Hazardous Materials

Chapter 12

For hazardous materials, the goal for CEQR is to determine whether the proposed project may increase the exposure of people or the environment to hazardous materials, and, if so, whether this increased exposure would result in potential significant public health or environmental impacts. If significant adverse impacts are identified, CEQR requires that the impacts be disclosed and mitigated or avoided to the greatest extent practicable.

As mentioned throughout the Manual, it is important for an applicant to work closely with the lead agency during the entire environmental review process. In addition, the New York City Department of Environmental Protection (DEP) often works with the lead agency during the CEQR process to provide technical review, recommendations, and approval relating to hazardous materials. When the review identifies the need for long-term measures to be incorporated after CEQR (prior to or during development), the lead agency, in coordination with DEP, determines whether an institutional control (discussed in more detail in Sections 550 through 552), such as an (E) Designation, may be placed on the affected site. The Mayor's Office of Environmental Remediation (OER) has the authority and responsibility for administering (E) Designations and existing hazardous materials Restrictive Declarations recorded on privately-owned parcels as a result of zoning and/or variance actions approvals, pursuant to Section 11-15 (Environmental Requirements) of the Zoning Resolution of the City of New York and Chapter 24 of Title 15 of the Rules of the City of New York.

100. Definitions

110. HAZARDOUS MATERIALS

A hazardous material is any substance that poses a threat to human health or the environment. Substances that may be of concern include, but are not limited to, the following:

HEAVY METALS. These include lead, cadmium, mercury, arsenic, chromium, *etc.*, that are used in smelters, foundries, platers, and metal works and may be components in paint, ink, petroleum products, and coal ash. Heavy metals may be toxic to humans and cause serious physical impairment.

VOLATILE ORGANIC COMPOUNDS (VOCS). These include aromatic compounds, such as benzene, toluene, ethylbenzene, and total xylenes (BTEX), as well as methyl tertiary butyl ether (MTBE), that are found in many petroleum products; aliphatic compounds such as hexane; and chlorinated compounds, such as trichloroethylene (TCE) and tetrachloroethylene (PCE), that are commonly used as solvents and cleaners. VOC vapors may be toxic, and under certain conditions may result in vapor intrusion, and potentially lead to explosive or ignitable conditions.

SEMIVOLATILE ORGANIC COMPOUNDS (SVOCS). These include phenols and other components of creosote and coal tar, as well as polycyclic aromatic hydrocarbons (PAHs), that may be naturally occurring but are more commonly found at higher levels in combustion byproducts such as ash. Several PAHs are either known to be or suspected to be carcinogenic.

METHANE. This is generated by decomposing plants and other organic materials. Often found in or near filled wetland areas, methane trapped beneath foundations may lead to explosions.

POLYCHLORINATED BIPHENYLS (PCBS). Formerly used in electrical equipment and as a plasticizer, PCBs bioaccumulate in aquatic organisms and humans and may cause a variety of neurological and other adverse effects.

PESTICIDES. These are substances or a mixture of substances used to destroy or mitigate insects, rodents, fungi, weeds, or other plant life. Many pesticides are toxic to humans and animals.

POLYCHLORINATED DIBENZODIOXINS AND DIBENZOFURANS (COMMONLY REFERRED TO AS DIOXINS). These are or were generally formed as byproducts of combustion or manufacturing and industrial processing.

HAZARDOUS WASTES. These are defined by regulations promulgated under the Federal Resource Conservation and Recovery Act and by the New York State Department of Environmental Conservation, found at 6 NYCRR Part 371, as solid wastes that either meet one of four characteristics (chemically reactive, ignitable, corrosive, or toxic) with respect to defined test methods or are listed in one of following: 1) a generic list of chemicals that are hazardous regardless of the source that produces them; 2) a list of wastes from specific industrial sources; and 3) a list of chemicals that are deemed hazardous wastes if they are discarded or intended to be discarded rather than used as intended. There are slight differences between the state and federal regulations.

Other less commonly encountered hazardous materials include radionuclides (*e.g.*, radiation sources) and biological wastes (*e.g.*, medical waste). When these are managed in accordance with applicable regulatory requirements (*e.g.*, in a hospital or laboratory setting), they would not be expected to be associated with adverse effects. However, when evidence is found that they have been abandoned or are otherwise mismanaged, the appropriate regulatory agencies (*i.e.*, DEP, the New York City Department of Health and Mental Hygiene (DOHMH), New York State Department of Health (NYSDOH), New York State Department of Environmental Conservation (NYSDEC), the United States Environmental Protection Agency (USEPA), or the Nuclear Regulatory Commission (NRC)) should be contacted for additional guidance.

120. SITES OF CONCERN

Many sites in urban areas contain soil and/or ground water that are known to be or may be contaminated. However, the presence of hazardous materials on a site may not be obvious. Sites that appear to have no apparent impacts and have no commonly known sources of contamination may have been affected by past uses either on the site or in the surrounding area. Many activities use hazardous materials, and many past waste management practices that were once commonplace are now considered unacceptable.

The presence or likely presence of any hazardous substance or petroleum products on a site under conditions that indicate an existing release, past release, or a material threat of release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property is known as a Recognized Environmental Condition, as defined by the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments (ESA): Phase I ESA Process (ASTM E-1527), currently ASTM E-1527-05. A Recognized Environmental Condition (REC) should be disclosed under CEQR. Examples of RECs include contaminants spilling or leaking into the soil or ground water, dispersed in the soil vapor, suspended in indoor or ambient air, or contained in fugitive dust. Hazardous materials may contaminate a site in several ways:

- They may be present in the soil, ground water, soil vapor, or buildings and structures on-site as the residue of past or current activities. Manufacturing processes and commercial activities typically utilize, and thus require storage and handling of, hazardous materials.
- They may have been imported to a site as fill or grading material over the years. It is not uncommon to find elevated levels of hazardous materials in fill of unknown origin, also known as "historic fill," where the past and current activities do not suggest these types of materials were used. This is especially true for properties that are adjacent to waterways where, historically, large amounts of fill material have been used as part of urban development.

- They may migrate to the site from off-site areas as a result of soils impacted by an upgradient source through local ground water flow or migrating soil vapor. For example a site may be of concern if hazardous materials migrated to the site from a leaking underground storage tank nearby.
- They may be incorporated in on-site buildings and structures; examples are lead in paints or asbestos in insulation, tiling, caulking, roofing materials, or electrical components.

130. POSSIBLE EXPOSURE

The presence of hazardous materials on a given site is likely to threaten human health or the environment if exposure to those materials occurs. Potential routes of exposure to hazardous materials can include: direct contact, *e.g.*, contact between contaminated soil and skin (dermal contact); breathing of VOCs or chemicals associated with suspended soil particles (inhalation), swallowing of soil or water (ingestion). Public health may also be threatened when soil vapors migrate through the subsurface and/or along preferential pathways (*e.g.*, building foundations, utility conduits, or duct work) and accumulate beneath a concrete slab or inside a basement, resulting in an explosive, oxygen-deficient, or hazardous atmosphere.

Activities that can lead to increased exposure include the following:

- Introduction of a new population to an existing building or site containing hazardous materials.
- Conversion of buildings from industrial or commercial to residential use.
- Investigation activities on a contaminated site.
- Excavation, dewatering, grading, or other construction activities on a contaminated site.
- Construction activities in existing buildings that disturb the building slab and sub-surface soils.
- Construction or maintenance activities on unimproved/landscaped areas that disturb sub-surface soils.
- Creation of fugitive dust from exposed soil containing hazardous materials.
- Demolition of buildings and structures that include hazardous materials.
- Introduction of new activities or processes that use hazardous materials.
- Building on former landfills or filled wetland where methane is present or will be produced.

The circumstances under which potential exposure may occur as a result of a proposed project determine the manner in which hazardous material impacts are assessed for CEQR.

200. DETERMINING WHETHER A HAZARDOUS MATERIALS ASSESSMENT IS APPROPRIATE

The potential for significant impacts related to hazardous materials can occur when: a) elevated levels of hazardous materials exist on a site and the project would increase pathways to human or environmental exposure; b) the project would introduce new activities or processes using hazardous materials and the risk of human or environmental exposure is increased; or c) the project would introduce a population to potential human or environmental exposure from off-site sources. If all these elements can be ruled out, then no further analysis is necessary.

The following circumstances are examples of projects where a hazardous materials assessment is warranted:

- Rezoning (or other discretionary approvals such as a variance) allowing commercial or residential uses in an area currently or previously zoned for manufacturing uses.
- Construction requiring soil disturbance in a manufacturing zone.
- Development within close proximity to a manufacturing zone or existing facilities (including nonconforming uses) listed in the Hazardous Materials Appendix (“the Appendix”).

- Rezoning to a residential or mixed-use district, if the area may have historically stored, used, disposed of, or generated hazardous materials, such as an area in a C8 zoning district.
- Development on a vacant or underutilized site if there is a reason to suspect contamination, illegal dumping, or historic/urban fill.
- Renovation of interior existing space on a site with potential vapor intrusion from on-site or off-site sources; compromised indoor air quality; or the presence of asbestos, PCBs, mercury, or lead-based paint.
- Development in an area with fill material of unknown origin. Fill material historically used in New York City includes dredged material that may contain petroleum, heavy metal, or PCB contamination and ash from the historical burning of garbage. In addition, former wetland areas or areas with fill material containing organic wastes may produce methane.
- Development on or near a government-listed or voluntary clean-up/brownfield site (*e.g.,* solid waste landfill site, inactive hazardous waste site, NYSDEC Brownfield Cleanup Program or Local Brownfield Cleanup Program site), current or former power generating/transmitting facilities, municipal incinerators, coal gasification or gas storage sites, current or former dry-cleaning facilities, or railroad tracks/rights-of-way.
- Development where underground and/or aboveground storage tanks (USTs or ASTs) are (or were) located on or near the site.

A list of facilities, activities, or conditions that warrant further assessment regarding the potential for hazardous materials is found in the Appendix. Sites that have been potentially affected by the presence of existing or historical land uses involving hazardous materials, including those not contained in the Appendix, should be examined further to evaluate possible exposure pathways and potential impacts on public health or the environment. As described in greater detail in the following sections, evaluation of a site for hazardous materials concerns should generally include a Phase I Environmental Site Assessment (ESA) in accordance with the most recent ASTM E-1527 Standard, and, if appropriate, a Phase II ESA in accordance with ASTM E-1903, including physical sampling of media (*e.g.*, soil, ground water, and soil gas) on the site of concern. If potential hazardous materials impacts are identified, mitigation and/or remediation in accordance with a Remedial Action Plan (RAP) would be required. In cases where the site is listed in the Appendix and sufficient site history is known, the site owner may elect not to complete a Phase I ESA described in Section 320 and proceed directly to a Phase II ESA as described in Section 330. In most cases, however, knowledge of the site history is not sufficient and completion of a Phase I ESA is strongly recommended.

300. ASSESSMENT METHODS

The hazardous materials assessment generally begins with a Phase I ESA, which is a qualitative evaluation of the environmental conditions present at a site, based on a review of available information, site observations, and interviews. As outlined in Section 320 below, the Phase I ESA is conducted in accordance with the standards established by the current ASTM Phase I ESA Standard and includes research and field observations (but typically not subsurface or building testing results) to determine whether the site may contain contamination from either past or present activities on the site or as a result of activities on adjacent or nearby properties. If a potential REC is identified during this assessment, then building and subsurface investigations are usually conducted as part of a Phase II ESA to confirm the presence and extent of the contamination.

Whenever possible, the Phase I and Phase II ESAs should reference and take into account proposed project plans to the extent they are known. For example, during the performance of the Phase I ESA, it may be sufficient to know that the existing building is to be demolished and excavation required. In contrast, when preparing the Phase II ESA Work Plan, which will guide the Phase II investigation, excavation depth(s) and the proposed conceptual foundation design may be necessary to define the appropriate investigation scope. Therefore, project plans (whether conceptual or final) should be referenced in, and attached to, the Phase II ESA Work Plan and any subsequent reports.

310. STUDY AREA

The first step in any hazardous materials assessment is to establish the study area. The project site and any associated excavation areas (*e.g.*, for utilities, elevator pits, foundations) comprise the focus of the study area, but the area of study should also include any other areas that might have affected or may currently affect the project site. Usually in heavily urbanized settings, other areas include the adjacent properties and, at a minimum, properties within 400 feet of the project site. Regulatory database searches should be performed per the ASTM Phase I ESA Standard.

For the soil, ground water, or soil gas investigations associated with a Phase II ESA (discussed below in Section 330), the study area is typically limited to the project site itself. On a site, this sampling focuses on areas that have higher potential for (a) contamination, based on the results of the Phase I ESA; or (b) enhanced exposure pathways, based on the Phase I ESA and the activities that would be associated with the proposed project. For example, the scope of the Phase II ESA Work Plan for a project involving conversion of an existing building to a new use would likely have limited overlap with a project at the same site involving demolition that is followed by excavation for a new building with a cellar, basement, or multi-level basement.

320. PHASE I ENVIRONMENTAL SITE ASSESSMENT

The current ASTM Phase I ESA Standard should be consulted for the general scope of the qualitative Phase I ESA. For some proposed projects (*e.g.*, area-wide rezonings), portions of the scope, such as site inspections, may not be possible. For other projects, such as zoning text amendments or other generic actions, actual affected sites may be unknown, and the analysis should consider what the potential impacts would be for a variety of different types of sites (see Section 400, below). Generally, Phase I ESAs should be no more than six months old when submitted as part of CEQR documentation. If more than six months old, the Phase I ESA should be updated with current regulatory database and site reconnaissance information. This may not be necessary if an adequate Phase II ESA will be performed to confirm the presence or absence of contamination. In addition to the ASTM Phase I ESA Standard, additional sources of information that are specific to New York City may assist in preparation of Phase I ESAs. These can be found in Section 731, "Sources of Data to Supplement ASTM Standards."

321. Assessment, Conclusions and Reporting

To identify and evaluate potential RECs at a project site, a Phase I ESA should be conducted. The Phase I ESA report typically includes the following kinds of information:

- Site and neighboring properties' history, including required ASTM searches.
- Interviews with past and present owners and occupants.
- Surface and subsurface drainage patterns or infrastructure.
- Site reconnaissance findings.
- Federal, state, and local regulatory agency list review findings.
- Potential impacts from nearby sites, such as landfills, National Priority List (NPL) sites, Brownfield Cleanup Program (BCP) sites, surface impoundments, ASTs, USTs, leaking USTs (LUSTs) of unknown status, *etc.*
- On-site concerns, such as ASTs, USTs, and LUSTs of unknown status, dumping of hazardous materials, PCBs, *etc.*
- Previous environmental reports or sampling and analytical data.
- Discussion of the results of the Phase I ESA in the context of the proposed project.
- Recommendations for additional actions, if any.

Based on the findings of the Phase I ESA, or a recognition that existing or historical uses at the site have included those listed in the Appendix, the applicant should assess the potential for hazardous materials on the project site. In general, there may be potential RECs if any of the following have occurred:

- Past or present uses on the site or in the surrounding area used or use hazardous materials.
- The site or surrounding area includes locations listed in federal, state or local regulatory agency records, and known and/or potential RECs have not been rectified.
- Past or present surrounding uses are a concern and the site is downgradient in terms of ground water flow or topographically from those uses. Qualitative assessments of ground water depth and flow direction should not be used exclusive of other available data.
- The proposed project may create the potential for hazardous materials migration (*e.g.*, due to excavation and/or dewatering).
- Records indicate that the site has been filled and the nature and extent of the fill is unknown.

The conclusions of a Phase I ESA should be made by a qualified environmental professional. The credentials of the qualified environmental professional should be included in the Phase I ESA report. As defined by the 2002 Brownfields Amendments to CERCLA, a qualified environmental professional is someone who possesses sufficient specific education, training, and experience necessary to exercise professional judgment to develop opinions and conclusions regarding conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to a property, sufficient to meet the objectives and performance factors found at 40 CFR Part 312. In addition, an environmental professional must have:

- A state or tribal issued certification or license and three years of relevant full-time work experience;
- A baccalaureate degree or higher in science or engineering and five years of relevant full-time work experience; or
- Ten years of relevant full-time work experience.

The conclusions of this assessment can fall into the following categories:

- There is little or no likelihood of contamination, and therefore, there would be no significant adverse impacts resulting from hazardous materials, and no further investigation is warranted. Note that a Phase I ESA cannot entirely eliminate uncertainty regarding the potential for hazardous materials or a REC in connection with a property. Therefore, the preparer and reviewer must make certain that all due diligence measures have been undertaken before concluding that no potential adverse impact would occur.
- Contamination may exist or is known to exist. More work is required to determine the nature and extent of the contamination so that the potential for significant adverse impacts can be fully disclosed and mitigation developed, as appropriate. A Phase II ESA (described in Section 330) should be performed to determine the nature and extent of any contamination. At this point, it is strongly recommended that DEP be contacted.

The Phase I ESA should be summarized as part of the CEQR documentation, including a description of the scope of work, research and activities undertaken, findings, and conclusions.

330. PHASE II ENVIRONMENTAL SITE ASSESSMENT

Prior to conducting a Phase II ESA, a Work Plan should be prepared that details the proposed soil, ground water, or soil gas scope of work. A Work Plan for the Phase II ESA should include three major elements described in greater detail below: (1) an analytical plan that addresses the types of sampling and rationale for the approach, along with the investigative, sampling, and laboratory analysis methods to be used; (2) a Health and Safety Plan

(HASP) (see Section 332) for personnel undertaking the work; and (3) a quality assurance and quality control plan for the acquisition, handling, and analysis of samples taken. The Phase II Investigative Work Plan and HASP should be submitted to DEP for review and approval to insure that the investigation conducted satisfies the requirements of the CEQR process. A standard guide for Phase II ESAs has been developed by ASTM (ASTM E 1903) that can be used as a framework for developing the scope of work for the assessment activities. In some cases, depending on the potential contaminants and the surface and subsurface drainage patterns on the site, it is advisable to conduct a physical investigation of the soil, ground water or soil gas on an adjacent property with appropriate access approvals.

Sites should be thoroughly characterized to: (1) document contaminant levels; (2) ensure that all potential exposure pathways to on-site and off-site receptors have been addressed; and (3) ensure public and worker health and safety during remedial activities and construction. The items below present guidance on the type and level of effort required to adequately characterize a site during a Phase II ESA.

- A geophysical survey through a ground penetrating radar (GPR) investigation with confirmatory test pits (if warranted) should be conducted in areas where buried tanks, drums or other subsurface conditions are suspected to be present based upon a review of the site history, regulatory databases, and/or other documentation/reports, but are not evident at grade. A GPR survey may also be warranted if extensive fill exists at a site with limited historic information.
- In general, evenly spaced test borings spread across the entire site should be advanced to the proposed excavation depth(s) as well as to the water table to adequately characterize a site during a Phase II investigation. The test boring locations may be biased towards identified RECs and are usually situated on-site. They may also be located off-site with appropriate authorizations.
- At a minimum, one test boring should be advanced in each identified REC (as per the Phase I ESA findings) and focused on the locations where the greatest contamination is suspected. These areas could include, but are not limited to, petroleum or hazardous material storage areas; drywells or leach fields/pools; dry cleaning areas; stained soil or stressed vegetation areas; industrial/manufacturing processing areas; and areas where on-site contamination from off-site sources is suspected.
- To adequately characterize UST areas, a minimum of two test borings should be advanced per tank cluster. Test borings should be advanced within two feet of the tanks, if possible, and to a minimum depth of five feet below the tank invert for the collection of representative soil samples. In the event that any leaking tanks are identified at the site during the Phase II ESA, NYSDEC DER-10 guidance should be followed.
- Test borings should be advanced at least to the proposed excavation depth for future on-site structures or to the depth of RECs.
- In general, two soil samples should be collected from each test boring/probe, and the samples should be focused on any sections exhibiting evidence of contamination based on field screening. One surface soil sample should be collected from the upper two feet of soil (typically the 0-2 feet below grade surface (bgs) interval) and one subsurface soil sample should be collected between 2 feet bgs and the maximum proposed excavation depth (based on visual/olfactory evidence of impacts and/or elevated soil screening readings obtained using accepted field instruments). If no evidence or elevated readings are noted during borehole advancement, the subsurface soil sample should be collected from the two foot interval below the proposed maximum excavation depth(s) and/or the ground water interface (whichever is encountered first). If ground water is encountered in a test boring/probe within five feet of surface grade, only one soil sample per boring may be warranted as long as adequate upgradient and downgradient ground water samples are collected.
- Where the water table is less than 30 feet beneath the deepest level of existing or proposed on-site basement or slab-on-grade foundation, ground water samples should be collected for laboratory analysis. Ground water samples should be collected within the areas of concern and should intercept potential mi-

gration from off-site sources. Depending on the Phase I ESA findings, as well as known regional ground water or soil vapor contamination, collection of ground water samples may be warranted at depths ranging from 30 to 100 feet below the deepest structural elevation of the proposed structure. It is recommended that ground water samples be collected to adequately characterize the site.

- Soil, ground water, and soil gas samples should be collected in accordance with the methods described in Subsection 331.2.
- Unless contamination is known to be limited to specific compounds, soil and ground water samples should be analyzed for Full List volatile organic compounds (VOCs) with Methyl tert-butyl ether (MTBE) by EPA Method 8260B, semivolatile organic compounds (SVOCs) by EPA Method 8270C, polychlorinated biphenyls (PCBs) by EPA Method 8082, pesticides by EPA method 8081A, and Target Analyte list (TAL) metals by EPA Method 6020 at a NYSDOH-ELAP (Environmental Laboratory Approval Program) certified laboratory. Soil gas, sub-slab soil gas, and indoor air samples should be analyzed for VOCs by EPA Method TO-15 at a NYSDOH-ELAP-certified laboratory. If ELAP certification is not available, certification by other agencies and/or organizations is recommended. Additional analyses may be warranted if the type of contamination suspected cannot be adequately characterized by these analyses. NYSDOH Category B Deliverables are not required for CEQR. However, specific levels of quality control deliverables may be required for some projects using grant money, for legal defense, or if the analysis must comply with requirements of other agencies.
- Where the potential for vapor intrusion from ground water or soil above the water table is suspected based on the identified RECs such as LUSTs, petroleum spills, chlorinated compounds, *etc.*, located at or near the site, the NYSDOH's October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York should be used as a guidance tool to design an appropriate vapor intrusion study at the site. The NYSDOH 2006 guidance document provides evaluation methods for existing buildings undergoing a change of use and/or renovations, as well as general site investigation protocols applicable to any building scenario. An example is the renovation of a building formerly occupied by a dry-cleaning facility. In some instances it may also be necessary to collect and analyze soil gas, sub-slab soil vapor, indoor air, and/or ambient air samples.

In the process of performing the Phase II ESA described in the following sections, immediate notification(s) to NYSDEC, NYCDEP, and/or USEPA may be required upon:

- Discovery of a petroleum spill or "reportable quantity" hazardous substance discharge. This discovery must be reported in accordance with applicable federal, state and local laws.
- Discovery or evidence of hazardous materials that pose a potential or actual significant threat to public health or the environment that must be reported in accordance with applicable federal, state or local laws.

When possible, the Phase II ESA should be conducted before a determination of significance is made at the EAS stage or, if a positive declaration is being issued, before the DEIS is completed.

331.1 Phase II ESA Work Plan

The Phase II ESA Work Plan should include an analytical plan, which describes the site investigation appropriate to find and identify the type and extent of contamination that may be present. In general, a single phase of analytical work is conducted, although completing the work in stages may be necessary as a result of access limitations.

The investigative Work Plan should specify the proposed number and locations of test borings on a site map; boring depths for collection of representative soil, ground water, and soil gas samples; well specifications; split-spoon or macro core sampling intervals and how representative samples will be selected for laboratory sampling; organic vapor screening (using, for example, a photo-ionization device or PID) and soil description methods (as conducted by a professional geologist or qualified environmental personnel); potential aquifer permeability testing or determination; well development techniques; handling and disposal of borehole cuttings and well development water; and methods of determining the ground water depth/elevation, *etc.* The Work Plan should include site development plans showing at least the maximum soil excavation depths/elevations for basements, footings, sub-surface utilities, elevator pits, *etc.*, as well as any proposed grade-level yard, courtyard, parking, or grass/landscaped areas.

The Work Plan should be tailored to the proposed project. Sampling should typically be performed, at a minimum, to the depth of the project excavation and generally deeper, where the potential for subsurface soils, ground water, and/or soil vapor impacts have been identified. The potential for vapor intrusion should be assumed where on-site/off-site VOC-contaminated ground water is likely located within 30 feet, vertically or horizontally, below an occupied building foundation. When chlorinated VOCs have been identified in the soil vapor, the potential for vapor intrusion may warrant investigation at depths ranging from 30 to 100 feet, vertically or horizontally, below an occupied building foundation.

331.1. Elements of the Work Plan

All Phase II ESA Work Plans consist of the investigative work plan (described above) and sample analysis (described in 331.2). However, not all elements listed below are necessary for all projects. The following elements may be necessary for a Phase II ESA Work Plan:

GEOPHYSICAL SURVEY

If recommended by the Phase I ESA, a geophysical survey may be undertaken to help locate buried metallic objects or material, characterize the subsurface conditions and geology, identify sub-surface utility infrastructure, or determine the presence or extent of a groundwater contaminant plume. Typical geophysical tools and techniques may include magnetometers (to test for buried metal, such as tanks or drums), ground-penetrating radar, ground conductivity surveys, and seismic refraction/reflection surveys. Limits on geophysical techniques can include cost and the presence of interference structures, such as overhead electric wires or excessive subsurface metal (*e.g.*, reinforced concrete) or fill (such as demolition debris) that can produce anomalous readings and difficulty in interpretation of data. The primary goal of the geophysical survey is to guide subsequent fieldwork by aiding in the determination of optimum sampling locations at the site.

SOIL-GAS SURVEY

A soil-gas survey tests the unsaturated zone (soil area above the water table) for the presence of VOCs or methane. Typical volatile compounds include constituents in gasoline, such as, MTBE, BTEX compounds (benzene, toluene, ethylbenzene, and total xylenes), and industrial solvents, such as tetrachloroethylene (PCE) and trichloroethylene (TCE). These VOCs may persist from surface spills or leaking underground storage tanks, or may be diffusing upward into the unsaturated zone from deeper contaminated media, especially ground water. Soil gas sampling may be required in landfilled and/or swampy areas to determine whether methane gas is present. Accepted techniques (see NYSDOH's October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York) include the placement of a vapor sampling probe (usually a hollow steel rod with a slotted intake point) into the subsurface, purging the sampling system, and testing the effluent soil gas with field analytical equipment or collecting samples for laboratory analysis. The 2006 NYSDOH guidance document provides guidelines for sampling of soil vapor, sub-slab vapor, crawl space air, indoor air, and outdoor air.

SHALLOW TEST PROBES

A large number of shallow soil samples can be collected in a relatively short time using direct push technology (DPT). This type of DPT probing is routinely done during first stage surveys to collect a number of preliminary soil samples to assist in the characterization of the site. This type of probe sampling is easier to maneuver and results in less site disturbance than a typical full sized drilling rig.

Upon retrieval, the soil samples should be scanned using an organic vapor analyzer or other suitable field-screening equipment that has been properly calibrated. The field screening results should be noted on a test boring log, along with information regarding sample interval, soil description, relative moisture content, color, and any evidence of contamination (*e.g.*, odor, sheen). As appropriate, a limited number of soil samples can be selected for further analysis at a NYSDOH ELAP-certified laboratory. In certain cases, completion of the shallow soil probe investigation may be sufficient to characterize site concerns. Although this type of soil probe sampling relies heavily on dedicated sampling equipment, this equipment should be decontaminated between sampling locations to avoid cross contamination. Limitations of this type of soil probe sampling include limitations on depth (especially at sites with fill or boulders), limited sample volume, and inability to provide blow counts (standard penetration test).

SUBSURFACE EXCAVATIONS

Test pits and trenching allow for inspection and sampling of subsurface materials, equipment, and structures. Exposing the subsurface to inspection often reveals heterogeneity or other features that may have been missed by probe sampling. In certain situations where the area of concern is defined and relatively small in extent, excavation equipment can quickly assess subsurface conditions with a limited number of test pits. This is especially useful in determining composition of fill material or debris piles.

SURFACE SOIL AND WASTE SAMPLING

Sampling of surface soil, exposed wastes, or other surfaces for contaminants is often conducted during first stage analyses. A large number of such samples can be quickly collected with very little disturbance to activities at the site. For example, if PCB transformers were noted in the initial assessment, a wipe sample and surface soil sample in those locations could be taken to determine whether the transformers had leaked PCBs. Areas where suspected wastes are exposed at the surface should also be sampled. Again, depending on the media sampled (*i.e.,* liquid, solid, semi-solid, or mixed), the samples can be quickly collected with simple sampling tools, such as dedicated spoons or trowels. Special consideration and care should be exercised in conducting this type of sampling since any contaminants exposed at the surface provide a potential exposure pathway for persons occupying or working at the site.

SOIL AND GROUND WATER PROBE INVESTIGATIONS

During more detailed surveys and subsurface investigations at contaminated sites, DPT can be used to collect both soil and ground water samples from discrete depths by using 4-foot macro-core samplers and/or hydro-punch technology expandable screens. Although DPT ground water collection is possible, temporary small diameter PVC well points are preferred.

SOIL BORINGS AND MONITORING WELLS

Soil boring and monitoring well installations can be implemented at areas of concern identified in initial analyses. This is usually accomplished by mobilizing an environmental drilling rig at the site. Soil samples are generally obtained with a 2-foot split spoon sampler. For both ground water and subsurface soil, sampling depends on rig access to the site and the presence of underground and overhead utilities and right-of way issues. Soil samples may be obtained by other types of rigs or hand auguring if full-size rig access is not available; however, other types of rigs and hand auguring may require the subsurface to be penetrable, may only extend to limited depths, and may not allow for the determination of the ground water flow direction.

TESTING BUILDINGS AND STRUCTURES

It is common for building structures to contain hazardous materials. These materials could have been introduced as components of construction materials or discharged as a result of poor operational practices on the part of an industrial occupant. Appropriate sampling techniques depend on the material of concern and the location of the contamination in or on the building. Wipe samples, bulk samples, air samples, coring samples, or field measurements may be appropriate in different situations. Regulations governing demolition may apply.

Asbestos is a name applied to a group of natural minerals, with particularly good fire resistant and insulation properties. These minerals include chrysotile, amosite, crocidolite, actinolite, tremolite, and anthophyllite. In addition to insulation/fireproofing products, asbestos is also commonly found in roofing materials, floor tiles, vinyl flooring, gaskets, mastics, caulks, plaster, joint compound, ceiling tiles and a range of other building materials. Materials containing more than one percent asbestos are considered asbestos-containing materials (ACM). ACM are classified as friable or non-friable. Friable ACM (*e.g.*, most spray-applied fireproofing and pipe/thermal insulation) more readily release asbestos fibers than non-friable ACM (*e.g.*, vinyl flooring and most roofing materials). Title 15 Chapter 1 of the Rules of the City of New York and New York State Industrial Code Rule 56 set out requirements for sampling and abatement of ACM.

Lead-based paint (LBP) was generally not allowed to be applied inside residential buildings after 1960 in New York City. After 1977, its use inside other buildings was also restricted and its use elsewhere became much less common, but LBP may still be used outdoors. LBP can present a hazard, particularly to children, and especially when it is in a deteriorating condition. Lead dust may be present in some structures and on some paved surfaces in building yards or surrounding streets. New York City's Local Law 1 of 2004 promulgated under the New York City Childhood Lead Poisoning Act of 2003, sets out requirements for testing and abatement of dwellings and child-occupied facilities, and USEPA certifies LBP evaluation and abatement firms.

Visible signs of staining, pooling, or discharge of waste material inside structures should be sampled based on the suspected material. For example, suspected PCB-containing surface stains are usually assessed by collecting wipe samples, which are then analyzed in a laboratory.

331.2. *Sample Analysis and Analytical Methods*

Samples collected pursuant to the investigation work plan are sent to a NYSDOH-ELAP certified laboratory for analysis. The laboratory analyses of environmental samples should be conducted according to the holding time and QA/QC requirements of the NYSDEC Analytical Services Protocol (ASP) unless superseded by newer guidelines.

Analytical methods for solid matrices are published in USEPA SW-846: Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, 3rd edition, (see the Appendix). The wastewater and drinking water analytical methods are provided by the USEPA Office of Water: EPA Methods and Guidelines for Analysis of Water (see the Appendix). Environmental samples should typically be analyzed for the Full List volatile organic compounds (VOCs) with Methyl tertbutyl ether (MTBE) by EPA Method 8260B, semivolatile organic compounds (SVOCs) by EPA Method 8270C, polychlorinated biphenyls (PCBs) by EPA Method 8081A, pesticides by EPA method 8082, and Target Analyte list (TAL) metals by EPA Method 6020. For a modified list(s) of constituents from other regulatory entities, methods appropriate for the project objective and acceptable to DEP may be used. Sample collection and analytical methods for contaminants in air (*i.e.*, the vapor phase) are provided by the USEPA Center for Environmental Research Information: Office of Research and Development. Environmental samples should be collected and analyzed for the contaminants defined in *Compendium Method TO-15: Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS).*

For buildings and structures, paint samples may be analyzed for the presence of lead utilizing the EPA Method 7420 (Flame Atomic Absorption) or 7421 (Graphite Furnace Atomic Absorption), as appropriate. This can be supplemented by portable X-ray fluorescence to reduce the analytical burden. Wipe samples for PCB-containing surface stains are analyzed using EPA Method 8081. Asbestos samples must be sent to a laboratory accredited by the NYS-ELAP and the National Voluntary Laboratory Accreditation Program (NVLAP), and analyzed by Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM), if appropriate, for asbestos type and percentage. If the site history or inspection indicates that other hazardous materials might be present, analyses for these materials should be conducted.

332. Health and Safety Plan

As part of the Phase II ESA Work Plan, surface and subsurface assessments must be conducted in a safe manner and in accordance with a site-specific Health and Safety Plan (HASP), established to protect the health and safety of both on-site personnel and the surrounding community. The HASP is prepared in accordance with the applicable U.S. Occupational Health and Safety Administration (OSHA) requirements under 29 CFR Part 1910.120. The intent of the HASP is to provide appropriate procedures to minimize the potential for injury or exposure to site contaminants during the assessment. The HASP must describe all of the potential hazards at the site and the methods to mitigate such hazards. Special attention must be given to the procedures to monitor for potential exposure and the various levels of protection required for tasks to be completed safely. The HASP may also describe site perimeter and/or community air monitoring that may be needed. The HASP should clearly note that prior to any type of intrusive investigation or sampling, subsurface utilities will be marked out to avoid possible injury to workers and the potential danger of damaging the utility. As a standard requirement, the HASP should include VOCs, SVOCs, Pesticides/PCBs, and Heavy Metals (specifically arsenic, lead, and mercury) as potential chemicals of concern. All associated information fact sheets or Material Safety Data Sheets (MSDS) for these potential chemicals of concern should be included in the HASP.

333. Quality Assurance and Quality Control

The third major element of the Work Plan, a laboratory analytical program and proper field and laboratory Quality Assurance/Quality Control (QA/QC) regulatory procedures, must be developed before beginning fieldwork. This program establishes general sampling and QA/QC requirements for all sampling and laboratory analysis activities. Also referred to as a Quality Assurance Project Plan (QAPP), its main goal is to assure sample integrity from the field to the laboratory and that the proper laboratory analytical procedures and protocols are followed. The program should include sampling QA/QC protocols for all compounds sampled. It should describe sampling techniques and methods, including those described in NYSDEC guidelines, to assure sampling integrity; field instrumentation calibration and maintenance procedures; decontamination procedures for all equipment; chain-of-custody procedures; sample preservation requirements; laboratory analytical procedures; laboratory equipment calibration and maintenance procedures; the experience and capabilities of personnel; and any other factors associated with obtaining, delivering, and analyzing samples. The plan should clearly document the procedures regarding decontamination of drilling and subsurface sampling equipment between sampling locations. The USEPA provides guidance in developing a QAPP, and references for these guidance documents are included in the Appendix.

340. CONCLUSIONS AND DOCUMENTATION

The final step of the Phase II ESA is to prepare a report documenting the following:

- Description of the site and surrounding area;
- The methodologies used (including any deviations from the Work Plan);
- Field activities;
- Compilation and tabulation of all analytical data (even if non-detectable concentrations are revealed);
- Description of the site hydrogeology;

- Interpretation of the analytical and site assessment data;
- Comparison to appropriate standards, criteria, or guidance values; and
- Findings and recommendations.

The contents and format of the Phase II ESA Report should conform as closely as possible to the guidelines in ASTM E 1903 Appendix X1.

The results of the Phase II ESA (both in the field and from the laboratory analyses) are interpreted to characterize the extent of hazardous materials and the ranges of soil, ground water, or soil gas contaminant concentrations. The soil and ground water sampling data are quantitatively compared to existing guidelines and standards. Most commonly, soil sampling results are compared to the NYSDEC 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives (SCOs). Comparison with the relevant unrestricted or restricted SCOs should be based on the exposure scenarios associated with the proposed project, and different SCOs may be appropriate at different locations and for different land uses. Note that soil contamination must be evaluated for protection of ground water in addition to public health criteria, unless excluded by 6 NYCRR Part 375-6.5 (NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4046 should no longer be used). Ground water sampling results should be compared to NYSDEC Class GA water quality standards that are listed in NYSDEC's Technical & Operational Guidance Series (TOGS). Note that aquifers in New York City should be viewed as potential drinking water sources. As appropriate, ground water sampling results should also be compared to City or State guidance values for dewatering to City sewers and USEPA guidance values for vapor intrusion. Soil vapor and indoor air sample concentrations should be compared to guidelines, where available, in the NYSDOH's October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York. When investigations identify soil vapor contaminants outside of NYSDOH's constituent list, USEPA guidance values may be used for comparison purposes.

The Phase II ESA Report is provided to DEP or OER, as applicable, for review and approval. If hazardous materials are identified at the site and it appears that remedial measures would likely be required to adequately mitigate the contamination, a Draft Remedial Action Plan (RAP) and site-specific Construction Health and Safety Plan (CHASP) should be submitted along with the Phase II ESA Report.

400. DETERMINING IMPACT SIGNIFICANCE

The potential for significant adverse impacts from hazardous materials depends on the type of materials present, their levels, their location on the site, and whether exposure to the hazardous materials would be associated with the proposed project, either during or following construction. In general, given adequate knowledge of the site and its environs, the following two questions can be used to determine whether a significant adverse impact would occur:

1. Is there a potential for human exposure to hazardous materials? This includes present and future users of the site and surrounding area, as well as construction workers.
2. Is there a potential for environmental exposure to hazardous materials? This includes hazardous materials affecting on-site or surrounding natural resources or exacerbating existing environmental contamination.

If the answer to both of these questions is "no," it is unlikely that a potential for significant impacts exists. If the answer to either is "yes," then a significant adverse impact might occur. Examples of significant adverse impacts from hazardous materials include the following:

- Workers may be exposed during excavation. For example, sites that were formerly solid waste landfills may contain explosive levels of methane; compounds adsorbed to soil may become airborne as dust and be ingested through the nose and mouth; or dewatering activities may expose workers to contaminated ground water.
- Future site occupants may be exposed to on-site hazardous materials. For example, children at a residential site may ingest contaminated soil or lead-laden particles from a building's interior.

- Future site occupants may be exposed to materials migrating from off-site. For example, materials leaking from a gasoline UST on an adjacent property may migrate in the subsurface as a separate-phase liquid, dissolved in ground water, or as a vapor.
- Occupants of adjacent properties may be exposed. For example, contaminated soil or dust may be transported to adjacent sites during excavation. Surface and subsurface drainage patterns may cause on-site contaminants to migrate off-site during or following construction, impacting adjacent properties or natural resources. Soil gas may migrate to adjacent properties or buildings.

For projects that would introduce hazardous materials to a site or involve management of hazardous materials, the methods of handling and disposing of those materials (in accordance with all applicable legal requirements of City, State, and federal agencies) should be described, but compliance is generally assumed for the purposes of determining whether a significant impact exists under CEQR.

Conditions of contamination that are generally not considered significant adverse impacts include the following:

- No significant impact would occur when hazardous material concentrations in ground water exceed NYSDEC Class GA ground water quality standards listed in TOGS, unless there is a potential route of exposure through drinking water, vapor intrusion into buildings or structures, or ground water recharge to surface waters, or the proposed project involves impacts associated with dewatering.
- In certain circumstances—particularly when asbestos and lead are present—compliance with applicable regulatory requirements would prevent significant impacts. For example, if the project requires demolition or renovation of a building containing asbestos, compliance with applicable regulatory requirements is necessary whether or not the project is also subject to CEQR.
- If an institutional control (see Subsection 550 below) related to hazardous materials has been imposed on the project site or will be imposed on the site as part of the project, compliance with the terms and conditions of the institutional control may preclude the potential for significant adverse impacts.

Decisions regarding the potential for significant adverse impacts must be made on a site-specific, project-specific basis, considering all available information. The lead agency should consult with DEP in determining and assessing the potential for significant adverse impacts. However, if such potential exists, the lead agency must coordinate with DEP or OER, as appropriate, in developing measures to avoid or mitigate the potential impacts. Depending on the adverse impact identified, other agencies (*e.g.*, DOHMH, NYSDEC, NYSDOH, USEPA, US Coast Guard) may also require notification. For generic or programmatic actions, site-specific conclusions may not be possible. In this case, more general conclusions about the type of impacts that may be expected for different types of sites may be appropriate.

500. MITIGATION AND REMEDIATION

Mitigation is the implementation of actions designed to eliminate, contain, or control sources of significant adverse impacts and eliminate exposure pathways. Remediation is the implementation of actions designed to remove or treat the sources of significant adverse impacts and eliminate and/or reduce concentrations of hazardous materials. Mitigation and remedial measures are determined based in part on the detailed findings of the Phase II ESA. DEP and OER recommend a "risk-based" approach in determining the proper course of mitigation. The risk-based approach evaluates the exposure pathways associated with the proposed project. Implementation of mitigation and remedial action follows careful development of an appropriate Remedial Action Plan (RAP) and site-specific Construction Health and Safety Plan (CHASP). Both short-term and long-term risks should be assessed. Questions that the City considers when evaluating a proposed remedial approach are:

- Which available mitigation and remedial technologies would accomplish the mitigation and remedial goals for the site?
- What are the short-term risks?

- What are the long-term risks?
- What are the risk-based benefits of the RAP?
- Would implementation create potential new or additional risks to on-site occupants or the surrounding public?
- Would implementation result in residual hazardous materials remaining in place on site so that an appropriate institutional control (*e.g.*, (E) Designation, declaration of covenants and restrictions for ongoing site management, memorandum of understanding (MOU)) governing ongoing monitoring is required?

In evaluating the short-term risks associated with a remedial technology, both adjacent community and on-site worker risks are assessed. Examples of short-term risks to an adjacent community that may be posed by certain remedial approaches include emissions from an on-site remedial system or fugitive dust emissions and/or odors as a result of excavation activities. In addition, on-site worker health and safety issues should be considered.

Evaluation of long-term risks focuses on residual risk and the effectiveness of the remedy over time. Residual risk may occur if hazardous materials are left on-site but are mitigated by reducing or eliminating exposure through measures such as capping, or sub-slab vapor barrier and depressurization systems. These measures should be monitored through a site monitoring plan, which may be ensured through a combination of institutional controls such as an (E) Designation, declaration of covenants and restrictions for ongoing site management, MOU, land disposition agreement, and/or mapping agreement (See Subsection 550 below).

Implementation of a mitigation or remedial measure does not absolve the site owner from additional mitigation or remediation in the future should conditions warrant (*e.g.*, site use changes). In addition, NYSDEC or other agencies may require additional investigation, mitigation, and/or remedial measures. Procedures documenting that the selected remedial action was properly implemented should always be incorporated into the chosen remedy or mitigation. For example, where site excavation would be followed by the placement of fill meeting specified requirements, the RAP should set out appropriate testing protocols and timely submission to DEP or OER, as applicable, of laboratory testing data, documenting both proper off-site disposal and compliant incoming fill materials.

510. CONTAINMENT TECHNIQUES

Containment is the process of covering or enclosing hazardous materials to minimize direct contact with or exposure of receptors. For subsurface contamination, capping of the affected area is often used to control the infiltration of surface water or rainwater and reduce contaminant migration. Caps are often employed when contaminated materials are left in place. Capping is sometimes performed together with measures for ground water contaminant control, surface water control, and sub-surface gas collection or control. Various cap designs and materials are available—from clean soil or standard paving to multi-layer engineered membranes. The selection of the cap design and materials depends on the nature of the waste to be covered and the intended use of the capped area. Disadvantages of capping include an uncertain design life; the need for long-term inspection and maintenance; and problems that arise should they need to be breached to install or repair utilities. Depending on the materials used, caps can be vulnerable to erosion, cracking or other types of deterioration.

Lateral migration of contaminants can be contained by such techniques as the construction of subsurface barriers, such as sheeting, slurry walls, or grout curtains, in which liquid material is injected into the soil where it solidifies to form a barrier. Where the potential for vapor intrusion by contaminated soil vapor is identified, resulting from contaminated ground water or soil above the water table, exposure to impacted indoor air can be mitigated through installation of technologies like sub-slab vapor barriers, and depressurization systems. In situations where exterior installation is not practical, membranes or coatings can be applied to the building's interior slab and subgrade walls. Heating, ventilating, and air conditioning (HVAC) systems can also be adjusted so that there is a "positive pressure" environment within the building that prevents soil vapor from entering indoor spaces. Where below-grade levels of a building are open to outside air or ventilated in accordance with all applicable New York City Department of Building (DOB) Codes (*e.g.*, parking garages beneath residential buildings), additional systems to prevent vapor intrusion may not be warranted. The need for additional systems would be evaluated on a case-by-case basis, pending evaluation of proposed sub-grade uses and ventilation systems.

520. REMOVAL TECHNOLOGIES

Contaminated surface and subsurface materials can be removed from a site. The types of equipment and construction techniques selected are determined by the physical characteristics of the materials being excavated, the volume of material to be excavated, the depth of the excavation, and the haul distances involved. In general, hazardous wastes and petroleum-contaminated materials require removal, whereas historic fill and other materials with concentrations typical of urban fill material may be reused on-site, provided that doing so is not in violation of any applicable regulatory requirements and that exposure to such materials is mitigated by installation of a cap or other appropriate mitigation controls. In accordance with NYSDEC's Rules and Regulations on beneficial use, found at 6 NYCRR Part 360, Section 1.15(b)8, nonhazardous, contaminated soil that has been excavated as part of construction projects may be used as backfill for the same excavation or excavations containing similar contaminants at the same site.

Once removed from the project site, the contaminated materials must be properly disposed of or beneficially reused in accordance with NYSDEC regulations. The transport, treatment, and disposal of solid and hazardous wastes and other materials are regulated by many agencies including the USEPA, NYSDEC, the U.S. Department of Transportation, the New York City Fire Department (FDNY), the New York City Department of Sanitation (DSNY), and other state regulations if the materials are disposed of in other states outside of New York. In some cases, it is possible to treat hazardous materials on-site or off-site and return the treated material to the site (see Subsection 530 below), or to use the treated material elsewhere (*e.g.*, as fill). In all cases, any soil or fill removed from a site must be properly disposed of in accordance with all applicable federal, state, and local regulations. A copy of all relevant documents, including transportation manifests, documentation of the destination of all material removed from the site, disposal/recycling certificates, weight tickets, and documentation associated with disposal showing requisite approvals for receipt of the material, must be maintained by the engineer/architect of record, associated consultants, and property owner/developer.

Ground water may be extracted to halt the lateral and vertical migration of contaminated ground water for subsequent treatment and/or disposal.

Where contaminated soil vapor is present, passive or active gas control systems (*i.e.*, sub-slab depressurization systems) may be appropriate to prevent exposures. These can include collection and treatment, but more commonly, the emphasis is on control measures that ensure that gases do not form explosive, oxygen deficient conditions, high concentrations of soil vapor contaminants, or enter into structures.

Bulk liquids and sludges are sometimes found in pits, ponds, lagoons, sumps, trenches, or tanks. These liquids and sludges almost always require removal to prevent the contamination of soil and ground water adjacent to the area.

When abandoned storage drums, gas cylinders, or similar potentially acutely hazardous items are found at a site, timely removal actions are likely warranted. These activities require specialized knowledge and safety procedures. Appropriate consultation with regulatory agencies may be required.

All contaminated materials treated on site or removed from the site for recycling and/or disposal must be managed in accordance with all applicable federal, state, and local regulations.

530. TREATMENT TECHNOLOGIES

Treatment technologies involve treating hazardous materials to either reduce the concentration of the contaminants of concern or alter the characteristics of the contaminated material. This can be performed on-site (either in-situ or ex-situ), or off-site. All treatment technologies should be implemented in accordance with all applicable federal, state, and local regulations.

INCINERATION is a well-proven method of burning wastes containing organic compounds at a very high temperature. However, incineration is usually too expensive to be a cost effective approach and it also requires removal and transportation of the materials off-site.

THERMAL TREATMENT TECHNOLOGIES include a number of methods that use heat to separate contaminants thermally from the media in which they are found. These technologies do not destroy the contaminants; consequently, they often require subsequent off-site disposal. An exception is the thermal treatment of petroleum-contaminated wastes that, rather than being disposed of, are incorporated into asphalt and subsequently used for paving roads.

SOIL VAPOR EXTRACTION (SVE) is a method of treating soil in the unsaturated zone contaminated with VOCs. Soil vapor extraction consists of a network of wells with perforated well screens spanning the contaminated portion of the unsaturated zone to remove VOCs.

AIR SPARGING/SVE includes passing air through a column of VOC-contaminated ground water and collecting the contaminant-enriched vapors with a SVE system above the water table. The system includes a series of air injection points below the water table and a series of vapor extraction points above the water table. With favorable site conditions, this type of system can clean up both the ground water and soil at VOC-contaminated sites.

AIR STRIPPING is a process of forcing air through impacted ground water or surface water to remove harmful chemicals. Water is pumped into an air stripper and then sprayed over packing material where a fan blows the evaporated water vapor upward. Air stripping is most effective when dealing with contaminants that evaporate easily, such as fuels or solvents.

SOIL FLUSHING is the application of a liquid flushing agent to soil to physically and/or chemically remove contaminants. This process is not commonly used in New York City, but can be applicable for a low- to medium-concentration of contamination that is distributed over a wide area.

CHEMICAL OXIDATION applies chemicals called oxidants to destroy pollution in soil and ground water. Chemical oxidation can destroy many types of contaminants such as fuels, solvents, and pesticides.

IN-SITU BIODEGRADATION is the process of enhancing microbial action to remediate subsurface contaminants that are adsorbed to soil particles or dissolved in the aqueous phase by adding oxygen and phosphorous, nitrogen, potassium, or other nutrients to the system.

MONITORED NATURAL ATTENUATION (MNA) is a combination of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or ground water. These processes include biodegradation, dispersion, dilution, sorption, volatilization, chemical or biological stabilization, transformation, or destruction of contaminants. This remedial strategy requires continued monitoring to assess progress and to ensure that exposure scenarios do not change as attenuation proceeds. MNA has been gaining acceptance for sites where there is no potential for human or environmental exposure, such as sites with low levels of VOCs in ground water that is not used as a source of drinking water. When MNA is the strategy selected for remediation of VOCs, the potential for soil gas contamination and vapor intrusion should be considered as an exposure pathway during monitoring.

SOLIDIFICATION AND STABILIZATION SOLIDIFICATION refers to treatment processes that are designed to change the physical characteristics of the waste, thereby minimizing free liquids and/or decreasing leachability. Stabilization techniques involve processes that limit solubility.

540. MITIGATION TECHNIQUES FOR CONTAMINATION IN BUILDINGS OR STRUCTURES

Mitigation measures depend on the type(s) of contaminant, the location of the contamination in or on the building or structure, and the potential exposure pathway(s). Generally, hazardous materials contaminating building components can be either contained or removed. While lead and asbestos are the two most common building contaminants, the regulatory frameworks for which were described above in Subsection 331.1, other possible hazardous conditions may be present. The mitigation for specific problems should be resolved in coordination with DEP for asbestos and/or DOHMH for lead on a case-by-case basis.

550. MITIGATION THROUGH INSTITUTIONAL CONTROLS

In certain instances, generally when testing is not physically possible during the CEQR process or when CEQR investigations identify the need for the City to ensure that post-CEQR remediation is completed adequately, an institutional control, such as an (E) Designation, MOU (in the case of City-owned property), recorded declaration of covenants and restrictions, land disposition agreement or mapping agreement, is placed on or entered into with respect to the subject property to establish a review and approval framework.

The lead agency should work with DEP during the CEQR process to determine the appropriateness of an institutional control. The Mayor's Office of Environmental Remediation (OER) has the authority and responsibility to administer (E) Designations and existing Restrictive Declarations, pursuant to Section 11-15 (Environmental requirements) of the Zoning Resolution of the City of New York and Chapter 24 of Title 15 of the Rules of the City of New York. When an institutional control is necessary on City-owned land, a MOU may be entered into between DEP and the agency controlling the site, whereby DEP would review and approve any testing and/or remedial plans for that property. DEP and all parties to an MOU should be consulted early in the CEQR process to reach agreement on the form and specifics of an MOU.

551. (E) DESIGNATIONS

The hazardous materials (E) Designation is an institutional control that can be placed as a result of the CEQR review of a zoning map or text amendment or action pursuant to the Zoning Resolution. It provides a mechanism to ensure that testing for and mitigation and/or remediation of hazardous materials, if necessary, are completed prior to, or as part of, future development of an affected site, thereby eliminating the potential for a hazardous materials impact.

Chapter 24 of Title 15 of the Rules of the City of New York and Section 11-15 of the Zoning Resolution of the City of New York set out the procedures for placing (E) Designations, satisfying related requirements, and removing (E) Designations. Detailed requirements on how to investigate, remediate, satisfy, and receive appropriate sign-offs for sites with (E) Designations are included in the Rules. If necessary, the lead agency may consult with DEP during the CEQR process to identify sites requiring an (E) Designation. After a site has been identified or after the (E) has been placed, applicants are advised to provide the CEQR number to OER. In order to facilitate OER's review of work proposed to address the requirements of the (E) Designation, it may be necessary for property owners to provide historical technical documentation related to the hazardous materials CEQR review (e.g., EAS/EIS, Phase I ESA, Phase II ESA Work Plan/HASP, Phase II ESA Report(s), RAP/CHASP, lead agency and DEP correspondence, Restrictive Declarations, Notices) to OER.

With respect to an applicant-owned or -controlled site, if the lead agency determines that the proposed zoning action warrants a hazardous materials assessment and a Phase I ESA, the Phase I ESA must be completed during CEQR. If the Phase I shows that potential hazardous materials conditions exist, which will need to be addressed during development, the lead agency may assign an (E) Designation to the site, requiring a Phase II ESA and any necessary remediation prior to and/or during redevelopment of the site (see Section 330 above). It is possible that, based on the Phase I and consultation with DEP, the lead agency may determine that the identification and characterization in the EAS/EIS of the actual nature and degree of contamination is appropriate during CEQR. If a Phase II ESA is, therefore, completed during CEQR and remediation is required, the lead agency may assign an (E) Designation if such remediation will involve more than standard construction practices and the proper removal of soil and site preparation in accordance with applicable laws and regulations. Such (E) Designation will require the preparation of a Remediation Action Plan in consultation with OER. Otherwise, remediation proposed to be undertaken in accordance with standard construction practices should be reviewed and approved by DEP, and an (E) Designation may not be warranted.

(E) Designations are listed in a table, "CEQR Environmental Requirements," appended to the Zoning Resolution and appear in DOB's online Buildings Information System (BIS).

With respect to lots with (E) Designations, DOB will not issue building permits or certificates of occupancy in connection with the following actions until it receives an appropriate "Notice" from OER that the environmental requirements have been met:

- Developments;
- Enlargements, extensions, or changes of use, involving residential or community facility use; or
- Enlargements or alterations that disturb the soil.

As appropriate, OER will issue the applicable notices to DOB including a Notice of No Objection, Notice to Proceed or Notice of Satisfaction.

552. RESTRICTIVE DECLARATIONS

Historically, until the amendments to the (E) Rules, which became effective on June 18, 2012, allowing lead agencies to place (E) Designations on applicant-owned or -controlled sites and in connection with all zoning actions, Restrictive Declarations were used as an institutional control to ensure that the required testing, remediation, and/or mitigation occurred prior to or as part of the development of applicant-owned or -controlled sites.

Restrictive Declarations are recorded instruments, binding the property owner, long-term lessee, future owners/lessees, and/or other parties-in-interest, to investigation and/or remediation requirements at predetermined stages of the project, as overseen by DEP during the CEQR review process or by OER during post-CEQR review. In particular, Restrictive Declarations require written notice from OER before DOB may issue building permits or certificates of occupancy in connection with the actions described above under (E) Designations.

If an applicant proposes a Restrictive Declaration with requirements to address potential hazardous materials contamination as part of a proposed project, as described in Section 421.1 of Chapter 2, "Establishing the Analysis Framework", the lead agency may instead elect to incorporate such provisions in an (E) Designation.

600. DEVELOPING ALTERNATIVES

Alternatives to the proposed project would most commonly include the mitigation methods described above and/or specific changes to the proposed project that minimize possible exposure. If increased exposure to hazardous materials may be associated with excavation, an alternative requiring less extensive excavation may be considered. If there is a concern for exposure to surface soil at a residential development, an alternative may be to cap the area or select another use for that portion of the site. Alternative sites for the proposed project may also be considered. In order to consider an alternative site for private developments, the applicant must own or own a right to use the alternative site.

700. REGULATIONS AND COORDINATION

710. REGULATIONS AND STANDARDS

Regulations regarding hazardous materials address their identification, registration, classification, discharge, handling and storage, generation, treatment, transportation, and disposal. They also provide a means to identify and fund the clean-up of hazardous sites and hazardous releases. Regulations are promulgated by the City, State, and Federal governments. An overview of key applicable regulations is presented below. The primary reference for this section is Parkin, W.P., *et.al.*, 1992, The Complete Guide to Environmental Liability and Enforcement in New York, sponsored by the National District Attorney's Association.

711. Federal Government

711.1. Resource Conservation Recovery Act (RCRA) and Hazardous and Solid Waste Amendments (HSWA)

RCRA, adopted in 1976 and amended in 1984, creates the basic framework for the Federal regulation of hazardous wastes. It provides controls for the generation, transportation, treatment, storage, and disposal of hazardous waste through a comprehensive "cradle to grave" system of hazardous waste management techniques and requirements. USEPA administers RCRA and delegates administration of major components to New York State. RCRA defines hazardous waste either as a listed hazardous waste or a waste exhibiting any of the characteristics of a hazardous waste (40 CFR Part 261). The four characteristics of hazardous waste are: (1) ignitability; (2) corrosivity; (3) reactivity; and (4) toxicity as measured by the Toxicity Characteristic Leaching Procedure (TCLP). The 1984 Hazards and Solid Waste Amendments (HSWA) added Federal regulation of underground storage tanks.

711.2. Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and Superfund Amendments and Reauthorization (SARA)

Congress enacted CERCLA (also known as Superfund) and its amendments (40 CFR Part 300) to fund the clean-up of hazardous substance waste sites. CERCLA, which was amended by SARA, has created a national policy and procedures for containing and remediating released hazardous waste substances and for identifying and remediating sites contaminated with hazardous substances. CERCLA's purview excludes crude oil, petroleum products, and natural gas products.

Title III of SARA, the Federal Emergency Planning and Community Right to Know Act, was promulgated to allow public access to information about local use of hazardous chemicals and to require each generator of such materials to develop chemical emergency planning procedures (40 CFR Part 300). A list of Extremely Hazardous Substances (EHSs) and their respective reportable quantities was created.

711.3. Transportation of Hazardous Materials

The U.S. Department of Transportation addresses the listing and transportation requirements for hazardous materials under 49 CFR Part 171 through 177, and USEPA regulates hazardous waste transport under 40 CFR Part 262 and 263.

711.4. Toxic Substances Control Act (TSCA)

TSCA empowers USEPA to regulate specific toxic substances. Federal regulation of polychlorinated biphenyls (PCBs) and asbestos-containing materials falls under TSCA.

712. New York State

712.1. Environmental Conservation Law

NYSDEC has developed the regulatory framework for hazardous waste management in New York in response to the State's Environmental Conservation Law. The criteria for determining a hazardous waste closely parallel those of RCRA and are set forth in 6 NYCRR Part 371.

The State has also created its own Superfund-like program to help finance the State's share of clean-up costs under the Federal program or to finance clean-ups at State sites that are not under the Federal program. New York State's Superfund program, the Inactive Hazardous Waste Sites Law, was passed in 1979. This program is described in 6 NYCRR Part 375. The law provides for the identification, listing, and remediation of inactive hazardous waste sites. Under the law, NYSDEC has provided for a comprehensive listing of inactive hazardous waste sites.

712.2. Petroleum and Hazardous Substances Storage Laws

The storage of petroleum and hazardous substances in New York State is regulated through a series of laws enacted to ensure proper storage and to address petroleum and hazardous substance spills and leaks. In 1984, Federal underground storage tank requirements were adopted as required by Subtitle I of RCRA. The New York State petroleum and hazardous substance storage laws are more comprehensive than the Federal laws and include the Oil Spill Prevention, Control and Compensation Act of 1977; the Petroleum Bulk Storage Act of 1986; and the Hazardous Substance Bulk Storage Act of 1986.

The Hazardous Substances Bulk Storage Act of 1986 specifically addresses the storage of nonpetroleum hazardous substances. Owners of tanks storing listed hazardous substances are required to register all tanks storing listed hazardous substances with a capacity greater than 185 gallons.

713. New York City

713.1. Hazardous Substances Emergency Response Law (Spill Law)

New York City has enacted Local Law 42 of 1987, the New York City Hazardous Substances Emergency Response Law, also known as the Spill Law. Under this law, the City has declared its policy to respond to emergencies caused by releases or threatened releases of hazardous substances into the environment that may have an adverse effect on the public health, safety, and welfare and to prevent injury to human, plant, and animal life and property. DEP administers this law, which allows the department to order clean-up of hazardous substance spills.

713.2. Community Right-to-Know Law

The New York City Community Right-to-Know Local Law 26 of 1988 authorizes DEP to gather chemical information from facilities that use, store, or manufacture hazardous substances and to use this information for emergency planning and response purposes. The intent of this law is to protect the health and safety of the community and the environment against accidental release of hazardous materials. In addition, the law gives New York City residents the right to know the identities, quantities, characteristics, and locations of hazardous substances used, stored, and manufactured in their communities.

713.3. Asbestos Legislation

Asbestos-containing materials are regulated at the City, State, and Federal levels of government. NYCDEP, under Title 15 Chapter 1, regulates building surveys, professional certifications, and asbestos abatement procedures. Local Laws 70 of 1985 and 21 of 1987, administered by the New York City Department of Sanitation, govern the transport, storage, and disposal of asbestos waste in the City. The City's regulations are more stringent than those of the state and federal governments. The New York State Industrial Code 56, administered by the New York State Department of Labor, and the USEPA administered National Emissions Standards for Hazardous Air Pollutants (NESHAP) also regulate asbestos activities. Asbestos laboratories are regulated by the NYSDOH under the Environmental Laboratory approval program.

713.4. Industrial Pretreatment Program

This program establishes standards for certain pollutants discharged to the sewer system, requiring pretreatment for effluent that would otherwise not meet the standards.

713.5. Lead Paint

Lead-based paint (LBP) in certain residential and child-occupied facilities is regulated under NYC Local Law 1 of 2004, NYS Public Health Law Title 10 of Article 13, and the Federal "Residential Lead-Based Paint Hazard Reduction Act of 1992." The USEPA regulates training and certification of individuals and certification of firms under 40 CFR Part 745. In other facilities, worker exposure to lead is regulated by the Federal OSHA regulations 29 CFR 1926.62 and 29 CFR 1910.1025. Disposal of waste with lead paint is regulated by the NYSDEC under Chapter IV Subchapter B - Solid Wastes.

714. Applicable Standards

New York State has promulgated standards and guidance values for ground and surface waters and suggested soil clean-up guidelines.

714.1. Surface and Ground Water

The NYSDEC Division of Water has published Water Quality Regulations for Surface Waters and Groundwaters under 6 NYCRR Parts 700-705, last amended August 1999. Under these regulations NYSDEC provides a water classification system for surface and ground water (Part 701). For all water classifications, the discharge of sewage, industrial waste, or other wastes shall not cause impairment of the best usages of the receiving waters as specified by the water classification at the location of the discharge and at other locations that may be affected by such discharge.

The Water Quality Regulations establish eight fresh surface water classifications, five saline surface water classifications, and three ground water classifications, and for each, provide a definition of their best usage. Ambient Water Quality Standards and guidance values are categorized according to this water classification system. The standards are derived to provide for the protection of human health, potable water supply, aquatic life, and consumers of aquatic life.

In addition to the Water Quality Regulations under 6 NYCRR Part 700-705, NYSDEC Division of Water has issued Technical and Operational Guidance Series 1.1.1 to provide a compilation of ambient water quality guidance values and ground water effluent limitations for use where there are no standards or regulatory effluent limitations. This document also provides a summary of the water quality standards and limitations under 6 NYCRR Part 700-705.

Standards and guidance values for protection of water bodies with a best usage as a source of potable water supply protect human health and drinking water sources, and are referred to as health (water source) values. For the majority of specified substances, these values generally equal the maximum contaminant level (MCL) for that substance. If no specific MCL exists, the standard or guidance is 5 micrograms per liter (µg/L) or a less stringent value, as determined by the Commissioner of the New York State Department of Health. For those substances that do not have an applicable health (water source) standard, and for which the NYSDEC has determined that a threat to human health may exist if discharged into the waters of the State, a guidance value is derived by applying the procedures utilized by the State or a "general organic guidance" value of 50 µg/L for an individual organic substance may be utilized (Part 702.15), whichever is more stringent.

The three classification categories of ground water established based on their best usage include Class GA fresh ground water, Class GSA saline ground water, and Class GSB saline ground water. The best usage of Class GA ground water is as a source of potable water supply. Thus, the Class GA standards generally correspond to the MCL. The best usages of Class GSA saline ground water are as a source of potable mineral waters, for conversion to fresh potable waters, or as a raw material for the manufacture of sodium chloride or its derivatives or similar products. The best usage of Class GSB saline waters is as a receiving water for the disposal of wastes. The Class GSB is not assigned to any ground waters of the State, unless the commissioner of NYSDEC finds that adjacent and tributary ground water and the best usages thereof will not be impaired by such classification. The ground water of the five boroughs are classified as Class GA ground water, except where the criteria for saline ground water are met (Part 703.5).

Ground water analytical data generated from a site are typically compared with NYSDEC standards and guidance values that apply to a site's ground water classification. This comparison aids in the evaluation of the extent of impairment of the ground water being analyzed. Unless volatilization at the ground water interface would result or a drinking water supply is affected, no significant impact may be considered to result from the ground water contamination.

714.2. Soil

Human exposure to soil contaminants can occur through inhalation, ingestion, or skin contact, as well as indirectly through contaminants leaching or percolating to ground water, if it is used as a source of drinking water. There are no Federal, New York State, or New York City clean-up standards or guidelines applicable to all situations to define "acceptable" levels of contaminants in soil. There are, however, promulgated values applicable to certain situations and guidance values that have been proposed by various government agencies. These standards and guidelines are typically derived from models employing numerous conservative assumptions developed to set clean-up levels at contaminated sites.

In New York, NYSDEC has developed soil cleanup objectives (SCOs), promulgated in 6 NYCRR Subpart 375-6: Remedial Program Soil Cleanup Objectives. NYSDEC's Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (TAGM 4046, January 1994 with updates) also sets up recommended soil cleanup objectives (RSCOs). The goal of the SCOs and RSCOs is to eliminate significant risks to human health and the environment.

The SCOs (and RSCOs especially for evaluating metals) should be used to assess levels of environmental contamination, while taking into account each site's particular circumstances regarding current and proposed future exposure scenarios and factors.

714.3. Solid and Hazardous Waste Characteristics

6 NYCRR Part 360 describes how solid waste must be transferred, processed, recovered, stored, reclaimed, or disposed of. Material at a site is considered solid waste if it exhibits characteristics identified in 6 NYCRR Part 360-1.2.

6 NYCRR Part 371 requires that before transport and disposal of contaminated soil from a site, the generator must determine if it is subject to regulation as a hazardous waste. A solid waste, such as contaminated soil, is considered a hazardous waste if it exhibits one or more of the characteristics identified in 6 NYCRR Part 371.3 or if it is a listed acutely hazardous or toxic waste.

720. APPLICABLE COORDINATION

As noted above, several Federal, State, and City regulations govern hazardous materials. The agencies that administer these regulations at a Federal and State level, such as USEPA and NYSDEC, typically are not active in the CEQR process. However, if a significant amount of hazardous waste exists on the site and poses a significant threat to public health and the environment, the appropriate regulatory agencies must be notified by either DEP or the lead agency. For instance, if a petroleum spill of more than 5 gallons is found during a site investigation being performed for a CEQR, NYSDEC must be notified pursuant to Article 17, Section 1743 of the New York State Environmental Conservation Law and Article 12, Section 175 of the New York State Navigation Law. The appropriate Federal and New York City government agencies must also be notified. DEP can provide complete notification requirements. Other than regulatory notification requirements, however, Federal and State agencies typically do not have a review and/or approval role in the CEQR process.

At the City level, coordination with DEP's Bureau of Environmental Planning and Analysis is required when the proposed site is likely to show potential for the presence of hazardous materials (such as a site in or near manufacturing uses or with a history that reveals a potential hazardous materials issue). DEP will provide consistent technical guidance and review throughout the research, investigation, and remediation phases of a hazardous waste assessment.

730. LOCATION OF INFORMATION

Throughout this chapter, references to publications, regulations, regulatory agencies, and other sources of information are made. Generally, publications and guidelines can be purchased or obtained free-of-charge from the referenced agencies. Listed below are regulatory agencies and current addresses, along with publications and/or regulations that may be obtained. NYC agencies can be contacted through the web site NYC.Gov or by calling 311. NYSDEC may be contacted at 718-482-4900.

- RCRA/Superfund Hotline (Publications and technical information).
- Government Printing Office, 26 Federal Plaza, New York, NY 10278 (USEPA regulations and guidelines available for a fee).
- New York State DEC Regional Office, Region 2 Hunters Point Plaza, 47-40 21st Street Long Island City, NY 11101 (Division of Air Resources, Division of Solid and Hazardous Materials, Division of Fish, Wildlife, and Marine Resources, Division of Water, Division of Environmental Remediation, and Division of Lands and Forests).
- DEP Bureau of Environmental Planning and Analysis, 59-17 Junction Boulevard, 11th Floor Flushing, NY 11373.
- DEP Bureau of Environmental Compliance, 59-17 Junction Boulevard, 1st Floor Flushing, NY 11373 (Copies of "Spill Law" and Right-to-Know Laws available free of charge).
- United States Geological Survey, P.O. Box 1669, Albany, NY 12201 (Topographic maps). Also available at local map stores, such as the Hagstrom Map Company.
- New York Public Library, 455 Fifth Avenue, New York, NY 10018 (Fire insurance maps and City directories).
- New York City Department of Buildings (Manhattan), 60 Hudson Street, New York, NY 10013 (Building renovation records and certificates of occupancy for past and present uses available for review).
- New York City Department of Buildings (Brooklyn), Municipal Building Brooklyn, NY 11201 (Building renovation records and certificates of occupancy for past and present uses available for review).
- New York City Department of Buildings (Bronx), 1932 Arthur Avenue, Bronx, NY 10457 (Building renovation records and certificates of occupancy for past and present uses available for review).
- New York City Department of Buildings (Queens), 126-06 Queens Boulevard, Kew Gardens, NY 11415 (Building renovation records and certificates of occupancy for past and present uses available for review).
- New York City Department of Buildings (Staten Island), Borough Hall, Staten Island, NY 10301 (Building renovation records and certificates of occupancy for past and present uses available for review).
- New York City Fire Department, Bureau of Fire Prevention, 250 Livingston Street, Brooklyn, NY 11201 (Records on fuel tanks, storage of flammable materials).
- National Cartographic Information Center, U.S. Department of the Interior, Geologic Survey, 507 National Center, Reston, VA 27092 (Aerial photographs and information on commercial surveying firms).

Refer to Chapter 9, "Historic Resources," for more information on historic research sources.

731. Sources of Data to Supplement the ASTM Standard

In addition to the ASTM Standard, the following information may assist in preparation of Phase I ESAs.

- NYC Department of City Planning (DCP), including Zoning Information, (E) Designations, and Restrictive Declarations.
- New York City Department of Buildings, Buildings Information System (BIS) information.

- New York City Department of Finance, [Automated City Registration Information System (ACRIS)](#).
- New York City Fire Department, 9 Metro Tech Center, Brooklyn, NY 11201 (List of Registered Underground Storage Tanks).
- Chain-of-Ownership (title search) – although ASTM recommends searches of title records, many of which can be accessed from the ACRIS database, since multi-user buildings and other rental situations are common in New York City, City Directories (*e.g.*, historic telephone records) and other sources that may indicate use rather than ownership should be consulted, where possible. Interviews with building maintenance staff may be helpful.
- Information including base maps, imagery based on aerial photography, tax blocks and lots, roadways, building footprints, waterways, and mass transportation lines are readily available at http://www.nyc.gov/html/doitt/home.html and http://gis.nyc.gov/doitt/cm/CityMap.htm.
- Companies that specialize in providing fire insurance maps, city directories, aerial photographs, title search information, *etc.* (see, for example, http://www.toxicstargeting.com/ or http://www.edrnet.com).
- New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER), Environmental Site Database (includes Spill Incidents, Remedial Sites, and Bulk Storage (chemical and petroleum) records).
- New York State Department of Health (NYSDOH), Center for Environmental Health, Bureau of Environmental Exposure Investigation, "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York," October 2006.
- USEPA Center for Environmental Research Information, Office of Research and Development, "Compendium Method TO-15: Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS)," January 1999.