility unit encountered, and, upon approval of the FR by the Department, obtain the liability protection afforded by Section 501(a) of Act 2 (35 P.S. 6026.501).

As examples, typical units encountered are surface impoundments and waste piles. Closure requirements set forth in 40 CFR § 265.228 (surface impoundment closure) and 40 CFR § 265.258 (waste pile closure), incorporated by reference in 25 Pa. Code Chapter 265a, require removal of the solids and contaminated subsoils. To attain clean closure, the remediator should remove solids and contaminated soils that are above the level of the listing; i.e., characteristically hazardous solids and soils, and solids and soils contaminated by waste disposal above the residential Statewide health standard (SHS) for used aquifers. Any soil or groundwater contamination remaining after clean closure must be remediated using any one or a combination of Act 2 standards. If clean closure is not attained, the remediator must close the hazardous waste regulated unit in place using the closure standards for landfills set forth in 40 CFR § 265.310 and use the SSS for the in-place closed area. Any release into groundwater or soil outside the approved in-place closure area is subject to any one or a combination of Act 2 standards (except the Statewide health nonuse aquifer standard, which has not been SSS).

Hazardous waste facilities created after September 7, 1980, and hazardous waste facilities existing on September 7, 1980, which continued to receive waste after September 26, 1982, are subject to the closure, post-closure and corrective action requirements of 40 CFR Part 264, as incorporated by reference in Chapter 264a. As examples, a surface impoundment in this category is subject to the closure requirements of 40 CFR § 264.228 and a waste pile in this category is subject to the closure requirements of 40 CFR § 264.258. If clean closure is not attained, the remediator must close the regulated hazardous waste unit in place, using the closure standards for landfills set forth in 40 CFR § 264.310 and use the site-specific pathway elimination standard for the in-place closed area. Any release into groundwater or soils outside the approved in-place closure area is subject to one or a combination of Act 2 standards (except the Statewide health nonuse aquifer standard as explained above) at a point of compliance (POC) for groundwater set forth in 40 CFR § 264.95.

**b) Municipal Waste**

If a permitted municipal waste landfill received waste between October 9, 1993, and December 23, 2000, a release from the landfill of a regulated substance must be remediated in accordance with a closure plan approved prior to December 23, 2000, or remediation standards in the municipal waste regulations that are similar to the federal requirements under Subtitle D of RCRA.

A release of a regulated substance from a municipal waste landfill permitted on or after December 23, 2000 must be remediated in accordance with the remediation standards in the municipal waste regulations that are similar to the Subtitle D requirements in § 271.342(b)(2).

At properties where the unauthorized disposal of municipal waste occurred after October 9, 1993, remediation shall consist of removal of the non-media solids and the use of any one or a combination of Act 2 standards for the remaining contaminated media.

Where the Department determines that the removal of the waste, which was not authorized disposal, is impracticable or will cause unacceptable impacts to public health or the environment, the remediation shall consist of closing the facility in place by applying the applicable closure standards of the regulated facility encountered that are specified in Chapters 271 and 273, as required by 25 Pa. Code § 250.9(b) and by using pathway elimination under the SSS for the non-media solids on the ground, and any one or a combination of Act 2 standards for soils and groundwater outside the perimeter of the closure area that is consistent with the applicable requirements for groundwater remediation standards and POC set forth in 25 Pa. Code § 271.342(b).

## **B. Clean Streams Law Interface**

The Department has developed a contaminant dependent hierarchical process described in Section III.A.3 of this manual for demonstrating attainment of surface water quality criteria.

The waiver provision of 25 Pa. Code § 250.406 was included as part of the initial Chapter 250 Land Recycling Program regulations, as promulgated by the Environmental Quality Board on August 16, 1997. The preamble of this rulemaking explains: “This section was added on final rulemaking to clarify the relationship between the surface water quality standards and Act 2.” The preamble further clarifies the intent of the waiver provision in the section stating: “Section 902(b) of Act 2 authorizes the Department to waive applicable requirements where responsible persons can demonstrate, among other things, that the proposed remedial action will attain a standard of performance that is equivalent to that required under the otherwise applicable requirement through use of an alternative method or approach.”

Act 2 allows for a waiver of certain requirements as specified in Section 902 of the Act (35 P.S. § 6026.902). The substance of this waiver provision is provided in 25 Pa. Code § 250.406(c). The waiver provision of 25 Pa. Code Chapter 250.406 allows the remediator to apply to the Department for a waiver of the otherwise applicable requirements of Chapter 93 relating to human health criteria based on the use of alternative site-specific exposure factors or design conditions associated with the surface water pathway.

In order for a remediator to “demonstrate to the Department that the proposed remedial alternative will result in attainment of a concentration in the stream that does not exceed human health criteria” as stated in 25 Pa. Code § 250.406 (c)(2) for a waiver of provisions in 25 Pa. Code Chapter 93, they would need to use alternative site-specific exposure factors or design conditions that would demonstrate that human health exposures to the surface water pathway are controlled. The remediator could make this demonstration using a qualitative evaluation of alternative site-specific exposure factors. The remediator would not necessarily need to use a quantitative risk assessment process or submit a risk assessment report.

In cases where the remediator can demonstrate to the Department that future human health exposures to the surface water pathway are controlled, the Department may issue the waiver.

### **1. Point Source Discharges**

Surface water discharges associated with contaminated sites are classified as point and nonpoint sources. A point source is a distinct conveyance from which pollutants are or may be discharged into a surface water such as a leachate discharge from a disposal unit. Such point source discharges are required to be permitted as a NPDES discharges. In other situations, stormwater runoff from a contaminated site discharges through a storm sewer or surface water may be considered a point source discharge and may also be subject to NPDES requirements.

### **2. Nonpoint Source Discharges**

Act 2 requires that any site selecting the SHS or SSS must also demonstrate compliance with surface water quality criteria when a nonpoint source discharge such as contaminated groundwater discharges into surface water as summarized in § 250.309(a).

Within 25 Pa. Code 25 Pa. Code § 93.6, Water Quality Standards, the remediator is reminded that discharges to surface water should also be free of floating materials such as oil and grease (aesthetic or visible nuisances) in addition to the dissolved-phase impact.

### **3. Erosion and Sedimentation (E&S) Control**

In addition to evaluating the impact of discharges into surface water, the remediator must carefully evaluate remedial activities to minimize E&S in conformance with the requirements of 25 Pa. Code Chapter 102. In-place closures of unregulated and unauthorized disposal units will satisfy these requirements through the development, implementation, and maintenance of E&S control BMPs.

Remedial actions implemented during Act 2 cleanups that include any earth disturbance activities should be undertaken using the following procedures:

#### **a) For Earth Disturbances Less Than 5,000 Square Feet (Ft<sup>2</sup>)**

If the proposed earth disturbance at an Act 2 cleanup site involves an area of less than 5,000 ft<sup>2</sup> and the potential discharge is to waters other than special protection, the remediator should implement and maintain applicable E&S BMPs as outlined in the BMP program guidance manual on the DEP website (*Pennsylvania Stormwater BMP Manual*, December 2006). Chapter 7 of DEP's BMP manual is devoted to Special Management Areas, including Brownfields sites.

If the earth disturbance involves an area of less than 5,000 ft<sup>2</sup> and the potential discharge is to waters that are Special Protection (for example, Exceptional Value or High Quality Waters), then the requirements in the following section apply.

#### **b) For Earth Disturbances 5,000 Ft<sup>2</sup> to 1 Acre (and Discharge to Special Protection Waters For Any Size of Earth Disturbance Less Than 1 Acre)**

If the proposed earth disturbance at an Act 2 cleanup site involves an area 5,000 ft<sup>2</sup> or greater, the remediator should prepare an E&S plan. All earth disturbance activities should be conducted in accordance with the E&S plan. The remediator should have a copy of the E&S plan and all subsequent inspection reports and monitoring records onsite during all stages of the earth disturbance activity. The remediator should contact the county conservation district for any technical assistance prior to preparing the E&S plan. In some cases, the county conservation district may wish to review the plan voluntarily, or it may require the review on behalf of the local municipality. In addition, the county conservation district may inspect the site as a follow-up to the plan review, as part of routine inspections, or in response to a complaint.

#### **c) For Earth Disturbances 1 Acre or Greater**

If the proposed earth disturbance at an Act 2 cleanup site involves an area of one (1) acre or more, the planned action may require a general or individual NPDES permit for stormwater discharges associated with construction activities.

In these cases, the remediator should contact the DEP regional Waterways and Wetlands Program staff or assistant regional director to schedule a pre-application meeting. At the pre-application meeting, DEP and county conservation district staff will provide the remediator with the relevant information regarding the permit procedures and requirements. It is important to note that in addition to the development of an E&S Plan, the remediator will be required to develop a post-construction stormwater management plan for any new structures (e.g. buildings, parking lots, etc.). The remediator is not authorized to initiate any Act 2 earth disturbance activities until DEP or the Conservation District issues the permit to the remediator.

As previously detailed, a portion of Chapter 7 of the DEP's BMP manual is devoted to BMPs at Brownfield sites. The remediator should consult with the manual and ECB regional office staff in the coordination of any required E&S plan development and all permit applications.

Additional guidance may be found in DEP's *Erosion and Sediment Pollution Control Program Manual*, March 2012. The manual may be found on the DEP website.

**d) Post-Construction Stormwater Management (PCSM)**

A remediator proposing a new earth disturbance activity that requires permit coverage under 25 Pa. Code Chapter 102 or other Department permit that requires compliance with E&S control shall be responsible to ensure that a written PCSM Plan is developed, implemented, operated and maintained in accordance with the requirements of 25 Pa. Code § 102.8.

The remediator should keep in mind that a completed Act 2 cleanup site may contain existing site conditions which have public health or environmental limitations. Because of such limitations, the remediator may be able to demonstrate to the Department that it would not be practicable to complete all aspects of the E&S PCSM BMPs as outlined and required within 25 Pa. Code Chapter 102. 25 Pa. Code § 102.8(g)(iii) describes how an applicant who is developing a Brownfield site with impervious conditions or conditions that represent a concern to public health or environmental limitation, e.g., cannot infiltrate stormwater due to residual impacts being addressed through the Act 2 SSS, can demonstrate to the Department that it is not practicable to satisfy the PCSM requirements pertaining to stormwater volume and quality.

Local municipalities and entities (e.g. Philadelphia Water Department) may have separate regulations regarding stormwater management obligations post construction. The remediator of an Act 2 site should be mindful of local stormwater management compliance issues. These obligations are outside of DEP's authority and may require separate permitting application(s).

## **C. Clean Air Act and Air Pollution Control Act Interface**

One area of interface is the case of applying remediation technologies (e.g., air strippers or incineration units) which result in air emissions. In such a situation, a remediator may be required to obtain a general air quality plan approval and operating permit under 25 Pa. Code Chapter 127, Subchapter H. Exemptions to the Air Quality permit requirements are listed and explained in the Air Quality Permit Exemptions document (275-2101-003).

Some pertinent exemptions in this document include an exemption under 25 Pa. Code § 127.14(a) regarding the use and occupancy of a building. Other exemptions under § 127.14(a)(8) include those regarding sources of uncontrolled VOCs with limited emissions increases, those considered as de minimis (25 Pa. Code § 127.449) increases, remediation technologies meeting defined specifications, and any source granted an exemption via a request and submittal of a Request for Determination (RFD). This exemption request is defined in the exemptions document as well as on the Air Quality webpage.

Installation of radon-type vapor mitigation systems as part of an Act 2 remediation does not require a permit if the emission will be of minor significance as defined in 25 Pa. Code §§ 127.3 and 127.14. These systems do not require testing after installation for purposes of determining compliance with air emissions criteria. However, the installed radon-type vapor mitigation systems will need to be tested to demonstrate that sub-slab depressurization is occurring (i.e., the pressure gradient indicates that advective air flow is out of the structure, rather than into the structure). Section IV of this manual (Vapor Intrusion) discusses this process in greater detail.

In cases other than remediation technology emissions, care should be taken to conduct the remediation such that odor (25 Pa. Code § 123.31) and particulate (25 Pa. Code §§ 123.1, 123.2) nuisances will be addressed.

Asbestos is regulated as a hazardous air pollutant under Section 112 of the Clean Air Act. Guidance for the management of asbestos is available on the Department's website as well as EPA's website.

## **D. Regulated Storage Tank Release Sites**

### **1. Introduction**

Storage tank cleanups conducted pursuant to the Storage Tank and Spill Prevention Act (35 P.S. §§ 6021.104 – 6021.2104 Act 32 of 1989, as amended) are required to meet one or more of the standards established under Act 2. Section 904(c) of Act 2 preserves the CAP for the remediation of releases from storage tank systems regulated by Act 32 (35 P.S. 626.904(c)). Regulated storage tank systems include a wide range of underground and aboveground tanks containing petroleum products and hazardous substances. The CAP applies to releases from regulated tank systems for which remediation (anything beyond notification) was initiated on or after August 5, 1989, the effective date of Act 32. Remediators who take corrective action under Act 32 and demonstrate attainment of one or more of the standards under Act 2 will be afforded liability protection. Where Act 32 applies, remediators are not subject to the notice, fee and approval provisions contained in Act 2, but reports submitted under the requirements of Act 32 are subject to review times and deemed approval provisions of 25 Pa. Code Chapter 245.

A remediator who initiated cleanup prior to a tank becoming deregulated by Act 16 of 1995 (which amended Act 32) should continue to implement the CAP, along with use of the Act 2 remediation standards, to receive liability protection. Where a tank is not governed by Act 32 (non-regulated tanks), adherence to the Act 2 administrative process and cleanup standards is required to receive liability protection. When releases of petroleum products occur at sites with both regulated and non-regulated storage tank systems, the remediator may elect to address the releases together, or to address them separately on a dual track of the Act 2 and Act 32 processes. If the remediator elects to address the releases together, then combined reports and notices that satisfy the requirements of each statute, as they apply to each particular tank system, may be submitted. Department reviews will also be conducted to satisfy the requirements of both statutes.

For example, a remediator may submit a combined site characterization/RIR that contains the information required for regulated tank systems under the CAP and unregulated tanks under Act 2, and it will serve a dual function under both Act 32 and Act 2. It should be submitted on a timeframe that meets both statutes; thus, if there is no specific time required to submit the RIR under Act 2, but a site characterization report under Act 32 is required within 180 days of reporting the release, the site characterization/RIR should be submitted within 180 days. Compliance with Act 2 notice and public participation requirements is necessary to receive liability protection for non-regulated tank systems.

The remediator is reminded that the public notification process is abbreviated as allowable if the FR demonstrating attainment of the background or SHSs for a tank cleanup is submitted to DEP within 90 days of the release.

### **2. Short List of Petroleum Products**

The Department has developed an abbreviated list (“short list”) of regulated substances for specific petroleum products. The short list for releases of petroleum products is

discussed in detail in this guidance document in Section III, Technical and Procedural Guidance.

### **3. Management of Separate Phase Liquid (SPL) under Act 2 and Act 32**

When a liquid (such as gasoline or chlorinated solvent), also referred to as free product, is released to the environment, accumulations of the free product as a separate phase (SPL) may occur within soil or bedrock. Depending on the density of the liquid relative to water, the SPL may migrate under gravity through the subsurface and either remain on or just below the water table or sink through the water column and accumulate on impermeable surfaces lower in the aquifer. Substances that are less dense than water, like most petroleum products, are called Light Nonaqueous Phase Liquids (LNAPL). Substances that are denser than water, such as chlorinated substances, are called Dense Nonaqueous Phase Liquids (DNAPL).

The presence of SPL may be found in various media and locations including the soil, vadose zone, aquifer, surface water, or sediments. SPL may also be present in differing phases. Residual SPL is SPL in the subsurface that is hydraulically disconnected in the pore spaces in a porous media or fractures in bedrock/clay. The residual SPL may be present at concentrations below saturation, may not extend great lateral distances from the source of the release, and it tends to be relatively immobile. Mobile SPL is SPL that is hydraulically connected in the pore space or fractures and has the potential to move under the prevailing hydraulic conditions. Mobile SPL that is stable has the potential to migrate if the prevailing hydraulic conditions are altered.

If not removed, the presence of SPL may be a long-term management concern at sites undergoing remediation. SPL might constitute a continuing source of contamination and could greatly increase the time and cost for post-closure care monitoring. The presence of SPL introduces complex fate and transport issues and uncertainties regarding the future migration of contamination and its impact. Remediation should be based on a thorough site conceptual model.

SPL at contaminated sites should be addressed in the following manner:

#### **a) Management of SPL under Act 32 and Chapter 245**

Under Act 32 and 25 Pa. Code Chapter 245, Subchapter D, the corrective action obligation for releases from regulated aboveground and underground tank systems must include the removal of SPL from the environment to prevent migration into uncontaminated areas (25 Pa. Code § 245.306(b)(1)). This obligation begins immediately upon release as required under interim remedial action requirements discussed below and continues until the SPL body is no longer capable of migrating into uncontaminated areas.

U.S. EPA regulation 40 CFR § 280.64 requires owners and operators to remove “free product” to the maximum extent practicable (MEP) as determined by the implementing agency. As the implementing agency, the Department defines MEP as the extent of removal necessary to prevent migration of SPL to uncontaminated

areas and prevent or abate immediate threats to human health or the environment. MEP is discussed further in this section and Section III of this guidance.

25 Pa. Code § 245.306(a)(3)(ii) requires that SPL recovery resulting from a release from a regulated storage tank system be initiated IMMEDIATELY upon its discovery to prevent or address an immediate threat to human health and the environment. This may include the abatement or prevention of vapors from entering structures and creating unacceptable health, fire or explosion risks.

25 Pa. Code § 245.306(b)(1) requires that SPL removal be conducted in a manner that prevents the spread of contamination into uncontaminated areas. Interim remedial actions that prevent the further migration of SPL into uncontaminated areas include, but are not limited to, the following:

- Excavation of contaminated soils for treatment or disposal. Excavation that intends to remove LNAPL with highly contaminated soil should include any saturated contaminated soils and unconsolidated material at and just below the water table, to the extent feasible, because a significant volume of an LNAPL release is contained within and below the vadose zone. Removal of this mass reduces both contaminant flux into groundwater and plume migration.
- Rapid containment, absorption, and removal of surface releases.
- Installation of subsurface extraction or deployment of in-situ destruction technologies to remove SPL that causes vapor migration or fire and explosion hazards.

If a sufficient volume of SPL is released into the subsurface, then multiple phases (e.g. soil, water, vapor) are generally present. As each of these phases behaves differently, the ultimate remediation to a cleanup standard may require a combination of corrective action technologies. Initial recovery of SPL is an especially important aspect of site remediation because improper recovery techniques may reduce the effectiveness of the treatment and transfer significant portions of the contaminant mass into other phases.

**b) Management of SPL under Act 2 and Chapter 250**

While Act 2 and 25 Pa. Code Chapter 250 do not specifically mandate SPL recovery within the property, the Department encourages removal of SPL within the property to the MEP, as described above, as an immediate or interim response. The extent of SPL removal will be determined by the standard(s) selected by the remediator after immediate threats to human health and safety and the environment have been mitigated. The Department recognizes that the amount of SPL that can be removed will depend on the hydrogeologic framework of the site, the type of product, and the remediation technology employed, among other factors. In cases relying on natural attenuation, removal of SPL may simplify and

shorten the timeframe for fate and transport analyses, attainment of a standard and postremediation care monitoring.

**c) Relationship of SPL to Compliance with Act 2 Standards**

**i) Background Standard**

The background standard is available at sites where SPL is migrating onto the property from an offsite source. It should be demonstrated that concentrations of regulated substances in both soil and groundwater at the source property are not related to any release on the property. Once that is established, attainment of the background standard should be demonstrated within the soil and groundwater directly impacted by the SPL at the POC.

**ii) Statewide Health Standard (SHS)**

For an Act 2 remediation using the SHS, the Department urges removal of SPL throughout the plume to the MEP, as described above.

**(a) Groundwater**

The Department has determined that the SHS is not available when SPL, as LNAPL or DNAPL, is present in POC wells. The rationale behind development of the saturation and solubility caps under the promulgated SHS MSCs was that no SPL should be present at the POC at attainment. At sites where SPL remains within the interior of the property, attainment at the POC shall be demonstrated within the groundwater impacted by the SPL.

**(b) Soil**

In addition, within the property, the lesser of the direct contact number to a depth of 15 feet for chemicals of concern and the soil-to-groundwater pathway number throughout the entire soil column should be attained in soil that is saturated with the SPL. This soil requirement applies to all sites including both those where the SPL has been removed and those where some amount remains.

At sites where applicable soil standards have been attained and the remediator has determined that unrecoverable SPL remains, a release of liability under the SHS will not be conveyed until the remediator has established through monitoring and fate and transport modeling that any remaining SPL will not migrate to compliance points.

**iii) Site-Specific Standard (SSS)**

Under Act 2, attainment of the SSS when SPL is present at the POC may be permissible as long as it has been demonstrated that any discharge to surface water meets the requirements of 25 Pa. Code § 250.406, there is no unacceptable risk-based exposure, and sufficient evidence exists to demonstrate that SPL is unlikely to migrate to new areas and impact offsite receptors. If the contamination is from a regulated tank site, compliance with 25 Pa. Code § 245.306 to demonstrate the SPL has been removed to the MEP. Activity and use limitations (AULs) that are part of the postremediation care plan should be included in the environmental covenant.

**d) Management of Light Nonaqueous Phase Liquids (LNAPL) under Act 32**

LNAPL typically has been viewed as SPL that is less dense than water and can be measured in a well or on a water surface. When measurable LNAPL is not detected within a well, LNAPL can remain trapped in nearby soils. Depending on site conditions and how conditions can change, this residual LNAPL may remain trapped or become mobile. Therefore, it is important to keep the following in mind:

- The absence of measurable LNAPL in a well does not definitively establish the absence of mobile LNAPL at a site.
- The presence of measurable LNAPL in a well does not definitively establish the size, volume, thickness, or recoverability of LNAPL at the site or in the vicinity of the well.
- The measured LNAPL thickness in a well may not be indicative of the actual LNAPL thickness or volume within the formation.
- The presence of recoverable LNAPL in a well may only indicate that mobile LNAPL exists in the immediate vicinity of that well.
- The observation that LNAPL is no longer accumulating at a significant or appreciable rate in a well may only indicate that the LNAPL in the vicinity of the well is no longer mobile under the present conditions.
- The mass of residual LNAPL remaining in the soil and/or rock matrix after recovery to the MEP may be orders of magnitude larger than the amount of mobile LNAPL that was recovered at the site.
- LNAPL may spread in many directions not necessarily coincident with groundwater gradients (including but not limited to structural influences, preferential pathways, permeability contrasts, and pumping well influences).

- LNAPL migration rates may not be the same as the groundwater flow rates.
- Some mobile LNAPL is persistent and can be bailed, but quantities removed may be relatively small. Product bailing alone rarely achieves significant LNAPL recovery.

LNAPL exists in residual and non-residual (mobile) phase, so some LNAPL may remain at the site after reaching removal to the MEP. Although the remaining LNAPL may take years to degrade, the low recoverability along with a demonstration of low risk posed by the LNAPL source may make recovery of remaining LNAPL infeasible or unnecessary. In such instances, evaluating the site for terminating LNAPL recovery is warranted. Information necessary to determine when LNAPL removal meets the MEP is identified below.

**i) Site Characterization and LNAPL Conceptual Site Model**

25 Pa. Code § 245.309 requires completion of a site characterization. A complete and concise site characterization is an important step in identifying the presence, properties, distribution and migration of LNAPL. Simple visual observations during site work and interpretation of analytical results can help identify the presence of LNAPL. The characterization of a site with LNAPL includes the development of an appropriate LNAPL Conceptual Site Model (LCSM). The level of detail required for a given LCSM is site-specific and based on the complexity of environmental conditions at each site. As the corrective action progresses, the LCSM should be regularly re-evaluated in the light of additional site/LNAPL data, pilot test data, remedial technology performance metrics, and monitoring data. A complete and up-to-date LCSM allows the best possible decisions about application and operation of remedial technologies to be made and when removal actions are no longer necessary. Documents that should be used to guide the development of an LCSM are included in the list of references, below. The LCSM may require revisions as site conditions change due to remediation and other site factors. Figure V-1 is a worksheet that can be used when preparing an LCSM.

Older LNAPL cases which pre-date this guidance may require additional assessment to update the LCSM for the purposes of making MEP decisions. Results from an updated LCSM may provide additional information about LNAPL recovery potential for the site. While technologies may appear costly or overly complex, the use of these technologies may assist responsible parties, consultants, and staff to develop the most cost-effective decision regarding LNAPL recovery or case closure. Information needed to characterize LNAPL at a site and develop a thorough LCSM typically includes, but is not limited to:

- **Delineation:** LNAPL does not necessarily form a “pancake” on the groundwater surface, but shares the pore space in the vadose zone, the capillary fringe, and/or beneath the water table within the smear zone. Different industry standard practices can be used to identify LNAPL trapped in soils or bedrock (ranging from shake test to Laser-Induced Fluorescence (LIF) in conjunction with core photography).
- **Sources and Pathway:** Geologic or manmade features such as fractures in bedrock or clay and fill material adjacent to underground utilities may also contain LNAPL and may serve as pathways for enhanced migration of SPL vapor and dissolved phases. The movement and storage of LNAPL in these features need to be considered as part of the characterization, and their presence may significantly increase risk by accelerating potential migration to receptors.
- **Volume:** Where possible, the volume (or plausible volume range) of LNAPL within the subsurface should be established to allow the development and selection of an appropriate recovery strategy as well as a basis for the risk evaluation. Historic records for the site should be reviewed to identify past releases that may have contributed to the volume of LNAPL.
- **Age and Chemical/Physical Character:** LNAPL and groundwater can be analyzed to identify or verify the type of product as well as assess if the product poses a risk to receptors. As LNAPL weathers, the physical and chemical properties of the LNAPL can change. Weathered LNAPL can be more viscous and therefore less mobile and less recoverable than unweathered LNAPL. LNAPL properties can also assist in determining a probable date or timeframe for the product release. Knowing the amount of time the product has been present compared to the known impacts (or lack thereof) can provide valuable insight on whether case closure is advisable.
- **LNAPL Migration:** LNAPL moving into previously uncontaminated areas indicates that LNAPL is migrating. It is a condition requiring immediate recovery under the regulations. The potential for mobile LNAPL to migrate may depend on geologic conditions, changing hydraulic or LNAPL gradients as well as precipitation and groundwater recharge. The presence of other contaminants may impact migration of LNAPL.

**Figure V-1: LNAPL Conceptual Site Model (LCSM) Worksheet**

**LCSM - describes the physical properties, chemical composition, occurrence and geologic setting of the LNAPL body from which estimates of flux, risk and potential remedial action can be generated (definition taken from ASTM E2531-06).**

| Site Characterization |                                                                                                                       | Yes | No | N/A | Comments |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|-----|----|-----|----------|
| 1.                    | Do you know the past and present site use?                                                                            |     |    |     |          |
| 2.                    | Do you know the geology of the site (i.e., soil and bedrock characteristics)?                                         |     |    |     |          |
| 3.                    | Do you know the hydrogeology of the site?                                                                             |     |    |     |          |
| 3.a.                  | Unconfined aquifer?                                                                                                   |     |    |     |          |
| 3.b.                  | Confined/Semi-confined aquifer?                                                                                       |     |    |     |          |
| 3.c.                  | Perched aquifer?                                                                                                      |     |    |     |          |
| 4.                    | Is the source known?                                                                                                  |     |    |     |          |
| 4.a.                  | If yes, what is the source and quantity released?                                                                     |     |    |     |          |
| 5.                    | Has the vertical and horizontal extent of the LNAPL body been delineated?                                             |     |    |     |          |
| 5.a.                  | If yes, have direct and/or indirect indicators been used to detect presence of LNAPL trapped in soils and/or bedrock? |     |    |     |          |

| Site Characterization                                                                                                                                                              | Yes | No | N/A | Comments |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|-----|----------|
| 6. Has dissolved phase or vapor phase plume data been evaluated?                                                                                                                   |     |    |     |          |
| 6.a. Do any dissolved concentrations in groundwater approach their effective solubility?                                                                                           |     |    |     |          |
| 7. Have the physical (density, viscosity, interfacial tension, vapor pressure) and chemical properties (constituent solubilities and mole fractions) of the LNAPL been determined? |     |    |     |          |
| 8. Have potential migration pathways been identified (i.e. fractures in bedrock and clay, karst features, utilities)?                                                              |     |    |     |          |
| 9. Are there complete or potentially complete exposure pathways present (potable wells, surface water, vapor intrusion, etc.)?                                                     |     |    |     |          |
| 10. Are there ecological receptors impacted by the LNAPL body?                                                                                                                     |     |    |     |          |
| 11. Has sufficient gauging data been gathered to determine if LNAPL is mobile?                                                                                                     |     |    |     |          |
| 11.a. Has gauging taken place during drought or after heavy precipitation events?                                                                                                  |     |    |     |          |
| 12. Has LNAPL transmissivity been determined?                                                                                                                                      |     |    |     |          |

| <b>Site Characterization</b>                                                             | <b>Yes</b> | <b>No</b> | <b>N/A</b> | <b>Comments</b> |
|------------------------------------------------------------------------------------------|------------|-----------|------------|-----------------|
| 13. Has a qualitative assessment of Natural Source Zone Depletion (NSZD) been completed? |            |           |            |                 |
| 14. Does characterization indicate that the LNAPL is no longer migrating?                |            |           |            |                 |

- **LNAPL Mobility:** LNAPL needs to exist at saturations greater than its residual saturation in order to be mobile. It is the mobile portion of the LNAPL body that is typically recovered by LNAPL extraction and recovery technologies. However, the presence of mobile LNAPL in a well does not necessarily indicate that the LNAPL body is migrating. Gauging or recovery data from drought and heavy precipitation events may provide mobility data.
- **LNAPL Recoverability/Transmissivity:** LNAPL Transmissivity (LNAPL Tn) is a useful metric for determining the recoverability of mobile LNAPL. Since LNAPL Tn accounts for multiple LNAPL properties such as density, viscosity, and LNAPL saturation, LNAPL Tn can be more useful than just the measured thickness for determining LNAPL recoverability (ASTM E2856). However, LNAPL Tn can vary over time due to subsurface conditions such as groundwater fluctuations, corrective action implementation (reduced LNAPL saturation), or weathering of LNAPL.

LNAPL Tn tests should be performed at sites where LNAPL is present to aid in determining the recoverability of the LNAPL. LNAPL Tn tests can also be completed over time to document the progress of LNAPL recovery efforts. The ASTM Standard E2856 discusses several LNAPL Tn test methods and how to select the most appropriate method for site conditions. More information about LNAPL Tn may be found in the references to this section, particularly ASTM Standard E2856.

Characterization of LNAPL is found through direct and indirect indicators. Both types of indicators determine where and how much LNAPL is on the property and are especially important if the release history is unknown. The level of detail needed when using these methods is commensurate with the complexity of the site.

Some direct methods of detecting the presence of LNAPL include:

- Direct push technologies that can measure for the presence of LNAPL such as LIF, Rapid Optical Screening Tool LIF, Membrane Interface Probes and cone penetrometers.
- Observation of LNAPL presence in wells, borings or test pits.
- Field screening tests such as staining, odors, Organic Vapor Analyzers, Photo Ionization Detectors, Flame Ionization Detectors, shake test using oleophyllic dyes, paint filter test (EPA method 9095B) and paper towel tests.

- Ultraviolet light boxes and soil cores.
- Soil and rock core lab analysis.
- Core photography under UV light, pore fluid saturations, soil properties, fluid properties, and LNAPL fingerprinting.

LIF is used to collect real-time, in-situ field screening of residual and nonaqueous phase hydrocarbons in undisturbed vadose, capillary fringe and saturated subsurface soils and groundwater. Detailed information regarding this technology can be found at EPA's Contaminated Site Clean-Up Information website.

LNAPL presence in wells, borings or test pits indicates that LNAPL is in the surrounding formation. In unconfined conditions, the LNAPL could rise and fall with the fluctuation of the water table. However, it is not a reliable indicator of vertical and lateral extent in the formation or for determining the volume of the release. The absence of LNAPL in a well does not necessarily mean the source is eliminated; it may be trapped deeper in the formation by a high water table.

Some indirect indicators of LNAPL presence in the formation include:

- A persistent dissolved phase plume.
- Dissolved phase groundwater concentrations that are close to the effective solubility of the LNAPL that was released.
- Total Petroleum Hydrocarbons (TPH) concentrations (EPA Method 418.1) that are greater than the Carbon Saturation (C<sub>sat</sub>) in a given soil type.

Other potential indirect indicators of LNAPL presence are found in EPA's petroleum vapor intrusion guidance document (510-R-15-001, Table 3, p. 52, 2015).

**ii) Is the LNAPL Body Migrating?**

Removal of LNAPL must be conducted to prevent the spread of contamination into previously uncontaminated zones. Following a release, LNAPL can move at higher rates than groundwater due to a large LNAPL hydraulic head. The LNAPL can be upgradient of the release point due to the mounding effect. Removal of the source will shorten the time until the LNAPL body stops migrating.

In order to demonstrate that an LNAPL body is not migrating, the Department requires an evaluation of migration potential. The following

can be used to make this determination. A more detailed description of each follows the list. This list is not all inclusive. Some methods that may be used to demonstrate that LNAPL is not migrating include:

- Monitoring results
- LNAPL velocity
- Recovery rate
- Age of the release
- Tracer test

Monitoring results are most important in evaluating migration potential. Assuming that there is an adequate monitoring network and sufficient temporal data, there are several factors that are evidence for a stable footprint, which include a stable or decreasing thickness of LNAPL in monitoring wells, sentinel wells outside of the LNAPL zone that remain free of SPL, and a shrinking or stable dissolved phase plume.

Calculating the potential LNAPL velocity using Darcy's Law is also important in the evaluation. The key parameter is LNAPL conductivity, which may be estimated from bail-down tests, or from the measured LNAPL thickness, soil capillary parameters and a model that assumes static equilibrium. The American Petroleum Institute (API) Interactive LNAPL Guide is one tool that may be used to estimate the LNAPL velocity using this model. It is important to recognize that use of Darcy's Law would be precluded for some site conditions, such as a fractured bedrock site.

The recovery rate that is observed as LNAPL is removed from a well is important to the evaluation. Although not directly correlated to LNAPL migration, declining recovery rates would generally indicate reduced potential for LNAPL to migrate.

The age of the release, when known, aids in determining migration potential. If a relatively long time has transpired since the release, there is reduced potential for migration due to smearing of LNAPL within soil and weathering of LNAPL through dissolution, volatilization, and biodegradation.

Tracer tests using hydrophobic dye can also be used for this evaluation. The dilution rate of the dye gives an indication of the rate of movement of the LNAPL. Monitoring wells need to have at least 0.2 feet of LNAPL for this method to work.

**iii) Remedial Action Plan (RAP)**

After a complete Site Characterization as outlined in 25 Pa. Code § 245.309 has been completed and when LNAPL recovery continues, a RAP addressing the technologies and methods to remediate both the LNAPL and the dissolved phase portion of the contamination is required under 25 Pa. Code § 245.311. The RAP should specify remediation goals and endpoints that can be obtained with the most cost effective solutions/technologies currently proven to remediate the identified contaminants.

If the RAP recommends the ceasing of or no LNAPL recovery, the RAP should clearly list the lines of evidence that demonstrate the LNAPL is not recoverable, is stable, is not migrating and poses no risk to human health and the environment. Once the soil and dissolved phase in groundwater have met attainment under the selected remediation standard, a Remedial Action Completion Report (RACR) can be submitted.

**iv) Demonstrating LNAPL Meets MEP Criteria**

To determine when LNAPL recovery is no longer necessary or if a case with LNAPL can be recommended for closure, several lines of evidence should show that LNAPL has been recovered to the MEP and that the remaining LNAPL is not migrating and poses no risk. These lines of evidence should also show that natural attenuation processes are continuing, further demonstrating the LNAPL body is stable and not migrating. Lines of evidence should be documented in the RAP and RACR for Act 32 and in the Cleanup Plan and/or FR for Act 2. Lines of evidence may include the following:

- An estimate, or supportable estimated range, of the total volume of LNAPL released and present in the subsurface. Volume estimates help determine dissolved plume longevity and the potential to migrate to new areas.
- A discussion, including supporting data, regarding the importance of site-specific soil structure, geology/hydrostratigraphy with an emphasis on the possible existence of macropores, fractures, or conduits in karst. All potential pathways for migration should be analyzed to ensure LNAPL migration to new areas is not occurring.
- A discussion with supporting data that establishes whether LNAPL at the site is a function of groundwater level or confined conditions. Since LNAPL thicknesses are often exaggerated under confined conditions, the LCSM must provide adequate characterization of hydrostratigraphy to determine if confining layers are present.

- A demonstration that constituents in the vapor phase do not present a risk to potential receptors. All potential pathways for vapor migration should be analyzed to ensure migration to new areas is not occurring.
- Documentation that demonstrates the areal extent of the LNAPL plume at the site is stable or decreasing. Monitoring of LNAPL thickness in wells over time is needed to determine stability.
- Documentation that demonstrates the areal extent of the dissolved phase plume at the site is stable or decreasing.
- Documentation that shows concentrations of chemicals of concern are below the standards attained and dissolved plume is undergoing attenuation.
- An evaluation that shows the effective solubility of remaining LNAPL and dissolved-phase concentrations are below the standards attained.
- LNAPL Tn data that documents LNAPL recoverability over a range of aquifer conditions. If LNAPL Tn as measured by ASTM E2856 is below 0.1 ft<sup>2</sup>/day, then hydraulic recovery is not feasible. If values exceed 0.1 ft<sup>2</sup>/day, demonstrate that LNAPL body is not migrating or that Tn values have been decreasing with recovery efforts and have reached asymptotic conditions.
- A qualitative assessment of natural attenuation.
- A description of the removal methods and technologies which have been used and/or evaluated. Evaluation of the results of product removal including whether data shows asymptotic recovery trends through seasonal water table variations. Data that demonstrates the technologies and additional recovery are not effective.
- Supporting data which contains current site and area maps that show all current receptors, preferential pathways (such as utilities), basements, drinking water wells, and surface water bodies including High Quality and Exceptional Value streams, wetlands, and sensitive ecological areas.
- Documentation that the NSZD (ITRC, LNAPL-1, 2009) of the LNAPL body and natural attenuation of the dissolved-phase plume are continuing at the site and are expected to further mitigate risk from the release.

v) **Closure of Sites with LNAPL**

For purposes of this guidance, recovery to MEP is considered complete if the following have been demonstrated:

LNAPL remains onsite, but the following have been achieved:

Receptor evaluation demonstrates that remaining LNAPL, dissolved phase constituents, and associated vapors are not a risk to human health or the environment, and

- i. Natural Source Zone Depletion of the LNAPL body and natural attenuation of the dissolved-phase plume are documented as occurring at the site and are expected to further mitigate risk from the release;
- ii. Multiple lines of evidence demonstrate that LNAPL had been recovered to MEP;
- iii. For sites with active LNAPL recovery, evaluation of corrective actions performed at the site shows asymptotic recovery trends through seasonal water table variations; and
- iv. Remaining LNAPL is not recoverable, or has low mobility/recoverability (as evidenced by LNAPL Tn tests).

Situations do exist in which LNAPL can justifiably remain at a site after case closure. However, the Department should have a full understanding of the site-specific geological, hydrogeological and receptor risk factors before closing a case with measurable LNAPL.

If an institutional or engineering control is needed to attain a standard, then an environmental covenant would be needed.

Note: A closed case may be re-opened if significant previously unidentified environmental problems related to the original release (for example, additional LNAPL, extensive saturated soils, or an impacted receptor) are discovered.

## **E. HSCA/CERCLA Remediation**

### **1. Hazardous Sites Cleanup Act (HSCA) Sites**

HSCA is the state Hazardous Sites Cleanup Act (P.L. No. 108 of 1988; 35 P.S. §§ 6020.101-6020.1305). HSCA is the state cleanup law that provides for the remediation of sites contaminated with hazardous substances. HSCA provides the Department with enforcement authorities to encourage parties who are responsible for the release of hazardous substances to conduct the necessary response actions. HSCA also provides the Department with the funding and the authority to conduct response actions when the responsible parties are unwilling or unable to conduct the appropriate response action. The responsible parties can then be held liable for those response costs.

HSCA sites are a limited set of sites that have been officially designated by the Department as meeting the criteria for response action under HSCA. Some HSCA sites are listed on the Pennsylvania Priority List (PAPL) for remedial response pursuant to Section 502 of HSCA (35 P.S. § 6020.502). These are the HSCA sites where the response is expected to cost more than \$2 million or take more than one year to conduct. Pursuant to Section 904(b) of Act 2, “any remediation on a site included on the state priority list established under ... [HSCA], shall be performed in compliance with the administrative record and other procedural and public review requirements of ... [HSCA]” (35 P.S. § 6026.904(b)). For these listed sites, a party interested in conducting a remedial response can submit a proposal to the Department and work with the Department to reach a settlement. A proposal to conduct a remedial response should be in the form of a letter to the regional ECB Manager, not an Notice of Intent to Remediate (NIR). Responsible parties under HSCA are encouraged to propose an Act 2 remedy they would like to perform on the HSCA site. The proposal will be evaluated and published in accordance with HSCA. The Department is responsible for choosing a remedy that satisfies Act 2, and that considers public comments and the Department’s analysis of the alternatives, pursuant to Section 506(e) of HSCA. It is possible that the Department will select an Act 2 remedy other than that proposed by a responsible party based upon these considerations. Persons who wish to conduct the remediation may follow the settlement procedures established under HSCA. The settlement process would follow the procedures established under HSCA. This would result in a binding settlement agreement which would be subject to the public notice and comment provisions of HSCA.

Most HSCA sites are not listed on the PAPL for remedial response. These are sites where a HSCA site study or a HSCA interim response is planned. For these HSCA sites where the Department has not yet taken an interim response action or committed to a remedy for the site, a party interested in conducting a voluntary response can submit an NIR and proceed using the normal Act 2 procedures. The Department would monitor the progress of the voluntary response action. If the Department determined that the pace and the scope of the voluntary response was acceptable then no further action pursuant to HSCA would be required. If the Department determined that the pace or the scope of the voluntary response was not acceptable, then the Department could proceed with further action pursuant to HSCA.

**2. Comprehensive Environmental Response Compensation Liability Act (CERCLA) Sites**

CERCLA is the federal Superfund law (42 U.S.C. §§ 9601, et seq.). Under CERCLA the U.S. Environmental Protection Agency (EPA) can place sites on the National Priority List (NPL) “Superfund List” for remedial response. For sites listed on the NPL, EPA requires that all remedial response actions be conducted pursuant to the procedural requirements of CERCLA. As a state law, Act 2 does not waive or supersede the procedural requirements of the federal law, and therefore the Act 2 liability relief cannot automatically confer release from CERCLA liability. However, the Act 2 remediation standards may be considered applicable standards for remediations conducted at CERCLA sites. EPA also has authority under CERCLA to conduct removal response actions or take enforcement actions at sites that are not listed on the NPL.

## F. References

ASTM E2531, Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous Phase Liquids Released to the Subsurface.

ASTM E2856, Standard Guide for Estimation of LNAPL Transmissivity.

EPA. 1996. How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites: A Guide for State Regulators. EPA 510-R-96-001.

EPA. 2015. Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites. EPA 510-R-15-001.

ITRC (Interstate Technology & Regulatory Council) 2009. Evaluating Natural Source Zone Depletion at Sites with LNAPL. LNAPL-1. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. [www.itrcweb.org](http://www.itrcweb.org)

ITRC (Interstate Technology & Regulatory Council) 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. [www.itrcweb.org](http://www.itrcweb.org)

API (American Petroleum Institute) Interactive LNAPL Guide.  
<http://www.api.org/environment-health-and-safety/clean-water/ground-water/lnapl/api-interactive-lnapl-guide>

EPA. Contaminated Site Clean-Up Information. <http://clu-in.org/characterization/technologies/lif.cfm>

EPA. <http://www.epagov>