

WATER AND WASTEWATER FUNDAMENTALS

GLOSSARY OF ACRONYMS AND TERMS

Note to User: *Every industry, field and discipline has its own language, including acronyms. The following glossary provides a guide to the terminology of the water and wastewater industries. It has been compiled from various sources and is in no way complete. The Atlantic Water and Wastewater Association (ACWWA) provides this glossary without charge as a tool to assist operators in their studies. Please address any corrections in writing to ACWWA. This document will be periodically updated.*

Acronyms

AL	Action Level. The concentration of a contaminant that triggers treatment by a water system. Action levels are reported at the 90 th percentile for homes at greatest risk.
ANSI	American National Standards Institute
AO	Aesthetic Objectives
BDOC	Biodegradable Dissolved Organic Carbon
BNR	Biological Nutrient Removal
BOD (<i>Biochemical Oxygen Demand</i>)	The rate at which organisms use the oxygen in water while stabilizing decomposable matter under aerobic conditions.
BPJ	Best Professional Judgment
BPR	Biological Phosphorus Removal
BPT	Best Practicable Technology
CBOD	Carbonaceous Biochemical Oxygen Demand at 5 days and 20 °C
CFID	Continuous feed and intermittent discharge
CSA	Canadian Standards Association
C Factor	A factor or value used to indicate the smoothness of the interior of a pipe. Related to friction loss.
COD	Chemical oxygen demand measures the amount of oxygen that is consumed by the water in the decomposition and oxidation processes, specifically the decomposition of organic matter and oxidation of inorganic matter, or chemicals.
CT Value	The concentration of a disinfectant expressed in mg/L times time expressed in minutes. Essentially a kill factor.
DAF	Dissolved Air Flotation
DBP (<i>Disinfection By-Product</i>)	Chemical compounds generated through disinfection processes.
DCS	Distributed Control System
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon

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DPD	N, N – diethyl –p – phenylene diamine - Reagent used in the analysis of residual chlorine
EPEA	Environmental Protection and Enhancement Act
F/M	Food to Microorganism ratio
FOG	Fat Oil and Grease
G	Velocity Gradient
GCDWQ	Guidelines for Canadian Drinking Water Quality
GWUDI	Groundwater under the direct influence of surface water
GIS (<i>Geographic Information System</i>)	A computer program that combines mapping with detail information about the physical location of objects within specified geographic areas.
HTH (<i>High Test Hypochlorite</i>)	Calcium hypochlorite, typically (commercially) 65% available chlorine.
Hp	horsepower
HPC	Heterotrophic Plate Count
HRT	Hydraulic Retention Time
IE	Invert Elevation
IFID	Intermittent feed and intermittent discharge
lbs/day	(lbs d) pounds per day, a chemical feed rate
IMAC	Interim Maximum Acceptable Concentration.
kW	Kilowatt
kwh	kilowatt hour
MAC	Maximum Acceptable Concentration. Expressed in mg/L unless otherwise stated.
MBR	Membrane Bioreactor
MCC	Motor Control Center
MCL	Maximum Contaminant Level. The highest level of a contaminant that is allowed in drinking water.
MCGL	Maximum Contaminant Level Goal. The level of a contaminant in drinking water below which there is no known or expected health risk.
MCRT	mean cell residence time; same as SRT
mL	milliliter

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mg/L	Milligrams per litre. Weight to volume relationship used interchangeably with ppm in water and wastewater dosage calculations.
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed Liquor Volatile Suspended Solids
MPN	(Most Probable Number) The statistical analysis for the determination of bacteriological counts.
MSHA	Mining Safety and Health Association
NFPA	National Fire Protection Association
NH3-N	Ammonia nitrogen
NIOSH	National Institute of Occupational Safety and Health
NR	Not Regulated
NSF	National Sanitation Foundation
NTU	Nephelometric Turbidity Units – units to measure turbidity.
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Association
OU	Odour Unit
pCi/L	Picocuries per litre is a measure of the radioactivity in water. A picocurie is 10 ⁻¹² curies.
PCB	Polychlorinated biphenyl
pH	Potential of hydrogen
PLC	Programmable Logic Controller
ppb	Parts per billion.
ppm	Parts per million. Same as mg/L - A weight to weight ratio used to express the number of pounds or kilograms of a chemical in a million pounds or kilograms of water.
RAS	Return Activated Sludge
QA/QC	Quality Assurance/Quality Control
RBC	Rotating Biological Contactor
SAR	Sodium Adsorption Ratio
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition

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SCBA	Self Contained Breathing Apparatus
SDS	Safety Data Sheet
SRT	Sludge Retention Time
TBOD	Total Biochemical Oxygen Demand at 5 days and 20 oC
TCU	True Colour Unit
TDS	Total Dissolved Solids
THM	Trihalomethanes. Formed through the reaction of chlorine with certain organic compounds.
TOC	Total Organic Carbon
TP	Total Phosphorus
TSS	Total Suspended Solids
TT	Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.
TTHM	Total Trihalomethanes
UC	Uniformity Coefficient
WAS	Waste Activated Sludge
WCB	Worker's Compensation Board
WHMIS	Workplace Hazardous Materials Information System

Terms

A	
Acid	A substance that contains sufficient acid components (hydrogen [H ⁺] ions) to lower the pH to less than 7.0.
Acid Treatment	Method used to loosen and remove incrustations from wells
Acidic	Having the characteristics of an acid.
Acidified	The addition of an acid to a sample to lower the pH below 2.0. The purpose is to "fix" a sample so it won't change until analyzed.
Activated Carbon	A form of particulate carbon (a crude form of graphite) with increased surface area to enhance adsorption of soluble contaminants. Activated carbon is sometimes mistakenly called charcoal or just carbon.
Acre-Foot	A volume of water that covers one acre to a depth of one foot. (43,560 cubic feet/1,233.5 cubic metres)

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Adsorption	(1) The attraction and adhesion of molecules of a gas, liquid, or dissolved substance to a surface. Adsorption is generally a passive and reversible process. Granular or powdered activated carbon is often used as an adsorption medium. (2) The interaction of an analyte with the surface of a matrix. This interaction can form the basis for the extraction of analytes from water or the chromatographic separation of compounds.
Aeration	A gas transfer unit process that allows for the adsorption of gas (frequently oxygen) by water.
Aerobic	A condition in which atmospheric or dissolved molecular oxygen is present in the aquatic environment.
Aesthetic	Describes a quality of water that is determined by the senses, e.g., colour, taste, or odour.
Aggressive	Describes a corrosive water that will cause deterioration of material such as distribution piping.
Air Gap	The space between the outlet of a pipe and the surface of the liquid into which the pipe discharges. An air gap is the most reliable method of ensuring there is no backflow from the surface into the discharging pipe.
Air Binding	The clogging of a filter, pipe or pump due to the presence of air released from the water.
Air Line	Small diameter pipe used to determine water depth in a well.
Air Padding	The practice of pumping dry air (-40°F dew point) into a container to facilitate the withdrawal of a liquid or force a liquefied gas (eg. chlorine) out of a container
Air Stripping	A treatment used to remove dissolved gases and volatile substances from water.
Air Valve	Device used to release air or allow air into piping systems.
Algae	The simplest plants that contain chlorophyll and require sunlight; they vary from microscopic forms to giant seaweed. In drinking water sources, blooms of microscopic forms (phytoplankton) cause taste and odour problems.
Algae Activity	The formation of algae blooms in water bodies.
Algaecide	Any substance or chemical specifically formulated to kill or control algae. An alternative spelling is algicide.
Algicides	Any substance or chemical specifically formulated to kill or control algae.
Aliquot	Portion of a sample; often an equally divided portion.
Alkaline	On the pH scale substances that are basic in nature
Alkalinity	Capacity of water to neutralize acids due to the presence of carbonate, bicarbonate, hydroxides, etc.; expressed in mg/L of calcium carbonate equivalent.
Alum	An aluminum sulphate compound used to cause suspended particles in the water to congeal into filterable masses or to settle to the bottom of treatment units. Formula $(Al_2(SO_4)_3 \cdot 14H_2O)$.

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- Aluminum Sulphate** An inorganic compound commonly used as a coagulant in water treatment. It contains waters of hydration, $Al_2(SO_4)_3 \cdot XH_2O$ (where X is a variable number). Aluminum sulfate is often called alum.
- Alluvial** Relating to mud and/or sand deposited by flowing water.
- Ammonia** An inorganic gas commonly detected in waste water. Ammonia may be present in drinking water that has been chloraminated, as well as in source waters. Formula: (NH_3) .
- Ammonia Compounds** Compounds containing ammonia, usually used as sources for nitrogen.
- Amorphous** Without shape of form. Usually refers to colloidal material in suspension.
- Amperometric** A measurement method that records electric current generated by a sensor. Commonly used in amperometric titration for chlorine residual analysis.
- Anaerobic** In the absence of oxygen
- Analog** The read out of an instrument by a pointer or other indicator against a dial or scale.
- Anions** Negatively charged particles.
- Annular Space** A ring shaped space located between two circular objects such as well casing and the well hole.
- Anode** The positive pull or electrode of an electrolytic system. The anode attracts anions.
- Apparent Colour** The colour of the water that includes true colour (dissolved solids) and turbidity.
- Approvals** Acceptance by governing bodies, usually governmental, of plans for new or changed operations or facilities, or their completion.
- Appurtenance** Machinery, valves, structures, components, etc. of the main system required to allow it to operate as intended but not integral to the main structure.
- Aqueous** A substance composed of, similar to, or containing water; watery.
- Aquifer(s)** A geologic formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs. A water bearing formation
- Arsenic** A naturally occurring element often associated with well water. Exceedances can cause skin damage, circulatory problems and increase the risk of cancer.
- Artesian Well(s)** A well (or wells) that flows freely, without pumping, as a result of the piezometric surface of the aquifer area being at a higher elevation than the well discharge. Artesian wells are found in mountainous areas in which the aquifer supply is confined between two impervious layers, permitting a pressurized system to exist at a higher elevation than the well discharge.
- Asbestos** A fibrous silicate mineral in the form of very fine, short fibres. If ingested, asbestos has serious health effects. The use of asbestos is generally prohibited because of the risks to health, but may exist in older installations as insulation and filter medium.

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- Aseptic** Free from the living germs of disease, fermentation or putrefaction. Sterile.
- Atom** The smallest particle of an element that still retains the characteristics of that element.
- Atomic Number** The number of protons in the nucleus of an atom.
- Atomic Weight** The sum of the number of protons and the number of neutrons in the nucleus of an atom
- Audit, Water** A process requiring the examination of water record accuracy and metering evaluation used as a tool to determine water loss in a distribution system.
- Auger(s)** A type of drill used to create holes to allow examination of subsurface soils and aquifers. Augers typically bring the subsurface material up in a continuous stream as opposed to bringing up cores.
- Available Chlorine** A measure of the amount of chlorine in chlorinated lime, hypochlorite compounds, chloramines, and other materials used for disinfection as compared to the amount in elemental (liquid or gaseous) chlorine.
- B**
- Backfilling** The placing of material into holes made in the earth during construction, inspection, repair, or subsurface exploration.
- Backflow**
A hydraulic condition, caused by pressure differential, resulting in non-potable water or other fluid flowing into a potable water system.
- Backpressure** A pressure that can cause water to backflow into the water supply when a user's water system is at a higher pressure than the public water system.
- Backsiphonage** A form of backflow caused by a negative or sub-atmospheric pressure within a water system.
- Backwash** The process of cleaning a filter by reversing flow (backwards) through the filter.
- Bacteria** Microscopic unicellular organisms having a rigid cell wall. Most are nonphotosynthetic; photosynthetic forms do not contain plant-type chlorophyll.
- Barrel(s)** *Abbreviation bbl.* A unit of volume, frequently 42 U.S. gallons (158.97 litres) for petroleum, or 55 U.S. gallons (208.175 litres) for water.
- Base** Any substance that releases hydroxyl ions (**OH⁻**) when it dissociates in water
- Basic** A substance that contains insufficient acid components (hydrogen [H⁺] ions) to lower the pH to less than 7.0. In practical terms, describes a solution with a pH greater than 7.0.
- Beaver Fever (*Giardia*)**
Common name of the human diarrheal disease caused by *Giardia lamblia*, a pathogenic protozoan.
- Becquerel (Bq) Unit**
The unit of activity of a radioactive substance, or the rate at which transformation occur on the substance. One becquerel is equal to one transformation per second and is approximately equal to 27 picocuries (pCi)

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- Bed Loading** Sediment sliding, rolling, or skipping on or very near a stream bed, at velocities less than that of adjacent flow.
- Berm(s)** A narrow bank of soil used for containment of liquid.
- Biofilm** Biological growth associated with the inside of pipes composed primarily of slimes and algae. Biofilm can harbour pathogens, usually resides near impermeable surfaces.
- Biosolids** A nutrient-rich organic material resulting from the treatment of wastewater. Unprocessed wastewater treatment sludge must at least be digested before being referred to as biosolids. Biosolids contain nitrogen and phosphorus along with other supplementary nutrients in smaller doses, such as potassium, sulphur, magnesium, calcium, copper and zinc.
- Bioswale** Responsible for moving storm water runoff as slowly as possible along a slight decline of soil and plants. Suspended solids have a chance to settle into the soil.
- Boil Water Advisory** As issued by health authorities an advisory typically calls for a rolling boil for a minimum of one minute.
- Booster Pump(s)** A pump(s) used (1) to increase the pressure on the discharge side of a pump that provides pressure in a closed distribution system and (2) to lift or boost water from a lower pressure plane to a higher pressure plane.
- Bowl(s)** The submerged pumping unit in a well, including the shaft, impellers, and housing.
- Brake Horsepower** 1) The horsepower required at the top or end of a pump shaft (input to a pump)
2) The energy provided by a motor or other power source.
- Breakpoint (*Chlorination*)** The point at which the chlorine dosage has satisfied the chlorine demand exerted by ammonia. A dosage at which free chlorine residual begins to establish itself.
- Breakthrough** A crack or break in filter bed allowing the passage of floc or particulate through the filter increasing effluent turbidity.
- Buffer** A solution or liquid that neutralizes acids or bases without a significant change to pH.
- C**
- Calcium Carbonate** A colourless or white crystalline compound that occurs naturally as chalk, limestone, marble and other forms. Formula: CaCO_3 . Calcium carbonate solubility decreases with increasing temperature. It has the potential to cause scaling if sufficiently concentrated.
- Calcium Hypochlorite** A chemical compound, formula $\text{Ca}(\text{OCl})_2$, used as a bleach or disinfecting agent and a source of chlorine in water treatment. Commercial grades contain 70% available chlorine. Calcium hypochlorite is specifically useful because it is stable as a dry powder and can be formed into pellets.
- Capillary Action** The movement of water through very small spaces due to molecular forces.
- Carbon Dioxide** A colourless, odourless, incombustible gas that is a normal component of natural waters. It may enter surface and ground waters by absorption from the atmosphere or biological oxidation of organic matter. Formula: CO_2 .

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- Carbon Monoxide** A colourless, odourless poisonous, flammable gas formed when carbon compounds burn in insufficient air, and by the action of steam on hot carbon. Formula: CO.
- Carcinogenic** Able to produce carcinoma or a cancer, arising from epithelial cells. The term is also commonly used to describe any process or agent that produces cancer, regardless of the cell of origin.
- Casing Vent** Releases air and eliminates vacuum conditions during well operation.
- Catalyst** A substance that changes the speed or yield of chemical reaction without being consumed or changed by the reaction.
- Cathode** The negative pull or electrode of an electrolytic cell. Attracts cations
- Cathodic Protection** A electrical system for the prevention of corrosion of metal surfaces that are in contact with water or soil (typically pipe and water storage tanks).
- Cation** A positively charged particle or ion.
- Caustic** (1) Caustic soda, formula: NaOH, or any compound chemically similar to caustic soda.
(2) Any substance capable of burning or destroying animal flesh or tissue. The term is usually applied to strong bases.
- Caving** The collapse of the sidewalls of a hole in the earth.
- Cavitation** The formation and collapse of a gas pocket on the blade of an impeller or the gate of a valve.
- Centrifugal Pump** A pump with a center suction and an outward discharge that uses rotation of an impeller on a shaft inside a casing to provide a velocity or outward force to the water, thus creating a lift or pressure.
- Centrifuge** A mechanical device that uses centrifugal force to separate solids from liquids.
- Check Valve** A valve with a hinged disk or flap that opens in the direction of normal flow but impedes reverse flow. One-way valve.
- Chelation** A chemical complexing of metallic cations with certain organic compounds used to prevent the precipitation of the metal. See Sequestration.
- Chemical Bond** The force that holds atoms together within molecules
- Chemical Feed Pump(s)** A pump used to apply chemicals to water. They are designed to provide accurate control of the volume of chemical delivered.
- Chemical Floc** Collections of small particles brought together by chemical action to form larger collections which are more easily settled for separation from the fluid.
- Chemical Precipitation** The formation of chemical particulates as a result of chemical addition.
- Chemical Reaction** A process that occurs when atoms of certain elements are brought together and combine to form molecules or when molecules are broken down into individual atoms.
- Chloramination** The application of chlorine and ammonia solutions to form chemicals called chloramines for the purpose of disinfection.

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- Chlorinating** Adding chlorine, particularly to promote oxidation of contaminants and/or disinfection.
- Chlorination** A process initiated by the addition of chlorine to promote oxidation of microbiological material, and organic and inorganic compounds. Chlorination is the principal form of disinfection in public water supplies.
- Chlorinator** A device used to feed gaseous chlorine.
- Chlorine** A toxic, pungent, greenish-yellow gas used as a disinfectant and oxidizing agent.
Formula: Cl₂.
- Chlorine Demand** The amount of chlorine applied to achieve a specific objective and the difference between dosage (applied chlorine) and chlorine residual after a specified contact time.
- Chlorine Residual** The concentration of chlorine remaining in solution.
- Chloroorganic** Organic compounds combined with chlorine. See Disinfection By-products
- Circumference** The distance measured around the outside edge of a circle
- Cistern** A small water storage tank typically for a home or farm to collect rainwater.
- Clarification** Any process or combination of processes that reduces the amount of suspended matter in water.
- Clarifier** A tank or basin in which wastewater is held for a period of time, during which the heavier solids (referred to as sludge) settle to the bottom and any lighter materials present (referred to as scum) float to the water surface. See Sedimentation Basin
- Clear Well** A reservoir or storage tank of filtered water sufficient to avoid the need to vary the filtration rate. Also used to provide contact time for disinfection.
- Coagulant** A chemical added to water that has suspended and colloidal solids to destabilize particles, allowing subsequent floc formation and removal by sedimentation, filtration, or both. Typically, the use of alum or iron salts for removing turbidity in a water treatment process.
- Coagulant Aids** Chemicals added during coagulation to stimulate floc formation or strengthen floc. Also called Flocculant Aid.
- Coliform** Bacteria commonly found in the digestive tracts of warm-blooded animals. In sanitary bacteriology, these organisms are defined as all aerobic and facultative anaerobic, gram-negative, nonspore forming, rod-shaped bacteria that ferment lactose with gas and acid formation within 48 hours at 95° Fahrenheit (35° Celsius).
- Collection** The finding and bringing together of water for supply to a public system.
- Colloids** Finely divided suspended particles which due to the minute size and electrical charge are not likely to settle.
- Colour** The colour of water imparted by any combination of natural metallic ions (iron and manganese), humic and fulvic acids from humus and peat materials, plankton, dissolved plant components, iron and sulfur bacteria and industrial wastes. Turbidity increases apparent but not true colour.

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- Combined Chlorine** The sum of the species composed of free chlorine and ammonia (NH₃), including monochloramine (NH₂Cl), dichloramine (NHCl₂), and trichloramine (nitrogen trichloride, NCl₃). Dichloramine is the strongest disinfectant of these species, but it has less oxidative capacity than free chlorine. Di- and trichloramines can result in unfavorable tastes and odors.
- Combined Sewers** A sewer system in which the storm water and sanitary waste are combined. The system can be overwhelmed during severe storms, resulting in untreated waste being flushed into the receiving waters as a combined sewer overflow (CSO).
- Comminutor** a machine that pulverizes solids, as in waste treatment.
- Composite Sample** A series of grab samples based on time or on a flow proportional basis.
- Compounds** Two or more elements bonded together by a chemical reaction
- Compound Loop Control** A method to control a chemical metering device by receiving two distinct control signals (eg. flow and residual control).
- Concentration** A measurement of how much solute is contained in a given amount of solution. e.g. (mg/L)
- Conditioning** Pretreatment of sludge to facilitate removal of water in subsequent treatment processes.
- Conductivity** A measure of the ability of a solution to carry an electric current. Method of estimating dissolved solids in water. See Specific Conductance.
- Cone of Depression** A roughly conical shaped depression produced in the water table by the pumping of water from a well. See Radius of Influence.
- Confined Space** A space with limited access, which could pose a hazard to workers who maybe required to enter into the space for maintenance purposes. Contact WCB for specifications.
- Contact Time** The time during which a chemical or constituent is in contact with another reacting chemical or constituent. The contact time in a basin or storage vessel can be expressed on a theoretical basis by dividing the volume by the flow rate, or on a practical basis using tracer studies that account for contactor hydrodynamics. Contact time is often abbreviated to CT, which must not be confused with C X T.
- Contaminants** Any physical, chemical, biological, or radiological substances or matter in water.
- Contamination** The presence in water of microorganisms, chemicals, wastes, or wastewater in concentrations that make the water unfit for its intended use. Contaminate is the action of adding such contaminants.
- Control(s)** (1) A condition in which specific quality criteria have been achieved in a laboratory analysis. (2) A type of sample used to assess the quality of an analytical process.
(3) A section or reach of an open conduit or stream channel where artificial or natural conditions, such as the presence of a dam or stretch of rapids, make the water level upstream a stable indicator of the discharge rate.
(4) A waterway cross-section that serves as a bottleneck for a given flow and determines the energy head required to produce the flow.
(5) Control of chemical metering (feed) equipment and valves, pumps etc. require variable rates or adjustment.

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Control Loop

The path through the control system between the sensor which measures a process variable and the control device which adjusts the process variable.

Conventional Treatment

Coagulation, flocculation, sedimentation and filtration

Copper Sulphate

A chemical (formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) prepared from copper and sulphuric acid, used to control algal growths. It is also called blue vitriol, blue copperas, bluestone, and cupric sulphate.

Corrosion

The deterioration of material through electrochemical processes, e.g., rust.

Corrosive

Tending to deteriorate material, such as pipe, through electrochemical processes.

Coupon

A steel specimen inserted into water to measure the degree of corrosiveness of the water.

Cross Connection

The physical connection of a safe or potable water supply with another water supply of unknown or contaminated quality or such that the potable water could be contaminated.

Cross Multiplication

A method used to determine if two ratios are in proportion.

Cryptosporidium

A widespread intestinal coccidian protozoan parasite about 3.5 micrometres in diameter, causing diarrhea and capable of infecting humans, birds, fish, and snakes. It is responsible for waterborne disease outbreaks.

Curb Stop

A water service shutoff valve located in the service pipe near the curb and between the water main and the building, also called curb cock.

Current

The "flow rate" of electricity measured in amperes.

D

Day Tank

A chemical tank used to supply a metering pump; typically sufficient for at least one day of supply.

Dead Ends

Pipe sections that are connected to a system on one end only. They may hold stagnant water if not flushed.

Dechlorinate

To remove chlorine from a solution.

Dechlorinated

Describes a solution from which chlorine has been removed.

Dechlorination

The partial or complete reduction of chlorine in water by any chemical or physical treatment.

De-energized

Describes a piece of equipment that has been disconnected from its source of energy, usually electricity; one step necessary to make equipment safe for service or repair.

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Degasification

A water treatment process used to remove dissolved gases from the water; the processes may be mechanical, chemical or a combination of both.

Delivery

Conveying a water plant's finished product to its users.

Denitrification

The conversion of nitrogen compounds to nitrogen gas nitrous oxide by microorganisms in the absence of oxygen.

Denominator

The part of the fraction below the line. A fraction indicates division of the numerator by the denominator

Density

The weight of a substance per a unit of its volume. (eg, kilograms per cubic metre)

Dental Caries

The progressive decay of teeth.

Desalinization

The removal of dissolved salts from water by natural means (leaching) or by a dedicated treatment process.

Destratification

The vertical mixing within a lake or reservoir which eliminates separate layers of temperature, plant or animal life. This can be achieved by pumping water or by forcing air through diffusers into lower layers into the reservoir.

Detention Time

- 1) The theoretical (calculated) time required for a specific volume of water to pass through a tank at a specified flow rate.
- 2) The actual time in hours, minutes or seconds that an amount of water is in a tank mixed chamber, reservoir, etc.

$$\text{Detention Time, hr} = \frac{(\text{Basin Volume, m}^3)(24\text{hr/day})}{\text{Flow, m}^3/\text{day}}$$

Dewater

- 1) To remove or separate a portion of the water present in a sludge or slurry in order to partially dry it for disposal or handling purposes.
- 2) To remove or drain the water from a tank or a trench.

Dewatered Cake

Biosolids or residuals that have been dewatered to greater than 20 percent dry solids to produce a material of soil-like consistency.

Dew Point

The temperature to which air with a given quantity of water vapour must be cooled to cause condensation of the vapour in the air.

Diameter

The length of a straight line measured through the centre of a circle from one side to the other.

Diaphragm

A thin flexible partition (disk) supported at the edges, used to transmit pressure from one substance to another while keeping them from direct contact.

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Diatomaceous Earth

A fine siliceous material composed primarily of the skeletal remains of diatoms. Used in filtration processes.

Dielectric The substance which does not conduct electric current; an insulator.

Digester A tank in which solid material removed from wastewater (including raw and/or waste activated sludge) is placed to allow for decomposition by micro-organisms. Digestion may occur under anaerobic or aerobic conditions. Reduction in levels of pathogens and volatile solids is achieved.

Dimictic Lakes and reservoirs which freeze over and typically undergo two stratification and mixing cycles per year.

Dioxins A family of chlorinated organic compounds, of varying degrees of toxicity, that inadvertently result from certain chemical manufacturing processes, and from the incomplete combustion of organic compounds at high temperatures.

Disinfectant

An agent that destroys or inactivates harmful microorganisms.

Disinfection (1) The process of destroying or inactivating pathogenic organisms (bacteria, viruses, fungi, and protozoa) by either chemical or physical means.
(2) In water treatment, the process in which water is exposed to a chemical disinfectant - chlorine, chloramines, chlorine dioxide, iodine, or ozone – for a specified time period to kill pathogenic organisms.

Dissolves Goes into solution.

Distribution The system or process by which a commodity, for example water, is delivered to customers.

Distribution System

A system of conduits (laterals, distributaries, pipes, and their appurtenances) by which a primary water supply is distributed to consumers. The term applies particularly to the network of pipelines in the streets of a domestic water system.

Dosage The amount of chemical applied per unit flow of water. Expressed in parts per million (ppm) or milligrams per litre (mg/L).

Drawdown 1) The drop in the water table or static level of groundwater when a pump is engaged.
2) The amount of water used from a tank or reservoir.
3) The drop in the water level of a tank or reservoir.

Drift The difference between the actual value and a desired value (set point).

Dual Media Filter

A filter using 2 types of media (sand and anthracite coal are most common).

Ductile Describes a form of cast iron used in water pipes. It is stronger and less brittle than ordinary cast iron.

Duff Organic matter in various stages of decomposition on the floor of the forest.

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Dynamic Discharge Head

The difference in height measured from the pump center line (at the discharge) to the point on the hydraulic grade line directly above it.

Dynamic Head

Pressure associated with fluids in motion.

Dynamic Suction Head

The distance from the pump center line (at the suction) to the point of the hydraulic grade line directly above it.

Dynamic Suction Lift

The distance from the pump center line (at the suction) to the point of the hydraulic grade line directly below it.

E

Efficiency The ratio of the total energy output to the total energy input, expressed in per cent

Ejector The component of a chlorination system that creates a vacuum and feeds the chlorine solution into a pipe under pressure. See Injector

Electrolysis The decomposition of material by an outside electric current.

Electrolyte A substance dissociates into two or more ions when dissolved in water.

Electron One of the three elementary particles of an atom (protons and neutrons). A tiny negatively charged particle that orbits the nucleus of an atom. Determines how reactive an element will be

Element Any of more than 100 fundamental substances that consist of atoms of only one kind and that constitute all matter.

Elevated Reservoir

Man-made water storage physically located above the level of consumption so that delivery is by means of gravity without the use of a pump. Pumps are usually required to fill the reservoir.

Elevated Storage Pump

A pump used to deliver water into an elevated reservoir.

Elevation Head

A measure of the pressure due to the depth of a column of fluid. Typically measured in feet or metres of head

Encrustation

The build-up of material on the inside of a potable water pipe or appurtenance caused by the precipitation of a mineral or by corrosion of an exposed metal, resulting in the formation of tubercles. Encrustations may result in a rough or smooth surface and normally restrict flow by reducing diameter or increasing roughness.

Endemic Something unique to a particular population or locality, such as a disease which is always present in the population.

Enteric Of intestinal origin, especially in reference to waste or bacteria.

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Entrain To trap bubbles in water either through mechanical turbulence or through chemical reaction.

Environmental Assessment

A comprehensive and systematic process designed to identify, analyze and evaluate the environmental effects of proposed projects.

Epidemiology

A branch of medicine which studies epidemics designed to determine causation and prevention.

Epilimnion

The upper level of water in thermally stratified lake or reservoir.

Esthetics

Describes a quality of water that is determined by the senses, e.g., colour, taste, or odour.

Eukaryote

The **eukaryotes - Eukarya**, are organisms whose cells have a membrane-bound nucleus. All animal, plants and fungi and many unicellular organisms are eukaryotes.

Eutrophic

Lakes and reservoirs which are rich in nutrients and biologically productive.

Eutrophication

The increase in the nutrient levels of a lake or other body of water leading to high productivity.

Evaporation

A process in which a liquid is changed by volatilizing (boiling) to a gaseous state at a set of temperature and pressure conditions.

Evapotranspiration

The process by which water is removed from an area by transpiration (plants) and evaporation from soil, snow and water surfaces.

Excavation(s)

The removal of material to create a trench, hole or cut in the earth's surface, resulting in a change in all or a part of the elevation of a site.

Exponent

An exponent indicates the number of times a base number is to be multiplied together, for example, 6^3 is $6 \times 6 \times 6 = 216$

F

Facultative

Bacteria that can use either dissolved molecular oxygen or oxygen obtained from food materials such as sulfate or nitrate ions. (Aerobic or anaerobic conditions)

Faecal Coliform Bacteria

Members of the total coliform group of bacteria that are characterized by their ability to ferment lactose at 112.1°Fahrenheit (44.5°Celsius) and that are considered more specific indicators of faecal contamination than are coliforms that ferment lactose only at 95°Fahrenheit (35°Celsius). Sometimes referred to as FC.

Feedback

The exchange of information between a sensor measuring a process variable and the control device.

Fertilizers

Organic or inorganic products containing nutrients and applied to soil for the purpose of supporting plant growth

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Filtration	The removal of suspended materials in a fluid stream by passage of the fluid through a filter medium.
Filter Media	The granular material used in a filter (ie. sand, coal, GAC, etc.).
Filter Run	The length of time a filter operates before backwashing.
Finished Water	The end product of treatment processes
Flammable	Pertaining to substances that burn easily, strongly, and at a rapid rate.
Floc	Clumps of bacteria and particles that have come together to form clusters, or small gelatinous masses that are amenable to settling and/or filtration. Alum is used to aid the floc formation process.
Flocculation	The agglomeration of fine particles following coagulation to form floc through a slow mixing process.
Fluoridation	The addition of a chemical at a specific dosage to achieve an appropriate concentration of fluoride ions in drinking water to reduce tooth decay.
Fluoride	Any compound containing fluorine, typically added to water to reduce tooth decay.
Flushed	The condition of a pipeline or system through which water has been run to clean the pipeline or system.
Flushing	The act of running water through a distribution system or water main to remove debris, discoloured water, or chemical solutions in order to clean the line or system.
Free Chlorine	Also <i>available</i> chlorine, the amount of chlorine available as dissolved gas (Cl ₂), hypochlorous acid (HOCl), and hypochlorite ion (OCl ⁻), that is not combined with ammonia (NH ₃) or other compounds in water.
Free-Flowing Artesian Well	An artesian well from which water flows freely, that is with out pumping or other lifting means.
Friction Loss	The pressure (energy) loss incurred by water moving through a restricted area such as a pipe, also know as head loss.
Fuel Value	A measure of the energy released during complete oxidation to carbon dioxide and water. Organic compounds vary in their fuel value.
G	
Galvanic Series	A list of metals and alloys presented in the order of their tendency to corrode.
Garnet	A group of hard, reddish, glassy mineral sands made up of silicates of base metals – has a higher density than sand.
Gasket(s)	A compressible material used between the faces of metal pieces to provide a seal.

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Gauge	A number that defines the thickness of the sheet used to make steel pipe. The larger the number, the thinner the pipe wall.
Germicide	A substance formulated to kill germs (microorganisms).
Giardia	The genus name for a group of single-celled, flagellated, pathogenic protozoans found in a variety of vertebrates including mammals, birds and reptiles. These organisms exist either as trophozoites or as cysts, depending on the stage of the life cycle.
Giardiasis	Intestinal disease caused by infestation of <i>giardia</i> flagellates
Grain Size	The dimension of particles in a subsurface water stream.
Gravimetric	1) A means of measuring unknown concentration of water quality indicators in a sample by weighing a precipitate or residue of the sample. 2) Used to describe chemical feeders which meter by weight.
Gravity Filter	A filter in which water flows by the force of gravity through the filter.
Greensand	A mineral material (glauconite), which is sand like and used typically for the removal of iron and manganese.
Grid System	A system of distribution pipes in which, if one path is disturbed, alternative paths exist through which water can flow.
Ground Truthing	The process of physically (at the site) confirming data collected by a method of remote sensing or data collection such as aerial photography.
Groundwater	The water contained in interconnected pores located (1) below the water table in an unconfined aquifer or (2) in a confined aquifer.
H	
Haloacetic Acids	Disinfection by-products related to the combination of organic precursors and chlorine; Mono-, di-, and tri-chloroacetic acid; mono- and di-bromoacetic acid; and bromochloroacetic acids.
Haloacetonitriles	Disinfection by-products related to the combination of organic precursors and chlorine; Dichloro-, trichloro-, bromochloro-, and dibromoacetonitrile.
Hardness	A quality of water caused by divalent metallic cations and resulting in increased consumption of soap, scale in boilers, damage in some industrial processes, and sometimes objectionable taste. The principal hardness-causing cations are calcium, magnesium, strontium, ferrous iron, and manganese ions. Hardness may be determined by a standard laboratory titration procedure or computed from the amounts of calcium and magnesium expressed as equivalent calcium carbonate (CaCO ₃). Generally hardness levels between 80 and 100 mg/L (as Ca CO ₃) are considered acceptable; levels greater than 200 mg/L are considered poor but can be tolerated; those in excess of 500 mg/L are normally considered unacceptable

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Hardness Ions

The ions described in the definition of Hardness that cause that condition

Hard Water Water that requires considerable amounts of soap to produce a foam or lather and that also produces scale in hot water pipes, heaters, boilers, and other units in which water temperature is raised materially. Water hardness has been rated as very soft, soft, moderately hard, hard, and very hard.

Head The energy per unit weight of a liquid. In practical terms, head is the pressure at any given point in a water system.

Header A pipe to which a series of smaller pipes are connected; also called a manifold.

Head Loss A decrease in head pressure between two points

Hepatitis A viral pathogen causing an inflammation of the liver and related syndromes.

Hertz (Hz) Also called frequency of current; the number of complete electromagnetic cycles in one second of an electric or electronic circuit.

Heterotrophic

Describes organisms that use organic matter for energy and growth. Heterotrophic plate counts are used as an indicator of water quality.

Hydrant(s) A device connected to a water main and provided with the necessary valves and outlets so that a fire hose may be attached for discharging water at a high rate to extinguish fires, wash streets, or flush out the water main. A hydrant is also called a fire plug.

Hydrant Isolating Valve

A valve installed in the lateral line to a hydrant that can be closed to cut off supply of water to the hydrant.

Hydrated Lime (Slaked Lime)

Limestone that has been treated with water until the calcium oxide component has been converted to calcium hydroxide. (Ca (OH) ₂)

Hydrochloric Acid

A water-based solution of hydrogen chloride that is a strong, highly corrosive acid. Hydrochloric acid (HCl) may be used as a regenerate for cation resin deionization systems operated in the hydrogen (H⁺) cycle.

Hydrogen Ions

- (1) In aqueous solution, a positively charged combination of a proton and a water molecule (hydrated, H₃O⁺).
- (2) A single proton, usually abbreviated H⁺.

Hydrogen Sulphide

An extremely toxic gas (H₂S) produced by the anaerobic decomposition of organic matter and sulphate-reducing bacteria. Hydrogen sulphide has a very noticeable rotten egg odour at very low concentrations, but not at dangerous concentrations. Respiratory paralysis and death may occur quickly at concentrations as low as 0.07% by volume in air.

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Hydrologic Cycle

The natural process recycling water from the atmosphere down to (and through) the Earth and back to the atmosphere.

Hydrolysis A chemical reaction in which a compound is converted to another compound by taking up water.

Hydrophilic Having a strong affinity for water (opposite of hydrophobic)

Hydrophobic Having a strong aversion for water (opposite of hydrophilic).

Hydrostatic Pressure at specific elevation exerted by a body of water at rest.

Hygroscopic Absorbing or attracting moisture from the air.

Hypochlorinator(s)

A device used to chlorinate a liquid stream by adding chlorine in the form of liquid sodium hypochlorite (NaOCl, commonly called bleach) or calcium hypochlorite (Ca(OCl)₂).

Hypochlorite Ions (OCI⁻)

The ionized form of hypochlorous acid (HOCl)

Hypochlorite Solution

An aqueous solution of a metallic salt of hypochlorite ion (OCI⁻) that is used as a disinfectant and as a bleaching and oxidizing agent.

Hypochlorous Acid (HOCl)

An acid (HOCl) used as a disinfectant and as a bleaching and oxidizing agent. During the disinfection of water with chlorine (Cl₂), hypochlorous acid reacts with natural organic matter and bromide (Br⁻) to form disinfection by-products.

I

Impeller(s) A rotating set of vanes in a pump designed to pump or lift water.

Impermeable

The property of a material or soil that does not allow the movement or passage of water.

Impervious Resistant to the passage of water.

Impoundment(s)

A pond, lake, tank, basin or other space, either natural or artificial, that is used for storage, regulation and control of water.

Incineration The combustion of the organic (carbon-containing) solids present in wastewater solids and biosolids to form carbon dioxide (a greenhouse gas) and water. The temperature in the combustion zone of furnaces is typically 760 to 870 degrees C. The solids that remain at the end of the process are an inert material commonly known as ash.

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Indicator	(1) A substance that gives a visible change, usually of colour, at a desired point in a chemical reaction, generally at a specified end point. (2) A device that indicates the result of a measurement. Most indicators in the water utility field use either a fixed scale and moveable indicator (pointer), such as a pressure gauge or a moveable scale and a moveable indicator, like those used on a circular flow-recording chart. This type of indicator is also called a receiver.
Infiltration	The seepage of groundwater into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joints, connections or manhole walls.
Infiltration Gallery	A horizontal subsurface tunnel for intercepting and collecting groundwater by gravity flow.
Inflow	The deliberate, planned diversion of water to sanitary sewer systems
Injector	Also called ejector. The component of a chlorination system that creates a vacuum and feeds the chlorine solution into a pipe under pressure.
Inlet(s)	(1) A surface connection to a drain pipe. (2) A structure at the diversion end of a conduit. (3) The upstream end of a structure through which water may flow. (4) An intake.
Inorganic	Material that is not organic in nature. Example: sand, salt, metals and minerals
Insoluble	A substance which does not dissolve into solution
Intake(s)	(1) The works or structures at the head of a conduit into which water is diverted. (2) The process or operation by which water is absorbed into the ground and added to the saturation zone. (3) The flow or rate of flow into a canal, conduit, pump, stack, tank, or treatment process before treatment.
Invert	The lowest point of the channel inside a pipe, conduit or canal
Ion	An electrically charged atom, radical or molecule formed by the loss or gain of one or more electrons.
Ion Exchange	A water treatment process involving the reversible interchange of ions between the water being treated and a solid resin. Undesirable ions are switched with acceptable ions.
J	
Jar Test	A laboratory procedure that simulates treatment coagulation/flocculation units with different chemical doses and rapid mix energy and settling time. Used in process optimization.
L	
Land Application	The beneficial use of biosolids based upon crop needs. The application of biosolids to land improves soil properties and plant productivity, and reduces dependence on inorganic fertilizers.

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Langelier Index (L.I.)

An index reflecting the equilibrium pH of a water with respect to calcium and alkalinity. The index is used in stabilizing water to control both corrosion and the deposition of scale.

Lateral(s) (1) Directed toward, coming from, or situated on the side.
(2) A ditch, pipe, or other conduit entering or leaving a water main from the side.
(3) A secondary conduit diverting water from a main conduit for delivery to distributaries.

Lethal Deadly; fatal.

Licenses The formal approval of a governing body allowing a construction, operation or other function.

Limestone A sedimentary rock composed mostly of calcium carbonate (CaCO_3) and usually some magnesium carbonate (MgCO_3).

Loam Rich, friable soil containing a relatively equal amount of sand and silt and somewhat smaller proportions of clay.

Loess A loamy deposit formed by wind; usually yellow and calcareous.

Logarithm (Log)

The exponent that increases the power to which a number must be raised to produce a given number.

Looped System

A distribution system designed to avoid dead ends where water might stagnate, and to provide alternate flow paths to outlets.

Lotic Pertaining to or living in flowing water

Lowered Explosive Limit (LEL)

The lowest concentration of gas or vapour (percent by volume in air) that explodes if an ignition source is present at ambient temperature.

M

Main A pipe that transports or distributes water from the supply system to the service lines of a water customer.

Master Plan A comprehensive plan to guide long-term development in a particular area that is broad in scope. It focuses on the analysis of a system for the purpose of outlining a framework for use in future individual projects.

Mercury (Hg)

Well known as an environmental contaminant. Its high toxicity and penchant for bioaccumulation make it of particular concern among heavy metals.

Mesophilic Bacteria

A group of micro-organisms typically used in digestion that grow and thrive in a moderate temperature range between 68 F (20 C) and 113 F (45 C).

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Methane A gaseous hydrocarbon (CH₄) that occurs in natural gas and coal gas as a result of decaying vegetation and other organic matter in swamps and marshes. Methane is flammable, as well as asphyxiating.

Methylmercury (MeHg⁺) A product of the metabolic conversion of Hg species. A highly toxic form, which can accumulate in tissues. This is especially true in fish.

Microbial Growth The activity and growth of microorganisms such as bacteria, algae, diatoms, plankton and fungi.

Micron Also, called micrometer (mm). A unit of length one millionth of a meter.

Micronutrients An element required by plants and bacteria, in proportionately smaller amounts, for survival and growth. Micronutrients include Iron (Fe), Manganese (Mn), Zinc (Zn), Boron (B), and Molybdenum (Mo).

Milligrams per Litre (mg/L) A measure of the concentration by weight of a substance per unit volume. Used to measure concentrations of contaminants, chlorine residual, etc.

Multi Media Filter A filter using 3 types of media (anthracite coal, sand and garnet sand)

Multistage Turbine Pump(s) A special design of pump with more than one impeller, to allow high pressure to be developed.

Muriatic Another name for hydrochloric acid.

N

Nephelometric A means of measuring turbidity in a sample by using an instrument called a nephelometer. A nephelometer passes light through a sample and the amount of light deflected (usually at a 90 – degree angle) is then measured.

Neutralization (1) A chemical reaction which causes acidic ions and basic ions to be in balance. It may or may not produce water. It does not necessarily have a pH of 7.0.
(2) The process by which the cell-attachment protein of a virus is bound by an antibody, thereby inhibiting infection by the virus.

Neutralizes See neutralization.

Nitrification An aerobic process in which bacteria reduce the ammonia in water into nitrite and then nitrate.

Non-Flammable Opposite of flammable; Pertaining to substances that do not burn easily, strongly, or at a rapid rate.

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Nonpoint Source Pollution

Pollution that originates from a variety of sources and no single source is evident.
See Point Source Pollution

Nozzles (1) Short cone-shaped tubes used as outlets for hoses or pipes. The velocity of the emerging stream of water is increased by the reduction of cross-sectional area of the nozzles.
(2) A short piece of pipe with a flange on one end and a saddle flange on the other.
(3) A side outlet attached to a pipe by such means as riveting, brazing, or welding.

Nuisance Organisms

Bacteria and other forms of life which cause taste, odour or health problems in water.

Nutrient Management Act

A nutrient management framework for Ontario's agricultural industry, municipalities and other generators of materials containing nutrients, including biosolids, that contains environmental protection standards.

Nutrients Substances which are required to support living plants and organisms. Major nutrients include carbon, hydrogen, oxygen, sulphur, nitrogen, phosphorus and potassium.

O

Odours The quality of something that stimulates the olfactory organ, i.e. it smells. Many compounds have characteristic odours that serve as effective means of identification.

Open Reservoirs

Any uncovered area of stored water.

Organic(s) Of, related to, or derived from living organisms (plants or animals); of, relating to, or containing carbon compounds.

Organic Compounds

Carbon-containing compounds, either natural or synthetic in origin. Those of natural origin include plant and animal-based compounds such as fats, carbohydrates, proteins and fossil fuels. Those of synthetic origin include industrial chemicals produced from fossil fuels, such as polymers and plastics.

Orthotolidine (OT)

A chemical ((C₆H₃(CH₃)NH₂)₂) used in tests for free chlorine. Not widely used any more. See DPD.

Osmosis The passage of a liquid from a weak solution to a more concentrated solution across a semipermeable membrane. The membrane allows a passage of water (solvent) but not the dissolved solids (solute).

Outlet(s)

(1) the downstream opening or discharge end of a pipe, culvert or canal.
(2) an opening near the bottom of a dam for draining the reservoir.
(3) in plumbing, a discharge opening for water from the water distributing system to a fixture, to atmospheric pressure (except into an open tank that is part of the water supply system), to a boiler or heating system, or to any water-operated device or equipment that requires water to operate but is not a part of the plumbing system.

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Overlying Layer

Refers to the soil layer above an aquifer.

Oxidant Any oxidizing agent; a substance that readily oxidizes (removes electrons from) something chemically. Common drinking water oxidants are chlorine (Cl₂), chlorine dioxide (ClO₂), ozone (O₃), and potassium permanganate (KMnO₄). Some oxidants also act as disinfectants.

Oxidation (1) A process in which a molecule, atom or ion loses electrons to an oxidant. Oxidation is always part of an oxidation-reduction reaction. The oxidized substance, which loses the electron, increases in valence. The reduced substance, which gains the electron, decreases in valence.
(2) In electro dialysis, a chemical reaction that occurs at an anode and results in the loss of electrons from the anodic material.
(3) In ion exchange, a specific attack on the cross-linking of the copolymer of an ion exchange resin by an oxidant (e.g., chlorine, hydrogen peroxide (H₂O₂), or ozone) leading to degradation (loss of structure of resin beads) and shortening of the resin life.

Oxidation-Reduction Potential

The electrical potential required to transfer electrons from one compound or element (the oxidant) to another compound or element (the reductant).

Oxidize(1) To combine with oxygen.

(2) To change a compound by increasing the proportion of the electronegative part or to change an element or ion from a lower to higher oxidation state.

(3) To remove one or more electrons from an atom, ion, or molecule.

Oxidizing Agent

Any substance such as oxygen (O₂) or chlorine (Cl₂) that will readily take one electrons. The opposite of reducing agent.

P

Palatable Agreeable or pleasant, particularly to the sense of taste.

Parasite An organism that lives in or on an organism of another species (its host) and benefits by deriving nutrients at the other's expense:

Parshall Flume

A flow measurement device used in an open channel.

Particle Counter

A device which counts and measures the size and density of individual particles in water.

Particulate Very small solids suspended in water. Can be organic, inorganic and vary in size, shape, density and electrical charge

Pathogenic Biologically harmful. Disease causing.

Pathogens Disease-causing organisms, including bacteria, viruses and parasites (protozoa and helminthic worms). Their numbers and types in wastewater, unprocessed sludge and biosolids depend on: the season of the year; sanitary habits, population density and rates of disease in the servicing area; and, the type and performance of wastewater and sludge treatment processes.

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Peak Demand

The maximum momentary load (expressed as a rate) placed on a water treatment plant, distribution system, or pumping station. It is usually the maximum average load in one hour or less, but it may be specified as instantaneous or for some other short time period.

Pelletization

Biosolids that are stabilized using digestion, then completely dried and pressed into small pellets. The pellets are then used as fertilizer since they contain nutrients essential to plant growth, such as nitrogen.

Percolation

The movement of water through the pores of soil or geological formations.

Percolates

Moves or flows through a porous medium.

Permeability

The property of a material or soil that permits considerable movement of water through it when saturated.

Permeate

To penetrate or pass through. Also, the liquid that passes through a membrane filter containing a low concentration of dissolved solids.

Permits

Official documents, issued by a governing authority, which specify conditions under which work may be undertaken, e.g., construction; or under which a plant or system may be operated.

Personal Protective Equipment (PPE)

Such as hard hats, gloves, goggles, and steel-toed shoes used by workers to prevent injuries from workplace hazards.

pH

A measure of the acidity or alkalinity of a solution, such that a value of 7.0 is neutral; lower numbers represent acidic solutions and higher numbers, alkaline solutions. The pH of a aqueous solution is an important characteristic that affects many features of water treatment and analysis.

Phosphorous

An essential chemical element (P) and nutrient for all life forms. It occurs in orthophosphate, pyrophosphate, tripolyphosphate, and organic phosphate forms. Each of these forms, as well as their sum (total phosphorous), is expressed in terms of milligrams per litre elemental phosphorous.

Phosphorus Precipitation

The removal of soluble phosphorus from water by precipitation.

Photosynthesis

A process in which organisms convert carbon dioxide and inorganic substances into oxygen and an additional plant material using the energy of the sun. This is accomplished with the aid of chlorophyll and all green plants grow through this process.

Phytoplankton

Small typically microscopic plants found in lakes, oceans, reservoirs and most other bodies of water.

Pigging

The process of forcing an in-line scraper or polypig through a water line by the force of moving water or flush water to remove scale, sand, and other foreign matter from the interior surface of the pipe.

Planimetry

The measurement plane areas.

Plan View

A diagram or photo showing a facility as it would appear when looking down from above.

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Plat A sectional map covering specific areas of water distribution system.

Point Source Pollution

Pollution where the source has been clearly identified. See Non-point Source Pollution

Polyelectrolytes

Chemicals used to increase the density of floc particles.

Polymer

A long chain molecule mold formed by the union of many monomers, they are typically chemical agents used to assist in the coagulation process; turning suspended particles into floc

Porosity

A measure of the spaces or voids in a material or aquifer. Will determine rate of water flow through material.

Portable Dewater Pump(s)

Moveable positive displacement pumps used to remove excess water from sludge.

Positive Displacement (PD)

Refers to a device which controls or measures a definite volume of fluid.

Positive Displacement Pump(s)

A pump in which a measured quantity of water is collected or entrapped and forced to the discharge side by a reciprocating piston, a gear, or a rotary vane.

Potable Water

Water that is safe and satisfactory for drinking and cooking.

Potassium Permanganate

A substance (KMnO₄) in the form of dark purple crystals used as an oxidant in drinking water treatment. Potassium permanganate is used for taste-and-odour control and for iron and manganese removal. Unlike other oxidants, potassium permanganate has not been associated with the production of disinfection by-products.

Powdered Activated Carbon (PAC)

Activated carbon composed of fine particles and providing a large surface area for adsorption. Powdered activated carbon (PAC) is typically added as a slurry on an intermittent or continuous basis to remove taste-and-odour causing compounds or trace organic compounds, and is not reused.

Precipitate(s)

- (1) A substance separated from a solution or suspension by a chemical reaction.
- (2) To form such a substance.

Precipitation

- (1) The total measurable supply of water received directly from clouds as rain, hail, or sleet, usually expressed as depth in a day, month or year (i.e., daily, monthly, or annual precipitation, respectively).
- (2) The process by which atmospheric moisture is discharged onto land or water surface. (3) The process by which small particles settle out of a liquid or gaseous suspension by gravity.
- (4) The process of particle formation during a chemical reaction.
- (5) In the context of corrosion, the shifting of chemical equilibrium to cause the formation of a solid protective coating, usually calcium carbonate (CaCO₃) on interior pipe surfaces.

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Precursor	Natural organic compounds found in surface and groundwater. Such compounds may react with halogens (chlorine etc) to form disinfection by products such as THMs and HAAs.
Preliminary Treatment	Part of the treatment process that removes large objects such rocks, rags, sand, tree branches and similar materials that may hinder the operation of a treatment plant. Preliminary treatment is accomplished by using equipment such as racks, bar screens and grit removal systems.
Preserved	Treated to maintain original composition, as in a sample.
Pressure	The force pushing on a unit area. Water pressure is normally measured in pounds per square inch, kilopascals, or feet or metres of head.
Pressure Filter	A filter in which water flows under pressure through a filter
Pressure Head	The vertical distance in feet or metres equal to the pressure in psi or kPa at a specific point.
Primary Coagulants	The first or main coagulant added to a system.
Primary Treatment	The physical removal of sand, grit, and larger solids from wastewater by settling tanks and/or skimming devices
Prime	The action of filling a pump casing with water to remove the air. Most pumps require priming to enable start-up.
Prokaryote	Any organism that lacks a distinct nucleus and other organelles due to the absence of internal membranes. Bacteria are among the best-known prokaryotic organisms.
Profile	A drawing showing elevation plotted against distance, such as the vertical section or side view of a pipeline.
Protists	Any member of a kingdom (Protista) of diverse eukaryotes, including algae, protozoans, fungi.
Protozoa	A kingdom of unicellular animals, some of which are parasites and considered pathogens, such as “Giardia” and “Cryptosporidium”.
Pump	A mechanical device for driving fluid flow, for raising or lifting a fluid, or for applying pressure to a fluid.
Pumphouse	A housing or shelter for pumps.
Pump Station	A structure containing relatively large pumps and appurtenant piping, valves, and other mechanical and electrical equipment for pumping water. A pump station may also be called a lift station.
Purveyor	An agency or person that supplies water.

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R

Radiological Contamination

Contamination caused by radioactive particles (radionuclides) which may be natural in origin and are measured in Becquerel (Bq) units.

Radius of Influence

The outermost area affected by the pumping of water from a well measured from the center line of the well.

Raw Sludge The solid materials collected from primary treatment

Raw Water Water in its natural state, prior to treatment.

Reagent A pure chemical substance used to make new products or used in analytical chemistry (to examine other substances).

Reciprocating Pump(s)

A pump that applies pressure and motion to a fluid by the back-and-forth movement of a piston or plunger in a cylinder.

Redd The spawning area or nest of trout or salmon.

Reducing Agents

Any chemical that decreases the positive valence of an ion; A substance exerting demand on oxidants such as chlorine

Reduction The addition of hydrogen, removal of oxygen or the addition of electrons to an element or compound.

Regeneration

The process of restoring the original capability of greensand media.

Regulated

Action, movement, or operation which is controlled physically or legally.

Regulations Rules or orders issued by a federal, provincial or local government agency having the force of law.

Reliquefaction

The return of a gas to a liquid state, typically due to cooling.

Representative

A portion of water or material that is, as nearly as possible, identical in content and consistency to that in the larger body of water or material being sampled.

Reservoir An impounded body of water or controlled lake in which water can be collected and stored.

Residuals Solids produced from the treatment process used to produce drinking water and formed when suspended solids in the untreated water react with chemicals added during the treatment process to make the solids coagulate and settle out.

Residual Chlorine

The concentration of free available chlorine remaining after a given contact time under specified conditions.

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Return Activated Sludge (RAS)

That portion of the solid materials collected from secondary treatment that is returned to the aeration tanks to sustain biological activity there.

Reverse Osmosis

The application of pressure to a concentrated solution causing the passage of a liquid from the concentrated solution to a weaker solution across a semipermeable membrane.

Riparian

Pertaining to or situated or dwelling on a bank of a river or other body of water.

Rotameter

A device used to measure the flow rate of gases and liquids. The gas or liquid flows vertically up a tapered calibrated tube. Inside the tube is a small ball or bullet-shaped float that rises or falls depending on the flow rate.

Rotary Pump(s)

A type of displacement pump consisting essentially of elements rotating in a pump case in which they closely fit. The rotation of these elements alternately draws in and discharges the fluid being pumped. Such pumps have neither suction nor discharge valves, operate at almost any speed, and do not depend on centrifugal forces to lift the water.

S

Sacrificial Anode

An easily corroded material installed in a pipe or tank to protect the material from electrolytic corrosion

Sanitary Sewer

Sewer pipe that conveys wastewater to a wastewater treatment plant.

Saturation

The condition of a liquid when it has taken into solution the maximum possible quantity of given substance at a given temperature and pressure.

Scale

A coating or precipitate deposited on surfaces, also called hard water scale.

Scale Formation

The deposition of scale on surfaces, including oxide flakes (rust) forming on metal surfaces, carbonate precipitates depositing in piping systems or water heaters, sulphate scale precipitating in desalting systems, and silica scale forming in boilers. Water that contains carbonates or bicarbonates of calcium or magnesium are especially likely to cause scale when heated.

Scale Forming

Describing materials prone to promote scaling.

Schedule, Pipe

A sizing system of numbers that specifies the ID and OD for each diameter pipe.

Schmutzdecke

A layer of trapped material at the surface of a slow sand filter in which a dense population of microorganisms develops.

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Secondary Treatment

Biological wastewater treatment process that occurs in two steps. First, micro-organisms are used to break down contaminants in wastewater that are organic in origin. This occurs in a series of aerated tanks. Second, micro-organisms and other solid materials are then settled out of the wastewater in secondary settling tanks.

Self-Contained Breathing Apparatus (SCBA).

A full-face respirator connected to a tank that contains a 30- or 60-minute supply of compressed air suitable for breathing (Grade D air).

Sedimentation

A treatment process using gravity to remove suspended particles.

Sediments

- (1) Solid material settled from suspension in a liquid.
- (2) Mineral or organic solid material that is being transported or has been moved from its site of origin by air, water, or ice and has come to rest on the ground surface either above or below sea level.
- (3) Inorganic or organic particles originating from weathering, chemical precipitation, or biological activity.
- (4) Any solid phase settling out of a liquid phase, e.g., deposits in rivers and lakes or sludge in clarifiers.

Septic

A condition produced by bacteria when all oxygen supplies are depleted. Bottom deposits produce hydrogen sulphide and the water turns black giving off foul odours.

Septic Fields

Systems of porous pipes, or pits, used to dispose of liquid effluent from septic tanks after the solids have settled out in the tanks.

Sequestration (Chelation)

A chemical complexing of metallic cations with certain inorganic compounds such as phosphate. This prevents the precipitation of the metals.

Settling

Sedimentation.

Sewage Lagoons

A large holding or detention pond used as a settling basin during the treatment of wastewater.

Shields Structures built on site to prevent the earth walls of a trench or hole from falling inwards.

Shock Treatment

Typically refers to the application of large concentrations of chlorine to facilitate the removal of high levels of organic matter or contamination.

Shoring

A mechanical, metal hydraulic, or timber system that is able to withstand the forces that are imposed by the surrounding earth to prevent cave-ins and thereby protect workers.

Short-Circuiting

A condition that occurs in tanks or reservoirs when the incoming water travels too quickly to the outlet while leaving the main body of water to stagnate or miss intended treatment.

Sievert (Sv)

The unit of radiation dose

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- Siphoning** Moving a liquid up and over an elevation above the source by means of a closed system having the outlet below the level of the fluid surface at the inlet.
- Slightly Acidic** Having a pH below, but close to, 7.0.
- Slimes** Any of numerous substances of viscous organic nature that are usually formed from microbiological growth and attach themselves to other objects, forming a coating.
See Biofilm.
- Slope (Grade)** The slope or inclination of trench bottom or trench side wall is a ratio of the vertical distance to the horizontal distance referred to as rise over run.
- Sludge** The settleable solids separated from water during processing.
- Sodium Hypochlorite** Commonly called bleach, formula NaOCl, used for disinfection as an alternative to chlorine gas, especially where there are safety concerns over storage of the gas. When it is added to water it hydrolyzes to form hypochlorous acid; the same active ingredient that occurs when chlorine gas is used.
- Soft Water** Water having a low concentration of calcium and magnesium ions. Soft water is considered to be aggressive (corrosive).
- Soluble** A substance which can be dissolved into solution.
- Solute** A substance, gas, liquid or solid, which is dissolved by a solvent rendering a solution.
- Solution** A mixture of a solute and a solvent
- Solvent** A liquid capable of dissolving other substances. Water is considered to be the universal solvent.
- Specific Capacity** The well yield per unit of drawdown or specific capacity = $\frac{\text{well yield}}{\text{drawdown}}$ (expressed in gal/min per ft drawdown or L/m per meter drawdown)
- Specific Conductance** A rapid method used to determine the level of dissolved solids in a solution at a specific temperature, usually 25°C.
- Spoil** Excavated materials such as soil from the trench of a water main.
- Spontaneous Combustion** The unintentional starting of a fire, usually due to unexpected or inadvertent events, such as the combination of chemicals.
- Spring** A concentrated discharge of groundwater appearing at the ground surface as a current of flowing water.

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Stage(s)	(1) The elevation of a water surface above its minimum or above or below an established low-water plane or datum of reference. (2) One of many steps in the operation of an evaporator, filter, compressor, or pump, each of which is operated at different conditions of pressure. Such a stage is also called an effect.
Stagnant	Motionless, or nearly motionless, as water in a dead-end pipe, or in an inactive reservoir.
Standpipe(s)	A high tank, usually small in diameter compared to height, for holding water. This water is used to maintain pressure in a water supply system and as storage for fire protection.
Static Head	The pressure of water created by elevation in a case where water is not moving.
Static Pressure	When water static the vertical distance in feet or metres from a specific point to the water surface is static head. The static pressure is expressed in psi or kPa
Sterile	Having been treated to kill or remove all forms of life, usually by heat, ultraviolet irradiation, gamma irradiation, or filtration.
Storage	The impounding of water, in either surface or underground reservoirs, for future use.
Storm Sewer	A separate pipe that carries runoff from storms, surface drainage and street wash, but does not include domestic and industrial wastes.
Stormwater	Precipitation that accumulates in natural and/or constructed storage and stormwater systems during and immediately following a storm event.
Stripping	A process of transferring a target compound from the liquid phase to the gas phase, often accomplished by passing a large volume of air through the water.
Strong Acid	An acid that has a great tendency to transfer a proton to another molecule
Submersible	Designed to operate under water.
Submersible Turbine	A type of pump designed to operate under water, with the motor mounted below the bowl rather than driving the pump by a long shaft from above.
Suction	The inlet side or pipe leading to a pump.
Suction Lift	The negative pressure in feet or metres of water on the suction side of the pump.
Super Chlorination (Shock Treatment)	The application of high doses of chlorine to provide a powerful disinfection or oxidation outcome.
Surface Runoff	The portion of rainfall, irrigation water or wastewater that does not infiltrate into the soil.

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Surface Source

A source of water present above the surface of the ground, such as a lake, pond or stream, as opposed to groundwater from beneath the surface.

Surface Water

All water on the surface, as distinguished from subsurface or groundwater.

Suspended Matter

See suspended solids and turbidity.

Suspended Solids

Solid organic and inorganic particles that are held in suspension by the action of flowing water and are not dissolved.

Swabbed

The state of a pipe having been internally cleaned by drawing or forcing a brush through it.

Swabbing

Internally cleaning a pipe by forcing or drawing a brush through it. Swabbing will remove loose material left after flushing, but will not likely remove scale from the inner pipe surface.

System Pressure

Water pressure within the distribution system.

T

Tastes and Odours

The blend of taste and odour, often called flavour, which can be perceived by the tongue and nose in combination, and which may be pleasant, unpleasant, or neutral.

Thermophilic bacteria

A group of micro-organisms that grow and thrive in temperatures above 113 F (45 0C), typically used in anaerobic digestion. The optimum temperature range for these bacteria in anaerobic decomposition is 120 F (49 0C) to 135 F (57 0C).

Thickening

Treatment to remove water from the sludge mass to reduce the volume that must be handled.

Thrust Block

A massive concrete or similar material appropriately placed around a pipe to prevent movement when the pipe is carrying water. Usually placed at bends and valve structures.

Topography

The configuration of a surface, including its relief and the position of its natural and artificial features.

Total Chlorine Residual

The sum total of free chlorine residual and combined chlorine residual.

Total Dissolved Solids (TDS)

The weight per unit volume of solids remaining after a sample has been filtered to remove suspended and colloidal solids. The solids passing the filter are evaporated to dryness. The filter pore diameter and evaporation temperature are frequently specified.

Totalizer

A device or meter that continually measures (adding) a process rate variable. Example: flow totalizers and hour meters.

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Toxic	A substance that is poisonous to a living organism
Transpiration	The process by which water vapour is lost to the atmosphere from living plants.
Treatment	The modification of water quality to make it suitable for its intended use.
Treatment System	The equipment and processes by which water quality is made suitable for its intended use.
Tree System	A particular design of water distribution system which has a main pipeline with branches leading from it, the branches supplying successively smaller pipes, including to areas and individual consumers.
Trenches	An excavation made for installing pipes or other underground equipment, and which is temporary and will be backfilled. It differs from a ditch which is permanent and will stay open.
Trench Sloping	The practice of sloping the walls of an excavation to below the natural angle of repose of the material being excavated so that shoring or other wall support is not required for safety to prevent collapse.
Trihalomethanes (THM's)	Chloroform, bromochloromethane, dibromochloromethane, and bromoform. Compounds formed as disinfection by-products when chlorine is combined with water containing certain organic constituents. These compounds have carcinogenic potential as well as other potential health effects so are regulated.
True Colour	The colour of water from which turbidity has been removed. Measured in NTUs
Tuberculation	The development or formation of corrosion build up on the inside of iron pipe. This occurrence increases the roughness of the inside of the pipe causing increasing resistance to flow.
Tubercule	A protective crust of corrosion products (such as rust), which builds up over a pit, caused by the corrosive loss of metal.
Turbidity	(1) A condition in water caused by the presence of suspended matter, resulting in the scattering and absorption of light. (2) Any suspended solids that impart a visible haze or cloudiness to water and can be removed by treatment. (3) An analytical quantity, usually reported in nephelometric turbidity units, determined by measurements of light scattering.
U	
Underground Reservoirs	A reservoir constructed so that the top is at or below the ground surface level.
Underlying Layer	Refers to impervious layers of rock or other natural material lying beneath an aquifer.
Unprocessed Sludge	Raw sludge or WAS alone, or in combination, prior to any processing such as digestion.

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Upper Explosive Limit (UEL)

The point at which the concentration of a gas in air becomes too great to allow an explosion due to insufficient oxygen.

V

Vacuum Feed

Vacuum feed is a means of injecting one stream into another by creating a low pressure in the receiving stream.

Vacuum Relief

The admission of air into a vessel in which a vacuum has been created. It is usually necessary to prevent collapse of the vessel.

Valve(s)

A mechanical device installed in a water distribution system or treatment plant to close off or regulate the flow of water in the system.

Valve Boxes

Housings that enclose the operating nuts of gate valves, and which extend to the ground surface, allowing an access opening for an operating or valvekey to be inserted and connected to the operating nut so that the valve may be opened and closed.

Velocity Head

The energy in flowing water has determined by vertical height (in feet or metres) equal to the square of the velocity of flowing water divided by twice the acceleration due to gravity. ($V^2/2g$)

Velocity Pump

A pump which creates pressure in water by first causing the water to move at speed, then converts that speed to pressure. These are the most common types of pumps used in water systems today, and include centrifugal pumps.

Venturi Meter

A constriction in a pipe shaped so that a lowered pressure area is created in the flow.

Vertical Turbine Pump

A centrifugal pump, commonly of the multistage diffuser type, in which the pump shaft is mounted vertically.

Viruses

Microorganisms which are smaller than bacterium and characterized by their total dependence on living cells to reproduce. Viruses often cause debilitating disease.

Viscosity

A property of water or any fluid which resists efforts to change its shape or flow. The viscosity of water increases significantly as temperatures decrease.

Volatile

Capable of turning to vapour. Usually accompanied by a set of temperature and pressure conditions.

Volatile Organic

Organic matter that is capable of turning to vapour.

Volatile Solids

Organic compounds in solid form, present in wastewater, unprocessed sludge and biosolids, that are amenable to biological or chemical oxidation.

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Volute Case(s)

A centrifugal pump case shaped as a spiral to cause the rotation or speed of the water flow

W

Waste Activated Sludge (WAS)

That portion of the solid materials collected from secondary treatment that is not returned to the aeration tanks.

Wastewater The waste products of domestic, industrial, agricultural and manufacturing activities.

Wastewater Treatment Plant

A plant that treats urban wastewater and some of the runoff collected in the combined sewer system, and discharges the treated effluent to a receiving body of water.

Water Audit A thorough examination of the accuracy of water agency records and systems such as volumes of water and system control equipment. The primary goal is to identify water losses.

Water Bearing Formation

A geological formation (ie. sand and gravel layer) containing water. An aquifer.

Water Cycle (Hydrologic Cycle)

The process of evaporation of water into air and its return to earth through precipitation. The tracking of water in its various states.

Water Hammer (Hydraulic Shock)

The hammering sound that occurs in a piping system due to a rapid valve opening or closure. Can cause system damage.

Watershed

(1) The drainage basin area contained within the bounds specified by a divide and above a specified point on a stream. In water supply engineering, a watershed is also called a catchment area; in river control engineering, it is called a drainage area, a drainage basin, or a catchment area.
(2) The divide between drainage basins.

Water Supply

(1) In general, the sources of water for public or private uses.
(2) The furnishing of a good quality potable water under satisfactory pressure for domestic, commercial, industrial, and public service, as well as an adequate quantity of water under reasonable pressure for fire fighting.

Water Table

The surface in an unconfined aquifer where the water pressure is atmospheric. The water table is determined by measuring the water level in shallow wells installed a few feet into the zone of saturation.

Water Treatment Plant

A plant that treats raw water for use as potable (drinkable) water

Watt

A unit of power equal to one joule per second. The power of a current of one ampere flowing across a potential difference of one volt. (Volts x Amps)

Weak Base

A mildly alkaline solution, pH slightly above 7.0.

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Wet Weather Flow

Water entering storm sewers during rainstorms/wet weather events.

Wood Staves

Sections of wood timber used to build cylindrical tanks or pipes. The staves are arranged parallel to the axis of the tank or pipe and are held together by outside banding.

Y

Yield

The quantity of water expressed as a rate of flow that can be collected for a given use from a surface or groundwater source.

Z

Zeolite

A type of ion exchange material used to soften water. Natural zeolites are siliceous compounds, which remove calcium and magnesium from hard water, replacing them with sodium.

Zeta Potential

In coagulation and flocculation processes the difference in the electrical charge between the particles and the surrounding fluid.

Zooplankton

Small typically microscopic animals found in lakes, reservoirs and oceans.