# Glossary of Technical Terms Related to Pall/Gelman Sciences

***1,4-Dioxane***
(Also diethylene dioxide, diethylene ether, diethylene oxide). A colorless, flammable and water-miscible solvent. Dioxane is a solvent classified by the EPA as a probable human carcinogen (Group 2B), and some research suggests that it may suppress the immune system; it is also being investigated as a mutagen.

Generic residential and commercial I Cleanup criterion for 1,4-Dioxane in groundwater (GRCC) in Michigan is 85 ppb and the groundwater-surface water interface criterion for discharge to surface water bodies is 2800 ppb.

***Advection***
One of two processes by which substances are transported in a fluid. Advective transport is the bulk movement of a substance as a direct result of movement of the fluid elements**.**

***Aerobic biodegradation***
Process by which microbes decompose complex organic compounds in the presence of oxygen and use the liberated energy for reproduction and growth. At waste sites or in groundwater, aerobic bacteria use oxygen as an electron acceptor, and break down organic chemicals into smaller organic compounds, often producing carbon dioxide and water as the final product. Aerobic biodegradation is also known as aerobic respiration. Aerobic biodegradation is an important component of the natural attenuation of contaminants at many hazardous waste sites.

***Anaerobic biodegradation***
Reduction of the volume and change in chemical composition of organic matter caused by microorganisms in an oxygen-free environment. Some anaerobic bacteria use nitrate, sulfate, iron, manganese, and carbon dioxide as their electron acceptors, and break down organic chemicals into smaller compounds, often producing carbon dioxide and methane as the final products. Anaerobic biodegradation is an important component of the natural attenuation of contaminants at many hazardous waste sites.

***Attenuation***
Reduction in mass or concentration of a compound in groundwater over time or distance from the source of constituents of concern due to naturally occurring physical, chemical, and biological processes, such as; biodegradation, dispersion, dilution, adsorption, and volatilization.

***Aquifer***
A layer or layers of rock or other geological strata below the surface of the ground that is porous enough to allow a significant flow of groundwater and may be used for a well.

***Aquitard***
Geological formation that may contain groundwater but is not capable of transmitting significant quantities of it under normal hydraulic gradients. May function as a confining layer.

***Area of Concern (AOC)***
An environment identified as a potential pollution risk.

***Bedrock***
A general term for the rock layer that lies beneath soil, loose sediments, or other unconsolidated material. Groundwater often is found in the bedrock layer.

***Biodegradation***
The breakdown of organic materials into simpler components by microorganisms.

***Borehole***
Hole made by inserting a hollow tube with drilling equipment to draw up a core of soil. The soil samples are collected for testing to determine the site geology and to learn if the soil has been contaminated.

***Boring (or soil boring)***
A circular hole made in the ground by an auger or mechanical drill rig to collect soil samples deep in the ground. Representative samples are collected for testing to see if the subsoil has been contaminated. Sometimes these borings are converted into groundwater monitoring wells.

***Boring logs***
The record of formations penetrated, drilling progress, record of depth of water, location of contaminants, and other recorded information having to do with the drilling well.

***Carcinogen***
A substance that causes cancer.

***CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)***
Federal law passed in 1980 that created a tax to fund Superfund, a trust fund used to investigate and clean up abandoned or uncontrolled hazardous waste sites.

***Clean Water Act (CWA)***
The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. (The Act does not deal directly with groundwater or water quantity issues). The law employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff.

***Cleanup process***
A comprehensive program for the clean up (or remediation) of a polluted site. It involves investigation, analysis, and development of a cleanup plan and implementation of that plan.

***Confined aquifer***
An aquifer in which groundwater is contained under pressure that is significantly greater than atmospheric pressure.

***Contaminant Fate and Transport***
How a chemical changes and moves in the environment.

***Contamination***
Introduction of a substance to an environment where it does not belong at levels that might cause harmful health effects.

***Detection limit***
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

***Dispersivity***
A scale-dependent property of an aquifer that determines the degree to which a dissolved constituent will spread in flowing groundwater. Dispersivity is comprised of three directional components - longitudinal, transverse and vertical.

***Dissolution***
A procedure by which one substance is dissolved in another to form a solution.

***Drawdown***
The drop in the water table or level of water in the ground when water is being pumped from a well.

***Ecological risk assessment***
Evaluation of actual and predicted effects of contaminants on animal and plant populations and their habitats or communities. An ecological risk assessment does not evaluate the impact of contaminants on humans and domestic animals.

***Environmental receptors***
Any organism, including site employees, building occupants, the public at large, the atmosphere, animals, plants and microorganisms that may be affected by a release of a contaminant or pollutant.

***Equivalent drinking water levels (EDWL)***
A standard of protection to prevent exposure to potentially non-carcinogenic or carcinogenic chemicals in potable water. EDWLs are derived using EPA toxicity standards for chemicals *without* established MCLs.

***Exposure Assessment***
The process of identifying how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

***Exposure pathways***
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it.

***Ex-situ***
Ex-situ is Latin for "out of place." Ex-situ cleanup strategies for environmental media that involve excavating or otherwise removing the contaminated media, treating where appropriate, and disposing of these wastes in a facility that isolates the waste from the environment.

***Extraction Well***
A well used for the extraction (or pumping) of groundwater, usually as part of a remedial or removal action

***Facility***
A facility is defined by the boundaries of an area in which one or more sources of pollution may be located.

***Feasibility Study***
A preliminary study performed to collect information to support the choice of a cleanup remedy to reduce or eliminate the risks associated with contamination at a site.

***Gamma logging***
Gamma logging of a well records the natural gamma radiation generated by sediments penetrated by the well. The gamma ray detection tool (similar to a Geiger counter) is lowered to the bottom of the well on a wireline. It is then pulled out of the well at a constant speed while the number of gamma ray counts per second is recorded. Plots of gamma ray counts as a function of depth thus provide a log of subsurface properties that can be used to infer hydraulic characteristics (sediments containing abundant clays yield high gamma ray counts and are inferred to be aquitards, while well sorted quartz sands or gravels yield low gamma ray counts and are inferred to be aquifers) or correlate aquifer and aquitard units between wells.

***Geology***
Study of rocks, rock formations, and the structure of the earth.

***Geomorphic:***
Relating to the form or surface features of the earth or other celestial body (such as the moon).

***Geophysical study***
Methods of investigating the formations below the ground surface that involve the analysis of electrical measurements on the land surface or the analysis of subsurface vibrations that are created by an energy source on the land surface.

***Geoprobe***
A machine used to make soil borings and to create temporary groundwater monitoring wells.

***GRCC – Part 201 generic residential and commercial I cleanup criterion for groundwater***
The concentration of a hazardous substance in groundwater that is protective for human consumption; for 1,4-dioxane, 85 ppb.

***Groundwater Discharge***
The removal of water from the saturated zone is called groundwater discharge. The discharge area is the geographic area in which the removal occurs.

***Groundwater Recharge***
Land surfaces where water enters the ground and replenishes groundwater. This process occurs naturally when precipitation infiltrates down through the soil or rock into an aquifer. It can also occur unnaturally as artificial recharge.

***Groundwater***
The supply of fresh water found beneath the earth's surface that supplies wells and springs. Because groundwater is a major source of drinking water, there is concern over contamination from leaching pollutants and leaking tanks.

***Groundwater-surface water interface criterion***
The concentrations of a hazardous substance in groundwater, per Part 201, that are protective of surface water to which the groundwater discharges; for 1,4-dioxane, 2,800 ppb.

***Half-life***
The time required for the amount of a reactant to decrease to half its initial value.

***Hazardous Waste***
Byproducts of society that can pose substantial or potential harm to human health or the environment when improperly managed. Possesses at least one of four characteristics (flammable, corrosive, reactive, or toxic), or appears on special EPA lists.

***Henry's Law***
A law formulated by English chemist William Henry that states that the amount of a gas that will be absorbed by water increases as the gas pressure increases.

***Hollow stem auger drilling***
Conventional drilling method that uses a rotary drill with a screw device (auger) to penetrate the soil. As the augers are rotated, soil cuttings are conveyed to the surface by auger spirals.

***Hydraulic conductivity***
The ability of an aquifer to transmit water. Aquifers with high hydraulic conductivity yield and transmit more water than similar aquifers with low hydraulic conductivity.

***Hydraulic gradient***
In general, the direction of groundwater flow due to changes in the depth of the water table.

***Hydrogen Peroxide***
A viscous liquid with strong oxidizing properties; a powerful bleaching agent; also used as a disinfectant and (in strong concentrations) as an oxidant in rocket fuels

***Hydrogeology***
The geology of ground water, with particular emphasis on the chemistry and movement of water.

***Hydrolysis***
The decomposition of organic compounds by interaction with water.

***Impermeable***
Not easily penetrated. The property of a material or soil that does not allow, or allows only with great difficulty, the movement or passage of water.

***Industrial waste***
Unwanted materials from a manufacturing or similar operation; they may be liquid, sludge, solid, or hazardous waste.

***Infiltration***
The penetration of water through the ground surface into sub-surface soil, or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls.

***Injection Well***
A well into which fluids are injected for purposes such as disposing of waste and introducing reagents for purposes of destroying contaminants in groundwater.

***Inorganic compounds***
Compounds that either do not contain carbon or do not contain hydrogen along with carbon. Inorganic compounds include metals, salts, and various carbon oxides (carbon monoxide, carbon dioxide). These compounds do not combust in incinerators.

***In-situ***
Refers to treatment of contaminated areas without excavation or other removal, as in the in-situ treatment of soils through biodegradation of contaminants.

***Institutional Controls***
Legal controls intended to influence human activities in such a way as to prevent or reduce exposure to hazardous wastes or hazardous constituents that are left on a site following active cleanup work.

***Interim (Permit) Status***
Period during which treatment, storage and disposal facilities coming under RCRA in 1980 are temporarily permitted to operate while awaiting a permanent permit. Permits issued under these circumstances are usually called "Part A" or "Part B" permits.

***Isotropy***
The condition in which the hydraulic or other properties of an aquifer are the same in all directions.

***Land treatment***
Any activity or project to improve conservation of soil, water, or other resources and improve productive use of the resource.

***Limit of detection***
The minimum concentration of a substance being analyzed test that has a 99 percent probability of being identified.

***Longer-Term Exposure***
Repeated exposure by the oral, dermal, or inhalation route for more than 30 days, up to approximately 10% of the life span in humans (more than 30 days up to approximately 90 days in typically used laboratory animal species).

***Maximum Contamination Level (MCL)***
The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards designed to protect drinking water.

***Miscible***
A material that mixes readily with water. Two liquids are considered "miscible" or mixable if shaking them together results in a single liquid phase, with no visible boundary between layers of liquid.

***Mineralization***
A chemical process that converts organic materials into inorganic forms.

***Monitored Natural Attenuation***
The testing of a contaminated site to ensure natural attenuation is occurring.

***Monitoring Well***
A well used to obtain water quality samples or measure groundwater levels. A well drilled at a hazardous waste management facility or Superfund site to collect ground-water samples for the purpose of physical, chemical, or biological analysis.

***National Pollution Discharge Elimination System (NPDES)***
The primary permitting program under the Clean Water Act, which regulates all discharges to the surface water.

***National Pollution Discharge Elimination System Permit***
A permit given through the National Pollution Discharge Elimination System that regulates quantities of discharge to surface and ground waters.

***Natural Attenuation***
A remediation strategy that relies on natural processes to clean up or attenuate pollution in soil and groundwater.

***Non-Aqueous Phase Liquid (NAPL)***
Liquids, commonly a mixture of several different chemicals, that are either denser or less dense than water. Dense NAPL (DNAPL), such as chlorinated solvents, will sink if it enters groundwater; less dense, or light NAPL (LNAPL), such as gasoline, will float on the water table. NAPL in the subsurface can be a persistent source of groundwater contamination due to its low solubility and viscosity.

***Non-point source***
Starting place of pollution that is discharged into the natural water body from multiple points is called non-point source of pollution. Urban and agriculture runoff are examples of non-point source of pollution.

***Observation Well***
A non-pumping well used for observing the elevation of the water table or the piezometric pressure.

***Organic compounds***
Naturally occurring (animal, plant-produced or synthetic) substances containing mainly carbon, hydrogen, nitrogen, and oxygen.

***Oxidant***
A substance that oxidizes another substance.

***Oxidize***
To chemically transform a substance by combining it with oxygen. In treatment systems at contaminated sites, contaminants are destroyed by oxidizing them.

***Ozone***
A gas that is a variety of oxygen. The oxygen gas ($O_2$) found in the air consists of two oxygen atoms stuck together; this is molecular oxygen. Ozone consists of three oxygen atoms stuck together into an ozone molecule (or $O_3$).

***Ozonation***
The use of ozone for water purification.

***Parts per billion (ppb)***
The concentration of a substance in air, water or soil. One ppb means that there is one part of a substance for every billion parts of the air, water or soil in which it is measured. One ppb is about one drop of dye in 18,000 gallons of water or about one second in 32 years. One ppb is 1,000 times less than one part per million.

***Parts per million (ppm)***
The concentration of a substance in air, water or soil. One ppm means that there is one part of a substance for every million parts of the water or soil in which it is measured. One ppm is about one drop of dye in 18 gallons of water, about one inch in 16 miles, or one penny in $10,000.

***Part 201 Rules***
The Part 201 Administrative Rules issued by DEQ under Part 201 establish standards and processes for remedying contamination intended to protect public health, safety and welfare, and the environment.

***Part 201***
The Environmental Remediation section of the NREPA is the primary Michigan law-governing cleanup of environmental contamination sites.

***Permeable***
A property of a material or soil that allows the movement or passage of water.

***Peroxone***
A mixture of ozone and hydrogen peroxide.

***pH***
A logarithmic scale used to describe the acidity or alkalinity of a solution. Water has a neutral pH of 7. A pH below 7 is acidic; a pH above 7 is alkaline (or basic).

***Phase I Environmental Assessment***
Determining if hazardous substances may have been released onto a property. Includes historical use of property and a visual inspection.

***Phase II Environmental Assessment***
Determine if a property meets the definition of a "facility" under Federal law and developing enough information to prepare a study of the property for a possible due-care compliance plan under the law.

***Piezometer***
An instrument for measuring the pressure of liquids, especially of the water pressure in an aquifer.

***Piezometric head***
The measure of the pressure in the aquifer.

***Piezometric surface***
An imaginary surface formed by measuring the level to which water will rise in wells of a particular aquifer. For an unconfined aquifer the piezometric surface is the water table; for a confined aquifer it is the static level of water in the wells. (Also known as the potentiometric surface.).

***Plume***
In groundwater or surface water, a visible or measurable discharge of a contaminant from a given point of origin.

***Point source***
Any specific starting place of pollution discharge, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or watercraft.

***Potentiometric Surface Map***
The map of surfaces to which water in an aquifer can rise by hydrostatic pressure.

***Purge Well***
A well used for the purpose of extracting and treating water from a contaminated aquifer

***Reactivity***
The tendency of a compound to chemically react with other substances or itself, resulting in the release of energy. Can cause the formation of toxic or corrosive materials, pressure buildup, and temperature changes.

***Recalcitrant Compound***
Compounds resistant to degradation/transformation.

***Remedial Action Plan***
A work plan for the cleanup, removal, containment, isolation, treatment, or monitoring of hazardous substances released into the environment. Or taking actions to prevent, minimize, or reduce injury to the public or environmental health from a release of a hazardous substances or a potential release of a hazardous substance.

***Remedial Technologies***
Techniques that can be used either individually or in combination to control risks to human health and the environment and satisfy the remedial action objectives unique to each contaminated site.

***RCRA (Resource Conservation and Recovery Act)***
RCRA is a Federal law that established a regulatory system to track hazardous substances from their generation to their disposal. It requires the use of safe and secure procedures in treating, transporting, storing and disposing of hazardous substances.

***Risk Assessment***
A scientific process that estimates the type and magnitude of risk to human health posed by exposure to chemical substances.

***Risk-based Cleanup Standards***
A remediation requirement based on public health and environmental risks specific to a site.

***Rotosonic drilling***
Combines downward pressure, pipe rotation, and high frequency vibration to drill through sediments while simultaneously producing a continuous sediment core.

***Saturated zone***
A geological area below the ground surface in which all pores and cracks are filled with water under pressure equal to or greater than that of the atmosphere.

***Screening levels/ intervals***
The intervals in a groundwater monitoring well where the samples are taken or the interval between the upper and the lower extents of the screen of a groundwater well through which the sample is taken. Maximum screening interval usually is 5 ft.

***Semi Volatile Organic Compound (SVOCs)***
A substance that evaporates slowly at standard temperature (20° C).

***Simulprobe***
Simulprobe operations are conducted to obtain groundwater samples at different depths as a well is being drilled. After reaching the depth of interest, drilling is suspended while the simulprobe device is driven into the bottom of the well. Upward pressure is then exerted on the device to expose a screen through which a groundwater sample is drawn into a chamber in the tool. The device is then retrieved; the water sample is collected for laboratory analysis; and drilling is resumed.

***Site Assessment***
A site assessment is a determination if a hazardous substance was released, the level of detectable contaminant, and the likely spread of the hazardous or potentially hazardous pollutant.

***Soil boring (or boring)***
A circular hole made in the ground by an auger or mechanical drill rig to collect soil samples deep in the ground. Representative samples are collected for testing to see if the subsoil has been contaminated. Sometimes these borings are converted into groundwater monitoring wells.

***Sorption***
The action of soaking up or attracting substances; process used in many pollution control systems. The term is often used to describe the ability of a contaminant to remain sorbed to (or stuck to) another substance (e.g., soil particles).

***Steady State***
Steady state refers to the values of the variables within the system such as volume, concentration, etc. not changing over time. This happens when the inputs and outputs to a system.

***Stochastic Approach***
In groundwater modeling, stochastic refers to a dynamic model that may produce multiple possible outcomes from which decision makers can select.

***Surface Water***
All water naturally open to the atmosphere (water creeks, rivers, lakes, reservoirs, ponds, streams, seas, estuaries).

***Test Well***
A well that is used to obtain information on groundwater quantity, quality, or aquifer characteristics for the purpose of designing or operating a water supply well.

***Threshold Limit Value (TLV)***
Recommended guidelines for occupational exposure to airborne contaminants published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs represent the average concentration in $mg/m^3$ for an 8-hour workday and a 40-hour work week to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

***Toxicity***
A measure of the poisonous or harmful nature of a substance.

***Transmissivity***
It is the ability of an aquifer to transmit water. The rate of flow of water through a vertical strip of aquifer that is one unit wide and extends the full saturated-depth of the aquifer.

***Trench***
Linear hole or pit into which a new pipe (for example, water supply pipes) will be inserted or an existing pipe will be serviced.

***Turbidity***
The cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter, or tiny substances.

***Unsaturated Zone***
The unsaturated zone is the area between the land surface and the uppermost aquifer (or saturated zone). The soils in an unsaturated zone may contain air and some water.

***Upper till***
Directly overlying the lower till is the upper till. This geology layer is similar to the lower till in sand-silt clay percentages in the surrounding substance, or matrix. It is very soft by comparison, often appears to be less stony (fewer pebble and gravel-size sediment) than the lower till, and is characteristically more plastic.

***Volatile Organic Compound (VOC)***
Any organic compound that evaporates readily to the atmosphere. VOCs contribute significantly to photochemical smog production, air pollution and certain health problems.

***Volatilization***

Process during which a substance changes from the liquid to the gaseous state.

***Volumetric Flux***
Volumetric Flux refers to a volume of water per unit time crossing a defined area essentially a flow rate. Because groundwater flows primarily in the horizontal direction, flux crossing an area defined within a vertical plane is of primary interest.

***Wastewater***
Spent or used water from an individual home, community, farm or an industry that contains dissolved or suspended substances.

***Water Table***
The upper surface of the saturated zone in aquifers that are not confined by impermeable geologic material.

***Wellhead Protection Area***
A protected surface and subsurface zone surrounding a well or well field supplying a public water system and designed to keep contaminants from reaching the well water.