Appendix C

Credits for Low Impact Development Best Management Practices

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Credits for Low Impact Development (LID) Best Management Practices (BMPs)

LID Technique	Compliance Requirements	Credit	LID Used	Credit Taken
Minimizing Soil Compaction (*Section 4.4.1*)	• The "no disturbance" areas are protected by having the limits of disturbance and access clearly shown on the Stormwater Management Plan, all construction drawings, and delineated/flagged/fenced in the field. • "No disturbance" areas are not to be stripped of existing topsoil. • "No disturbance" areas are not to be stripped of existing vegetation. • Vehicle movement, storage, or equipment/material lay-down is not to be permitted in "no disturbance" areas. • Use of soil amendments and additional topsoil is permitted in other areas being disturbed. Grading may be performed using low ground pressure equipment (less than 3 pounds per square inch) to reduce the potential for soil compaction. • Lawn and turf grass are acceptable uses. Planted meadow is an encouraged use.	Areas that comply (i.e., "no disturbance areas") can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.	☐	☐
Minimizing Site Disturbance (*Section 4.4.2*)	Site disturbance including earthwork and clearing of vegetation should be limited to 40 feet beyond the building perimeter, 10 feet beyond the primary roadway curbs, walkways, and main utility branch trenches, and 25 feet beyond areas of proposed infiltration in order to limit compaction in the proposed infiltration area. This guidance is not intended to limit lawn areas.	Areas that comply can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.	☐	☐
Protecting Sensitive Natural Areas (*Section 4.4.3*)	Sensitive natural areas should be conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. The area must be permanently protected under a conservation easement.	The project proponent can subtract the conservation area from the total area in the Water Quality Volume calculation.	☐	☐
Protecting Riparian Buffers (*Section 4.4.4*)	Effective treatment of stormwater runoff is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site. • The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the top bank elevation of a stream or the boundary of a wetland. • The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces. • The average contributing overland slope to and across the buffer shall be less than or equal to 5%. • Runoff shall enter the buffer as sheet flow. A level spreader shall be utilized where local site conditions prevent sheet flow from being maintained. • The stream buffer remains unmanaged other than routine debris removal. • The buffer is protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area. The easement must clearly specify how the natural area vegetation shall be	The area draining by sheet flow to a buffer can be subtracted from the total area in the Water Quality Volume calculation, and the impervious area draining to the buffer by sheet flow can be subtracted from the impervious area in the Groundwater Recharge Volume calculation and post-development impervious area in the Runoff Reduction Volume calculation.	☐	☐

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	managed and boundaries will be marked. [Note: managed turf (e.g., playgrounds, regularly maintained open areas) is not an acceptable form of vegetation management.]			
Avoiding Disturbance of Steep Slopes (*Section 4.4.5*)	Development on steep slope areas shall be avoided. Unnecessary grading should be avoided on all slopes, as should the flattening of hills and ridges. Development shall follow the natural contours of the landscape.	Undisturbed steep slope areas can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.	☐	☐
Siting on Permeable and *Erodible Soils (Section 4.4.6*)	Whenever possible, highly erodible soils should be left undisturbed and protected from disturbance during site construction. Gravel soils tend to be the least erodible. Also as clay and organic matter increase erodibility tends to decrease. Infiltration practices should be located on those portions of the site with the most permeable soils.		☐	☐
Protecting Natural Flow Pathways (*Section 4.4.7*)	Site designs should use and/or improve natural drainage pathways whenever possible to reduce or eliminate the need for stormwater pipe networks. Natural drainage pathways should be protected from significantly increased runoff volumes and rates due to development. The design should prevent the erosion and degradation of natural drainage pathways through the use of upstream volume and rate control BMPs, if necessary. Level spreaders, erosion control matting, revegetation, outlet stabilization, and check dams can also be used to protect natural drainage features.		☐	☐
Reducing Impervious Surfaces (*Section 4.4.8*)	By reducing the amount of paved surfaces, stormwater runoff is decreased while infiltration and evapotranspiration opportunities are increased.	Reducing impervious surfaces reduces the Water Quality Volume, Runoff Reduction Volume, Groundwater Recharge Volume, and Peak Flow/Runoff Attenuation requirements.	☐	☐
Stormwater Disconnection (*Section 4.4.9*)	Disconnecting roof leaders and routing road and driveway runoff from conventional stormwater conveyance systems allows runoff to be collected and managed onsite. Runoff can be directed to vegetated areas designed for onsite storage, treatment, and volume control. All design criteria from section 4.4.9 must be met in order to obtain the credits shown.	Methods to compute the resultant runoff volumes and peak runoff rates from disconnected impervious areas are discussed in Section 4.6 of this manual and the design references cited therein. For simple disconnection, subtract 100% of the disconnected area from the total area in the Water Quality Volume calculation if the receiving pervious area is HSG A or B soils or 50% of the	☐	☐

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LID Technique	Compliance Requirements	Credit	LID Used	Credit Taken
		disconnected area if the receiving pervious area is HSG C or D soils. For disconnection to LID BMPs, subtract 100% of the disconnected area from the total area in the Water Quality Volume calculation.		

Compost-Amended Soils	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of infiltration BMPs.
	• Soil must be tilled to 12 to 16 inches and amended with small amounts of organic material.
	• For mechanical aeration of lawns/turf to be effective:
	  ○ Utilize a soil aerator that has a mechanical action that not only penetrates the soil surface but also shatters the soil matrix, causing the soil to decompact and crack, thus creating void space and increasing infiltration. (Passive-type aerators which simply poke a hole into the soil, whether it removes a plug or simply spikes a hole, can create a hardpan effect at the depth of penetration.)
	  ○ Shatter-type aerators include vertidrain, soil reliever, agrivator, and groundbreaker. Shatter-type aerators should penetrate the soil at depths of 8 to 18 inches.
	• The depth to water table or bedrock must be greater than 18 inches.
	• Existing soils may not be saturated or seasonal wet.
	• Slopes may not exceed 10%.
	• Existing tree root systems shall be avoided, no deep till or amendment under the tree drip lines.
		Subtract 50% of any restored areas (100% of any restored **and** reforested areas) from the total post development site area and re-calculate the Runoff Reduction Volume.	☐	☐

Rainwater Harvesting (Rain Barrels)	Rain barrels should hold a minimum of 50 gallons. Rain barrels can be connected in series to provide larger storage volumes. Equip rain barrels with a drain spigot near the bottom of the barrel with garden hose threading to allow easy hook up and use for watering. Provide an overflow pipe or hose near the top of the rain barrel. Provide removable, child-resistant covers. Provide mosquito screening on water entry holes to prevent mosquito breeding in standing water	Subtract 25% of the contributing drainage area from the total area in the Water Quality Volume calculation.	☐	☐

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Rainwater Harvesting (Cisterns)	The rooftop runoff must be captured and either (1) used on site for irrigation of lawns and gardens, wash water and other non-potable uses, or (2) treated and released, or (3) infiltrated. The cistern must be sized to treat the design rainfall from the roof area directed to the water harvesting system. If all of the design volume captured cannot be used, then a scaled reduction in credit will be given. The remaining volume must be treated by a properly designed BMP. A minimum factor of safety equal to 1.2 must be applied to the calculated cistern volume required. All stormwater collected must have a dedicated, year-round, use to assure no overflow of the system during a design rainfall. A water balance calculation must be used to establish the dedicated use volumes and rates. The water balance calculation must demonstrate that the design volume can: (1) be drawn down (used) within 3 days to allow for available volume in the system for the next rain event to be captured and stored, or (2) have an overflow of no more than 14 percent of the annual average historic rainfall, or (3) be drawn down within 3 days and discharged to a properly designed BMP. On a case-by-case basis, reduced credit may be given if the design volume cannot be reliably drawn down within 3 days, or if a year-round reuse is not available. The dedicated water use system must be automated to ensure that the water will be used at the rate and volume designed. The overflow shall discharge flows in excess of the design volume to a vegetated or natural area, or to another properly designed BMP (e.g., rain garden). This discharge shall be non-erosive flow for the 10-yr rainfall event. It shall not discharge directly to impervious surfaces. The elevation of the overflow pipe from the cistern shall be at or above the design volume elevation. If a first flush diverter is used, the bypassed water must discharge to a properly designed BMP. The first flush can be directed to a relatively small BMP next to the water harvesting system, or it can be directed to and accounted for in other BMPs on the site. At a minimum, a 1 mm or smaller screen at the entrance to the cistern from the gutter system shall be provided to filter out debris and to keep mosquitoes out of the cistern. If the water reuse system is designed to accommodate basement sump/foundation drain water and roof runoff, the design must allow for adequate storage for the full volume of roof runoff for the next design storm and basement sump/foundation drain water.	Subtract 100% of the contributing drainage area from the total area in the Water Quality Volume calculation.	☐	☐

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	A properly designed footing for the cistern must be designed if the load of the cistern at full capacity is greater than the soils will support. If it is buried, buoyancy calculations must be provided to show the cistern will not float when empty. Buoyancy calculations and flotation constraints must be provided if any part of the buried cistern is below the seasonal high water table, or if the area is subject to flooding. An appropriate pump shall be selected to provide adequate pressure for its designated uses. Above ground cisterns shall be made of a material or color that prevents light from entering the cistern, which helps prevent algae growth within the cistern. Irrigation water from a cistern shall be applied so that the water infiltrates into the ground. If for any reason the designed dedicated end use becomes unavailable because of some change, it will be required that an approved alternative end use or a properly designed BMP treatment system be installed on site to manage the roof runoff. The harvesting system shall be labeled and identified as non-potable water. The harvesting system shall meet all local and state building and plumbing codes.			

Credits for Low Impact Development (LID) Best Management Practices (BMPs)

LID Technique	Can Credit be Used? Groundwater Recharge Volume GRV	Can Credit be Used? Run-off Reduction Volume RRV	Can Credit be Used? Water Quality Volume WQV
Minimizing Soil Compaction (*Section 4.4.1*)	NO	NO	YES
Minimizing Site Disturbance (*Section 4.4.2*)	NO	NO	YES
Protecting Sensitive Natural Areas (*Section 4.4.3*)	NO	NO	YES
Protecting Riparian Buffers (*Section 4.4.4*)	YES	YES	YES
Avoiding Disturbance of Steep Slopes (*Section 4.4.5*)	NO	NO	YES
Siting on Permeable and *Erodible Soils (Section 4.4.6*)	NO	NO	NO
Protecting Natural Flow Pathways (*Section 4.4.7*)	NO	NO	NO
Reducing Impervious Surfaces (*Section 4.4.8*)	YES	YES	YES
Stormwater Disconnection (*Section 4.4.9*)	NO	NO	YES
Compost-Amended Soils	NO	YES	NO
Rainwater Harvesting (Rain Barrels)	NO	NO	YES
Rainwater Harvesting (Cisterns)	NO	NO	YES