CHAPTER 6:

6 GLOSSARY

Acute. Acute effects refer to physiological effects observed following limited duration exposure to contaminants.

Adsorption. Adsorption is the process by which dissolved pollutants adhere to suspended particulates, bottom sediments, vegetation surfaces, or other media (such as activated carbon). Some filtration media help remove charged pollutant particles, such as metal cations, by adsorption.

Aquatic or Riparian Problems: means construction or development sites where control practices are needed to protect aquatic or riparian environments or conditions (e.g., bank habitat, associated vegetative cover, preservation of habitat, life cycle impacts to plants and animals, water quality limitations that affect fish and wildlife).

Avulsion (avulsing). The rapid migration of the primary stream channel from its previous course, usually during flood events.

Backwater. The accumulation of water and slowing of flow behind (upstream of) an obstruction or constriction in a stream or floodplain.

Bank erosion. The carrying away or displacement of solids (sediment, soil, rock, and other particles) along a stream bank usually by the agents of streamflow or by downward or down-slope movement in response to gravity or by living organisms. Bank erosion is distinguished from weathering, which is the process of chemical or physical breakdown of the minerals in the rocks, although the two processes may be concurrent.

Bed load. The portion of the total sediment load of a river or stream that is in intermittent contact with the streambed.

Bedrock. The native, contiguous, consolidated rock underlying the surface of the Earth. Above bedrock is usually an area of broken and weathered unconsolidated rock, usually called sediment. Occasionally bedrock is exposed on the surface indicating that sediment has been removed by streamflow or some other sediment transport process (e.g., landsliding).

Best Management Practices (BMPs): means structural and non-structural methods, measures or practices implemented to prevent, reduce or mitigate adverse water quality impacts resulting from construction and operation of a project.

Better site design: includes a series of techniques that reduce impervious cover, conserve natural areas, and use pervious areas to more effectively treat stormwater runoff and promote the treatment train approach to runoff management.

Bioavailable. Able to interact with an organism in a physiologically meaningful (e.g., tissue uptake, bioaccumulation in tissue, metabolism) way.

Biochemical oxygen demand. A measure of the amount of oxygen needed by aquatic organisms to break down solids and other readily degradable organic matter present in water. Also called biological oxygen demand.

Biofiltration. The process of reducing pollutant concentrations in water by filtering the polluted water through biological materials, such as vegetation.

Bioinfiltration. The process of reducing pollutant concentrations in water by infiltrating the polluted water through grassy vegetation and soils into the ground. Biological oxygen demand. A measure of the quantity of oxygen used by microorganisms (e.g., aerobic bacteria) in the oxidation of organic matter. Frequently used as an indicator of water quality.

Bypass. An alternate flow path, such as an emergency overflow spillway, provided as part of a BMP. Designed to prevent facility failure when the primary mode of discharge is blocked.

Catch basin. A structure, typically concrete, that collects surface runoff through a metal grate. Catch basins typically include a sump where sediment can settle out.

Channel aggradation. The accumulation of sediment in a channel. It occurs when sediment supply exceeds the ability of a river to transport the sediment.

Channel incision. The deepening of the channel of a stream by erosion.

Channel migration. The movement of the horizontal position of a channel over time. Channel migration is often associated with the movement of a meander.

Chemical oxygen demand (COD). COD is a measure the amount of organic compounds in water. In natural surface waters, such as lakes and rivers, it indicates the presence of organic pollutants and is therefore a useful indicator of water quality. It is expressed in milligrams [of oxygen] per liter [of water, or other solution].

Chronic. Chronic effects refer to physiological effects observed following prolonged duration exposure to contaminants.

Colloidal. Remaining suspended without forming an ionic or dissolved solution.

Complexing. Bonding between a dissolved metal and another chemical (ligand) that keeps a dissolved metal in solution.

Composite sample. Composite samples involve a collection and mixing of multiple subsamples throughout a sampling period (usually an individual storm event) to provide water quality data that is more representative of the overall sampling period.

Contributing impervious area (CIA). All impervious surface within the project limits, plus impervious surface owned or operated by ODOT outside the project limits, that drains to the project via direct flow or discrete conveyance.

Cut bank. An erosional feature of streams. Cut banks are found in abundance along mature or meandering streams, they are located on the outside of a stream bend, known as a meander. They are shaped much like a small cliff, and are formed by the erosion of soil as the stream collides with the river bank. As opposed to a point bar, it is an area of erosion rather than deposition.

Detention. The temporary storage of stormwater runoff in a facility (typically a pond, vault, or large pipe) which is used to control the peak discharge rates. The entire stormwater volume is ultimately released, but at a lower discharge rate.

Dispersion. Release of surface water and stormwater runoff in such a way that the flow spreads over a wide area and is located so as not to allow flow to concentrate. Dispersion areas should be gently sloped, vegetated, and with underlying soils suitable for infiltration.

Dissolution. Dissolving a solid substance into a solvent to yield a solution.

Dissolved Metals. Metals bound to another chemical (ligand) through complexing that are in solution.

Dissolved Oxygen. The amount of oxygen dissolved in water. This term also refers to a measure of the amount of oxygen available for biochemical activity in a waterbody, an indicator of water quality.

Disturbed Soil Area: Disturbed soil areas (DSAs) are areas of exposed, erodible soil that are within the construction limits and that result from construction activities. The following are not considered DSAs:

> Areas where soil stabilization, erosion control, highway planting, or slope protection are applied and associated drainage facilities are in place and functional.
>
> Roadways, construction roads, access roads or contractor's yards that have been stabilized by the placement of compacted subbase or base material or paved surfacing.
>
> Areas where construction has been completed in conformance with the contract plans and permanent erosion control is in place and functional.

Durations. The cumulative amount of time that a receiving water experiences higher flows during and after storm events.

Effluent: The U.S. EPA defines effluent as wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall.

Emergency Overflow Spillway. An armored surface outlet from detention pond or other surface BMP to allow stormwater to discharge even in the event of outlet plugging or higher than design flows.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Erosion and sediment control (ESC) measures. Erosion control is the process of minimizing the amount of soil that runs off of a site (such as during construction). Sediment control is the process of retaining eroded soil on site, preventing damage to watercourses and infrastructure.

Eutrophication. A process whereby water bodies, such as lakes, estuaries, or slow-moving streams receive excess nutrients that stimulate excessive plant growth. Under

eutrophic conditions, dissolved oxygen levels may be depleted by the respiring algae and by microorganisms that feed on dead algae, threatening salmon and other marine animals.

Evapotranspiration. The sum of evaporation (movement of water to the air through tree canopy interception, soil, and water bodies) and transpiration (water loss as vapor through plant activity).

Event Mean Concentration (EMC). Mean concentration of pollutants in runoff from a storm event.

Federal nexus. A project receiving federal funding (e.g., a highway construction project) is subject to federal laws and regulations. For example, ESA issues must be addressed either in a no-effect memorandum or in a BA.

Filter strip. A grassy area with gentle slopes that treats stormwater runoff from adjacent paved areas before it can concentrate into a discrete channel.

Filtration: Physical trapping of suspended pollutants. Filtration can encompass a wide range of physical and chemical mechanisms, depending on the filtering media, typically some sand media, natural soil, grassy vegetation, or mixes of chemically active ingredients such as perlite, zeolite, and granular activated carbon. Filtration removes particulate matter either on the surface of the filter or within the pore space of the filter. Filtration such as a sand filter can provide the added benefit of removing stormwater constituents that may be attached to solids such as metals and bacteria. Filtration can also provide opportunities for sorption processes to occur, reducing dissolved and fine suspended constituents. Filtration can often be an effective preliminary treatment for stormwater, by increasing the longevity of downstream BMPs and reducing maintenance frequency.

Floodplain. A floodplain is an area adjacent to a river or stream channel that is usually fairly flat and experiences occasional or periodic inundation during floods. The floodplain includes the floodway and other areas sometimes referred to as the flood fringe, which are inundated during floods but do not contribute significantly to flood flow conveyance and do not experience significant flow velocities.

Floodway. A floodway is an area that includes that channel of a river, stream, or other watercourse and adjacent lands that conveys floodwaters. The floodway is composed of the active river channel and those parts of the floodplain which experience flows of significant velocity and convey flow during flood events. The floodway concept has regulatory significance, imposing boundaries on developable area.

Flow concentration. The result of large flows in association with developed (impervious surface) areas, where infiltration is prevented. In these areas, flow becomes concentrated and channelized much more quickly than in undeveloped settings.

Flow regime. Generally referring to type of flow present in a stream. This has impacts on the position of hydraulic control in a stream. Fast moving, or supercritical flows, are controlled from upstream conditions; while slow moving, or subcritical flows, are controlled from downstream conditions.

Flow-through. Facilities such as grass swales that convey stormwater, or store it temporarily, prior to release through surface runoff or enclosed (piped) drainage systems. Flow-through facilities are in contrast to infiltration facilities.

Grab sample. A single sample of stormwater collected for analysis. Grab samples provide a snapshot of water quality conditions, and may be useful if collected during the rising limb or at the peak of a storm hydrograph when higher concentrations might be expected.

Gutter. A depressed concrete channel that conveys stormwater along the edge of a street.

Hardness. Water hardness measures the presence of multivalent cations dissolved in water; particularly calcium and magnesium divalent cations (ions with a charge of +2).

Headcut. An active eroding bank or channel that moves further upstream as it continues to erode material.

Hydraulic gradient. Difference in hydraulic head between two or more hydraulic head measurements divided by the length of the flow path.

Hydraulic head. Measure of water pressure above a datum. Typically expressed as an elevation, in feet.

Hydrologic attenuation: Hydrologic attenuation achieves pollutant reduction through runoff volume reduction. Infiltration is the primary means of hydrologic attenuation for the purposes of the types of BMPs used in stormwater management. Attenuation reduces the pollutant load discharged to surface waters, but does not necessarily reduce pollutant concentrations. Infiltration includes several different treatment mechanisms. Processes such as sorption, filtration, and microbial degradation occur as runoff infiltrates through the soil matrix.

Hydrologic soil groups. A soil characteristic classification system defined by the Natural Resources Conservation Service in which a soil may be categorized into one of four soil groups (A, B, C, or D) based on infiltration rate and other properties.

Impervious surface. A hard surface area that either prevents or slows the entry of water into the ground as compared with natural conditions (prior to development), and from which water runs off at an increased rate of flow or in increased volumes. Common impervious surfaces include but are not limited to rooftops, walkways, roads, and other concrete or asphalt surfaces.

Incised, incision. See channel incision.

Inert. Not chemically active. Inert filtration media would rely only on physical properties, rather than chemical treatment mechanisms such as sorption, for pollutant removal.

Infiltration rate. The rate, usually expressed in inches per hour, at which water moves downward (percolates) through the soil profile.

Infiltration. The downward movement of rainwater or surface water through the soil.

Inlet. A structure, typically concrete, that collects surface runoff through a metal grate. Inlets may include a sump where sediment can settle out.

Inundate. To cover with water, usually associated with flooding.

Jurisdictional wetland. A wetland that is connected to a Water of the United States (WOUS) using the Corps definition of WOUS (Section 404 Clean Water Act).

Large woody debris (LWD). The accumulation of trees and large branches that have fallen into a stream. LWD serves many purposes in a stream that are vital to life history of many native species of fish, plants and animals.

Levee. A natural or artificial slope or wall, usually earthen and often parallel to the course of a stream, to protect adjacent areas (usually development) from flooding.

Log jams. These features are large accumulations of large woody debris (LWD) in particular places along a stream bank or in the middle of a stream. Log jams have traditionally been removed from streams. However, increased awareness of these features has shown to provide key hydraulic and geomorphic function necessary for a healthy stream ecosystem.

Low Impact Development (LID): A comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds. LID is a stormwater management design approach that attempts to mimic a site's predevelopment hydrology by using design practices and techniques that reduce impervious areas, and preserve native vegetation and soils. LID stormwater management techniques capture, filter, store, evaporate and infiltrate runoff near its source.

Meander(ing). A bend in a stream, also known as an oxbow loop, or simply an oxbow. A stream of any volume may assume a meandering course, alternatively eroding sediments from the outside of a bend and depositing them on the inside. The result is a "snaking" pattern as the stream meanders back and forth across its down-valley axis.

Microbially mediated transformation: Microbial activity promotes or catalyzes redox reactions and transformations including degradation of organic and inorganic pollutants and immobilization of metals. Bacteria, algae, and fungi present in the soil or water column are primarily responsible for the transformations. Stormwater treatment that incorporates vegetation or permanent water pools usually has a diverse microbial population. These transformations can remove dissolved nitrogen species, metals, and simple and complex organic compounds. Soils may be inoculated with desirable microbes to promote specific reactions.

Municipal Separate Storm Sewer Systems: is defined as any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that is designed or used for collecting or conveying storm water.

Non-Point Source:

Nonstructural BMPs: include pollution prevention practices and source control activities, designed to minimize or eliminate a problem before it occurs. Source control BMPs are sometimes referred to as "good housekeeping" measures because a clean site

will produce less pollutants than will a dirty one. Site planning and design of BMPs may, in and of itself, be considered a nonstructural BMP.

Outfall. Any location where concentrated stormwater runoff leaves the right if way as concentrated runoff. Outfalls may discharge to surface waters or groundwater.

Outlet protection. A protective barrier of rock, erosion control blankets, vegetation, or sod constructed at a conveyance outlet.

Overflow Spillway. See Emergency Overflow Spillway.

Particulates. A minute separate particle, such as a granular substance or powder.

Peak flow. Maximum discharge of stormwater associated with a particular design storm, e.g. 2-year, 24-hour design storm.

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Pipe cover. Vertical separation between pavement subgrade and the top of a pipe.

Planimeter. An instrument that measures the area of a plane figure as a mechanically coupled pointer traverses the perimeter of the figure.

Plug flow. A laminar flow regime where water flows as if in a full pipe, the unit that enters first, exits first and there is no mixing between different units of water, designing for this type of flow prevents "short circuiting".

Point bar. A depositional feature of streams. Point bars are found in abundance in mature or meandering streams. They are crescent-shaped and located on the inside of a stream bend.

Pollutant load. Mass of a pollutant that a waterbody receives.

Polycyclic aromatic hydrocarbons (PAHs). PAHs are hydrocarbon compounds with multiple benzene rings. PAHs are typical components of asphalts, fuels, oils, and greases.

Pour point. The point at which smaller stream or river basins meet larger stream or river basins.

Pretreatment. The removal of material such as solids, grit, and grease from flows to improve treatability prior to biological or physical treatment processes; may include screening, settling, oil/water separation, or application of a basic treatment BMP prior to infiltration.

Primary Treatment Mechanisms:

Project Types: means general categories and types of construction or development projects (e.g., bridges, crossing structures, channel work, utility construction, site development, roads and highways, instream mining, dams and reservoirs, specialty activities such as go f courses and driveways) in Hawaii that are likely to require federal or state permits (e.g. 404 permit, 401 certification).

Point Source: A point source is any discrete conveyance such as a pipe or a man-made ditch.

Pollutant load: refer to the mass of pollutants, or the total amount delivered to the storm system or receiving waters independent of the volume of stormwater.

Rain Event: A qualifying rain event is any storm event that produces precipitation of ½ inch or more at the time of discharge. In conformance with the USEPA definition, a minimum of 72 hours of dry weather will be used to distinguish between separate qualifying rain events.

Reference Types: means categories that refer to structural or source controls, permanent best management practices, and specialty practices used by Federal, State or local agencies (e.g. National Park Service). Reference types are applicable to construction or development sites.

Release rate. The design peak discharge rate, typically expressed in cubic feet per second (cfs) from a detention facility. When detention is required, design standards often stipulate that post development release rates must match pre-pre-development peak discharge rates.

Riparian Area: Vegetated ecosystems along a waterbody through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent waterbody. These systems encompass wetlands, uplands, or some combination of these two land forms. They will not in all cases have all of the characteristics necessary for them to be classified as wetlands.

Runoff: Rainwater or snowmelt that directly leaves an area as surface drainage.

Salinity: The dissolved salts content of a body of water.

Sand filter: A manmade depression or basin with a layer of sand that treats stormwater as it percolates through the sand and is discharged via a central collector pipe.

Saturated hydraulic conductivity: The rate of movement of water through a saturated porous medium.

Sediment Problems: means construction or development sites where sediment and erosion controls are necessary to prevent sediment pollution (e.g., sediment deposits and loading, steep slopes, stream bank instability, runoff or velocity controls, wind erosion).

Sedimentation/density separation: Density separation refers to the unit processes of sedimentation and flotation that are dependent on the density differences between the pollutant and the water to effect removal. Sedimentation is the gravitational settling of particles having a density greater than water. Flotation is similar to gravitational sedimentation except in the opposite direction. Typically, floatable materials such as trash, debris, and hydrocarbons are removed through treatment processes that utilize the location of these pollutants on the water surface for removal. Stormwater treatment that incorporates vegetation and or permanent water bodies usually has a diverse microbial population, and it is not possible to optimize conditions for all beneficial species.

Sediment supply: The amount of sediment made available to a stream from the surrounding landscape and its runoff.

Sediment transport: The movement of solid particles ("sediments") due to the movement of the fluid in which they are immersed. In streams, the particles are rocks (sand, gravel, boulders, etc.) or clay, and the fluid is water.

Sheet flow: Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.

Short Circuiting: the passage of runoff through a BMP in less than the design treatment time

Sorption: Sorption refers to the individual unit processes of both absorption and adsorption. Absorption is a physical process whereby a substance of one state is incorporated into another substance of a different state (e.g., liquids being absorbed by a solid or gases being absorbed by water). Adsorption is the physiochemical adherence or bonding of ions and molecules (ion exchange) onto the surface of another molecule. In stormwater treatment application, particularly for highway runoff, the primary pollutant types targeted with absorption unit processes are petroleum hydrocarbons, while adsorption processes typically target dissolved metals, nutrients, and organic toxicants such as pesticides and polycyclic aromatic hydrocarbons (PAHs). Different types of filter media may provide either or both of these unit processes.

Source Control BMP: Appropriate operational or structural measures that prevent or reduce pollutants from entering storm water. Examples of operational source control BMPs include good housekeeping practices, spill prevention, and employee training. Structural source control BMPs consist of enclosures or roofs for working areas where pollutants are present or installing devices that direct contaminated storm water to appropriate treatment BMPs.

Soil amendments. Materials that improve soil fertility for establishing vegetation or permeability for infiltrating runoff.

Soil texture. The proportion of sand, silt and clay in a soil. Many properties of soil are heavily dependent on texture including infiltration rate, resistance to erosion, and water-holding capacity.

Sorptive. A substance capable of taking up water or dissolved compounds.

Stormwater Management Plan. A document that describes the condition of receiving waters including water quality issues, channel conditions, watershed size and characteristics, and climate. It also describes the proposed drainage and stormwater management systems and estimates project impacts.

Stormwater treatment BMP. A BMP specifically designed for pollutant removal.

Swale. A wide natural channel with relatively gentle side slopes, generally with flow depths less than 1 foot, used to filter runoff.

Structural BMPs: are facilities constructed to passively treat runoff before it enters the receiving waters. Such BMPs (sometimes called "dirt moving" practices) used on a construction or development site can be either temporary or permanent, depending on the duration of their application, and are designed to reduce sediment pollution and

other pollutants in runoff. Additionally, they can provide for the protection of aquatic or riparian areas. A limited number of special use practices requiring additional demonstration under the semi-arid or mountainous conditions in Hawaii are also listed in the matrix and can be used on a case-by-case basis. Special use practices have been developed for golf course projects, driveways and high-altitude construction. Some construction BMPs result in permanent sediment and erosion control structures, which are designed to work beyond the construction period.

Total Dissolved Solids: The dissolved matter found in water comprised of minerals salts and small amount of other inorganic and organic substances.

Total Kjeldahl Nitrogen: The sum of organic nitrogen and ammonia in a water body, measured in milligrams per liter (mg/L). High measurements typically result from sewage and manure discharges to water bodies.

Total Maximum Daily Load (TMDL): the maximum amount of a pollutant that can be discharged into a water body from all sources (point and non-point) and still maintain water quality standards. Under Clean Water Act section 303(d), TMDLs must be developed for all water bodies that do not meet water quality standards after application of technology-based controls.

Total Nitrogen: A measure of all forms of nitrogen (e.g., nitrate, nitrite, ammonia-N, and organic forms) that are found in a water sample.

Total Phosphorus: the total concentration of phosphorus found in the water. Phosphorus is a nutrient and acts as a fertilizer, increasing the growth of plant life such as algae.

Total Suspended Solids (TSS): solids suspended in water including a wide variety of material such as silt and decaying plant matter.

Toxicity. Adverse effects on living organisms resulting from chemical exposure.

Treatment train or system. The combination of several treatment facilities with unique unit processes applied in a linear progression (also called "in series").

Turbidity. The cloudiness or haziness of a fluid caused by individual particles (suspended solids)) that are generally invisible to the naked eye. The measurement of turbidity is a key test of water quality.

Underdrain. Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration facility, that are used to collect and remove excess runoff.

Qualifying Rain Event: Any rain event producing precipitation of 0.5 inch or more over the duration of the rain event.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Ordinary High Water Mark: that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation,

the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Unit Operations. The treatment facilities in which the unit process occurs (i.e., wet pond or swale).

Unit Process. The specific mechanism of pollutant removal (i.e., sedimentation or vegetative uptake).

Vegetated filter strip. A facility designed to provide stormwater treatment of conventional pollutants (but not nutrients) through the process of biofiltration.

Vegetative (or Biological) Uptake. The processes by which nutrients and other dissolved chemicals are taken up by plants and algae. Chemicals may be metabolized or stored in plant tissues.

Uptake/Storage: Uptake and storage refer to the removal of organic and inorganic constituents by plants and microbes through nutrient uptake and bioaccumulation. Nutrient uptake converts required micro- and macro-nutrients into living tissue. In addition to nutrients, various algae and wetland and terrestrial plants accumulate organic and inorganic constituents in excess of their immediate needs (bioaccumulation). The ability of plants to accumulate and store metals varies greatly. Significant metal uptake by plants will not occur unless the appropriate species are selected.

Watershed. A geographic region within which water drains into a particular river, stream, or body of water.

Wetlands: are a subset of jurisdictional WUS and are jointly defined by the USACE and the U.S. Environmental Protection Agency (40 Code of Federal Regulations [CFR] 230.3) as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.