A

Abatement

The act or process of lessening, reducing, or removing material or contaminants.

Abiotic degradation

Process in which a substance is converted to simpler products by physical or chemical mechanisms; examples include hydrolysis and photolysis.

Absorption

Absorption is the assimilation or incorporation of a gas, liquid, or dissolved substance into another substance.

Accuracy

Accuracy of an analytical measurement is how closely the result corresponds to the true value. This normally requires the use of standards in carefully calibrating the analytical methods.

Acid mine drainage (AMD)

A low pH, metal-laden, sulfate-rich drainage originating from a mined area that occurs where sulfur or metal sulfides are exposed to atmospheric conditions. It forms under natural conditions from the oxidation of sulfide minerals and where the acidity exceeds the alkalinity. See also acid rock drainage.

Action level

The generic term applied to any numerical concentration value which will be compared with environmental data to arrive at a decision or determination about a potential contaminant(s) of concern (from survey through remediation) or for a user-defined volume of media using environmental sample data.

Active site

Part of an enzyme where catalysis of the substrate occurs.

Activity

Refers to when a microorganism performs a specific function (e.g., sulfate reduction, metabolism of benzene)

Activity patterns

The activity or activities in which the receptor is assumed to be engaged involving details regarding where they are, when they were there, how long they were there, and over what area.

Acute toxicity

Any poisonous effect produced within a short period of time following an exposure, usually 24 to 96 hours (USEPA 2013).

Adsorption

Adsorption is the adhesion of molecules of gas, liquid, or dissolved solids to a surface. The term also refers to a method of treating wastes in which activated carbon is used to remove organic compounds from wastewater. Additionally, Adsorption is defined as the process by which nutrients such as inorganic phosphorous adhere to particles via a loose chemical bond with the surface of clay particles.

Non-covalent bonding of a chemical to a solid surface.

Advanced geospatial methods

Methods that include an explicit spatial correlation model. These methods may also include spatial trend and statistical error components. Advanced methods are also known as geostatistical methods.

Advanced sensors

Munitions-classifying sensors that are designed with many transmit and receive coils rigidly assembled in a fixed-array configuration. The combination of multiple receive coils, large bandwidth electronics, and supporting sensor data results in the collection of significantly more data than can be collected with single-axis EM61 sensors.

Advection

Bulk transport of the mass of discrete chemical or biological constituents by fluid flow within a receiving water. Advection describes the mass transport due to the velocity, or flow, of the water body. It is also defined as: The process of transfer of fluids (vapors or liquid) through a geologic formation in response to a pressure gradient that may be caused by changes in barometric pressure, water table levels, wind fluctuations, or infiltration.

Transport of a solute by the bulk motion of flowing groundwater.

Advective groundwater flux

The rate or movement of chemical or biological materials within a groundwater system per unit time in response to a concentration gradient or some advective force.

Adverse human health effects

Typically defined as an incremental lifetime cancer risk (for example, exceeding a range of 1E-4 to 1E-6) or a hazard quotient or hazard index (for example, one).

Aerobic

Pertaining to or caused by the presence of oxygen.

Aerobic polishing cell (APC)

A shallow pond which allows for aeration and settling of particles, typically following a BCR.

Aliphatic

A hydrocarbon compound in which the carbon atoms are in a straight-chain, branched, or cyclic arrangement and are saturated or unsaturated.

Acyclic or cyclic, saturated or unsaturated, carbon compounds (excluding aromatic compounds).

Alkane

A group of chemicals (also known as paraffins or aliphatic hydrocarbons) for which the carbon atoms are all linked by single covalent bonds.

Alkene

A group of chemicals (also known as paraffins or aliphatic hydrocarbons) for which the carbon atoms contain at least one double bond.

Amorphous

Having no crystalline form.

Anaerobic

Pertaining to or caused by the absence of oxygen.

Anisotropy

The property of being directionally dependent (as opposed to isotropy, which means homogeneity in all directions).

The degree of spatial correlation is dependent on direction, typically assessed using directional variograms, covariograms, or correlograms.

Antagonism

A chemical interaction that influences the toxicity of a chemical when one chemical interferes or inhibits the effect of the other chemical; for example, 4 + 6 = 8 (USEPA 2015h).

Anthropogenic activity

Activity resulting from human activities.

Apatite

Name given to a group of phosphate minerals, usually referring to hydroxylapatite distributed widely in igneous, metamorphic, and sedimentary rocks, often in the form of cryptocrystalline fragments. Hydroxylapatite is used in chromatographic techniques to purify proteins and other chemicals.

Aqueous solubility

Aqueous solubility represents the maximum concentration of the dense nonaqueous phase liquid (DNAPL) chemical constituents that can be dissolved in an aqueous solution (groundwater, for the purpose of this document).

Archaea

Microorganisms that are genetically distinct from bacteria. Methanogens are an example of archaea (www.biology-online.org, accessed online, 2013).

Areal loading rate

The amount of something applied to an area per time.

Aromatic

An organic compound that contains one or more benzene or equivalent heterocyclic rings.

Aseptic

Free from pathogenic microorganisms.

Attenuation factor

A ratio of the indoor air concentration to soil gas or groundwater concentration; sometimes used to estimate the indoor air concentration from soil gas or groundwater concentration.

B

Background

Natural or baseline groundwater quality at a site that can be characterized by upgradient, historical, or sometimes cross-gradient water quality (Unified Guidance).

Background (reference conditions)

When used in sediment characterization studies, refers to both the concentrations of COPC that are not a result of the activities at the site undergoing assessment and the locations of the background areas (MacDonald and Ingersoll 2002). Therefore, there are two types of background recognized by USEPA and many states: naturally occurring background and anthropogenic background. Users should verify whether their state and/or USEPA region has different definitions and requirements for assessing background conditions as part of environmental site assessments.

Bandwidth parameter

A parameter in some regression models that helps fit the model to the sampled data.

Bathymetry

The measurement of or the information from water depth at various places in a body of water.

Benthic habitat

The benthic habitat is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some subsurface layers.

Bentomats

A reinforced geosynthetic clay liner (GCL) using sodium bentonite integrated into a geotextile matrix used in landfills, surface water impoundments and for secondary containment.

Bioaccessible

Describes the fraction of a chemical that desorbs from its matrix (such as soil, dust, or wood) in the gastrointestinal tract and is available for absorption. The bioaccessible fraction is not necessarily equal to the relative bioavailability but depends on the relation between results from a particular in vitro test system and an appropriate in vivo model.

Bioaccumulation

The accumulation of substances, such as pesticides, or other organic chemicals in an organism. Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost. Thus, the longer the biological half-life of the substance the greater the risk of chronic poisoning, even if environmental levels of the toxin are not very high.

Bioaccumulation factor (BAF)

The ratio of COPC in tissue to the COPC concentration in an external environmental phase (water, sediment, or food) (Spacie, Mccarty, and Rand 1995). The BAF is typically assumed to be measured or expressed on a steady-state basis. For applications to the water phase, the BAF is best determined from field data where sampled organisms are exposed to chemical measured in the water and their diet. For applications in reference to the ITRC- Contaminated Sediments Remediation August 2014 ITRC- Contaminated Sediments Remediation August 2014 496 sediment and food phases, the BAF is expressed using concentrations in the tissue and environmental phase on a wet weight basis or dry weight basis, for example, (µg/g of w/w tissue)/(µg/g of w/w food), (µg/g of d/w tissue)/(µg/g of d/w food), and (µg/g of d/w tissue)/(µg/g of d/w sediment). This definition of BAF is used for metals, organometallic compounds, and organic compounds. For clarity, the BAF is expressed with the units in subscripts. For the concentration in the tissue phase, the numerator (N subscript) is the basis of the tissue phase (L for lipid-normalized, WW for wet weight, and DW for dry weight bases). For the environmental phase, the denominator (D subscript) is the basis for the water (FD for freely dissolved, T for total, and D for dissolved/filtered water), food (WW for wet weight and DW for dry weight), or sediment (WW for wet weight, and DW for dry weight) phases. Some commonly used BAF expressions are as follows: • BAFL/FD = where concentrations in tissue and water are on a lipid and freely dissolved basis, respectively • BAFWW/T = where concentrations in tissue and water are on a wet weight and total basis, respectively • BAFDW/DW = where concentrations in tissue and sediment are both on a dry weight basis

Bioaugmentation

The introduction of cultured microorganisms into the subsurface environment for the purpose of enhancing bioremediation of organic contaminants (USEPA 2011)

Use of (microbes) to clean up oil spills or remove other pollutants from soil, water, or wastewater.

Bioavailability

The relationship between external (or applied) dose and internal (or resulting) dose of the chemical(s) being considered for an effect (NRC 2003).

The fraction of an ingested dose that crosses the gastrointestinal epithelium and becomes available for distribution to internal target tissues and organs (USEPA 2007c).

Bioavailability processes

Individual physical, chemical, and biological interactions that determine the exposure of plants and animals to chemicals associated with soils and sediments (NRC 2003).

Biochars

Biomass that has been carbonized under thermal conditions less intense than those that are used to form activated carbon.

Biochemical oxygen demand (BOD)

The amount of oxygen used as electron donor (food) is degraded by organisms.

Biochemical reactor (BCR)

An engineered treatment system that uses an organic substrate to drive microbial and chemical reactions to reduce concentration of metals, acidity, and sulfate in mining-influenced water.

Bioconcentration factor

The ratio of the steady-state COPC concentration in an aquatic organism (CB) and the COPC concentration in water (CW) determined in a controlled laboratory experiment where the test organisms are exposed to chemical in the water (but not the diet). In the subscript, the numerator (N) is the basis of the tissue phase (L for lipid-normalized, WW for wet weight, and DW for dry weight bases) and denominator (D) is the basis for the water phase (FD for freely dissolved, T for total, and D for dissolved/filtered water). Commonly used BCF expressions are as follows: • BCFL/FD = where concentrations in tissue and water are on a lipid and freely dissolved basis, respectively • BCFWW/T = where concentrations in tissue and water are on a wet weight and total basis, respectively • 497 BCFDW/T = where concentrations in tissue and water are on a dry weight and total basis, respectively

Biodegradation

A process by which microorganisms transform or alter (through metabolic or enzymatic action) the structure of chemicals introduced into the environment (USEPA 2011).

The breakdown of chemicals by microorganisms.

Biokinetics

Movement of a chemical (for example, absorbed lead) throughout the body by physiologic or biochemical processes.

Biomagnification factor (field based)

The ratio of the chemical concentrations in an aquatic or terrestrial organism (CB) and in the diet of the organism (CD) determined from field-collected animals that are exposed to chemical in air, water and diet. The numerator (N) is the basis of the tissue phase (L for lipid-normalized, WW for wet weight, and DW for dry weight bases) and denominator (D) is the basis for the diet (L for lipid-normalized, WW for wet weight, and DW for dry weight bases). Two commonly used BMF expressions are as follows: • BMFL/L = where concentrations in tissue and diet are on a lipid basis • BMFVWW/WW = where concentrations in tissue and diet are on a wet weight basis

Biomarker

A distinctive (unique) characteristic of a biomolecule that can be measured and used as an indicator of a target microorganism or biological process. For example, a specific DNA sequence (used as a probe on a microarray) could be a biomarker for a particular microorganism (e.g., Desulfotomaculum).

Biomimetic device

A diffusion-based sampler that is designed to “mimic” an aquatic organism (for example, a semi-permeable-membrane device is dialysis tubing filled with a purified fish oil like triolein).

Biomolecules

Classes of compounds produced by or inherent to living cells including phospholipids, nucleic acids (e.g., DNA, RNA), and proteins.

Bioremediation

The treatment of environmental contamination through the use of techniques that rely on biodegradation. Bioremediation has two essential components: biostimulation and bioaugmentation.

Biostimulation

A remedial technique which provides the electron donor, electron acceptor, and/or nutrients to an existing subsurface microbial community to promote degradation.

Modification of the environment to stimulate existing bacteria capable of bioremediation.

Biota sediment accumulation factor (BSAF)

Ratio of the chemical concentration in an aquatic organism (CB, in g chemical/kg lipid) and in the sediment from the site where the organism was collected (CS, in g chemical/kg organic carbon) determined from field or laboratory data: BSAF = CB/CS.

Bioturbation

The displacement and mixing of sediment particles and solutes by fauna (animals) or flora (plants).

Bog

A wetland that accumulates peat.

Bulk concentration

In water, the total COPC concentration in a bulk (unfiltered) sample of water (kg of COPC/L of water). In sediment, the total COPC concentration in a bulk sediment sample (kg COPC/kg dry sediment).

C

Capillary entry pressure

Capillary entry pressure (Pce) represents the capillary pressure at residual saturation (Sr) of the nonwetting fluid. The value of Pce represents the pressure that must be overcome for DNAPL (as a nonwetting fluid) to initially displace water from initially water-saturated media. The Pce represents the minimum pressure required for DNAPL to be mobilized into any geologic material.

Capillary pressure

Capillary pressure (Pc) represents the pressure difference between two fluids sharing pore space within a representative elementary volume (REV). Due to interfacial tension and the formation of a meniscus, the nonwetting fluid develops a greater pressure than the wetting fluid. Pc is a nonlinear function of saturation (S), with Pc increasing at greater saturation of the nonwetting fluid.

Capillary zone (or fringe)

The pore spaces in soil just above the water table that may contain water above the static level from interactive forces between the water and soil.

Capping

Technology which covers contaminated sediment with material to isolate the contaminants from the surrounding environment.

Carbon normalization

For sediment, dividing a bulk organic COPC concentration (for example, mg/kg fluoranthene) by the fraction of TOC measured in the same sample (such as 0.02 g carbon/ g sediment, or 2% TOC).

Cell

An individual unit in a treatment system.

Cellulose

An unbranched polymer of glucose found as the primary structural unit for green plants.

Chemical transformation

abiotic or biotic chemical process (such as photolysis, hydrolysis, oxidation/reduction, radioactive decay) that transform an element (Cr(VI) – Cr III) or compound (phenol – CO_2+ H_2O) to a different element or chemical compound.

Chemical warfare material (CWM)

Chemical materials used in warfare, such as explosives, toxic gases, defoliants, for the ultimate purpose of defeating the enemy.

Chemoheterotrophs

Bacteria that use organic compounds as both their electron donor and carbon source.

Chlorinated ethene

Organic compounds containing two double-bonded carbons and possessing at least one chlorine substituent.

Chlorinated solvent

Organic compounds with chlorine substituents that are commonly used for industrial degreasing and cleaning, dry cleaning, and other industrial processes.

Chlorite dismutase (cld)

An enzyme that catalyzes the disproportionation (simultaneous reduction and oxidation) of chlorite (ClO_2^-) to

chloride (Cl^-) and oxygen (O_2). Both perchlorate reductase and chlorite reductase are present in perchlorate respiring bacteria capable of using perchorlate or chlorate as electron acceptors during respiration.

Chronic toxicity values

Toxicity values used for repeated or persistent exposures (durations exceeding 10% of a lifetime [7 years or longer] and for exposures by children ages 0-6).

cis-DCE stall

In biodegradation through reductive dechlorination, the parent chlorinated ethene is sequentially dechlorinated via the following process: PCE to TCE to cis-DCE to vinyl chloride to ethene. For a variety of reasons, the slowest step in the process is often the dechlorination of the cis-DCE. This phenomenon is known as “cis-DCE stall”.

Clean Air Act (CAA)

Rule passed in 1970 that sets nationwide ambient air quality standards for conventional air pollutants. CAA sets standards for emissions from both stationary and mobile sources (for example, motor vehicles).

Clean soil

Soil with an acceptable level of contamination to remain conducive to biodegradation of petroleum vapors.

Clean Water Act (CWA)

Rule passed in 1972 that mandates “fishable/swimmable” waters wherever attainable. Provides for (1) a construction grants program for publicly owned water treatment plants and requires plants to achieve the equivalent of secondary treatment; (2) a permit system to regulate point sources of pollution; (3) area wide water quality.

Cleanup

The assessment and reduction, removal, or control of chemicals in environmental media. Cleanup is synonymous with other terms such as “corrective action” and “remediation” used in various state, local, and federal programs.

Coal tar

A brown or black liquid of extremely high viscosity. Coal tar is one of the resultant byproducts when coal is carbonized to make coke or gasified to make coal gas. Coal tars are complex and variable mixtures of phenols, polycyclic aromatic hydrocarbons, and heterocyclic compounds.

A byproduct of pyrolysis of coal, coke, or oil in a closed vessel during the production of manufactured gas containing a small percentage of volatile organics and polycyclic aromatic hydrocarbons.

Cobble

A stone measuring between 6.4 cm (2.5 in) and 25.6 cm (10.1 in) in size.

Colloid

A particle which will not settle. Colloidal particles are generally 1 – 1000 nm in size.

Community engagement

The process of communicating with local residents and other stakeholders to: provide information throughout the investigation and clean-up of a contaminated site; provide opportunities for offering input about site investigation/cleanup plans; and to facilitate the resolution of community issues related to a contaminated site.

Compensation and Liability Act (CERCLA)

Passed in 1980, commonly known as Superfund, this act covers the cleanup of hazardous substance spills, from vessels, active, or inactive facilities. Establishes a Hazardous Substances Response Trust Fund, financed by a tax on the sale of hazardous chemicals, to be used for removal and cleanup of hazardous waste releases. Cleanup costs must be shared by the affected state. Within certain limits and subject to a few defenses, anyone associated with the release is strictly liable to reimburse the fund for cleanup costs, including damage to natural resources.

Compliance monitoring

The collection of data which, when analyzed, can allow for the evaluation of the contaminated media against standards such as soil and or water quality regulatory standards, risk-based standards, or remedial action objectives.

Compound specific isotope analysis (CSIA)

Analyzes the relative abundance of various stable isotopes (e.g., ^{13}C:^{12}C, ^{2}H:^{1}H). Degradation processes can cause shifts in the relative abundance of stable isotopes of the contaminant; changes in isotopic ratios can be measured.

Comprehensive Environmental Response, Compensation, and Liability Act

Passed in 1980, commonly known as Superfund, this act covers the cleanup of hazardous substance spills, from vessels, active, or inactive facilities. Establishes a Hazardous Substances Response Trust Fund, financed by a tax on the sale of hazardous chemicals, to be used for removal and cleanup of hazardous waste releases. Cleanup costs

must be shared by the affected state. Within certain limits and subject to a few defenses, anyone associated with the release is strictly liable to reimburse the fund for cleanup costs, including damage to natural resources.

Concentration gradient

The change of concentration over a certain distance. conceptual site model A three-dimensional visualization of site conditions that allows for evaluation of contaminant sources and affected media, migration pathways and potential receptors.

Conceptual site model (CSM)

A representation of an environmental system and the biological, physical and chemical processes that determine the transport and fate of contaminants through environmental media to environmental receptors and their most likely exposure modes.

A conceptual site model (CSM) is a hypothesis about how contaminant releases occurred, the current state of the source zone, and current plume characteristics (plume stability).

A living collection of information about a site which considers factors such as environmental and land use plans, site-specific chemical and geologic conditions, and the regulatory environment (ITRC 2007b).

Iterative representation of the site that summarizes and helps project planners visualize and understand available information. The CSM is the primary planning and decision making tool used to identify the key issues and the data necessary to transition a project from characterization through post-remedy.

Describes the potential chemical sources, release mechanisms, fate and transport pathways, impacted environmental media, receptors, and exposure pathways for current and reasonably anticipated future activities and land uses. This model documents current site conditions and serves to conceptualize the relationship between chemicals in environmental media, sources, and receptors through consideration of potential or actual migration and exposure pathways (ITRC 2012a).

Consensus (ITRC definition)

ITRC defines consensus as general agreement or the collective opinion on an issue. ITRC does not require that everyone must agree before consensus is reached.

Constituents/contaminants of concern (COCs)

Materials or structures in an ecosystem that may have an effect on that or other environments. These may consist of chemicals, biota, natural features or any other thing that could affect the area of concern.

Contaminants in an ecosystem that may have an effect on that or other environments. These may consist of chemicals, biota, natural features or any other thing that could affect the area of concern.

Constructed wetland

A man-made treatment system using saturated soils or sediment beneath standing water to remove contamination. Constructed wetlands almost always treat waste water of some type and almost always contain wetland plants.

Contaminant flux

The ebb and flow of contaminants from and through an ecosystem.

Contaminant(s) of potential concern (COPC)

In a risk assessment, a substance detected at a hazardous waste site that has the potential to affect receptors adversely due to its concentration, distribution, and mode of toxicity (USEPA 1997b). COPCs are generally categorized operationally, based on how they are measured in the analytical laboratory. “Inorganic” COPCs generally address metals, elements, and unique inorganic compounds such as perchlorate. “Organic” COPCs include VOCs (such as acetone, benzene, and trichloroethylene), SVOCs (such as chlorophenols, chlorobenzenes, and phthalate esters), pesticides (such as atrazine, DDT, toxaphene), PCBs, and polychlorinated dibenzodioxin and dibenzofurans.

Contaminant-degrading population

The group of organisms that are capable of degrading a particular contaminant.

Contaminated sediment remedial alternatives

Combinations of technologies used in sequence or in parallel to remediate a contaminated site

Control charts

Graphical plots of compliance measurements over time; alternative to prediction limits (Unified Guidance).

Control plane

The location of the control plane, or response boundary, is defined as a location within the source area, or upgradient or immediately downgradient of the source area, where changes in the plume configuration are

anticipated due to the implementation of the DNAPL source zone treatment. The response boundary should not be confused with the term “point of compliance,” which USEPA defines as the point where media-specific standards (such as maximum contaminant levels or risk-based cleanup goals) must be achieved.

Convex hull

Boundaries of data location.

Co-precipitation

When a chemical is precipitated due to inclusion in a solid made from a different chemical.

Corrective action

Activities taken to restore integrity of institutional or engineering control.

Creosote

The portion of chemical products obtained by the distillation of a tar that remains heavier than water. Creosote is notably useful for its antiseptic and preservative properties. It is produced in some quantities by wood and coal burning (in blast furnaces and fireplaces).

Criterion

General term used in this document to identify a groundwater concentration that is relevant to a project; used instead of designations such as Groundwater Protection Standard, cleanup standard, or clean-up level.

Critical shear stress

The shear stress at which a small but measurable rate of erosion occurs (related to strength of the sediment).

Cross-validation

A geospatial model assessment method implemented by eliminating one observed value at a time from the data set, using the model to calculate a predicted value at that point, and then comparing the predicted value with the observed value.

Cued mode

A data collection scheme in which the user positions the sensor at discrete XY locations previously identified by other means (also referred to as static or stationary measurement).

Cumulative risk

The combined risks from aggregate exposures (combined exposure of an individual (or defined population) to a single chemical via relevant exposure routes, exposure pathways, and exposure media) to multiple chemicals (USEPA 2003c).

Cut face diffusion

Diffusion from the sloughing of the sidewalls and headwall of the dredge cut face back on to previously dredged areas.

Cyclic

A compound that contains a closed ring of atoms.

D

Darcy’s law

An equation which relates flow through a porous material to the driving force and the permeability of that material.

D**ata base management system**

Systems of software tools including databases and geographic information systems that allow a registry, monitoring, outreach, and enforcement.

Data gaps

Missing data or information needed to answer questions or allow a more refined analysis to be completed.

Data quality assessment (DQA)

The scientific and statistical evaluation of data to determine whether data obtained from environmental operations are of the right type, quality, and quantity to support their intended use (USEPA 2006b).

Data Quality Objective (DQO) Process

A systematic planning tool (based on the scientific method) that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use. DQOs are the qualitative and quantitative outputs from the DQO process (USEPA 2002b).

Data quality objective (DQOs)

A qualitative and quantitative statement derived from the DQO process that clarifies study technical and quality objectives, defines the appropriate type of data, and specifies tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

A qualitative and quantitative statement developed to clarify study objectives, define the type of data needed, and specify the tolerable levels of potential decision errors. A DQO is used as the basis for establishing the type, quality, and quantity of data needed to support decisions.

The qualitative and quantitative statements derived for the DQO process that clarify the study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity (USEPA 2006).

The qualitative and quantitative statements derived for the DQO process that clarifies the study's technical and quality objectives, defines the appropriate type of data, and specifies tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity (USEPA 2002b).

Degradation (chemical)

1) Changes brought about to an environment, ecosystem or physical structure due to interaction with a chemical or chemicals; 2) change of the composition and structure of a chemical due to influences from its environment.

Dehalococcoides

Dehalococcoides is a genus of organohalide-respiring bacteria (for example, bacteria that use chlorinated solvents as metabolic electron acceptors) within the phylum Chloroflexi, in the domain Bacteria, and currently represented by a single species, Dehalococcoides mccartyi (Dhc). This species is the only one known with strains that dechlorinate dichloroethenes (DCEs) and vinyl chloride (VC) to ethene and inorganic chloride.

Dehalogenase

An enzyme that catalyzes the removal of a halogen atom from an organic compound.

Denaturing gradient gel electrophoresis (DGGE)

Type of gel electrophoresis used to separate mixtures of PCR products based on the melting point which is reflective of the DNA sequence. DGGE is used to generate a genetic fingerprint of the microbial community and potentially identify dominant microorganisms.

Dense nonaqueous phase liquid (DNAPL)

A water-immiscible organic liquid that is denser than water (such as tetrachloroethene).

Density

Describes the mass per unit volume of the DNAPL, and is sometimes expressed as specific gravity, which is the density relative to water.

Deposition rate

The amount of material deposited per unit time or volume flow.

Desorption

The process in which atomic or molecular species leave the surface of a solid and escape into the surroundings.

Deterministic risk assessment

A quantitative estimate of risk using single-point estimates for input parameters such as exposure factors.

Detrend

Remove the trend component of the data set, usually based on other information or secondary data.

Diffusion

Movement of vapors away from areas of higher concentration.

The process of net transport of solute molecules from a region of high concentration to a region of low concentration caused by their molecular motion in the absence of turbulent mixing.

Diffusion sampler

A semi-permeable membrane or dialysis tube filled with distilled water or gel, which relies on solute gradient to establish equilibrium between pore water and the sampler.

Diffusive flux

A law describing the diffusion that occurs when solutions of different concentrations come into contact with molecules moving from regions of higher concentration to regions of lower concentration. Fick's law states that the rate of diffusion dn/dt, called the "diffusive flux" and denoted J, across an area A is given by $dn/dt = J = -DA\partial c/\partial x$, where D is a constant called the "diffusion constant," $\partial c/\partial x$ is the concentration gradient of the solute, and dn/dt is

the amount of solute crossing the area A per unit time. D is constant for a specific solute and solvent at a specific temperature. Fick's law was formulated by the German physiologist Adolf Eugen Fick (1829–1901) in 1855.

Diffusive gradient in thin films (DGT)

A sampler that is typically filled with a gel that is designed to target a specific compound (for example, binding of metals).

Digital geophysical mapping

Mapping data generated from a geophysical system that digitally records geophysical and positioning information to support initial mapping and identification of buried metal objects on a site.

Dilution

A reduction in solute concentration caused by mixing with water at a lower solute concentration.

Direct sources

Direct sources include effluent outfalls from factories, refineries, waste treatment plants, and similar facilities that emit fluids of varying quality directly into urban water supplies.

Discarded military munitions (DMM)

Munitions used by the military in war time or piece that are no further value to them. These are commonly, explosives and explosive devices, small and large arm ammunition, chemical warfare compounds, and byproducts of military activities

Dispersed alkaline substrate (DAS)

Media containing a fine alkalinity source, often limestone sand.

Dispersion

1) Pollutant or concentration mixing due to turbulent physical processes; 2) A distribution of finely divided particles in a medium.

The spreading of a solute from the expected groundwater flow path as a result of mixing of groundwater.

Dissolved concentration

In water, the concentration of COPC in filtered water, traditionally defined as water that will pass through a 0.45 µm filter.

Dissolved organic carbon (DOC)

The weight of organic carbon in solution in a stated volume of water. The amount of dissolved organic carbon is usually determined by filtering water through a 0.45-µm pore-diameter filter, acidifying to drive off inorganic carbon, and then measuring the carbon dioxide that results when the carbon remaining in solution is oxidized.

Divalent

Having two available outer shell electrons, generally resulting in a +2 or -2 charge

DNA probe

short DNA strand (see microarray probes, Microarray Fact Sheet; FISH probes, FISH Fact Sheet; qPCR probes, qPCR Fact Sheet).

DNA—Deoxyribonucleic acid

A nucleic acid that carries the genetic information of an organism. DNA is capable of selfreplication, and is used as a template for the synthesis of RNA. DNA consists of two long chains of nucleotides twisted into a double helix (USEPA 2004a).

DNases

Enzymes that specifically degrade DNA.

dNTPs Deoxyribonucleotide triphosphates

dNTPs are incorporated into DNA during elongation (USEPA 2004a).

Dose-response assessment

The relationship between exposure level (amount of chemical in an environmental media that is inhaled, absorbed, or ingested by a receptor) and the incidence of adverse effects (adapted from Commission 1997a).

Drift

In geostatistics literature, spatial trend is called drift.

E

Ebullition

The act, process, or state of bubbling up usually in a violent or sudden display.

Edge effects

In models of physical systems, the manner in which the boundaries of the study area are handled can have an impact on the calculations. If the influences across a boundary are not incorporated correctly the interpolation results will have errors at the edges of the modeled area.

Eh

The redox potential is the tendency of a compound to gain an electron. This is most often measured as the voltage required to prevent electrons to transfer between the measured sample and a standard reference electrode. For Eh, that standard reference, defined as zero volts, is $H2 \rightarrow 2\ H+ + 2\ e-$ at a specified standard condition.

Electromagnetic induction

Physical process by which a secondary electromagnetic field is induced in an object by a primary electromagnetic field source.

Electron acceptor

A chemical compound that accepts electrons transferred to it from another compound (based on USEPA 2011).

The molecule which is reduced during metabolism. In aerobic metabolism, oxygen is the electron acceptor, accepting two electrons and two protons to form water.

Electron donor

A chemical compound that donates electrons to another compound (based on USEPA 2011).

The molecule which is oxidized during metabolism. For example, one glucose molecule used as an electron donor can result, with the addition of six water molecules during metabolic reactions, in six carbon dioxide molecules, 24 protons (H+), and 24 electrons (e-).

Environmental forensics

The process of distinguishing contaminants from different sources.

Endocrine disruptors

Endocrine disruptors are chemicals that may interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological, and immune effects in both humans and wildlife. A wide range of substances, both natural and artificial, are thought to cause endocrine disruption, including pharmaceuticals, dioxin and dioxin-like compounds, polychlorinated biphenyls, DDT and other pesticides, and plasticizers such as bisphenol A. Endocrine disruptors may be found in many everyday products– including plastic bottles, metal food cans, detergents, flame retardants, food, toys, cosmetics, and pesticides. The NIEHS supports studies to determine whether exposure to endocrine disruptors may result in human health effects including lowered fertility and an increased incidence of endometriosis and some cancers. Research shows that endocrine disruptors may pose the greatest risk during prenatal and early postnatal development when organ and neural systems are forming. http://www.niehs.nih.gov/health/topics/agents/endocrine/

Energetics

explosives and propellant residues as specified in USEPA SW-846 Method 8330B.

Energy grade line (EGL)

A line that represent the elevation of energy head (feet/meters) of water flowing in a pipe, conduit, or channel. The line is drawn above the hydraulic grade line (gradient) a distance equal to the velocity head of the water flowing at each section or point along the pipe of channel (Sacramento State Office of Water, https://www.owp.csus.edu/glossary/energy-grade-line.php).

Engineering control

Physical modifications to a site or facility to reduce or eliminate the potential for exposure to residual contamination (for example, slurry walls, capping, or vapor intrusion liner).

Engineered and constructed physical barriers to contain, prevent, or mitigate exposure to chemicals in an environmental medium. Examples of engineering controls include engineered caps and subslab depressurization systems, mitigation barriers, and fences. Similar to activity and land use restrictions, engineering controls also typically require a specific mechanism for noticing the presence of engineering control and related restrictions, as well as long-term maintenance and management of the control. The timing of a decision to use an engineering control, and the specific mechanism to be used, may be based on criteria outlined in statute, regulation, policy, or guidance.

Enhanced monitored natural recovery (EMNR)

Used to reduce the concentration of chemicals in the biologically active zone of sediment in a manner that would enhance the potential for ecologically balanced recolonization, while not causing widespread disturbance to the existing habitat. EMNR technology relies on a combination of enhanced natural recovery via placing a thin (6-12 in or 15-30 cm) layer of clean sediment over contaminated sediment and an effective characterization and monitoring

program to project and verify recovery.

Environmental justice

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies

Environmental management system

Broad data management system used by state and federal agencies.

Environmental medium

Soil, surface water, groundwater, indoor air, outdoor air, sediment, and other parts of the environment that may be impacted by the release of a chemical.

Enzyme activity probes (EAPs)

Transformation of surrogate compounds (probes) resembling contaminants produces a fluorescent (or other distinct) signal in cells which is then detected using a microscope.

Enzymes

Any of numerous proteins or conjugated proteins produced by living organisms and facilitating biochemical reactions (based on USEPA 2004a).

Epibenthic

On or above the sediment/water interface.

Epifauna

Benthic invertebrates that live almost exclusively on or upon the benthic substrate. The substrate can range from soft silt or clay in a lentic environment to sand, gravel, pebbles, cobble, and boulders in a lotic environment.

Epifluorescent microscope

A type of microscope that uses a high energy light source (e.g., ultraviolet light) and specialized filters to visualize fluorescently stained specimens. Epifluorescent microscopy procedures can be used to determine both the total number of cells and total number of viable or active cells in a sample.

Equilibrium partitioning theory

A theory developed in the late 1980s as a means of predicting toxicity of PAHs to sediment-dwelling organisms. It posits that the toxicity to sediment organisms is directly proportional to the amount of unbound PAH dissolved in sediment pore water.

Eutrophication

Excessive growth of phototrophs such as algae in water bodies due to the addition of nutrients.

Exact interpolator

An interpolation method that produces values exactly equal to observed values at all measurement locations.

Exposure

Contact of a receptor with a chemical. Exposure is quantified as the amount of the chemical available at the exchange boundaries of the organism (for example, skin, lungs, gut) and available for absorption (USEPA 1989a).

Exposure area

A geographic area over which a receptor is reasonably assumed to move at random and equally likely to come into contact with an environmental medium (for example, soil) both spatially and temporally. An exposure area is further defined on the basis of observed or assumed patterns of receptor behavior, historic activity, and the nature and extent of chemicals in environmental media (USEPA1989a). An exposure area may also be called an exposure unit.

Exposure assessment

The determination or estimation (qualitative or quantitative) of the magnitude, frequency, duration, and route of exposure (USEPA 1989a).

Exposure factor

Factors related to human behavior and characteristics that define the time, frequency, and duration of exposure; and help determine an individual’s exposure to a chemical (USEPA 2011b).

Exposure medium

Environmental medium containing concentrations of a chemical that may be contacted by a receptor.

Exposure pathway

The channel or path followed by pollutants from their source, via air, soil, water, and food to humans, animals, and the environment.

The course a chemical takes from a source to a receptor. An exposure pathway describes a unique mechanism by which

an individual or population is exposed to chemicals at or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (for example, air) or media (in cases of intermedia transfer) also is included (USEPA 1989a).

Exposure point

A location of potential contact between a receptor and a chemical (USEPA 1989a). exposure route The way a chemical comes in contact with an organism (for example, by ingestion, inhalation, dermal contact (USEPA 1989a).

Exposure Point Concentration (EPC)

The value, based on either a statistical derivation of measured data or modeled data, that represents an estimate of the chemical or radionuclide concentration available from a particular medium or route of exposure.

Exposure scenario

A set of facts, data, assumptions, and professional judgment about how an exposure occurs or does not occur. An exposure scenario addresses the (1) chemicals in environmental media and their sources; (2) exposed populations (or receptors); (3) migration of chemicals in environmental media from sources to receptors; and (4) routes of exposure (ingestion, dermal contact, inhalation).

Exposure unit (or exposure area)

for purposes of risk assessment, a defined area throughout which a potential receptor may be exposed to a contaminant. The receptor is assumed to move randomly across the area, being exposed equally to all parts of the area. The assumption of equal exposure to any and all parts of the exposure area is a reasonable approach (USEPA 1992) that allows a spatially averaged soil concentration to be used to estimate the true average concentration contacted over time.

F

Fen

Fens are peat-forming wetlands that receive nutrients from sources other than precipitation, usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement. Fens differ from bogs because they are less acidic and have higher nutrient levels. They are therefore able to support a much more diverse plant and animal community. These systems are often covered by grasses, sedges, rushes, and wildflowers. Some fens are characterized by parallel ridges of vegetation separated by less productive hollows. The ridges of these patterned fens form perpendicular to the downslope direction of water movement. Over time, peat may build up and separate the fen from its groundwater supply. When this happens, the fen receives fewer nutrients and may become a bog. See EPA website: http://water.epa.gov/type/wetlands/fen.cfm 356

Fick’s law

The principle that diffusive flux goes from areas of high concentration to areas of lower concentration with a magnitude proportional to the concentration gradient.

Field replicate samples

Collected following the same the process within the DU but from a different set of locations. The manner in which the replicate is collected is determined during systematic planning. The purpose of the collection of replicates is to provide multiple estimates of the mean.

First statistical moment

An estimate of the central tendency of a sampled population.

Fluorescence in situ hybridization (FISH) probes

Short sequences of single stranded DNA carrying a fluorescent label. When the probe binds to the target DNA/RNA sequence of the microorganism(s) of interest in an environmental sample, the target cell will fluoresce and can be visualized and counted using a specialized microscope or a flow cytometer.

Detects the presence of targeted genetic material in an environmental sample and estimates the number of specific microorganisms or groups of microorganisms.

Flow cytometry

A method whereby cells or particles move in a liquid stream past a laser or light beam and a sensor detects the relative light scattering and fluorescence of the particles.

Flux

Flow per unit area.

Rate of flow of fluid, particles, or energy through a given surface.

The mass (mass flux) or volume (flux) moving through an area per time.

Food-web magnification factor

See trophic magnification factor.

Freely dissolved

The concentration of the chemical that is freely dissolved in water, excluding the portion sorbed onto particulate and dissolved organic carbon (kg of chemical/L of water). Freely dissolved concentrations can be estimated with an empirical equation with knowledge of the Kpoc and Kdoc and can be measured with passive samplers, such as POM, SPMD, SPME, and PE.

Fugacity

A measure of a chemical potential in the form of “adjusted pressure.” It reflects the tendency of a substance to prefer one phase (liquid, solid, or gas) over another and can be literally defined as “the tendency to flee or escape.”

The chemical potential of a gas. For most gases at pressures around atmospheric, fugacity is equal to the pressure of the gas.

Fugacity samplers

Polymeric materials inserted into sediment that accumulate hydrophobic organic compounds in proportion to their surface area.

Fulvic acids

A complex mix of the products of organic degradation which is resistant to further degradation and which are extracted into a strongly basic solution but will not precipitate with acid addition.

Functional gene

A segment of DNA that encodes an enzyme or other protein that performs a known biochemical reaction. For example, the functional gene tceA encodes the reductive dehalogenase enzyme that initiates reductive dechlorination of TCE. Other genes can code for RNA entities which can regulate the activity of other DNA target sequences.

G

Gasolines

Petroleum mixtures characterized by a predominance of branched alkanes with carbon ranges from C3 to C12 and lesser amounts of aromatics, straight-chain alkanes, cycloalkanes, and alkenes of the same carbon range.

Gavage

Introduction of nutritive material into the stomach by means of a tube.

Gene

A segment of DNA containing the code for a protein, transfer RNA, or ribosomal RNA molecule (based on Madigan et al. 2010).

Genetic algorithm

A mathematical procedure used in optimization to find possible solutions. Genetic algorithm is a heuristic optimization technique that mimics the concept of natural evolution and mechanisms such as crossover, mutations, and survival of the fittest. The genetic “code” for a given possible solution is composed of various model decision variables expressed in binary digits. A “population” of different solutions with different genetic codes are allowed to interact as a way to explore the universe of solutions to find an “optimal” solution.

Genus

A category of organism classification (taxonomy). A particular genus is a group of related species. For example, Pseudomonas is a genus of bacteria.

Geochemical factors

Geologic/chemical parameters such as oxidation/reduction potential, nitrate, and sulfate that may influence the distribution, concentration, or persistence of contaminants in the subsurface.

Geochemistry

1) Science that deals with the chemical composition of and chemical changes in the solid matter of the earth or a celestial body (as the moon); 2) The related chemical and geological properties of a substance.

Geomembrane

A kind of geosynthetic material made up of an impermeable membranes. Their uses include solid waste containment

(such as landfill liners), mining, and water containment applications.

Geomorphology

Study of the evolution and configuration of landforms.

Geophysical classification

The process of making principled decisions, using data collected by geophysical sensors, to differentiate between buried items that are potentially hazardous and those that can be safely left in the ground during munitions response actions.

Geophysical system verification

The quality control (QC) process used to verify that a geophysical sensor is operating properly, and to provide ongoing monitoring of the quality of the geophysical data collection and target selection process as it is performed in the production survey. The process includes daily measurements of an instrument verification strip and production area blind seeding.

Geospatial analysis

Process of compiling and analyzing data related in time or space.

Geospatial data

Data that are referenced in 2-D (x and y) or 3-D (x, y and z) space and/or time (t); where x, y and z represent spatial coordinates (e.g. latitude, longitude and depth, respectively) and t represents a specific time of sampling.

Geospatial methods

Spatial or temporal analytical methods used to estimate values (such as concentrations) at unsampled locations or times. These methods require data with information about sampling locations and times. Some methods can also generate measures of uncertainty associated with the estimates.

Geospatial support

Geometrical size, shape and spatial orientation of the units or regions associated with the measurements.

Geostatistical analyses

An analysis using a branch of statistics that focuses on the analysis of spatial or spatiotemporal data, such as groundwater data. One example of a geostatistical technique is kriging, which is an interpolation method that is based on a statistical model of spatiotemporal correlation (Gilbert 1987).

Geostatistical methods

A category of geospatial methods that make statistical assumptions about the sampled population and use statistical metrics to predict estimated values or uncertainty in space or time.

Geostatistics

A branch of statistics that focuses on the analysis of spatial or spatiotemporal data, such as groundwater data (Gilbert 1987).

Global data variation

Systemic changes in data over relatively large temporal or spatial scales.

Groundwater protection standard (GWPS)

Concentration limits set by the regulatory agency as a standard to be attained in groundwater monitoring. These limits may be fixed health- or risk-based limits (for example, MCLs) or a background level (Unified Guidance).

Grub

To remove plants by digging up the roots and/or stumps

H

Hazard identification

The process of determining whether exposure to a chemical in environmental media by a receptor can cause an increase in the incidence of an adverse human health effect (for example, incremental lifetime cancer risk) (USEPA 2012b).

Hazard index

The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways. The hazard index is calculated separately for chronic, subchronic, and shorter-duration exposures (USEPA 1989a).

Hazard quotient

The ratio of a single substance exposure level over a specified time period (for example, subchronic) to a reference dose for that substance derived from a similar exposure period (USEPA 1989a).

Head

A specific measurement of water pressure above a geodetic datum. It is usually measured as a water surface elevation expressed in units of length.

Hemicellulose

A branched polymer of sugars used as a structural unit in many plants, generally linked to lignin.

Henry's law

The principle that the amount of a gas dissolved at equilibrium in a certain quantity of liquid is proportional to the pressure of the gas in contact with the liquid.

Heterocyclic

A compound that contains a closed ring of atoms in which one of the ring members is not a carbon atom.

Heterotrophic plate count

A test used to estimate the total number of bacteria capable of growing on organic compounds in an environmental sample

Hewlett Packard TRIM

An HP records management system.

High density polyethylene (HDPE)

A high density linear polyethylene made from petroleum, often used as a liner for waste disposal interments.

Homoscedasticity

The equality of variance among sets of data (Unified Guidance).

Hoop stress

The circumferential stress (perpendicular both to the axis and to the radius of the object in both directions of every particle in the cylinder).

Hot spot

Generally described as an area of elevated contamination (ITRC 2008). A hot spot is not typically identified visually (i.e., stained soil, free product) but is primarily identified by soil sampling results. The specific area and magnitude of contamination constituting a hot spot should be agreed on during systematic project planning.

Hot spots are considered to be soil volumes with relatively high concentrations that could be present at a site but whose locations and dimensions cannot be anticipated prior to sampling (ITRC 2012a).

Humic acids

A complex mix of the products of organic degradation which is resistant to further degradation and which are extracted into a strongly basic solution but will precipitate when hydrochloric acid is added to adjust the pH to 1.

Hydraulic aperture

Hydraulic apertures are the theoretical fracture widths calculated with the cubic law using transmissivity (T) values determined from hydraulic tests. Hydraulic apertures represent the size of the fracture based on the hydraulic behavior.

Hydraulic conductivity

The capability of a geologic medium to transmit water. A medium has a hydraulic conductivity of unit length per unit time, if it will transmit in unit time a unit volume of groundwater at the prevailing viscosity through a cross section of unit area, (measured at right angles to the direction

Hydraulic dredging

Dredging by use of a large suction pipe mounted on a hull and supported and moved about by a boom, a mechanical agitator, or cutter head which churns up earth in front of the pipe, and centrifugal pumps mounted on a dredge which suck up water and loose solids.

Hydraulic loading rate

The volume of water applied to a system per time.

Hydraulic residence time

The mean length of time a fluid element is in the volume of interest, usually determined by dividing the flow rate into the liquid volume

Hydrodynamics

The branch of science that deals with the dynamics of fluids, especially that are incompressible, in motion.

Hydrodynamics data

Information on the on the flow rates and volumes of a system, including other data pertinent to the hydraulic function of a waterway.

Hypolentic

Transition zone between groundwater and surface water beneath lakes and wetlands (USEPA 2010).

Hyporheic zone

The hyporheic zone is an active ecotone between the surface stream and groundwater. Exchanges of water, nutrients, and organic matter occur in response to variations in discharge and bed topography and porosity. Upwelling subsurface water supplies stream organisms with nutrients while downwelling stream water provides dissolved oxygen and organic matter to microbes and invertebrates in the hyporheic zone. Dynamic gradients exist at all scales and vary temporally. At the microscale, gradients in redox potential control chemical and microbially mediated nutrient transformations occurring on particle surfaces.

I

In situ treatment (IST)

Treatment conducted while the subject or material is in its natural environment.

Indicator compound

A compound chosen for its likely presence in an area of interest that is used to estimate conditions as a whole for the area of interest.

Indirect sources

Like a source except the object to which it is attached knows very little about it, and requires another object to provide the pertinent information.

Industry standard object

Commonly available pipe sections that have been characterized and can be used as munition surrogates in the geophysical system verification process.

Infauna

Benthic invertebrates that live almost exclusively in or below the sediment/water interface. These are generally tube- or burrow-dwelling organisms that feed at either the sediment/water interface or burrow and ingest sediments and/or sediment-dwelling organisms.

I**nstitutional control**

LUC, AUL, LUR: A legal or administrative restriction on the use of, or access to a site or facility to eliminate or minimize potential exposure to chemicals of concern (such as proprietary controls or governmental controls).

Non-engineered instruments that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy (USEPA 2001c). Examples include deed restrictions on land use, groundwater use restrictions, and city ordinances prohibiting private well installations. The use of these controls typically require a specific mechanism for placing the restriction and future compliance with the restriction. The timing of the decision to use an institutional control, as well as, the specific mechanism to be used may be based on criteria outlined in statute, regulation, policy or guidance.

Non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy.

Instrument verification strip

One or more buried inert munitions or industry standard objects spaced approximately 5 meters apart. Data are collected over the IVS twice daily to verify that the geophysical sensor system can deliver the expected detection and classification performance.

Interfacial tension

Represents the force parallel to the interface of one fluid with another fluid (usually air or water), which leads to the formation of a meniscus and the development of capillary forces and a pressure difference between different fluids in the subsurface.

Interwell statistical testing

Statistical analyses of data collected from different monitoring wells (Unified Guidance).

Comparison of measurements over time at one monitoring well (Unified Guidance).

Statistical analyses of data collected from one monitoring well over a period of time (Unified Guidance).

Inversion

Fitting measured sensor data to an EMI response model (commonly the dipole model) to obtain the model parameters, including the object’s location and depth, orientations of its principal axes, and its principal axis response functions.

Isotope
Two atoms with the same number of protons but a different number of neutrons.

Isotopic fractionation
Some processes (for example, those which involve breaking chemical bonds) have slightly different rates for different isotopes, leading to a more rapid consumption of one isotope over the other. This characteristic is manifested in a change in the isotopic ratio of the residual compound.

Isotopic ratio
The concentration of the heavy isotope divided by the concentration of the light isotope.

Isotopically labeled contaminants
A contaminant that has been specially synthesized to deliberately contain specific isotopes at elevated levels above those found in either natural or commercial bulk forms of the same chemical.

Isotropy
Equal physical properties in all direction.

J

Johnson & Ettinger model

A one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces and provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination.

K

Kernel
The kernel is a weighting function used in locally weighted regression methods.

Kinetics
The study of rates of reaction

Kriging variance
A calculated value for the degree of confidence in the estimated values at unsampled locations. The kriging variance is calculated using the sampled values within the pre-defined search neighborhood.

Kurtosis
A measure of whether the data are peaked or flat near the mean. High kurtosis would show a distinct peak near the mean and drop off rapidly to heavy tails (NIST/SEMATECH 2012). Thus in a populations with high kurtosis, the variance results chiefly from a small number of points with very large deviations. In a population with low kurtosis, the variance results from a larger number of points with small deviations.

L

Labeled cell
A microorganism in which a gene probe has bound to a matching sequencing within the microorganism and released a fluorescent dye, resulting in a cell that is emitting fluorescent light.

Labile
Able to change; highly degradable.

Easily altered.

Laboratory replicate sample
A sample that is split into subsamples at the lab. Each subsample is then analyzed and the results compared. They are used to test the precision of the laboratory procedures.

Lag

A parameter of a variogram. When sampling on a regular grid, it is the distance between samples. If the distance between samples is irregular, then the lag may be calculated as the average of the distances between the sampling locations. A sampled interval in time that is used to express temporal relationships between sample observations.

Leaching

Leaching is the extraction of certain materials from a carrier into a liquid; usually, but not always, a solvent.

Library matching

Comparing the derived polarizabilities of each detected buried metal object with the polarizabilities of a collection of known munition items in a library. The objective is to classify the unknown objects based on the similarity of their polarizabilities to an entry in the library.

Ligand

A chemical which interacts with a metal to bind that metal into a complex.

Complexing chemical (ion, molecule, or molecular group) that interacts with a metal to form a larger complex (USEPA 2003a).

Light nonaqueous phase liquid

A liquid that is not soluble and has a lower density than water.

Lignin

A complex, non-homogenous plant-made polymer found in unit walls cross linked to hemicellulose. Lignin is aromatic, hydrophobic, and resistant to biodegradation by most organisms.

Limestone buffered organic substrate (LBOS)

A solid media containing limestone. Term is often used to describe the substrate used in vertical flow ponds.

Lines of evidence

Pieces of evidence are organized to show relationships among multiple hypotheses or complex interactions among agent, events, or processes. A weight of evidence approach includes the assignment of a numeric weight to each line of evidence.

Lipid-normalization

The COPC concentration in tissue (kg of chemical/kg of wet tissue) divided by the concentration of lipid in that tissue (kg of lipid/kg of wet tissue) or the COPC concentration in tissue (kg of chemical/kg of dry tissue) divided by the concentration of lipid in that tissue (kg of lipid/kg of dry tissue).

Lipids

A diverse range of organic compounds that are defined as being insoluble in water but soluble in non-aqueous solvents. Lipids include oils, waxes, and sterols.

Lithoautotrophs

Bacteria that grow only using inorganic chemicals such as ammonia, iron, or hydrogen as their electron donor.

Loading

Mass of something per time entering a volume (volumetric loading rate) or flowing into an area (areal loading rate).

M

Macroinvertebrate

Any organism that will, after sieving out surface water and fine suspended matter, be retained on a 0.5 mm mesh (No. 35 Standard Sieve) screen.

Mass balance

An accounting for the mass entering, leaving, accumulating, and reacting in a system, often in the form of an equation such as “In – Out + Generation – Consumption = Accumulation”.

Quantitative estimation of the mass loading to the dissolved plume from various sources, as well as the mass transport, phase transfer, degradation, and attenuation capacity for the dissolved plume.

Mass discharge

Mass discharge (Md) is a contaminant load past a transect (mass per time). It can also be referred to as cumulative mass flux, mass discharge, or mass flux.

Mass flux

Mass flux (J) is a contaminant load (mass) per time per unit area. It is a general term for performing mass-flux- or mass-discharge-type calculations.

Mass loading

Contaminant released to the environment (in this case, the aquifer or unsaturated zone) from the source material.

Mass transfer

The irreversible transport of solute mass from the nonaqueous phase (that is, DNAPL) into the aqueous phase, the rate of which is proportional to the difference in concentration.

Mechanical aperture

The mechanical aperture is the actual measured fracture width, which can vary significantly throughout the fracture, and represents the true aperture distribution throughout the fracture. This aperture can change if the fracture is pressurized or depressurized. Hydromechanical well testing attempts to measure this change (Rutqvist et al. 1998; Schweisinger et al. 2009).

Megasite

A large area, usually 5 – 500 km^2, with multiple contaminant sources.

Metabolic product

Products generated by a microorganism whose structure and function are defined by DNA sequences also called genes. Example metabolic products include RNA and proteins or enzymes.

Methanogenic

Able to produce methane from a limited number of substrates.

Microarray

Detects and estimates the relative abundances of hundreds to thousands of genes simultaneously. 350 microarray probes Short, defined segments of DNA that are designed to bind with the target gene if found in the environmental sample. The probes are attached to the solid surface of the microarray.

Microbial community

The microorganisms present in a particular sample.

Microbial community composition

Description of the types or identities of microorganisms present in a sample.

Microbial diversity

Microbial diversity can have many definitions but in this context generally refers to the number of different microbial species and their relative abundance in an environmental sample (Nannipieri et al. 2003).

Microbial fingerprinting methods

A category of related techniques that differentiate microorganisms or groups of microorganisms based on unique characteristics of a universal component or section of a biomolecule.

Microcosm

A sample that is regarded as a small but representative portion of something larger. In environmental studies microcosm are typically small samples of soil, sediment, or water incubated in enclosed containers under laboratory conditions.

Middle distillates

Petroleum mixtures characterized by a wider variety of straight, branched, and cyclic alkanes, as well as polycyclic aromatic hydrocarbons and heterocyclic compounds with 372 carbon ranges of approximately C9 to C25.

Mode of action

The way in which a chemical elicits toxicity; does not complete characterization of the mechanisms of action (USEPA 2005b).

Monitored natural recovery (MNR)

A remedy for contaminated sediment that typically uses ongoing, naturally occurring processes to contain, destroy, or reduce the bioavailability or toxicity of contaminants in sediments. These processes may include physical, biological, and chemical mechanisms that act together to reduce the risk posed by the contaminants.

Monomer

The repeating unit of a polymer.

Monte Carlo simulation

A technique for characterizing the uncertainty and variability in exposure estimates by repeatedly sampling the probability distributions of the exposure equation inputs and using these inputs to calculate a range of exposure values (USEPA2001c).

More complex geospatial methods

Regression methods with no spatial correlation model. These methods include spatial trend and statistical error components.

Multiaxis sensor

Advanced EMI sensor with excitation and receive coils arranged to interrogate a buried object along multiple axes from one measurement location.

Munitions and explosives of concern (MEC)

This term distinguishes specific categories of military munitions that may pose unique explosives safety risks means: Unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents (such as TNT or RDX) present in high enough concentrations to pose an explosive hazard.

Munitions constituents (MC)

Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions

Mutagenic carcinogen

The capacity of either a carcinogen or its metabolite to react with or bind to DNA in a manner that causes mutations (USEPA2007b).

N

National Contingency Plan (NCP)

Passed in 1988, this five-step process is used to evaluate contaminated sites and suggest the best plan for remediation.

National Marine Sanctuaries Act (NMSA)

The National Marine Sanctuaries Act mandates that parties who destroy, cause the loss of, or injure sanctuary resources are responsible for their restoration.

Nepheloid layer

A layer of water, above the bed or floor, that contains significant amounts of suspended sediments.

Nitrite reductase genes

Functional genes encoding the enzymes that catalyzes nitrite reduction. Nitrite reductase genes are commonly used as the target gene to detect microorganisms capable of denitrification.

Nonaqueous phase liquid (NAPL)

A liquid solution that does not mix easily with water. Many common groundwater contaminants, including chlorinated solvents and many petroleum products, enter the subsurface in nonaqueous-phase solutions.

Nucleic acid

A complex biomolecule consisting of a long “backbone” of organophosphate sugars with four different types of nucleotide bases attached.

O

Obligated party

The party who fulfills institutional control obligations, for example, the grantee in the case of the proprietary control, or county in the case of groundwater ordinance.

Octanol-water partition coefficient (Kow)

The ratio of a chemical concentration in 1-octanol (Co) and water (Cw) in an octanolwater system that has reached a chemical equilibrium: Kow = Co/Cw. Unitless.

Oil Pollution Act of 1990 (OPA)

OPA, along with the CWA and CERCLA, mandates that parties that release hazardous materials and oil into the environment are responsible not only for the cost of cleaning up the release, but also for restoring any injury to natural resources that results.

Open limestone channel (OLC)

A trench containing limestone and open to the air into which water is introduced to raise pH and add alkalinity, with sufficient water velocity to prevent the deposition of precipitates resulting from metal (Al, Fe) oxidation . Also called an open limestone drain.

Open limestone drain (OLD)

See open limestone channel; acronym also may describe

Organic carbon partition coefficient

The theoretical ratio of the mass absorbed to soil particles versus dissolved in pore water.

Organic matter

Strictly defined, compounds in which carbon is bonded to hydrogen. Generally describes decomposed biological residues and other organic compounds synthesized by organisms.

Organophilic clay

Clay minerals whose surfaces have been ion exchanged with a chemical to make them oilsorbent. Bentonite and hectorite (plate-like clays) and attapulgite and sepiolite (rod-shaped clays) are treated with oil-wetting agents during manufacturing. Quaternary fatty-acid amine is applied to the clay. Amine may be applied to dry clay during grinding or it can be applied to clay dispersed in water.

Overburden

Geological term for the material above solid rock. Sometimes called “soil”.

Oxidation-reduction potential (ORP)

The redox potential is the tendency of a compound to gain an electron. This is most often measured as the voltage required to prevent electrons to transfer between the measured sample and a standard reference electrode. ORP differs from Eh in that a variety of standard references may be used (often silver/silver chloride) and the resulting value can be adjusted to Eh by correcting for the electrode difference (e.g. 0 mV measured with a saturated KCl Ag/AgCl reference electrode is an Eh of 197 mV).

Oxygen sink

A process (such as biodegradation) that reduces the amount of oxygen present.

Oxygenase

An enzyme that catalyzes the incorporation of molecular oxygen into a compound (based on Madigan et al. 2010).

Oxyhydroxide

A compound containing an unspecified arrangement of oxygen and/or hydroxides.

P

Parameters

Intrinsic characteristics of a buried metal object, including size, shape, symmetry, aspect ratio, wall thickness, and material composition.

Permanent data gaps

Data gaps that cannot be resolved due to lack of information such as lack of information concerning the site history, future land uses, or from site-specific sampling information.

Permeability

1) Characteristic of a material or membrane that allows liquids or gases to pass through it; 2) The rate of flow of a liquid or gas through a porous material.

Permeable reactive barrier (PRB)

An engineered treatment system that uses a low hydraulic conductivity media to draw groundwater into contact with reactive substrate in order to reduce the concentration of one or more contaminants. Application of PRBs is governed by various patents (e.g. U.S. Patents 5,362,394 and 5,514,279).

Petroleum vapor intrusion

The process by which volatile hydrocarbons partition from petroleum-contaminated soils and/or groundwater and migrate through the vadose zone in gaseous form to receptors.

pH

A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14.

Pharmacokinetic

Study of the absorption, distribution, metabolism, and excretion of chemicals and the genetic, nutritional, behavioral, and environmental factors that modify these parameters (Commission1997a).

Phase partitioning

Separation of fuel into solid, liquid, and gas phases.

Phospholipid

A type of biomolecule that is a primary structural component of the membranes of almost all cells.

Phospholipid fatty acid (PLFA) analysis

A laboratory analytical techniques that differentiate microorganisms or groups of microorganisms based on quantifying PLFA groups.

Phylogeny (phylogenetic analysis)

Classification of microorganisms into groups (e.g. genus and species) based in part upon the rRNA sequences.

Phytoremediation

A bioremediation process that uses various types of plants to remove, transfer, stabilize, and/or destroy contaminants in the soil and groundwater. There are several different types of phytoremediation mechanisms.

Planktonic existence

Free floating microorganisms that are not associated with particles, sediments or biofilms. PLFA Phospholipid fatty acids derived from the two hydrocarbon tails of phospholipids.

Polarizabilities

Three principal axis responses returned by the inversion process, which relate directly to physical attributes of the object under investigation. Information inferred from the responses—including the object's size, shape, and wall thickness—forms the basis for classification decisions.

Polymerase chain reaction

Makes copies of a specific DNA sequence within a target gene of microorganisms that can be further analyzed.

Polysaccharide

A polymer of sugars.

Pooled

Groundwater samples from more than one sampling point.

Pore water

Water located in the interstitial compartment (between solid-phase particles) of bulk sediment.

Pore water expression

A technique used to serve to determine pore water ionic content.

Potentiation

A chemical interaction that influences the toxicity of a chemical. One chemical increases the effect of another chemical (USEPA 2014m) (for example, 1 + 2 = 10).

Precipitation

1) The formation of a solid in a solution or inside another solid during a chemical reaction or by diffusion in a solid; or 2) rain, sleet, hail, snow and other forms of water falling from the sky

Precision

Precision is the reproducibility of multiple measurements, usually described by a standard deviation, standard error, or confidence interval.

Preferential pathway

A high-permeability conduit for vapor migration such as a utility penetrations, lines, or drains; building sumps or drainage pits; elevator shafts; fractures in bedrock; or gravel channels.

Primers

Short strands of DNA that are complementary to the beginning and end of the target gene and thus determine which DNA fragment is amplified during PCR or qPCR.

Probabilistic risk assessment

A technique that uses statistically derived distributions of input values (for example, exposure factors) to calculate a range of risk.

Project manager

An individual from a regulatory agency (for example, federal, state, or local), or a consulting company, or responsible party company, who is coordinating the site cleanup including the risk assessment.

Project risk

Project risks include any uncertain events or conditions that have the potential to adversely affect a project's objectives, scope, time, cost, or targeted primary outcomes, or to result in unintentional adverse outcomes.

Proprietary control

Controls based on the rights associated with private ownership, particularly ownership of a limited interest in real property as specified in legal instrument such as an easement or a restrictive covenant.

Protein

Large organic compounds made of amino acids arranged in a linear chain and joined together by peptide bonds (US Navy 2009).

Proteobacteria

A broad phylum of gram negative bacteria that is categorized into six groups, involving many genera, based on 16s rRNA differences

Proxy data

Quantitative data such as field data that that can be used to supplement the core laboratory data being examined, data such as membrane interface probe data supplementing VOC data.

Pyrosequencing

A common high throughput DNA sequencing approach that uses light-emitting enzyme couple systems to detect pyrophosphate released when one nucleotide is attached to another. This is a well-established DNA sequencing approach that regulators, consultants and others in environmental site management are likely to encounter.

Q

Quality assurance validation blind seeding

Seeds emplaced by the government (or its representative) and blind to the production team to provide confidence to the entire project team and stakeholders that the data collected in the project are usable for their intended purpose

Quality control blind seeding

Inert munition or munitions surrogate buried on the site to serve as a process QC check. Surrogates are selected to correspond with munitions of interest on the site. QC blind seeds allow the production team to recognize that problems exist, and provides a means of identifying root causes so that corrective action can be undertaken while still in the field.

Quality system

A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization to ensure quality in work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing the work performed by an organization and for carrying out required quality assurance and QC activities.

R

Radioactive decay

The process by which an atomic nucleus of an unstable atom loses energy by emitting ionizing particles (ionizing radiation). There are many different types of radioactive decay.

Raoult’s law

The principle that the vapor pressure of an ideal solution is directly dependent upon the vapor pressure of each chemical component and mole fraction of each component in the solution.

Raster data

The result of spatial interpolation with a computer program that converts discrete point data (for example, monitoring well water level elevations or contaminant concentration) to a continuous grid of predictions with at least one value associated with each grid cell.

Realization

In geostatistical modeling, a realization is one model of spatial values prepared using specific values drawn from the statistical distribution of possible values determined by a site-specific spatial correlation analysis. Multiple realizations can be prepared from a given spatial correlation analysis. Also, an independent response produced by a mathematical model.

Reasonable maximum exposure

The highest exposure that is reasonably expected to occur at a site (USEPA 1989a).

Receptor

An individual (for example, residential adult, residential child, worker, trespasser, or recreator) who has the potential

to be exposed to a chemical in environmental media.

A plant, animal, or human that is typically the focus of a risk assessment following the direct or indirect exposure to a potentially toxic substance.

Redox conditions

Description of the oxidation/reduction potential of the subsurface (e.g. aerobic, anaerobic, sulfate reducing, or methanogenic conditions)

Reduced

In chemistry, having gained electrons. Often gaining electrons is accompanied with gaining protons (hydrogen). As an example, when O_2reacts with H_2, the oxygen is reduced, forming H_2O.

Reducing alkalinity producing systems (SAP)

An engineered treatment system that uses an organic substrate to drive microbial reactions to reduce the concentration of free oxygen, followed by a carbonate source to increase alkalinity in mining-influenced water. Also called a successive alkalinity producing system and also called a vertical flow pond.

Reducing conditions

A system in which the gain of electrons is energetically favored due to a low reduction potential.

Reference concentration (RfC)

A concentration specified by USEPA to limit human inhalation exposure to potentially hazardous levels of chemicals in air (Commission 1997a).

Reference dose (RfD)

A dose specified by USEPA to limit human oral and dermal exposure to potentially hazardous levels of chemicals that are thought to have thresholds for their effects, such as noncarcinogens (Commission 1997a).

Reference location (control)

An aquatic sediment system unaffected by COPCs which can be used in a baseline comparison of like parameters in a similar contaminated system. See entry for background.

Relative permeability

The actual or effective permeability of a fluid in a REV relative to the intrinsic water permeability of a porous medium. The value of relative permeability (kr) ranges from 0 to 1.0 as a nonlinear function of S, where kr = 1.0 at S = 1.0 and kr = 0 at S= 0.

Relative potency factor

A scaling factor that represents the relative toxicity of a chemical based on the toxicological dose-response data of an index chemical.

Remedial action objective (RAO)

Specific goals for protecting human health and the environment. RAOs are developed by evaluating Applicable or relevant and Appropriate Requirements (ARARs) that are protective of human health and the environment and the results of the remedial investigations, including the human and ecological risk assessments.

Cleanup goals for a selected remedial action. Preliminary RAOs are often developed during the Preliminary Assessment/Site Investigation phase of a munitions response, and are refined into definitive RAOs during the course of the Remedial Investigation/Feasibility Study process. Final RAOs are documented in the Record of Decision or Decision Document. Remediation efforts are considered complete upon attainment of the RAOs.

Remediation

The act or process of abating, cleaning up, containing, or removing a substance (usually hazardous or infectious) from an environment.

Remotely operated vehicle (ROV)

A vehicle that can be operated without a driver in the vehicle. These are often used for site investigations in areas where there are toxic or oxygen deficient atmospheres.

Representative elementary volume

The smallest subsurface element that can be considered to have homogeneous conditions representative of the system being evaluated.

Reproductive habitat

An environment where reproduction can occur, usually expressed as species specific.

Residual fuels

Petroleum mixtures characterized by complex, polar polycyclic aromatic hydrocarbons and other high molecular weight hydrocarbon compounds with carbon ranges that generally fall between C24 and C40.

Residual saturation

A combined property of the DNAPL and the subsurface formation materials. Sr is the fraction of pore space within a REV that is filled by the DNAPL at the point where it becomes disconnected from DNAPL in an adjacent REV and is no longer mobile. The value of Sr represents the fraction of DNAPL potentially remaining in zones that were previously directly exposed to DNAPL migration (Cohen et al. 1993; Pankow and Cherry 1996).

Resource Conservation and Recovery Act (RCRA)

Enacted in 1976, this provides a comprehensive management scheme for hazardous waste disposal. This includes a system to track the transportation of wastes and federal performance standards for hazardous waste treatment, storage, and disposal facilities. Open dumps are prohibited.

Responsible party

The entity that is required to ensure that selected institutional controls are properly applied and maintained.

RestFul

A systems architectural style consisting of a coordinated set of components, connectors, and data elements within a distributed hypermedia system, where the focus is on component roles and a specific set of interactions between data elements rather than implementation details.

Restriction enzymes

Restriction enzymes (also called restriction endonucleases) are bacterial enzymes that recognize and cut specific DNA sequences (typically 4 to 6 base pairs long). Each restriction enzyme has a unique recognition and cleavage site sequence.

Resuspension

A renewed suspension of insoluble particles after they have been precipitated.

Resuspension flux

The movement of a contaminant through a liquid (or gaseous media) upon resuspension of contaminated sediments.

Reverse transcriptase qPCR (RT-qPCR)

A laboratory analytical technique for quantification of a target gene based on RNA.

Rhizosphere

The root zone of plants.

Ribosome

A multi-component biological molecule which is part of the protein-synthesizing machinery of the cell.

Risk assessment

An organized process used to describe and estimate the likelihood of adverse health outcomes from environmental exposures to chemicals. The four steps are hazard identification, dose-response assessment, exposure assessment, and risk characterization (Commission 1997a).

Risk characterization

The risk characterization integrates information from the preceding components of the risk assessment and synthesizes an overall conclusion about risk that is complete, informative and useful for decision makers (USEPA 2000c).

Risk communication

Actions, words, and other messages, responsive to the concerns and values of the information recipients, intended to help people make more informed decisions about threats to their health and safety.

Risk communication is the formal and informal process of communication among and between regulatory agencies and organizations responsible for site assessment and management, and the various parties who are potentially at risk from or are otherwise interested in the site.

Risk management

The process of identifying, evaluating, selecting, and implementing actions to reduce risk to human health and to ecosystems. The goal of risk management is scientifically sound, cost-effective, integrated actions that reduce or prevent risks while taking into account social, cultural, ethical, political, and legal considerations (Commission 1997a).

RNA – ribonucleic acid

Single-stranded nucleic acid that is transcribed from DNA and thus contains the complementary genetic information.

Ruminant
An animal that digests plant matter in a process which allows microbes to break the cellulose and hemicellulose in the plant matter into digestible break-down products.

S

Sample extent
The observation domain or area of characterization. It can be defined by the spatial boundary of a site or the duration of sampling.

Sample interval
The sampling distance or frequency data are collected. A sampling interval can be regular (for example, equal-spaced sampling grid or time intervals) or irregular (for example, nested sampling intervals or time steps).

Sample support
The larger mass, length, area, or time represented by a smaller sample or group of composite samples.

Sampling optimization
Improving the spacing, timing and number of sample observations to adequately and defensibly characterize a site. Sampling optimization is geared towards optimizing the cost, time and manpower associated with field sampling efforts.

Saturation
Represents the proportion of the subsurface pore space within a REV that is occupied by a fluid (either DNAPL, air, or water), ranging from 0 to 1.0. When multiple fluids are present, the sum of all fluid saturations equals 1.0. DNAPL saturation very rarely approaches 1.0, because the NAPL typically shares pore spaces with water or air, and most porous media are water wetting.

Screening
The comparison (by ratio, usually the environmental medium concentration divided by a benchmark, standard, criterion, or similar value) of site conditions to a screening value. Often this is synonymous with “compare to a list that is readily available.”

Search neighborhood
The search neighborhood defines the area over which data points are considered when interpolating a value at a new location.

Secondary correlated data
Both qualitative information such as the location of a physical barrier or soil type, and quantitative data such as concentrations of another contaminant or mineral, or quantitative data (proxy data) collected by a different method from the primary data being modeled.

Secondary porosity
The openings or discontinuities in a rock matrix caused by breakage, fracture, or dissolution, which are further subdivided by origin as faults, joints, or karst channels (ITRC 2011b, p. 12).

Secondary stationarity
Assumes the mean and covariance of a population are consistent over space and time.

Sediment erosion and deposition assessment (SEDA)
A formal process that: 1) Identifies processes/mechanisms that might result in erosion and deposition; 2) Determines the most appropriate methods to assess erosion and deposition; and 3) Quantifies erosion and deposition under varying flow conditions.

Sediment quality guideline (SQG)
Same as SQV except a guideline is typically issued by a regulatory agency or, in rare cases, promulgated via a state law.

Sediment quality objective (SQO)
Same as SQV and SQG in some state-specific standards and rules.

Sediment quality value (SQV)
A numerical (bulk concentration) benchmark below which a lesser adverse effect (or no adverse effect) is anticipated and above which a greater adverse effect is anticipated sequestration. The act of segregation. In environmental terms this usually refers to separation of materials by use of various technologies. Carbon sequestration refers to the capture and removal of of $CO_2$from the atmosphere through biological or physical processes.

Sedimentation

The process of depositing entrained particles from water.

Seepage velocity

The rate of movement of fluid particles through porous media along a line from one point to another.

Seiche

When wind drives water to one side of a water body thus increasing water levels and causing the potential for flooding. This effect can be significant in large lakes such as the Great Lakes.

Semi-passive

Requiring some mechanical and/or energy to operate such as timed valves ort dosing pumps, but not major pieces of equipment.

Sensitivity

Sensitivity is the smallest amount of a substance in a sample that can accurately be measured by an assay.

Sequestration

The act of segregation. In environmental terms this usually refers to separation of materials by use of various technologies. Carbon sequestration refers to the capture and removal of of CO2 from the atmosphere through biological or physical processes.

Simple geospatial methods

Methods that are computationally simple, so that large data sets can be efficiently mapped. These methods have no spatial correlation or statistical error model and only require that the data are related in space or time, or both.

Skewness

A measure of asymmetry of a data set (Unified Guidance).

Slope factor

An upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg-day, is generally reserved for use in the lowdose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100 (USEPA 2013).

Sludge

A watery semi-solid.

Smoothing interpolators

Another term for inexact interpolators, because they produce smoother surfaces with fewer discontinuities that better reflect the spatial correlation of the broader data set.

Soil pore space

The air- or water-filled space that is between soil particles.

Soil screening level

See “Regional Screening Table” at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Solidification

To make solid, compact, or hard, to make strong or united, or to become solid or united

Solubility product (Ksp)

The equilibrium constant used to determine the amount of a chemical in solution. The value is related to the product of multiplying the molar concentrations of what dissolves, so the smaller the value, the less is the dissolved concentration.

Sorption

The uptake of a solute by a solid.

The process in which one substance takes up or holds another; adsorption or absorption.

Source control

Those efforts that are taken to eliminate or reduce, to the extent practicable, the release of COCs from direct and indirect ongoing sources to the aquatic system being evaluated.

Source strength

Mass discharge at the source zone.

Spatial component

That part of a description that defines an object’s position or location.

Spatial correlation

A relationship between a measured factor such a mineral concentration and its location.

Spatial trend

The differences in values between points across a sampled area. The spatial trend represents local average of the data as a function of the location. Large-scale variation.

Species

The lowest taxonomic rank, and the most basic unit or category of biological classification. (www.biology-online.org)

Specific discharge

An apparent velocity calculated from Darcy's law, specific discharge represents the flow rate at which water could flow in an aquifer if the aquifer were an open conduit.

Specificity

Analytical specificity is the ability of an assay to measure a particular constituent or parameter rather than others in a sample.

Splines

The result of a function which creates a contour between sampled data points.

Stable isotope probing (SIP)

A synthesized form of the contaminant containing a stable isotope (e.g., ^{13}C label) is added. If biodegradation is occurring the isotope will be detected in biomolecules (e.g., phospholipids, DNA).

Stable isotopes

Forms of an element that do not undergo radioactive decay at a measureable rate.

Stakeholder

Affected tribes, community members, members of environmental and community advocacy groups, and local governments.

A stakeholder is anyone who has a "stake" in the development, outcome or decisions made as a result of a risk assessment. A stakeholder can be a person, a group, or an organization that is either affected, potentially affected, or has any interest in the project 187 or in the project's outcome, either directly or indirectly (Commission1997a; Commission 1997b; NRC 1996; NRC 2009).

Stationarity

The assumption that the statistical characteristics of a population do not change over time or space. That is the statistical properties of a distribution, such as the mean and variance, are translation invariant.

A distribution whose population characteristics do not change over time or space (Unified Guidance).

Stoichiometry

The relative quantities of molecules involved in a reaction.

Subchronic toxicity values

Toxicity values typically used for exposure durations ranging from 2 weeks to 7 years, and are not used for children ages 0-6.

Substrate

Any substance that is acted upon by an enzyme.

Either (a) a chemical which reacts or (b) a solid surface or (c) an electron donor.

Successive alkalinity producing systems (SAP)

An engineered treatment system that uses an organic substrate to drive microbial reactions to reduce the concentration of free oxygen, followed by a carbonate source to increase alkalinity in mining-influenced water. Also called a reducing alkalinity producing system and also called a vertical flow pond.

Sulfate reducing bacteria (SRB)

Single-celled organisms in the bacteria domain which are able to use sulfate as an electron acceptor.

Sulfate reducing bioreactor (SRBR)

An engineered treatment system that uses an organic substrate to create sulfate reducing conditions and drive microbial and chemical reactions to reduce concentration of metals, acidity, and sulfate in mining-influenced water.

Sulfate reduction

The stripping of oxygen atoms from sulfate (SO_4^{2-}), most often yielding sulfide (S^{2-}) as an ultimate product.

Sulfhydryl

Thiol is a compound that contains the functional group composed of a sulfur atom and a hydrogen atom (-SH). Being

the sulfur analogue of an alcohol group (-OH), this functional group is referred to either as a “thiol group” or a “sulfhydryl group.”

Superfund Amendments and Reauthorization Act (SARA)

Passed in 1986, SARA provides cleanup standards and stipulates rules through the National Contingency Plan for the selection and review of remedial actions. It strongly recommends that remedial actions use on-site treatments that “permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances” and requires remedial action that is “protective of human health and the environment, that is cost-effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.”

Supersaturated

Present in a nonequilibrium condition where the concentration is above the saturation limit.

Surface Mining Control and Reclamation Act (SMCRA)

Passed in 1977, it regulates coal surface mining on private lands and strip mining on public lands. Prohibits surface mining in environmentally sensitive areas.

Survey mode

A data collection scheme in which the user scans the ground with a sensor to accomplish 100% coverage (also referred to as a reconnaissance survey, dynamic survey, or detection survey).

Suspended solids (SS)

The weight of material able to sediment out of a stated volume of water. The amount of suspended solids is usually determined by filtering water through a pre-weighed 0.45-µm pore-diameter filter, drying the filter, and determining the mass gained.

Synergistic effects

Effects from exposure to multiple chemicals that lead to an increased response that exceeds what would be estimated for exposure to each chemical independently (USEPA 2014e) (for example, 2 + 2 = 20).

Synoptic

A general view of the whole

Syntrophic population

Microorganisms that are associated or mutually dependent upon one another.

Systematic planning

A planning process that is based on the scientific method. It is a common-sense approach designed to ensure that the level of detail in planning is commensurate with the importance and intended use of the data, as well as the available resources. Systematic planning is important to the successful execution of all activities at hazardous waste sites, but it is particularly important to dynamic field activities because those activities rely on rapid decision-making. The data quality objective (DQO) process is one formalized process of systematic planning. All dynamic field activities must be designed through the use of systematic planning, whether using DQO steps or some other system. See also Data Quality Objective (USEPA 2015h).

T

Target-of-interest

Items that must be correctly classified and excavated to accomplish site remediation goals. All munitions, QC and QA seeds, and other items designated by the site team, such as significant pieces of munitions, are targets of interest. Some site teams may even include selected fuzes and other components to the TOI list. Munitions do not have to contain high-explosive filler to be classified as TOI; anything that must be excavated and examined to determine whether it is hazardous should be included in the definition of TOI.

Temporal component

That part of a description that defines an object or activity in regard to time.

Temporal variogram

A measure of how the data are related by time, a temporal variogram is a plot of the differences between measured values as a function of time between sampling events.

Terminal electron acceptors

Compounds used by microorganisms to support respiration. In aerobic organisms the terminal electron acceptor is

oxygen (O_2). Anaerobic organisms use compounds other than O_2. These include common naturally–occurring compounds such as nitrate (NO_3^-) or sulfate (SO_4^{2-}) or anthropogenic contaminants such as chlorinated ethenes (e.g. perchloroethylene). Atoms from electron acceptors are typically not incorporated into biomolecules made by organisms that reduce these compounds during respiration.

Terminal restriction fragment length polymorphism (T-RFLP)

A nucleic acid (DNA or RNA)-based technique used to generate a genetic fingerprint of the **microbial community and potentially identify dominant microorganisms.**

Tessellation

The covering of a surface with a pattern of flat shapes so that there are no overlaps or gaps.

Tortuosity

The ratio of the diffusivity in free space to the diffusivity in the porous medium.

Total dissolved solids (TDS)

The weight of matter, including both organic and inorganic matter, dissolved in a stated volume of water. Often used as a surrogate for the concentration of salts in solution. The amount of dissolved solids is usually determined by filtering water through a glass or 0.45- µm pore-diameter micrometer filter, weighing the filtrate residue remaining after the evaporation of the water, and drying to constant weight.

Total maximum daily load (TMDL)

A maximum amount of pollutant(s) that can be present in a body of water without exceeding regulatory limits.

Total petroleum hydrocarbons

The sum total of all compounds composed of hydrogen and carbon in petroleum including all aliphatic and aromatic components.

Total suspended solids (TSS)

The weight of material able to sediment out of a stated volume of water. The amount of suspended solids is usually determined by filtering water through a pre-weighed 0.45-µm pore-diameter filter, drying the filter to constant weight, and determining the mass gained.

Toxic Substances Control Act (TSCA)

Enacted in 1976 this act requires premarket notification of EPA by the manufacturer of a new chemical. Based on testing information submitted by the manufacturer or premarket test ordered by EPA (including biodegradability and toxicity), a court injunction can be obtained barring the chemical from distribution or sale. EPA can also seek a recall of chemicals already on the market. This act prohibits all but closed-circuit uses of PCBs.

Toxicity assessment

The combination of the hazard identification and the dose response assessment.

Toxicity unit

A unit formerly synonymous with “minimum lethal dose” but which, because of the instability of toxins, is now measured in terms of the quantity of standard antitoxin with which a toxin combines.

Toxicity values

Derived values (for example, reference doses and slope factors) that can be used to estimate the incidence or potential for adverse human health effects in receptor (USEPA 2015h).

Transcription

The first step in activation of a biochemical pathway where a complementary RNA copy is synthesized from a DNA sequence.

Translation

The second step of gene expression where messenger RNA (mRNA) produced by transcription is decoded by the cell to produce an active protein

Transport aperture

Solute transport apertures can be determined based on the behavior of solute transport through the fracture.

Trophic interactions

The interactions among producers and organisms that consume and decompose them.

Trophic magnification factor or food-web magnification factor (TMF or FWMF)

The average factor by which the normalized chemical concentration in biota of a food web increases with each increase in trophic level. The TMF is determined from the slope (m) derived by plotting the logarithmically transformed (base 10) lipid-normalized chemical concentration in biota vs. the trophic position of the sampled biota

(as TMF = 10m). Unitless.

U

Uncertainty

The lack of perfect knowledge of values or parameters used in a risk assessment. Uncertainty may be reduced by collection of additional data.

Unexploded ordnance (UXO)

Explosive weapons (such as bombs, bullets, shells, grenades, land mines, naval mines) that did not explode when they were used and still pose a detonation risk, potentially many decades after they were used or discarded.

V

Vadose zone

The unsaturated zone of soil in which the pore space is filled with both air and water.

Validation

A geospatial model assessment method that is implemented by dividing the observed data set randomly into two data sets and then using each set to calculate predicted values for the other set.

Vapor control technologies

Technologies employed to mitigate real or potential impacts from vapor intrusion.

Vapor intrusion

The process by which volatile vapors partition from contaminated groundwater or other subsurface sources and migrate upward through vadose zone soils and into overlying buildings.

Vapor pressure

Vapor pressure is the pressure exerted by the vapor phase of a substance at equilibrium with the pure condensed (solid or liquid) phase in a closed system.

Variability

A population’s natural heterogeneity or diversity, particularly that which contributes to differences in exposure levels or in susceptibility to the effects of chemical exposures (Commission 1997a). For example, workers may perform different functions that may affect time, frequency, and duration of contact with an environmental medium). Variability cannot be reduced by collection of additional data.

Vertical flow pond (VFP)

An engineered treatment system that uses an organic substrate to drive microbial reactions to reduce the concentration of free oxygen, followed by a carbonate source to increase alkalinity in mining-influenced water. Also called a successive alkalinity producing system and also called a reducing alkalinity producing system.

Vertical screening distance

The minimum distance in soil between a petroleum vapor source and building foundation needed to effectively biodegrade hydrocarbons below a level of concern for PVI.

Vertical separation distance

The vertical distance from a petroleum vapor source to a building foundation.

Viable biomass

In this context, viable biomass refers to living microorganisms (capable of metabolism and/or reproduction).

Viscosity (dynamic)

Represents the thickness or resistance to shear (flow) of the fluid. For example, honey is more viscous than water, which is more viscous than air.

Volatile suspended solids (SS)

The weight of material able to sediment out of a stated volume of water which will, effectively, burn away. Generally used as an estimate of the mass of organic particulate matter such as biomass. The amount of volatile suspended solids is usually determined by filtering water through a pre-weighed 0.45-µm pore-diameter filter, drying the filter, and determining the mass lost when the filter is incubated at 500 C or higher

Volatility

Represents the tendency of the DNAPL chemical constituents to evaporate into the vapor phase.

W

Water column

1) The basic habitat and the medium through which all other fish habitats are connected; 2) a conceptual column of water from surface to bottom sediments. This concept is used chiefly for environmental studies evaluating the stratification or mixing (such as by wind induced currents) of the thermal or chemically stratified layers in a lake, stream or ocean. Some of the common parameters analyzed in the water column are: pH, turbidity, temperature, salinity, total dissolved solids, various pesticides, pathogens and a wide variety of chemicals and biota. Understanding water columns is important, because many aquatic phenomena are explained by the incomplete vertical mixing of chemical, physical or biological parameters. For example, when studying the metabolism of benthic organisms, it is the specific bottom layer concentration of available chemicals in the water column that is meaningful, rather than the average value of those chemicals throughout the water column.

Water column transport

Movement within a water column due to changes in certain parameters (see water column).

Wettability

Represents whether a fluid is wicked into or repelled out of the subsurface media, and is defined by the contact angle of the DNAPL fluid against the matrix materials in the presence of water. Wettability is a combined property of the DNAPL and the subsurface formation materials, and can be affected by chemistry and the presence of co-contaminants. In the example in Figure 2-2 of this guidance document, the solid surface has sufficient attractive force to overcome the surface tension of the low-surface-tension droplet on the right, and the droplet is stretched out into a thin wetting layer. The solid surface energy is not high enough to overcome the high surface tension of the droplet on the left and wetting does not occur.

Whole cell

The entirety of a microbial cell, without extraction of DNA, RNA, or similar. A whole-cell preparation does not modify the cell but evaluates it as unit.

Whole effluent toxicity (WET)

Aggregate toxic effect to aquatic organisms from all pollutants contained in a facilities wastewater (EPA, http://water.epa.gov/scitech/methods/cwa/wet/)

Z

Zeolites

Microporous, aluminosilicate minerals commonly used as commercial adsorbents