CENTRAL COAST POST-CONSTRUCTION REQUIREMENTS

IMPLEMENTATION GUIDANCE SERIES[1]

SERIES ISSUE #2: DECENTRALIZED STORMWATER MANAGEMENT TO COMPLY WITH RUNOFF RETENTION POST-CONSTRUCTION STORMWATER CONTROL REQUIREMENTS

Low Impact Development (LID) is a stormwater management approach that seeks to manage rainfall using distributed and decentralized controls, natural treatment, and runoff volume reduction Stormwater Control Measures (SCMs). The goal of LID is to mimic the pre-development hydrologic condition of a site by minimizing disturbed areas and impervious cover and by infiltrating, storing, detaining, evapotranspiring, and/or biotreating stormwater runoff close to its source. Instead of conveying and treating stormwater solely in end-of-pipe facilities located at the bottom of large drainage areas (i.e., centralized stormwater management), LID manages stormwater through small-scale landscape practices and designs that preserve natural watershed processes throughout a project site (i.e., decentralized stormwater management).

What is decentralized enough?

Most LID guidance describes the decentralization approach for small-scale (e.g., parcel) projects in which one LID SCM is constructed to manage one Drainage Management Area (DMA) such as the roof area, parking lot, or sidewalk. The question of adequate decentralization can arise with moderate to large project footprints where there may be a design imperative to "scale-up" DMAs and construct larger corresponding SCMs, thereby resulting in centralized systems that fail to meet a key objective of LID. This guidance applies to projects that are at least five acres in size and is meant to provide direction to project applicants and plan reviewers on the appropriate scale for achieving a decentralized approach to managing stormwater runoff to meet Central Coast Post-Construction Requirements (PCRs)[2]. See Note 1 for further explanation of the regulatory context.

Delineating Drainage Management Areas

Delineating DMAs is the key step in achieving a decentralized approach. While a variety of design factors influence the size of a DMA (e.g., types of SCMs, categories of impervious surface, site gradient, land use), the PCRs intend for DMA sizing to reflect and preserve natural conditions to the extent possible. This is best achieved through an initial *coarse delineation*, followed by a *refined delineation* as follows:

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[1] The PCR Guidance Series is developed by the Central Coast Joint Effort Review Team (JERT). The JERT is a group of regional stakeholders focused on addressing issues associated with post-construction stormwater quality control requirements. Water Board staff facilitate JERT meetings, which are focused on issues where regulator input is desired to clarify the pathway to PCR compliance. JERT bulletins are a means to disseminate information, findings, and direction resulting from the JERT to the broader group of PCR stakeholders.

[2] Attachment 1 of Resolution No. R3-2013-0032: Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region (PCRs).

Coarse Delineation – Conduct this delineation prior to siting development features (e.g., buildings, roads). Delineate coarser DMAs based on the following elements:

- Natural/existing hydrologic features – DMAs should follow, not bisect, hydrologic features (e.g., watercourses, wetlands, high-infiltration zones). Additionally, the project applicant should strive to maintain hydrologic features' functions post-development. For example, a project with an existing wetland should delineate a DMA that includes the wetland such that the wetland does not accept untreated run-on and the water balance is maintained.

- Topography – DMAs should follow topographic grade breaks, similar to drainage catchment areas assigned for conventional hydrologic/hydraulic calculations.

- Watershed processes – Choose appropriate DMA sizes to support the watershed processes that were present at the project site pre-development. See Table 1 [Description of Watershed Processes] for help identifying which watershed processes exist at the project site. Next, Reference Figure 1 [DMA size, related to percent of project site that is impervious, for retention-based watershed processes] to determine the relative importance of delineating smaller DMAs to optimize protection and restoration of watershed processes.

Refined (Final) Delineation – Conduct a subsequent delineation, after development feature locations are established[3], to define final DMAs. Delineate sub-drainage areas, from the larger DMAs identified during the initial delineation, such that stormwater is managed at the source at an appropriate scale. The below land use based guidelines may be helpful in delineating final DMAs on project areas 5 acres and larger. Site specific conditions may warrant DMA sizing that differs from these guidelines. Please note, these guidelines are based on general guidance from practitioners, not analytical data, and are not intended to define regulatory compliance.

1) Single-family residential project (including parcels and associated roads) DMAs are:

Less than or equal to 10 lots **OR** 1/4 mile or less road length	**AND**	Less than 5 acres	**AND**	Less than 1 acre of total impervious area

2) Commercial, industrial, and multi-family project (including parcels and associated roads) DMAs are:

Land use specific (avoid comingling of runoff from multiple land uses where feasible)	**AND**	Less than 5 acres	**AND**	Less than 1 acre of total impervious area[4]

3) Road project DMAs are:

Local Road – 1/4 mile or less **OR** Collector Road – 1/8 mile or less **OR** Arterial Road – 1/8 mile or less	**AND**	2 blocks or less in road length	**AND**	Less than 5 acres	**AND**	Less than 1 acre of total impervious area

Selecting SCMs for each DMA

Watershed processes are most effectively protected through appropriately sized DMAs and well-chosen SCMs. This guidance intends for project applicants to design SCMs to accept runoff from only one DMA. For example, to mimic the interflow watershed process, SCMs should achieve distributed infiltration; to mimic the

[3] Project applicant must adhere to site design principles when siting development features [PCRs, Sections B.2.a and B.4.d].

[4] A building footprint exceeding 1 acre would need to divide the roof into separate DMAs.

evapotranspiration watershed process, SCMs should include vegetation; and to mimic the chemical and biological transformation watershed process, SCMs should integrate soil and vegetation.

In general, project applicants should strive to protect all watershed processes; however, it is critical to ensure the significant watershed processes occurring on the project site are protected. For example, a project located near a stream or wetland should construct SCMs focused on protecting the interflow watershed process, such that shallow subsurface flows supporting those features are preserved (e.g., distributed vegetation/soil-based shallow infiltration SCMs). Additionally, if the project is in close proximity to a riparian area, the project applicant should ensure protection of watershed processes associated with riparian areas (e.g., preservation of riparian area buffers, use of appropriate plant palette in vegetated SCMs and other project landscaped areas to promote supply of native organic matter and prevent invasive species introduction to riparian areas). Conversely, an upland project located over a groundwater basin where the priority watershed process is groundwater recharge, should include SCMs (e.g., deep infiltration wells, large-scale infiltration basins sited over highly infiltration areas with connectivity to groundwater basins) focused on groundwater recharge and infiltration. However, these project examples should also strive to protect other less dominant watershed processes present at the project sites, by considering SCMs and other site design strategies that achieve multiple benefits. For example, the landscape portion of new development project sites offers some level of evapotranspiration and chemical and biological transformations due to the existing vegetation and soil column.

Cautionary notes regarding SCM selection:

- Permeable Pavement and Pavers – Depending on the design, permeable pavement and pavers can provide infiltration opportunities; however, permeable pavement and pavers may not be as effective as bioretention or other plant and soil-based SCMs in promoting evapotranspiration or chemical and biological transformations that generally support healthy watersheds and receiving waters.

- Centralized Retention/Infiltration Basins – Although some exceptions exist (especially in areas with well-draining native soils), centralized basins often lose infiltration capacity over time. Common causes of decreased infiltration capacity include: compacting basin floor from construction vehicles; using the basin as a sediment collector during construction resulting in clogged basin; and fine sediment accumulating in the basin over time. Additionally, infiltrating runoff in one centralized location does not typically mimic pre-development infiltration patterns effectively, and may result in seasonal groundwater mounding. This is especially important where adjacent surface waterbodies rely on the interflow watershed process.

NOTE 1: Regulatory Context to the Central Coast PCRS

The Central Coast PCRs require project applicants subject to PCRs Performance Requirement No. 3 [Runoff Retention] to achieve the runoff retention requirements using a decentralized approach to stormwater management by:

- ✓ Delineating DMAs[5] [PCRs, Section B.4.d.iii];
- ✓ Mapping or diagraming DMAs [PCRs, Section B.4.d.iii]; and
- ✓ Accounting for drainage from each DMA using the following measures:
  - Site design and runoff reduction measures to reduce the amount of runoff; and
  - Structural SCMs that optimize retention and result in optimal protection and restoration of watershed processes, such as SCMs associated with small-scale, decentralized facilities designed to infiltrate, evapotranspirate, filter, or capture and use stormwater [PCRs, Section B.4.d.v].

NOTE 2: DMA Size Related to Site Imperviousness

The watershed processes associated with stormwater retention include the following: groundwater recharge and infiltration, interflow, and evapotranspiration. As the percent imperviousness increases at a site, so does the risk of disrupting retention-based watershed processes, because more of the landscape is capped with an impermeable layer without vegetation. Therefore, as a project site's percent imperviousness increases, so does the need to manage stormwater using multiple dispersed DMAs. Some exceptions to this correlation may apply (e.g., upland project located over a groundwater basin, where the priority watershed process is groundwater recharge, and the native soils are highly infiltrative or deep infiltration is the recharge mechanism). Note that in addition to retention-based watershed processes, the entire suite of watershed processes benefit from a decentralized approach to managing stormwater.

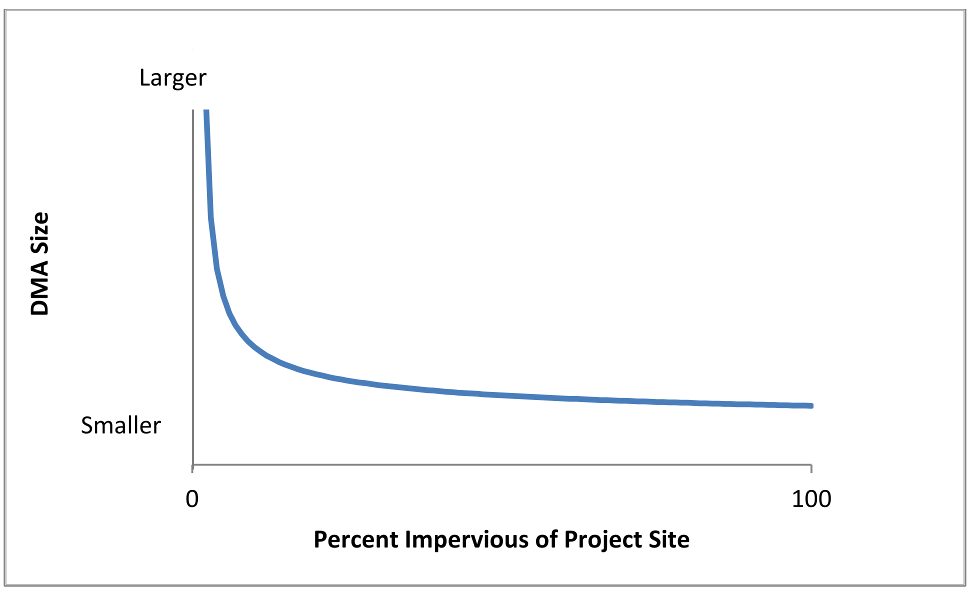

Figure 1. General relationship between DMA size and percent of project site that is impervious, for retention-based watershed processes.

[5] Drainage Management Area (DMA) – Following the low impact development principle of managing stormwater through small-scale, decentralized measures, DMAs are designated individual drainage areas within a Regulated Project that typically follow grade breaks and roof ridge lines and account for each surface type (e.g., landscaping, pervious paving, or roofs). Stormwater Control Measures for runoff reduction and structural facilities are designed for each DMA. [PCRs Glossary]

NOTE 3: Watershed Process Descriptions

Table 1 includes descriptions of watershed processes. Project applicants can use these descriptions to: a) using field observations, published literature, and common sense identify the significant and less significant watershed processes present on the project site; b) delineate DMAs that at a minimum protect the significant watershed processes; and c) spatially distribute and select SCMs that most closely replicate the significant watershed processes and at a minimum have ancillary benefits for the less significant processes.

Table 1. Description of Watershed Processes. [6]

Watershed Process	Description
Groundwater Recharge and Infiltration	These closely linked hydrologic processes are dominant across much of California's intact landscapes. They can be thought of as the inverse of overland flow; precipitation that reaches the ground surface and does not immediately run off has most likely infiltrated. Thus, on virtually any geologic material on all but the steepest slopes (or bare rock), infiltration of rainfall into the soil is inferred to be widespread, if not ubiquitous. With urbanization, changes to the process of infiltration are also quite simple to characterize: some (typically large) fraction of that once-infiltrating water is now converted to overland flow.
Interflow	Interflow takes place following storm events as shallow subsurface flow (usually within 3 to 6 feet of the surface) occurring in a more permeable soil layer above a less permeable substrate. In the storm response of a stream, interflow provides a transition between the rapid response from surface runoff and much slower stream discharge from deeper groundwater. In some geologic settings, the distinction between "interflow" and "deep groundwater" is artificial and largely meaningless; in others, however, there is a strong physical discrimination between "shallow" and "deep" groundwater movement. Urban development reduces infiltration and thus interflow, as well as reducing the footprint of the area supporting interflow volume.
Evapotranspiration	In undisturbed humid-region watersheds, the process of returning water to the atmosphere by direct evaporation from soil and vegetation surfaces, and by the active transpiration by plants, can account for nearly one-half of the total annual water balance; in more arid regions, this fraction can be even higher. Development covers soils with impervious surfaces and usually results in the compaction of soils when grading occurs. Native plants are often replaced with turf, which typically has lower rates of evapotranspiration unless irrigated throughout the summer months.
Overland Flow	Precipitation reaching the ground surface that does not immediately soak in must run over the land surface (thus, "overland" flow). Most un-compacted, vegetated soils have infiltration capacities of one to several inches per hour at the ground surface, which exceeds the rainfall intensity of even unusually intense storms. In contrast, pavement and hard surfaces reduce the effective infiltration capacity of the ground surface to zero, ensuring overland flow regardless of the meteorological attributes of a storm.
Delivery of Sediment to Receiving Waters	Sediment delivery into the channel network is a critical process for the maintenance of various habitat features in fluvial systems (although excessive

[6] Attachment 2 of Resolution No. R3-2013-0032: Technical Support Document for Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region.

	sediment loading from watershed disturbance can instead be a significant source of degradation). Quantifying this rate can be difficult; however, the overriding influence of slope gradient is widely documented. Maintenance of sediment delivery is essential to the health of certain receiving-water types (as is organic matter delivery), and it is this (long-term) process that should be considered in Storm Water Resource Plans. Development commonly covers surfaces, and non-native vegetation may also prevent the natural supply of sediment from reaching the stream.
Delivery of Organic Matter to Receiving Waters	The delivery of organic matter is critical to receiving water health as it forms the basis for the aquatic food web. Delivery of organic matter follows similar pathways as inorganic matter (e.g., sediment). However, the dominant amount and timing of delivery is often associated with the presence, width, and composition of the vegetative riparian zone.
Chemical and Biological Transformations	This encompasses the suite of watershed processes that alter the chemical composition of water as it passes through the soil column on its path to (and after entry into) a receiving water. The conversion of subsurface flow to overland flow in a developed landscape eliminates much of the opportunity for attenuation and transformations within the soil column, and this is commonly expressed as degraded water quality. The dependency of these processes on watershed conditions is complex in detail, but in general a greater residence time of storm water in the soil should be correlated with greater activity for this group of processes.