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Standard Guide for Beneficial Use of Landfills and Chemically Impacted Sites¹

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INTRODUCTION

Over the last half-century, environmental protection programs have withdrawn from use properties posing significant adverse human health impacts, yet some with lesser potential impact continue to be heavily used [for example, pedestrian; recreational; or outdoor entertainment-related, concert audience seating] without evaluation. Assessment of environmental conditions for properties undergoing ownership transfer is now common (and often required), yet those of historic ownership are not similarly evaluated. This guide serves the need for a forward-looking program that allows a knowledgeable environmental professional to complete an evaluation of a proposed beneficial use, utilizing readily available information and her/his professional judgment whether property usage restrictions are necessary to be protective of human health. Two outcomes of such an evaluation include finding that the proposed beneficial use is acceptable, or a finding that the proposed beneficial use request is not acceptable. The environmental professional may condition her/his finding of acceptability of beneficial use with institutional and engineering controls based on actual or potential soil chemical concentrations, known background chemical concentrations, and other approaches that provide a barrier between a chemical and a site user or limit times of use.

1. Scope

1.1 This guide provides a beneficial, *acceptable use* framework for the *development* of: (1) Inactive and *pre-RCRA* (or *pre-regulatory*) *solid waste landfills* that are considered *orphan* or *latchkey* to be repurposed, despite having offsite migration impacts of *landfill gases* and/or *leachate*, albeit at *de minimis* levels; (2) other types of unregulated *waste landfills*; (3) sites impacted by chemical releases; (4) *legacy* or ongoing, intentional, or unintentional fill placement; (5) *closed*, open, or operating *post-RCRA landfills* or *landfills* in the planning stages such that materials may be placed in ways that optimize a *landfill's* use in future years; and (6) underutilized or heavily used (for example, pedestrian; recreational; or repetitive, entertainment, single event) *chemically impacted sites*. Also, this guide identifies land usage and conditions of adjacent/non-waste portions of a *landfill* (that is, *buffer* areas not within the footprint of an actual *landfill* or *chemically impacted site* itself) that should be evaluated before a *site use* is considered *acceptable*.

1.2 Provided herein is instruction on evaluating and judging the *acceptability* of: (1) Chemical exposure barrier(s) (and

other *engineering and institutional control* measures) in place between actual or potential chemically impacted soil; and/or (2) time of use restriction(s) established at a *waste / chemically impacted site*.

1.3 Additionally provided is instruction on assessing the *terminal conditions* at a *municipal solid waste (MSW) landfill*; that is, flows of methane below which passive rather than active venting is recommended, and flows of *leachate* of a long-term, consistent quality that is clean enough to allow direct discharge of the liquid to surface waters. See **Appendix X3** for additional information.

1.4 This guide complements *solid waste* regulatory programs where guidance on beneficial usage is unavailable or insufficient, thereby improving the chance that such sites may be repurposed for public and/or private benefit.

1.5 This guide may be implemented in conjunction with ASTM's Standard Guide for Integrating Sustainable Objectives in Cleanups (Guide **E2876-13**) with respect to *community engagement* activities. See Guide **E2876** for more information.

1.6 This guide should not be used as a justification to avoid, minimize, or delay implementation of specific cleanup activities as required by law or regulation.

1.7 This guide should not be used to characterize (that is, environmentally assess) a site for the purpose of ownership transfer, although it could supplement other environmental assessments that are used in such a transfer.

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1.8 Users of this guide make professional judgments that only apply to a particular site, at a particular date and time, and do not warrant safe conditions existing beyond that date. It is not impossible that a significant environmental exposure condition exists at a site but was missed by the user of this guide or the *Environmental Professional* who led the evaluation, or that the condition was introduced subsequent to the evaluation. The evaluation of a site by an *Environmental Professional* is not intended to be exhaustive; there may be significant unknown conditions that may not be apparent through reasonable site characterization efforts. Further, the user of the guide should advise the site owner to maintain any *Environmental Professional*-recommended *engineering* and *institutional controls* and any *established* signage into the future for the planned, identified beneficial use. Those who use the final reports generated through the use of this guide are cautioned to understand the limits of what the *Environmental Professional's Completed Site Evaluation* describes. Compared to a *waste / chemically impacted site* NOT evaluated (in the manner described herein) before a use activity is implemented is clearly subject to greater *potential adverse impacts to human health, public safety, or welfare* than a *waste / chemically impacted site* that is. See 3.1.24 for a discussion of the *Due Diligence Threshold of the Environmental Professional* and 4.4 for additional information.

1.9 Users of this guide should comply with all applicable federal, State, and local statutes and regulations requiring and/or relating to protection of human health. This includes, and is not limited to, laws and regulations relating to health and safety of the people using a *developed waste / chemically impacted site*, the surrounding community, and/or public sector and private sector personnel who are involved in the management or oversight of *waste / chemically impacted sites*. See (1)² for useful information on land revitalization and (2) for information on chemical safety.

1.10 Use of this guide is considered a *sustainable urban governance* practice as identified by Rowland (2008) (3).

1.11 This guide is composed of the following sections: Referenced Documents; Terminology; Significance and Use; Planning and Scoping; Site Use Activity Evaluation and Selection Process; and Site Use Activity Evaluation, Reporting, and Documentation.

1.12 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

- E1527 Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process
- E2201 Terminology for Coal Combustion Products
- E2247 Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process for Forestland or Rural Property
- E2876 Guide for Integrating Sustainable Objectives into Cleanup
- E2893 Guide for Greener Cleanups

3. Terminology

3.1 Definitions:

3.1.1 *active use, n*—typically expressed as “active recreational use,” this term could be used to describe a use that has similar potential for exposure to chemicals in bare soil. See 4.1.1 for a discussion on this type of activity.

3.1.2 *acceptable use, n*—an *Environmental Professional's* description of a proposed beneficial use, characterized by the nature and duration of activities involved, for a property that is evaluated and determined to be protective of human health, public safety, and welfare with, if necessary, specified *engineering and institutional controls* and *established* signage.

3.1.3 *acceptable site conditions, n*—a descriptive condition for a site proposed for beneficial use (either *active use* or *passive use*) using Guide E3033 when concentrations of chemicals [listed in Appendix X5 as Soil Cleanup Objectives (SCOs)] are less than those listed but may otherwise be known to exist in surface soils, and no *imminent threats to human health, public safety or welfare* exist.

3.1.4 *applicable local, state, or tribal (regulatory agency) organization, n*—the political or official authority concerning the use of land for public or private purposes where there are *potential adverse impacts to human health, public safety, or welfare* or other objectionable conditions, such as odors, smells, or poor visual qualities.

3.1.5 *beneficial use of a coal combustion product, n*—the use of or substitution of the coal combustion product (CCP) for another product based on performance criteria. For purposes of this definition, beneficial use includes but is not restricted to raw feed for cement clinker, concrete, grout, flowable fill, controlled low strength material; structural fill; road base/sub-base; soil modification; mineral filler; snow and ice traction control; blasting grit and abrasives; roofing granules; mining applications; wallboard; waste stabilization/solidification; soil amendment; and agriculture. See Terminology E2201 and US EPA, 2015 (4) for more information.

3.1.6 *buffer area, n*—a geographically linear land parcel that blocks the adverse visual, auditory, or odiferous effects of *waste management*.

3.1.7 *caps and liners, n*—natural (for example, compacted clay liners) or synthetic (for example, HDPE) materials placed on the top, bottom, and sidewalls of a *landfill* to totally contain *leachate*, prevent rainwater and groundwater infiltration, and direct the flow of gases to a venting system on top (and the flow of leachate to the base, for extraction) of a *municipal solid waste landfill*.

² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.8 *caretaker mode*, *n*—long-term management scheme of a non-operating *landfill* in which *terminal conditions* for migrating methane, *leachate*, and low-density buried solids have been attained. See 3.1.42 and Appendix X3 for additional information.

3.1.9 *charrette*, *n*—an intensive planning session where *stakeholders* (including property owners and neighboring land-owners) collaborate on a vision for a use at a *chemically impacted site*. It provides a forum for ideas and offers the unique advantage of giving immediate feedback to the users of this guide. See Guide E2876 for more information.

3.1.10 *chemically impacted site*, *n*—an area where chemicals have been placed intentionally or by nature, upon the ground surface or at depth, not containing putrescible, organic wastes of a *municipal solid waste landfill*; includes sites with *historic*, *urban fill* and urban land areas impacted by lead emissions from automobiles and lead paint chips from building surfaces. It is common to label such sites as brownfields, as opposed to land that is not *chemically impacted* that are known as a greenfields.

3.1.11 *closed site*, *n*—see 3.1.39, *landfill closure*.

3.1.12 *coal ash*, *n*—collective term referring to any solid materials produced primarily from the combustion of coal (a type of *industrial waste*). Examples include fly ash, bottom ash, and boiler slag.

3.1.13 *coal ash dry management unit*, *n*—*coal ash landfill*, a material management unit that is characteristically more stable (that is, has a higher load bearing capacity) and therefore is potentially available for the eight types of beneficial *site uses* identified herein.

3.1.14 *coal ash wet management unit*, *n*—*coal ash* surface impoundment; a material management unit less stable than a *dry management unit*, associated with sidewall failures and spills into the environment. These types of units are not to be considered for any of the eight types of beneficial *site uses* identified herein. See Katz (2015)(5) and US EPA (2015) (6), for more information.

3.1.15 *community engagement*, *n*—pro-active reaching out to neighbors of a *waste / chemically impacted site*, adjacent property owners, *stakeholders*, and civic leaders by the owner of the *waste / chemically impacted site*, the guide user, *Environmental Professional*, and the *Project Team* for the purpose of selecting an *acceptable site use* activity. See Guide E2876 for more information.

3.1.16 *completed site evaluation*, *n*—the end of this guide's process; a report (prepared by an *Environmental Professional*) that *accepts* or *rejects* a proposed beneficial use of a *waste / chemically impacted site*. If *accepted*, one or more of the Appendix X4 forms are completed as described therein. See 7.2 for additional information.

3.1.17 *concurrence*, *n*—agreement among two or more individuals or organizations that a course of action provides *acceptable* protection of human health, public safety, and welfare.

3.1.18 *conditional expedited use*, *n*—a timely approval (that is, between 2 weeks and 90 days) for a proposed beneficial use.

See Appendix X2 for a discussion of the conditional expedited use process and guidance on filling out Form 2 – Conditional Expedited Use, and Appendix X4 for Form 2 that an *Environmental Professional* uses to identify an *acceptable* conditional expedited use. See 7.2.2 for additional information.

3.1.19 *construction & demolition debris*, *n*—a *waste* that includes wood, metal, glass, concrete, asphalt, and other materials associated with constructing buildings or tearing them down. This is a type of *industrial waste*.

3.1.20 *cover*, *n*—see 3.1.32, *generic cover*.

3.1.21 *de minimis*, *adj*—that which has an effect or quality that is *acceptable* and measurable; for example, human chemical exposure below an OSHA threshold limit value or US EPA concentration limit for water discharge to a river. See Appendix X5 for a listing of chemical concentrations in bare, surface soil considered *acceptable* for two types of recreational activities; generally, concentrations lower than those listed are considered *de minimis*. Also *de minimis* are concentrations of *pollutants* beneath a *generic cover* or *cap* that provide a barrier to exposure. Note that a concentration limit for water discharge to a river may not be *acceptable* with respect to direct human contact; the user or *Environmental Professional* using this guide does not identify as *acceptable*, activities for anything other than land-based uses.

3.1.22 *development*, *n*—act of taking a greenfield or restoring a *waste / chemically impacted site* and providing living space, recreational space, nature preserves, commercial / employment opportunities, agricultural products, and/or opportunities for recovering value from a site.

3.1.23 *due diligence*, *n*—the reasonable, environmental professional approach to research of *readily available information* and documents and interviews with available current or past owners or operators of property for the purpose of creating knowledge regarding the known or likely presence of *pollutants* in assessing *potential adverse impacts to human health, public safety, or welfare* at a specific site that includes consideration of: (1) past land usage; (2) *releases* of chemicals on the site or upon adjacent properties that might be expected to migrate onto the site; and (3) past placement of fill soils or *waste* and, if known, the origin of those materials. The performance of a Phase I environmental site assessment (in accordance with Practice E1527 or Practice E2247) is not required by this guide, but information resources referenced in those Practices should be considered. See 5.6.3 for a description of the *due diligence* process.

3.1.24 *due diligence threshold of the environmental professional*, *n*—the criteria used by an *Environmental Professional* for rendering judgment that sufficient knowledge has been reached whereupon the *Environmental Professional* may offer recommendations concerning what is an *acceptable use* at a selected *landfill* or *chemically impacted site*. The *Environmental Professional* should only offer beneficial use recommendations until she/he has reviewed *readily available information* and the eighteen considerations listed in Appendix X6.

3.1.25 *easements, buffers, and rights-of-way*, *n*—typically, narrow but long corridors of land that are used by municipal service or public or private utility vehicles for maintenance,

repair, or service; could contain buried or overhead utility systems or could be green spaces used innovatively for recreational space, stormwater management, *nature-based land usage*, or *nature preserve land usage*.

3.1.26 *engineering control, n*—a constructed measure that minimizes the flow of liquids into or out of a *post-RCRA landfill* (for example, compacted clay bottom, sidewalls, and *cap*; *leachate* and methane collection and removal systems) that may include below ground slurry walls (to block groundwater infiltration or outward migration) and *lined* drainage swales. For *chemically impacted sites*, an engineering control may include a dense grass cover or vegetation that limits exposure to chemically impacted soil. *Generic covers* are types of an engineering control.

3.1.27 *environmental justice, n*—the public administrative effort to question and/or prevent the siting of *waste sites* in poor neighborhoods, and those of people of color. Also includes such efforts to make currently used or abandoned sites *acceptable* for use or continued use.

3.1.28 *environmental professional, n*—a person trained and experienced in the management of *waste* materials and *chemically impacted* soils or materials, meeting the requirements of 40 CFR 312.10(b) (7); some U.S. State agencies identify this person as a Qualified Environmental Professional (QEP). In this document, this person is identified as an Environmental Professional, as she/he has the credentials to make professional judgments about the *acceptability* of how land is used in spite of *potential adverse impacts to human health, public safety, or welfare* should protective barriers (that is, *engineering controls*) or schedules for use (that is, *institutional controls*) to *waste* and *chemically impacted* soils be compromised or exceeded. See (7) for additional information.

3.1.29 *established, adj*—description of municipal code, law, regulation, or best management practice that is currently in effect regarding conditions of *acceptable* use of property and the prominent display (that is, signage, posting) of such conditions at the entrance(s) of the site (being or to be beneficially used), or in brochures, pamphlets, or programs available to site users.

3.1.30 *expedited use, n*—approval of a proposed beneficial use within two weeks of a request. See **Appendix X2** for a discussion of the expedited use process and guidance on filling out Form 1 – Expedited Use, and **Appendix X4** for Form 1 that the Environmental Professional uses to identify an acceptable expedited use. See 7.2.2 for additional information.

3.1.31 *freedom of information request, n*—a written or electronically composed and delivered message to a *regulatory agency* with jurisdiction over land being considered for beneficial use that asks for all correspondence and reports regarding the site, that are not already in the public domain.

3.1.32 *generic cover, n*—concrete, asphalt, or soil used to provide a physical barrier against contact with a soil *pollutant*; considered an *engineering control*. These materials impede but do not prevent the flow of liquids or gases into or out of a *landfill / chemically impacted site*.

3.1.33 *historic fill material, n*—primarily soil and soil-like *waste* generated near 19th and 20th century industrial urban

centers (that is, Northeast, Midwest, and Southeast U.S.), with constituents of lead, mercury, chromium, semivolatile organics, and PCBs; typically disposed without a 40 CFR Part 264 or Part 265 (RCRA) (or equivalent) permit. This is a type of *industrial waste*. See (8) for additional information.

3.1.34 *historic fill site, n*—the location where *historic fill material* was placed before effective environmental regulations (typically, in the U.S., before 1970 to as late as the 1990s, known as a *pre-regulatory site*) for the purpose of leveling property, filling in wetlands to increase acreage, and to discard *waste* materials at low cost.

3.1.35 *imminent threat to human health, public safety, or welfare, n*—the conclusion of an *Environmental Professional* (after a site evaluation), expressed at the instant she/he realizes that the current or proposed use of a site may have immediate adverse impacts on human health, public safety, or welfare, including death or injury from: a) Exposure to *pollutants*; b) conditions that might pose a likelihood of fire or explosion; or c) conditions that present tripping or falling hazards due to variable surface features of a *waste / chemically impacted site*. See Ref. (2) and 3.1.51 for additional information.

3.1.36 *industrial waste, n*—materials that are not putrescible, as is household *waste* (that contains a high percentage of food waste), but rather includes non-hazardous chemicals and by products of manufacturing, processing, and refining.

3.1.37 *institutional control, n*—administrative measures (of a *regulatory agency*) that guide property owners of *waste / chemically impacted sites* on required or prohibited activities, and deliverable documents concerning the control of *leachate*, methane, storm drainage, and water infiltration. These conditions may include what is allowed (when, how long, where, and by whom), what is to be measured during inspections, and what is to be done if conditions exceed what is considered *acceptable*. The *Environmental Professional* may recommend such controls in her/his evaluation of a site using this guide, in addition to what a regulatory agency requires.

3.1.38 *landfill, v*—the act of placing discarded materials into a land surface depression (for example, wetlands) and/or upon uplands; (n) the accumulated mass of discarded materials, typically of a mounded shape that often contains environmental pollutant media in the form of solids, liquids (*leachate*) and gases (for example, methane).

3.1.39 *landfill closure, n*—the transition period (of a duration of relative certainty) of a *landfill*, between the active receipt of discarded material and the start of the period of *post-closure care*; often involves the installation of a *landfill cap* (that is, low permeability soils, synthetic liner, gas collection wells, and piping systems) that isolates (that is, prevents the upward migration of) low density, discarded materials (that include automobile tires and glass) while accommodating the ability of gases and liquids to be removed during *waste* decomposition. *Pre-regulatory landfills* cannot achieve “closure;” all that they may attain is a periodically reviewable status of *acceptable use*.

3.1.40 *landfill gas*, *n*—typically, the gaseous byproduct of anaerobic decomposition of organic discarded material; includes methane, hydrogen sulfide, carbon monoxide, and carbon dioxide. However, this gas could also be that of the discarded material itself, such as gasoline or other volatile liquids.

3.1.41 *landfill post-closure care period*, *n*—an indefinite span of time that ends when *landfill* decomposition gases and liquid no longer pose *potentially adverse impacts to human health, public safety, or welfare* to the satisfaction of *applicable local, State, or tribal (regulatory agency) organization(s)*; may include a period of time of infrequent monitoring to assess when *terminal conditions* for monitoring or maintenance have been reached. See 3.1.52 and Appendix X3 for additional information.

3.1.42 *latchkey landfill*, *n*—an unwanted *landfill* that has a *caretaker* party / agency that provides minimal legal care of the property; such properties have potential values that are not currently recognized. See 3.1.8 for additional information.

3.1.43 *leachate*, *n*—the liquid byproduct of *landfilling* discarded materials whose origin may be of four sources: (1) The discarded material itself; (2) the result of anaerobic decomposition of organic waste; (3) waste dissolved in rainwater that infiltrates the *landfill*; or (4) waste dissolved in groundwater that has infiltrated the *landfill* (typically at the base of a *pre-regulatory landfill*) that began as a filled-in wetland, sandpit, natural surface depression, or man-made ditch or canal.

3.1.44 *legacy landfill*, *n*—a *landfill* containing *municipal solid waste*, typically disposed in the U.S. during the 1940s to the 1990s, without *regulatory agency* oversight (also called a *pre-regulatory landfill*).

3.1.45 *monofill landfill*, *n*—the accumulation of a homogeneous waste material (a type of *industrial waste*) configured and protected in ways to limit erosion, airborne dispersion, or the generation of *leachate*. See 3.1.13 for an example.

3.1.46 *municipal solid waste*, *n*—putrescible, organic waste that includes food waste and household garbage. Another name for *solid waste*, known by the acronym MSW. See 3.1.66 and 3.1.73 for additional information.

3.1.47 *nature preserve land use*, *n*—a landscape large enough for the maintenance of an ecosystem and/or isolated (that is, from human presence) enough to provide a corridor for wildlife movement.

3.1.48 *nature-based land use*, *n*—a landscape or constructed recreational park feature with barriers to human entry (for example, fencing, thick brush or bushes) such that the feature exists for visual pleasure and/or the sake of a non-human habitat; chemical concentrations in soil may exceed that which are *acceptable* for *passive recreational use*, as these barriers limit human exposures.

3.1.49 *orphan landfill*, *n*—an unwanted and abandoned, *pre-regulatory waste site* that has no active *caretaker* party / agency. Such properties may have potential values but are not currently recognized.

3.1.50 *passive use*, *n*—typically expressed as “passive recreational use,” this term is used to describe a use that has a similar potential for exposure to chemicals in soil. See 4.1.2 for a discussion of this type of activity.

3.1.51 *pollutant*, *n*—any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring; this may include the above-mentioned materials or agents as well as volatile chemicals, including petroleum, natural gas and synthetic gas flowing as a free product material or a constituent of gas, liquid, or solid, whether above the ground surface, upon the ground surface, or within (that is, dissolved) groundwater. This definition is similar to that found in (6).

3.1.52 *post-closure care measures*, *n*—activities that a *waste site* owner must take in order to maintain the effectiveness of *engineering and institutional controls* that protect against *potential adverse impacts to human health, public safety, or welfare*; applies to a site under the authority of a *regulatory agency*.

3.1.53 *post-RCRA landfill*, *n*—a *landfill* built to the specifications of 40 CFR Part 264 or Part 265 (1), or the regulations of a State authorized to administer the similar requirements. RCRA is the acronym for Resource Conservation and Recovery Act of 1976. This type of *landfill* accepts(ed) waste according to a permit, usually issued by a U.S. State that specifies(ed) what waste could and could not be buried; the *landfill* is constructed with protective measures to limit releases of *leachate*, the infiltration of surface water and groundwater, and to control the release of gases that include methane. *Landfills* of this type include sites that began *pre-RCRA* (that is, *pre-regulatory*) but were closed *post-RCRA*, meaning that no *landfill* bottom or sidewall protective measures (that is, *liners*) were installed, although a *cap* was installed.

3.1.54 *potential adverse impacts to human health, public safety or welfare*, *n*—the condition exhibited when chemicals in surface soils at a site under consideration for a beneficial use exceed the concentrations listed in Appendix X5 for either *active* or *passive use*, depending on the proposed use. The *Environmental Professional* may use professional judgment to advise (on a case-by-case basis) that such an impact has not been reached although one or more *Soil Cleanup Objective* of Appendix X5 has been exceeded. See 1.8, 3.1.21, 3.1.24, 3.1.28, 3.1.35, 3.1.65, and 4.4 for additional information.

3.1.55 *pre-RCRA landfill*, *n*—this type of *waste disposal site* (in the U.S.) was operated out of the necessity to discard unwanted materials, including *MSW* and/or *industrial waste*. Some federal, State, and local *landfill* regulations specified minimal standards for operation (including the federal Solid Waste Disposal Act of 1965). See (9) for additional information.

3.1.56 *pre-regulatory landfill*, *n*—a type of *waste* disposal site that is/was operated outside of the legal sanction of RCRA-type laws and regulations (designed to protect human health and the environment from chemical and waste exposures). This guide may be used to evaluate the *acceptability* of a beneficial use at a specific *waste / chemically impacted site*, but should not be used to designate a *waste* or *chemically impacted site* as closed, unless a *regulatory agency* with jurisdiction over the site adopts this guide for that purpose. Beneficial use requires the attainment of a periodically reviewable status of *acceptable use*. See 3.1.2, 3.1.3, and 3.1.39 for additional information.

3.1.57 *project team*, *n*—two or more professionals (including the *Environmental Professional*) who collaborate on the evaluation and selection of a particular use at a *landfill* or *chemically impacted site* in conformance with this guide. The team may include additional *Environmental Professionals*, the user (for example, the environmental consultant), the State and/or federal regulator, site owner and/or her/his representative, and additional experts, as needed. For some sites, the project team may include community *stakeholders*. In addition, the *Environmental Professional* and user can be the same person or work for the same entity.

3.1.58 *readily available information*, *n*—that which increases the knowledge of the *Environmental Professional* concerning the physical conditions at a *landfill* or *chemically impacted site* through: a) Real-time observations; b) electronic recordings; c) physical investigation and subsequent reports (including laboratory results of various environmental media analysis); and d) review of documents regarding prior ownership, use, and ownership/use of nearby and adjacent properties. See Appendix X6 for additional information.

3.1.59 *regulatory agency*, *n*—a governmental authority that is tasked to assure compliance with environmental protection and public / worker safety laws and regulations concerning the management of *waste* and *chemically impacted sites*; this includes cities, counties, States, federal governments, and tribal organizations. See (2, 10, and 11) for the identification of such an organization.

3.1.60 *release of a hazardous substance*, *n*—chemicals, chemical compounds, pure substances, or pollutants that are observed by the *Environmental Professional* or reasonably assumed by the *Environmental Professional* to be emitted to the air, surface water, soils, or groundwater upon her/his *Completed Site Evaluation* using Form 2 – Conditional Expedited Use and/or Form 5 – Site-Specific Use. Such a release may be a reason the *Environmental Professional* chooses to end her/his evaluation without recommending that the site be beneficially used. See Appendix X2 for a discussion of filling out those forms and Appendix X4 for the forms. See 3.1.21, 3.1.26, 3.1.35, 3.1.37, and 3.1.51 for additional information.

3.1.61 *restoring land*, *v*—bringing a land surface to its original condition, or modifying it to a desired condition.

3.1.62 *secured monitoring infrastructure*, *n*—constructed wells and vents that are used to periodically measure concentrations of chemicals in air, surface water, groundwater, *landfill* or soil pore gas, and/or *leachate* that are enclosed by fences

and other structures that keep trespassers out and keep wells and vents available for use by authorized environmental *technicians*. Property owners of sites being beneficially used should exclude access to these areas by *establishing* appropriate measures.

3.1.63 *site use*, *n*—the alternative to abandonment of property that includes the active preparation of land for productive utilization, also known as *development*.

3.1.64 *slope stability*, *n*—a physical condition of an engineered or natural mound, slope, hill, berm, or wall that is at a low risk of failure (that is, it is constructed or is naturally configured to safely support surface loads with a reasonable factor of safety, typically several times what is required to just preclude failure). See Appendix X3 for additional information.

3.1.65 *soil cleanup objective (SCO)*, *n*—the concentration of a chemical or chemical compound in exposed soil that suggests an unacceptable condition exists for *active* recreational or *passive* recreational uses. Soils under pavement, a *nature-based land use*, or other use feature that blocks the exposure pathway of subsurface chemicals or *wastes* has no SCO. See Appendix X5 for a listing of these chemicals and chemical compounds. The *Environmental Professional* may identify SCOs at a particular site for *pollutants* not listed in Appendix X5. Note that the SCO table in Appendix X5 is based on regulations identified in (10). These SCOs identify bare soil concentrations of chemicals that pose a risk of cancer at the rate of one cancer per one million people exposed. The user of the guide may use similar tables of other *regulatory agencies* in place of one in Appendix X5. See (11) for additional information on the creation of the SCO table in Appendix X5.

3.1.66 *solid waste*, *n*—discarded materials contained in a *landfill* that include *municipal solid waste* (garbage), *construction & demolition debris*, *coal ash*, *urban historic fill*, and other unwanted materials. As with US EPA definition, solid waste may be physically a solid, liquid, or gas.

3.1.67 *spill*, *n*—the accidental release of *waste* or chemicals into the air, land, surface water, or groundwater.

3.1.68 *stakeholder*, *n*—a person with an interest in the outcome of a decision to create a *site use* at a *waste / chemically impacted site*; includes the property owner, neighboring property owners, neighbors of the site, and community representatives.

3.1.69 *sustainability*, *n*—the achievement of institutional arrangements of human actions today that are guided by a vision of desired future arrangements which allow present societal needs to be met without compromising the ability of future generations to meet theirs.

3.1.70 *sustainable urban governance*, *n*—an integrated system of: city planning, capital projects, operations, and maintenance; security (police and fire protection); critical utility assurance (water supply, sanitary sewerage systems, power supply, and communication systems); sanitation and food security (health protection); natural environment systems (*waste* management and *pollutant* exposure protection); transit systems (roads, bridges, tunnels, and tracks); cultural, entertainment, and recreational venues; education provision;

and safe housing and public buildings (through building codes) that provides continually improving, higher quality of services at lesser per capita costs through focusing on key objectives that vary year to year, using outcome measurement and metrics to identify objectives to be met and results to be achieved. See Rowland (2008)(3) for additional information.

3.1.71 *technician, n*—a person with technical training in the monitoring and maintenance at a *waste / chemically impacted site* who periodically visits the site to perform tasks identified by the *Environmental Professional* that include: (1) Assuring that all technical settings of gauges and flow meters have nominal readings (that is, there is no threat of a chemical release or condition that would put the technician, the public, or other people at risk of harm); (2) assessing the site for trespass activity and correcting any infrastructure system that is deficient; (3) collecting air, gas, soil, or water samples; and (4) responding to complaints by the public or needs of the property owner.

3.1.72 *terminal conditions of a landfill that is beneficially used, n*—the measured concentration(s) of *marker chemicals and leachate markers* that meet (an) agreed upon target(s) for use activities [for example, the measured concentration, pressure, and flow (both onsite and *de minimis* offsite migration) of methane; and the absence of upwardly migrating, low-density buried solids (for example, glass) through a landfill *cap*] that is(are) evidence that a *landfill* no longer needs: (1) Frequent monitoring (that is, monthly or quarterly), but rather annual or less frequent monitoring; and/or (2) its *leachate* to be discharged to a municipal wastewater treatment plant, but rather allowed to flow to a receiving water body; and/or (3) its methane to be collected and flared, but rather allowed to passively vent or beneficially used. See [Appendix X3](#), and [Appendix X7](#), sections [X7.3](#) and [X7.5](#) for additional information.

3.1.73 *waste, n*—discarded household, agricultural, construction, or industrial materials that no longer serve their intended purposes, including soil and debris from a construction site that are in excess of need; contains a high percentage of food *waste*.

3.1.74 *waste / chemically impacted site, n*—property that contains *waste* or chemicals. See [Table 1](#) for examples of six categories and eleven types of such sites.

3.1.75 *waste site, n*—there are three categories of a MSW (waste) *landfill* site: *pre-regulatory landfill*; *pre-RCRA landfill*; and open or closed *post-RCRA landfill*. See [3.1.56](#), [3.1.55](#), and [3.1.53](#), respectively, for additional information.

4. Significance and Use

4.1 *Purpose*—This guide provides a process (complementary to various *regulatory agency waste site* use programs) for evaluating and *restoring* among eight *site use* activities at eleven types of *waste / chemically impacted sites*. The *site use* activities include: (1) Active Recreation; (2) Passive Recreation; (3) Alternate Energy / Deep Anchoring Need; (4) Materials Recovery; (5) Stormwater Management; (6) Composting Imported Debris; (7) Agricultural Cultivation (non- or lightly mechanized) or Marketing; and, (8) Nature Preserve /

Nature-based / Buffer Area Use. The *waste / chemically impacted sites* include: (1) MSW / Pre-RCRA; (2) MSW / Post-RCRA Closure – Operated pre-RCRA; (3) MSW / Operating(ed) or Closed Post-RCRA; (4) MSW / In-design; (5) C&D Landfill / Closed; (6) C&D Landfill / Operating or In-design; (7) Historic Fill; (8) Airborne Deposition; (9) Monofill / Coal Ash; (10) Monofill / Foundry Sand; (11) Non-impacted Buffer Area. More detailed descriptions of these use activities follow.

4.1.1 *Active Recreation*—Utilization of a *waste / chemically impacted site* where the likelihood of physical contact with and accidental ingestion of soil is high, due to the nature of the sport (for example, football, baseball, soccer). Note that active sports played on synthetic turf are not *active recreational uses* in this definition, as the focus is on potential human exposure to chemicals in soil and not on the activity, per se. See [Appendix X5](#) for a listing of chemical compounds and their concentrations considered appropriate for this *site use*. Also, see [3.1.65](#) for additional discussion of *SCOs*.

4.1.2 *Passive Recreation*—Utilization of a *waste / chemically impacted site* where physical contact with and ingestion of soil is possible but unlikely (for example, biking, walking, bird watching). See [Appendix X5](#) for a listing of chemical compounds and their concentrations considered appropriate for this *site use*. Also, see [3.1.65](#) for additional discussion of *SCOs*.

4.1.3 *Alternate Energy / Deep Anchoring Need*—Penetration of the *cover* soil or *capping* layer of a *waste / chemically impacted site* to establish a foundation for a structure subject to weight or wind loading, or seismic forces (for example, photovoltaic arrays, wind turbines, solar water heating systems).

4.1.4 *Materials Recovery*—Capture and utilization of *landfill gas*, or excavation of materials once considered *waste* but found to have high value (for example, beneficial capture and recovery of *MSW* methane, or excavation of *coal ash* for use as a beneficial cement or grout additive or fill material in soil stabilization projects such as those involving road beds). See [Appendix X2](#), item 6 for additional information.

4.1.5 *Stormwater Management*—Installation of a stormwater management practice that retains, detains, or slows down the flow of rainwater into an urban combined sewer (that is, combination sanitary and storm sewer) (for example, raingarden, bioswale, constructed wetland) and/or allows eroded sediments to settle out before entering a natural surface water body.

4.1.6 *Composting Imported Debris*—Placement of non-site organic *waste* and non-site soil upon a *waste / chemically impacted site*, and allowing the organic waste to decompose while the mixture is blended and turned; *site cover* material risks becoming part of the composting product unless a barrier is placed between the compost and cover.

4.1.7 *Agricultural Cultivation (non- or lightly mechanized) or Marketing*—The placement of soil (assured quality appropriate for the intended use) upon a *waste / chemically impacted site* in raised beds for the growing of vegetables (that is, leaf, root, or fruit types) (for example, community gardens and cooperative farms); the raising of animals for human consumption at a waste site; and, the marketing of produce from the

TABLE 1 Types of Waste / Chemically Impacted Sites

Site Types			Description
1 -	Municipal Solid Waste Landfill	Pre-RCRA	This type of site was not planned for environmental protection assurance. Prior to the 1980s (and even several years after), <i>MSW landfills</i> in the U.S. began as a desire to reclaim land through the filling in of wetlands. This is why many early such <i>landfills</i> have no bottom <i>liner</i> and are in hydraulic connection with open waters. Also, if the site ended operations before the 1980s, there may not be a surface cap to prevent the infiltration of rainwater, and thus there is an elevated risk of <i>leachate</i> generation and <i>leachate</i> discharges to surface water and groundwater.
2 -	Municipal Solid Waste Landfill	Closed Post-RCRA/ Operated pre-RCRA	<i>Landfills</i> of this type began as <i>pre-RCRA</i> but were <i>closed</i> with <i>post-RCRA</i> controls, such as an impermeable surface <i>cap</i> , a methane collection and flaring system, a leachate collection /treatment /discharge system, and a stormwater management system. An important monitoring feature is an array of methane migration observation wells on every border between the <i>landfill</i> and adjacent properties. If a methane capture and withdrawal system malfunctions, the impact may be the migration of methane to neighboring properties, and if the migration is strong enough, the methane could enter dwellings and be ignited (for example) by the pilot light of a water heater.
3 -	Municipal Solid Waste Landfill	Operating(ed) / Closed Post-RCRA	Operating <i>MSW landfills</i> or ones that operated and closed <i>post-RCRA</i> have all the required RCRA <i>landfill</i> features, including those mentioned immediately above, plus a bottom liner and bottom leachate collection system. This type of landfill is protective of the environment and provides for safe operations regarding waste and chemical exposure to the community within the vicinity of the site. Methane migration observation wells are a key protective feature of this <i>waste / chemically impacted site</i> .
4 -	Municipal Solid Waste Landfill	In design	<i>MSW landfills</i> in design have the opportunity to pre-design <i>post-closure</i> land uses; for example, deep anchoring systems for wind turbines and photovoltaic arrays. Also, special care can be taken to assure minimal upward movement of low density materials (for example, glass) in areas designated for <i>active recreational uses</i> such as ballfields and soccer fields.
5 -	Construction and Demolition Landfill	Closed	<i>C&D landfills</i> contain concrete, asphalt, soil, debris from the demolition of buildings, and other construction waste. Potentially, their internal volumes may have more void space than a <i>MSW landfill</i> , so that settlement of a surface <i>cap</i> may be greater than the latter type of <i>waste / chemically impacted site</i> . On the positive side, <i>C&D landfills</i> have much less <i>waste</i> that decomposes into methane. Although possible, it may be difficult to place an anchoring system for a wind turbine (for example) because of the often haphazard nature of <i>waste</i> placed in this type of <i>landfill</i> . Care must be taken for the possibility of asbestos being present in the surface soils or in the subsurface of a <i>C&D landfill</i> (if excavations are made).
6 -	Construction and Demolition Landfill	Operating / or In design	Operating and in-design <i>C&D landfills</i> could be engineered to support many of the eight <i>site uses</i> described in this guide.
7 -	Historic Fill		Urban areas with 19th and 20th century histories of U.S. industrial development (for example, East Coast, Midwest, and Southeast) used industrial and demolition wastes to fill in wetlands and other land surface depressions. In New York City, it is estimated that 20% of the land area rests upon <i>historic fill</i> (Walsh, 1991 (12)). The composition varies, but includes metals (for example, lead, chromium, zinc, and mercury), PCBs, and semivolatile organics. The challenge for a successful <i>site use</i> on this type of site is keeping low pH rainwater or stormwater from infiltrating these sites, as that may solubilize subsurface metals and cause once relatively stable buried <i>waste</i> to migrate offsite or into groundwater aquifers with unknown effects. Recreational uses and agricultural cultivation require clean cover soils to prevent chemical exposures. However, natural areas may be an appropriate <i>site use</i> as long as entry barriers are erected to control trespass.
8 -	Airborne Deposition		In addition to historic fill, older industrial cities have experienced a special type of polluting episode; one that accumulates over long periods of time from airborne chemicals that fall to the ground with rain water or as dust or soot. Metal smelting operations (for example, lead), the combustion of coal (for example, mercury), and the operation of automobiles fueled by leaded gasoline released metals into the air and then polluted the ground surface. Often these contaminants co-mingle with historic fill and other <i>waste / chemically impacted sites</i> so that the origin of chemicals is uncertain. In current, common usage of automobiles, semivolatile organics are known to be emitted from exhaust and settle on adjacent land. The effect is most pronounced within 100 feet of a stop sign (or example) where an automobile comes to a stop and is allowed to pollute a specific space greater than a more distant space. This phenomenon is an important consideration in the placement of agricultural cultivation and produce marketing sites, as well as recreational use sites, because as clean as a person may make a site, external factors may alter conditions incrementally over time.
9 -	Monofill	Coal ash	<i>Coal ash</i> is a high volume <i>waste</i> material that is typically placed in a single-purpose <i>landfill</i> called a <i>monofill</i> . It is conceivable that in the future, a society may find high value in this <i>waste</i> (beneficial use of <i>coal combustion products</i>) as an additive to cement in the manufacture of concrete or grout, for soil stabilization, and for road beds, although now the material is much more easily obtained from an operating coal-fired power plant. Recent episodes of sidewall failures (see Katz, 2015 (5)) at <i>coal ash wet management units</i> (surface impoundments) suggests that it is appropriate to limit use activities for only <i>coal ash dry management units</i> .
10 -	Monofill	Foundry sand	Foundry sand is an industrial byproduct of metal manufacturing; that is, the manufacture of automobiles. Sand is used to form a casting/ mold into which molten metal is poured in the creation of an engine block. The sand is used once and is discarded. The material has the same physical properties as natural sand, so very stable <i>site uses</i> are possible upon this type of <i>waste/chemically impacted site</i> . However, just as with <i>historic fill</i> and airborne deposited chemicals, caution has to be taken to assure chemicals are not transferred to compost / topsoil or allowed to be ingested during an <i>active recreational use</i> . Note that some foundries process different raw materials involving different contaminants, including heavy metals. Also, several types of <i>waste</i> may be generated within the same casting plant.
11 -	Non-impacted Buffer Area		The reason that a <i>buffer area</i> is included in this list of <i>waste /chemically impacted sites</i> is that many <i>MSW landfills</i> incorporate them in their designs to block public views of operations that are not attractive and may generate controversy. Often, these areas have no <i>waste</i> buried beneath them, so they could have <i>site uses</i> that complement activities of adjacent properties and/or provide amenities desired by a neighboring community. For example, <i>waste/chemically impacted sites</i> are known to provide stop overs for migratory birds; and <i>landfills</i> converted to parkland provide linkages for wildlife corridors for terrestrial animals.

above identified cultivation activities (for example, neighborhood green markets) according to *established* code and regulation.

4.1.8 Nature Preserve / Nature-based / Buffer Area Use—Natural or intentionally engineered surface vegetation and/or water features with limited access to human intrusion of the space. Some *waste / chemically impacted sites* utilize *buffer areas* (beneath which no waste or only *de minimis* concentrations of chemicals exist) to create distance between the public and *waste site* operations. Although, such areas could be “nature” areas, it may be appropriate and desirable (for example, by adjacent property owners) for *buffer areas* to host limited, *active* or *passive* recreational uses, or low impact *site use* activities. These uses may occur in locations identified as *easements, buffers, and rights-of-way*. See **Appendix X3**, item 8 for additional information.

4.2 Regulatory Context—This guide does not supersede federal, State, or local regulations.

4.2.1 The user is responsible for determining the regulatory context, and associated constraints and obligations at a designated *waste / chemically impacted site* and should comply with all *established* applicable laws and regulations, including CERCLA, RCRA, TSCA, and other environmental laws and municipal codes in the *development* of the site for a new use activity. The typical *waste / chemically impacted site* where this guide is intended to be used are ones that are not currently (and not anticipated to be in the future) within a *regulatory agency* program.

4.2.2 The user should comply with health and safety requirements under the Occupational Safety and Health Act (OSHA) (2), worker right-to-know laws, and parallel requirements of *applicable local, State, or tribal (regulatory agency) organizations*. See (2) for more information.

4.3 Use of Guide—*Regulatory agencies* may incorporate this guide, in whole or in part, into general guidance documents or site-specific regulatory documents. This guide may also be integrated into complementary standards, guidelines, or contractual agreements, relating to the post-construction / end use phase of *sustainable* or greener cleanups; see Guide **E2876** and Guide **E2893**, respectively.

4.4 Professional Judgment—This guide presumes the active involvement of an *Environmental Professional* who is knowledgeable in how to design and construct use activity features at a *waste / chemically impacted site* and how to identify *acceptable* site conditions or (when required) satisfy applicable statutory or *regulatory agency* limitations on the use of an operating, closed, abandoned, or *legacy waste / chemically impacted site*, including those with *community engagement* and *Environmental Justice* concerns. The *Environmental Professional* must be current (that is, is a qualified and registered professional in her/his field of expertise and have satisfied requirements for continuing education) in her/his knowledge of *developments* in the use of *waste / chemically impacted sites*, as well as case studies where some use activities succeed and others express *potential adverse impacts to human health, public safety, or welfare*.

4.5 Elimination of Uncertainty—Professional judgment, interpretation, and some uncertainty are inherent in the processes described herein even when decisions are based upon objective scientific principles and accepted industry practices. In addition, new methods are continually being developed for this evolving field.

4.6 Process Entry—This guide may be initiated at any stage of *waste / chemically impacted site development* from planning, construction, closure, and post-closure, or upon discovery of an unplanned or unsafe site, and/or a site with an emergency chemical *spill* or *release of a hazardous substance*.

4.7 Process Reporting and Documentation—The user should decide (in coordination with relevant *stakeholders*) when site evaluations, reporting, and documentation will occur during Planning and Scoping, Section 5.

4.8 Process Overview—At initiation, the user should review: Section 3, Terminology; and then proceed to Section 4, Significance and Use; Section 5, Planning and Scoping; Section 6, Site Use Activity Evaluation and Selection Process; and Section 7, Site Use Evaluation, Reporting, and Documentation.

4.8.1 Section 5, Planning and Scoping, describes the *Project Team* approach (see 3.1.56) for implementing this guide, including, but not limited to: a) Selecting the *waste / chemically impacted site*; b) selecting a desired *site use* and making a *due diligent* assessment of environmental conditions; c) evaluating possible *engineering controls*, site safety, and opportunities for material recovery; d) submitting the project to a *regulatory agency* and receiving approval (if required); e) selecting a site evaluation process (that is, choosing Site Evaluation Forms 1, 2, 3, 4, or 5); f) soliciting *concurrence* for the *Environmental Professional’s* proposed approach at a *stakeholder* and *community engagement charrette* (meeting) (if a *regulatory agency’s* approval is required but approval is not granted, go back a step, if approval is given or not needed, proceed); and g) arriving at two possible outcomes. These outcomes are: (1) The *Environmental Professional* prepares a final report that contains one or more *Completed Site Evaluation* forms for the use activity, delivers the report to the user of the guide, and completes all documentation – this includes having the *Project Team* and *stakeholders* making applicable planning and scoping documents available to the public; and (2) the *Environmental Professional* terminates the evaluation because the *Due Diligence Threshold* (of knowledge) of the *Environmental Professional* of the site had not been reached.

4.8.2 Section 6, Site Use Activity Evaluation and Selection Process describes steps for identifying, selecting, and implementing (a) use activity(ies) at (a) specific *waste / chemically impacted site(s)*.

4.8.2.1 Section 6 provides the four-step process for Site Use Activity Evaluation and Selection, including: Site Use Opportunity Assessment; Site Use Priority Listing; Site Use Selection and Reporting; and Site Use Implementation and Documenting.

4.8.3 Section 7 describes use activity evaluation, reporting, and documentation. Section 7 does not instruct the user on how to perform the use activity analysis; it presumes that at least one member of the *Project Team* is knowledgeable about each

type of proposed use activity at the *waste /chemically impacted site*, and sufficient, *readily available information* is available to them/her/him to complete one or more of the Site Use Evaluation Forms 1, 2, 3, 4, and 5. See [Appendix X2](#) and [Appendix X4](#) for more information on the use of those Forms. See [Appendix X1](#) for supporting documents cited in the body of this guide.

4.8.3.1 Section 7 identifies when the five Site Use Evaluation forms are to be used for which *site uses* and for which *waste / chemically impacted sites*. [Appendix X2](#) supports Section 7 by providing additional considerations on which Site Use Evaluation forms should be completed for the selected use activity.

4.8.3.2 [Appendix X3](#) provides the user with ten additional considerations in the beneficial use process / framework for site evaluation for eight possible uses. [Appendix X3](#) includes discussions of: a) Establishing when and how a *MSW landfill* could achieve conditions where active controls are limited or terminated (that is, removed or abandoned); b) need for special care regarding the venting of carcinogenic gases versus methane and other less harmful (to human health, public safety, or welfare) gases; c) physical safety requirements related to firm foundations for a proposed *site use*; d) special considerations for *pre-regulatory waste sites*; e) alternative methods for testing the solubility of *waste materials*; f) opportunities to enhance the flow of methane where it is being commercially recovered; g) the use of phytoremediation for beneficial *site use*; h) use of the guide by municipalities in the designation of easements, buffers, and rights-of-way; i) how this guide complements regulations, laws, and policies of *regulatory agencies*; and j) how the guide contributes to the *sustainable use of urban resources*.

4.8.3.3 [Appendix X4](#) includes five forms that the *Environmental Professional* selects for her/his evaluation that (a) use activity(ies) is(are) *acceptable* and thereby considered protective of human health, public safety, and welfare: Form 1 is for *expedited use* involving no *cover* or *cap* disturbance and a low chance of exposure to chemicals in soil (for example, see exposure assumptions of *passive recreational use*, Section 4.1.2); Form 2 is for *conditional expedited use* that may involve *cover* or *cap* disturbance and repair (note that a Form 3 evaluation is needed if a required *capping* system is disturbed or if a new *cap* is installed), with a sufficient number of control measures to protect human health, public safety, and welfare (for example, see exposure assumptions of *active recreational use*, Section 4.1.1); Form 3 is for *cap* disturbance (that is, that which may compromise the effectiveness of this *engineering control*), such as full intrusion of a protective *cap*, and a more extensive number of *engineering* and *institutional controls* to limit chemical exposures; Form 4 is for evaluating agricultural operations or marketing; and Form 5 is for site-specific use activities for sites that may require *regulatory agency* permit modifications to allow the *development* of a use activity at sites with irregular circumstances (for example, *regulatory agency* orders that limit what can be placed at a site, or operation and maintenance activities that may increase chemical exposures). An important feature of Form 5 is that it provides information about what needs to be controlled, and what *engineering* and

institutional controls are needed to protect human health, public safety, and welfare, what settings are needed for the *engineering controls*, the names and contact numbers for the person(s) responsible achieving an *acceptably* safe condition, and the conditions upon which the various controls and monitoring frequencies can be relaxed or *terminated* (as discussed in [Appendix X2](#) and [Appendix X3](#)). In each case the *Environmental Professional* completes the evaluation forms after a *due diligent* assessment of *potential adverse impacts to human health, public safety, or welfare* at the site by her/him and other professionals (as needed) with expertise to perform such assessments.

4.8.4 The *Environmental Professional* identifies an *acceptable* quality of soil in the conduct of her/his *waste / chemically impacted site* evaluation (that is, the *soil cleanup objective*, or *SCO*) as described below. See [Appendix X5](#) for more information.

4.8.4.1 [Appendix X5](#) includes a table of chemicals and chemical compounds with two columns of information. The first column is a set of maximum concentrations for those chemicals and chemical compounds that may be present in the upper six inches of uncovered, bare soil if the use activity involves *active* recreational use (where contact and ingestion of soil is likely because of the intended activity). The second column is a set of maximum concentrations for those chemicals and chemical compounds that may be present in the upper six inches of uncovered, bare soil if the use activity involves *passive* recreational use (where contact and ingestion of soil is possible but unlikely because of the intended activity). No single concentration should be considered a “bright line” limit, but rather an order-of-magnitude consideration when the *Environmental Professional* evaluates a use activity. For example, if a few concentrations are slightly above respective limits, the soil may still be *acceptable*. However, if ten or more are considerably above their limits or one is significantly above its limit, then the *Environmental Professional* may recommend against a use activity on those grounds. See (10) and (11) for more information.

4.8.5 The *Environmental Professional* determines whether or not a threshold of knowledge exists upon which she/he may offer recommendations on a *site use*. See 5.6 and [Appendix X6](#) for more information.

4.8.6 [Appendix X7](#) provides definitions for terminology used in the Appendices.

5. Planning and Scoping

5.1 When applying this guide, the user should perform the following planning and scoping activities: Select an *Environmental Professional* to lead the effort; assemble a *Project Team*; identify applicable *regulatory agency* goals; reference applicable documents listed in Section 2, [Appendix X1](#), and [Appendix X7](#); compile site data; determine the proposed use activity(ies) at each portion of a *waste / chemically impacted site*; and establish how, how long, when, and where the planning and scoping documents created from the use of this guide are to be made publicly available.

5.2 The user should select an *Environmental Professional* who for the purpose of this guide, is a person possessing

sufficient education, training, and experience who meets the requirements set forth in 40 CFR 312.10(b) (8), and exercises professional judgment regarding the Site Use Activity Evaluation and Selection Process (see Section 6) of this guide. The person may be an independent contractor or an employee of the user, or the user her/himself.

5.3 The user should assemble the appropriate *Project Team*, considering factors such as: Technical expertise related to the design, construction, monitoring, and maintenance of *waste / chemically impacted sites* that are protective of human health, public safety, and welfare, including the establishment of appropriate barriers against chemical exposure by the public and people visiting the *waste site*; *regulatory agency* requirements; *stakeholder* interests and concerns, if known; and project budget.

5.4 When a *regulatory agency* program governs a use activity, the user should evaluate whether the applicable program and the goals and requirements of this guide are each effective, complementary, and protective of human health, public safety, and welfare. All elements of *landfill post-closure care* (when applicable) must be cited in all *Completed Site Evaluations*. The user should discuss expectations for the use of this guide with the *regulatory agency* prior to implementation.

5.5 The user should: Compile environmental, demographic, and land use characteristics; estimate project costs; identify a project schedule (that includes reasonable contingencies); and identify other factors that may influence the decision to establish one or more use activity(ies) at the specific *waste / chemically impacted site*.

5.5.1 These characteristics include: Site size; actual or *potential adverse impacts to human health, public safety, or welfare*; presence and operability of all *engineering and institutional controls* that prevent such impacts (see [Appendix X2](#) and [Appendix X3](#) for additional information); distribution of existing use activities in the vicinity of the targeted *waste / chemically impacted site* so as to address community *acceptability* of the proposed use activity; presence and desirability of wildlife corridors (for the *nature preserve / nature-based / buffer use* activity); capacity impacts of potentially modified stormwater flows; and impacts of increased traffic of those wishing to use the site.

5.5.2 The user should identify the current and reasonably anticipated future use of the site, and of properties located proximate to the site.

5.5.3 The user should establish a budget and schedule for meeting the goals and requirements of this guide, and discuss how the Site Use Activity Evaluation and Selection Process (see Section 6) could maximize social benefits and/or private benefits.

5.6 *Process*—The Beneficial Use of Landfills and Waste / Chemically Impacted Sites Process is presented in [Fig. 1](#) and the Due Diligence Process is presented in [Fig. 2](#). Each process is described below. The more technical aspect of the guide is presented in Section 6, where the illustrated Site Use Activity

Evaluation and Selection Process describes how the match between a *waste / chemically impacted site* and a use activity is achieved.

5.6.1 [Fig. 1](#) presents a process that involves the *Environmental Professional*, and the *Project Team* who: a) Evaluate the possible use activities (that is, opportunity assessment) at a selected site; b) conduct a *due diligent* assessment of *potential adverse impacts to human health, public safety, or welfare* (that is, follow [Appendix X6](#)); c) identify *engineering and institutional controls*; d) submit the proposal to develop the site to *regulatory agencies* for approval to proceed (as required); e) identify evaluation form(s) to be used, and report the *site use* selection to the public and *stakeholders* (and seek *concurrence* with the proposed *site use*) at a *charrette*; and f) implement the selected use and provide documentation of the selection process.

5.6.2 [Fig. 2](#) presents the Due Diligence Process. This process involves the *Environmental Professional* and the *Project Team* in the determination of which Forms (as presented in [Appendix X4](#)) should be completed for a proposed *site use*. The six steps of this process are: a) Utilize *readily available information* about the site and review the eighteen considerations listed in [Appendix X6](#) to determine whether it is prudent to continue the evaluation of a site for a proposed beneficial use; b) if the *Environmental Professional's* review reveals data gaps and/or unacceptable conditions, the *Environmental Professional* proceeds to step “c)” below, but if no gaps or unacceptable conditions exist, the *Environmental Professional* prepares a Form 1 – Expedited Use – Completed Site Evaluation report; c) if the *Environmental Professional* determines that a *generic cover* (that is, concrete, asphalt, or soil) can make a proposed use *acceptable*, the *Environmental Professional* prepares a Form 2 – Conditional Expedited Use – Completed Site Evaluation report, or if *generic covering* is not *acceptable*, the *Environmental Professional* proceeds to step “d)” below; d) if the *Environmental Professional* determines that *capping* the site or restoring a disturbed, existing *cap* (alone) will *acceptably* control *potential adverse impacts to human health, public safety, or welfare* for the proposed beneficial use, the *Environmental Professional* prepares a Form 3 – Cap Disturbance – Completed Site Evaluation report with sufficient details (for example, engineering drawings) for implementation contained in that report, otherwise the *Environmental Professional* proceeds to step “e)” below; e) if it is determined that site-specific measures (perhaps including a supplemental *cap*) will *acceptably* control *potential adverse impacts to human health, public safety, or welfare* for the proposed beneficial use, the *Environmental Professional* prepares a Form 5 – Site-Specific Use – Completed Site Evaluation report, or if *potential adverse impacts to human health, public safety, or welfare* cannot be *acceptably* controlled, the *Environmental Professional* terminates the evaluation; and f) if, upon completion of Forms 1, 2, and 3, the *Environmental Professional* determines that the guide user desires to allow agricultural operations or the marketing of agricultural goods at the site, the *Environmental Professional* prepares a Form 4 – Agricultural Use – Completed Site Evaluation report, but if the guide user does not desire those uses, the *Environmental*

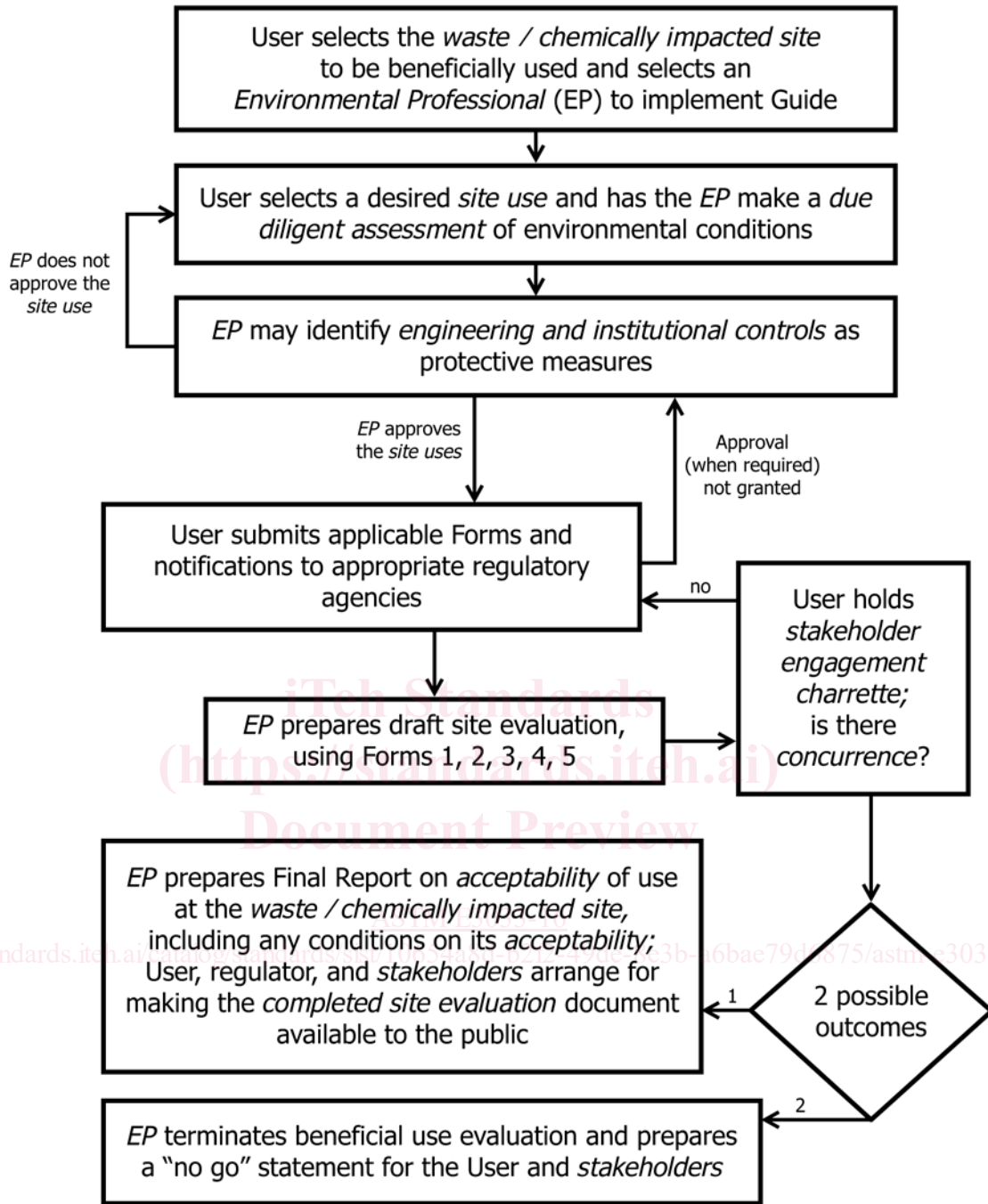


FIG. 1 Beneficial Use of Landfills and Waste / Chemically Impacted Sites Process

Professional terminates the evaluation. See 5.6.3 for obligations of the Environmental Professional, guide user, and site owner when the evaluation is terminated because potential adverse impacts to human health, public safety, or welfare cannot be acceptably controlled.

5.6.3 Fig. 2 has a due diligent process step of “Environmental Professional terminates the evaluation,” that identifies two situations when an site use evaluation may end. One situation is when one or more of the Appendix X4 evaluation forms are completed and the identified proposed beneficial use(s) is(are) implemented. In the other situation, the Environmental Professional cannot identify a cover, cap, or other site-specific

measure that could acceptably control potential adverse impacts to human health, public safety, or welfare. As Appendix X6 describes the latter situation, the Environmental Professional is obligated to refuse offering professional advice on acceptable uses of a site, and to fully explain why in a final evaluation report. However, the guide user and/or site owner is obligated to fairly compensate the Environmental Professional for the arrival of the Environmental Professional to that conclusion. The guide user and/or site owner must then provide that information to any subsequent Environmental Professional who evaluates the same site for a beneficial use. Any subsequent Environmental Professional who accepts the task of