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VIA E-MAIL

September 14, 2012
Ms. Laurie Walsh, Senior Engineer
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, Ca 92123-4340

Re: ADMINISTRATIVE DRAFT REGIONAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (Tentative Order No. R9-2012-0011)

Dear: Ms. Walsh

On behalf of the Building Industry Association of Southern California, Inc. (BIA/SC) and the Construction Industry Coalition on Water Quality (CICWQ) and the members of both, we appreciate the opportunity to provide comments on the Administrative Draft of the San Diego County Regional MS4 Permit (Administrative Draft Permit). We submit these comments in addition to and in support of comments made by our affiliate in San Diego County, the Building Industry Association of San Diego and its coalition partners, and comments submitted by Rancho Mission Viejo.

BIA/SC is a nonprofit trade association representing nearly 1,000 member companies, which together have nearly 100,000 employees. BIA/SC's members have, for decades, built the majority of the homes in Ventura, Los Angeles, Orange, Riverside, and San Bernardino Counties in southern California. CICWQ is a water quality coalition comprised of representatives from five industry trade associations (in addition to BIA/SC) involved in the development of public and private building, infrastructure and roads throughout California (Associated General Contractors, Engineering Contractors Association, Southern California Contractors Association, Engineering and General Contractors Association, and United Contractors). All of the above trade associations and their members and the union labor work force are affected by the post-construction runoff control requirements proposed in the Draft Permit, and this letter and supporting attachments are intended to provide the San Diego Regional Board staff with constructive suggestions for improvement.

We appreciate the Regional Board's release of the Administrative Draft Permit in April 2012, and the extensive stakeholder involvement process that ensued over the summer of 2012. The comments provided here are intended to further meet the permit's underlying objective of protecting and improving water quality within the watersheds administered by the San Diego Regional Board. Our comments, supporting attachments, and suggested redline permit language modifications reflect years of working not only on MS4 permits issued by the San Diego Board, but other MS4 permits administered by the Los Angeles, Santa Ana, and San Francisco Bay Regional Water Quality Control Boards.

We have four primary concerns with the Administrative Draft Permit content and the following discussion summarizes those concerns and provides the technical basis for those concerns including supporting attachments:

1. **Administrative Draft Permit Provision E. 3.c.(2)(c) establishes a zero discharge standard for biofiltration-type LID BMPs that are designed with an outlet/underdrain. This type of LID BMP cannot meet the on-site design capture volume standard as it is written. Such a zero discharge standard is scientifically and technically unsound and unsupported.**

Biofiltration is an established LID BMP for use in attempting to mimic pre-development hydrology. The US EPA, in multiple guidance documents produced since 2006, have recognized the use of biofiltration-type systems such as curb contained biofilters, bioswales, rain gardens, and using landscape areas for impervious area disconnection as essential LID BMP elements to include in land development projects, a few of which are cited below. The inclusion of biofiltration BMPs in US EPA's menu is a reflection of the practical limitations to retention of stormwater – retention practices are not universally feasible or desirable. When appropriately selected and designed, biofiltration BMPs achieve high levels of pollutant removal, which may exceed pollutant removal achieved in retention BMPs, particularly in cases where retention BMPs are inappropriately applied.

The retention requirement is contrary to EPA's definition of LID because it disfavors development strategies designed to appropriately "filter" runoff, such as bioretention cells or other vegetated LID BMPs. There are five principal EPA documents regarding LID; and four of them identify the appropriate roles of biotreatment-type BMP, such as detention (i.e., slow down, treat through vegetation, and then release across property lines), filtration, and surface release of stormwater.

In a compilation of case studies by EPA, most of 17 exemplary projects included biotreatment elements, such as bioretention, swales, and wetlands. *See* U.S. EPA 841-F-07-006. Each of two case studies described in another EPA document (s*ee* Attachment 1 at pp. 1-2, EPA 841-B-00-005) included the use of underdrains, and the example in one of the two specifically fed into the MS4 system at issue. Another EPA document updated in January 2009 refers to the many practices used to adhere to LID principles of promoting a watershed's hydrologic and ecological functions, such as bioretention facilities and rain gardens. *See* Attachment 2 at p. 2, EPA-560-F-07-231 (describing "an under-drain system to release treated stormwater off site," permitting planted areas to "safely allow filtration and evapotranspiration of stormwater");

http://www.epa.gov/owow/nps/lid/ (fact sheet describing under-drains used to release treated stormwater off site and permitting planted areas to safely allow filtration of stormwater). Thus, EPA's literature and guidance clearly recognize the important and even necessary role that biofiltration/biotreatment approaches play in real-world implementation of LID principles.

The National Research Council, in their 2008 Report to Congress titled "Urban Stormwater Management in the United States" cite the use of biofiltration and bioretention systems in improving water quality and in attempting to mimic predevelopment hydrology at many different site contexts and locations across the United States. The 2008 NRC report contains and cites numerous examples of using biofiltration type systems to reduce runoff volume and pollutant loads. The 2008 NRC Report clearly recognizes the role that biofiltration systems play in the LID BMP feasibility and selection process, and in achieving runoff management goals. The report states "In some situations ARCD (Aquatic Resources Conservation Design) practices will not be feasible, at least not entirely, and the SCMs [stormwater control measures] conventionally used now and in the recent past (e.g., retention/detention basins, biofiltration without soil enhancement, and sand filters) should be integrated into the overall system to realize the highest management potential." Note that the NRC report definition of ARCD includes both retention and biofiltration elements.

From a management perspective, a review of 4th Term Phase I MS4 permits within California (San Francisco Bay Area, Sacramento Area, North and South Orange County, Western and Southern Riverside County, and San Bernardino County) shows that the use of biofiltration to meet water quality volume and flow control performance standards is clearly allowed (See matrices submitted by BIA/SC_CICWQ at the August 22, 2012 Stakeholder Meeting and provided to the Regional Board by Mark Grey on August 24, 2012). These Regional Boards in California recognize that biofilter-type LID BMPs are an integral component of applying site design principles which seek to mimic pre-development hydrology. Furthermore, these permits implement a clear LID BMP feasibility and selection process, one that first requires examination of on-site retention systems (infiltration, harvest and use, and evapotranspiration), before moving to the evaluation and potential selection of bioinfiltration (some infiltration achieved) and biofiltration systems. This feasibility evaluation hierarchy, which is clearly explained in the South Orange County and South Riverside County MS4 permits adopted by the San Diego Regional Board in 2009 and 2010, respectively, must be preserved and included in the next version of the Administrative Draft Permit.

In summary, the zero discharge standard established by the Administrative Draft Permit significantly narrows the definition of LID, which is contrary to US EPA guidance, the 2008 NRC Report, and the standards established in recently-adopted Permits by the San Diego Regional Board and other Regional Boards. In essence, the proposed provisions would establish a standard that (i) will be impracticable in a relatively large proportion of sites, and (ii) has not been demonstrated to be necessary to protect receiving water quality. We provide in Attachment 3 suggested permit language to address the continued use of biofiltration.

2. **A mitigation requirement is established when using flow-thru biofiltration-type LID BMPs to manage that portion of the SWQDv that is not retained on-site. This requirement is inconsistent with all other adopted Phase I MS4 permits in California and nationally. Biofiltration and bioretention BMPs are established LID practices; requiring accompanying mitigation of SWQDv that has already been biofiltered penalizes and dis-incentivizes use of these controls.**

Equally problematic, because it does not allow biofiltration type LID BMPs to meet the on-site storm water quality design volume (SWQDv) standard, is the current requirement in Administrative Draft Permit Provision E. 3.c.(2)(c) to "perform mitigation for the portion of the pollutant load that is not retained on-site." In other words, the draft provisions would require that, if a project proponent cannot retain 100 percent of the SWQDv on-site, and must therefore use biofiltration LID BMPs (with a treated discharge), then the use and installation of these systems will trigger an off-site mitigation or in-lieu fee program participation requirement. This provision in the Administrative Draft Permit is technically unjustified, disfavors the use of all types of recognized biofiltration LID BMPs, and could theoretically require a project proponent to not only pay for the installation and O&M of a biofiltration LID BMP, but also require mitigation or fee payment for that portion of runoff managed by it.

Biofiltration BMPs including natural treatment systems such as those that are part of the Irvine Ranch Water District's Natural Treatment System in Orange County (a regional example) can remove vast quantities of pollutant load, and provide other benefits such as habitat, flood control, and aesthetic, recreational and educational value. To relegate multi-benefit biofiltration or biotreatment BMPs applied at a site scale to a status inferior to on-site retention BMPs is not justified on a water quality basis, and is poor public policy, essentially depriving the region of an extremely important and effective approach to managing water quality.

While we agree that project proponents should be required to retain stormwater where technically and economically feasible, there are numerous conditions beyond a project's control that make retention infeasible, undesirable and/or ineffective. For example, in achieving a zero discharge standard, it is necessary to either maintain pre-project ET (which is generally impracticable) or increase the volume of stormwater that is infiltrated (which is the common result). Over-infiltrating rainwater can have adverse consequences such as altering the natural flow regime of the receiving waters such that riparian habitat changes, mobilizing pre-existing contamination in shallow groundwater, increasing inflow and infiltration to sanitary sewers, causing damage from rising groundwater, and other potential effects. By discouraging the use of biofiltration LID BMPs where there are more appropriate than retention, the Administrative

Draft Permit irresponsibly encourages the use of retention where it may have adverse consequences.

Retention BMPs are not necessarily more effective than biofiltration BMPs as the Administrative Draft Permit implies, especially considering the back-to-back-to-back nature of storm systems that arrive in southern California during winter months and deliver the majority of total rainfall volume. The Administrative Draft Permit establishes a SWQDv that must be retained, but does not specify the time over which this volume must be drawn down (i.e., drained) in order to have capacity for the volume from subsequent storms. The rate at which the SWQDv can be drained is a function of the infiltration rates of soils and the demand for harvested water. Where soils are not sufficiently permeable and/or where harvested water demands are moderate to low, the drawdown time of retention BMPs can be in the range of several days to several weeks.

In comparison, biofiltration BMPs are designed with engineered soils that can generally drain the SWQDv much more quickly, on the order of several hours. In cases where retention opportunities are limited, this results in a higher level of capture and treatment by biofiltration BMPs than retention BMPs, which can more than offset the lower "treatment efficiency" afforded by biofiltration compared to full retention. For example, based on rigorous technical analysis contained in the Orange County Technical Guidance Document (Figure III.2, Page III-11), a hypothetical biofiltration BMP draining in 12 hours would achieve approximately 25 percent greater treatment of average annual stormwater runoff volume than an equivalently sized retention BMP that drains in 72 hours and approximately 60 percent greater treatment than a retention BMP that drains in 10 days.

Because drawdown time is an important factor in (i) assessing BMP effectiveness and (ii) evaluating the site-specific determination of whether retention or biofiltration are preferable, we strongly recommend (in addition to allowing the use of biofiltration or biotreatment systems to meet the retention standard) including a secondary performance metric of managing 80 percent of annual runoff volume using continuous simulation modeling. This provides a means of accounting for the performance of strictly on-site retention BMPs versus the addition of biofiltration or biotreatment BMPs which can be designed to manage a greater volume of average annual runoff volume than retention BMPs of the same size. The total amount of water captured and treated and associated pollutant load reduction should be a primary deciding factor in whether retention or biofiltration BMPs are selected for a given project. As written, the Administrative Draft Permit strongly discourages an entire group of effective practices which have the potential to provide better protection of water quality, when compared to retention, in a wide range of cases. Attachment 3 provides suggestions for permit language which corrects these deficiencies.

3. Hydromodification control measures should allow use of the EP method to meet in stream standards; recognize multiple types of channel hardening when evaluating applications for hydromodification control exemptions

In Attachment 3, we also make suggestions for improving the consistency of hydromodification control standards with those identified and allowed in the South Orange County MS4 permit. Specifically, we recommend providing for an in-stream hydromodification control performance standard using the erosion potential (EP) approach and recognizing that there are a number of different types of channel hardening that have been used for armoring in stream systems besides concrete.

The Administrative Draft Permit provides an "on-site" option for addressing hydromodification through flow duration control. This is an important element of the hydromodification control standard. However the Administrative Draft Permit is incomplete without an option to assess and demonstrate hydromodification control through in-stream metrics. In many cases, significant development within a watershed has already caused hydromodification impacts. Requiring project-by-project flow duration control for each new project may not address the existing issue as effectively as a regionally-coordinated approach that combines upland control with in-stream remedies. Including the EP standard enables the development of more comprehensive approaches that include both upland controls and stream modifications (i.e., restoration). This option is critical for more effectively and efficiently protecting the region's aquatic resources.

Additionally, the Administrative Draft Permit includes an unnecessarily narrow definition of hardened channels that includes only those channels lined with concrete. Other forms of artificial hardening may be comparably resistant to hydromodification impacts, such as channels that are lined with rip rap, armored with soil cement, or armored with other practices. While the Permittees or the project proponent should be responsible for demonstrating that a specific channel material is sufficiently stable, the narrow definition currently provided by the Administrative Draft Permit does not allow the use of sound engineering judgment and does not allow for use of innovative materials.

Finally, the Administrative Draft Permit should explicitly recognize the findings of hydromodification management plans (HMPs) that have been previously approved by this Board. The South Orange County HMP and the San Diego County HMPs were both the products of rigorous technical analysis based on the state of the practice, which were reviewed in detail by Board Staff. The findings of these efforts must not be jeopardized under the new terms of the Administrative Draft Permit. Specifically, findings regarding exempt water bodies must be appreciated and upheld, and they should be explicitly recognized in the Administrative Draft Permit per our suggested redline.

4. **The Permit must preserve important provisions for watershed level design and implementation of LID BMPs.**

The proposed development project criteria and requirements in the Administrative Draft Permit do not include the language in the current South Orange County Permit that provides for Alternative Compliance for Watershed-Based Planning (See page 40-41 of the 2009 Permit). We ask that the Regional Board continue to recognize the protections to water quality and enhancements to water bodies which are achieved through watershed-based projects such as the Rancho Mission Viejo Ranch Plan, as it has in the current South County MS4 permit, and define Watershed Planning as an alternative and co-equal approach to the project-specific requirements. Attachment 3 to this submittal contains suggested redline language for addition to the Administrative Draft Permit.

Concluding Remarks:

BIA/SC and CICWQ have been active participants and contributors to the creation of improved MS4 permits across southern California. We continue to believe that rational, *implementable*, and *effective* permit requirements are critical to achieving great progress concerning water quality and our environment. We hope that these comments are received in the manner in which they are intended – to continue the discussion of how we can create a workable permit that improves water quality to the maximum extent practicable. We remain committed to a positive dialog with the Board and its staff – one that will result in an informed, balanced and effective permit.

If you have any questions or want to discuss the content of our comment letter, please feel free to contact me at (951) 781-7310, ext. 213, (909) 525-0623, cell phone, or mgrey@biasc.org.

Sincerely,

Mark Grey, Ph.D.
Director of Environmental Affairs and Technical Director
Building Industry Association of Southern California and
Construction Industry Coalition on Water Quality

United States
Environmental Protection Agency

Office of Water (4203)
Washington, DC 20460

EPA-841-B-00-005A
October 2000

Bioretention Applications

Inglewood Demonstration Project, Largo, Maryland
Florida Aquarium, Tampa, Florida

Key Concepts:

- Retrofits
- Structural Controls
- Source Controls

LOW-IMPACT DEVELOPMENT CENTER

Project Benefits:

- Retrofit Opportunity
- Pollutant Removal
- Volume Reduction
- Cost-Effectiveness

Introduction

Two case studies demonstrate the potential to use integrated management plans (IMPs) in the design of new parking facilities and as retrofits for existing parking facilities. The Inglewood study in Largo, Maryland, compared the pollutant removal efficiency of a bioretention cell in a laboratory setting to that of a comparable facility constructed in a parking lot. The Florida Aquarium study in Tampa, Florida, included monitoring of several storm events for volume and water quality control.

Inglewood Project Area

The project area is an existing 5-acre outdoor parking area located in a highly urbanized office park adjacent to Interstate 95. Runoff from adjacent areas does not flow across the lot. The slope of the parking area is approximately 3 percent. Parking stalls are aligned at 90-degree angles, and there are approximately 30 cars in each row of an aisle. At the end of each aisle are planting areas surrounded by curbs and gutters. Curb drainage inlets have been placed in some of the islands to intercept and collect runoff as sheet flow, which is piped to a downstream regional stormwater management facility.

Inglewood Project Description

The Inglewood project consisted of a laboratory segment and a field segment. The laboratory segment involved construction of a planter box filled with a typical bioretention facility soil mixture (50 percent construction sand, 20 to 30 percent topsoil, and 20 to 30 percent compost). This facility is approximately half the size in volume of the Inglewood facility. The box was planted with representative plants and mulched. A synthetic stormwater mixture was applied and the pollutant removal efficiency, temperature, and runoff volume rate were measured. The pollutant mix included metals (copper, lead, and zinc), phosphorus, organic nitrogen, and nitrate.

A landscaped island measuring approximately 38 feet by 12 feet was chosen as the retrofit area. The island contains a curb inlet that drains into the municipal storm drain system. Almost the entire drainage area is impervious. A 4-foot slot was cut into the curb immediately before the inlet. The landscaped island was then excavated to a depth of 4 feet. An underdrain was installed and tied into the bottom of the existing inlet to completely drain the planting soil to avoid oversaturation. The underdrain was covered with 8 inches of 1- to 2-inch gravel and backfilled with typical bioretention soil mix. The backfill extended to a depth of about 12 inches below the top of the curb, which allows for a ponding depth of approximately 6 inches of water in the island

Figure 1. Bioretention landscaping at the Inglewood demonstration project site.

Table 1. Summary of bioretention pollutant removal results for the Inglewood demonstration project.

Pollutant	Input mean ± standard deviation	Output mean ± standard deviation	Output range	Output percent removal mean ± standard deviation
Cu dissolved (µg/L)	120 ± 27	63 ± 6.5	55–75	48 ± 12
Cu total (µg/L)	120 ± 27	69 ± 9.4	55–85	43 ± 11
Pb dissolved (µg/L)	54 ± 9.4	11 ± 6	6.7–25	79 ± 26
Pb total (µg/L)	54 ± 9.4	16 ± 7	6.7–26	70 ± 23
Zn dissolved (mg/L)	1.1 ± 0.021	0.24 ± 0.44	0.11–0.56	78 ± 29
Zn total (mg/L)	1.1 ± 0.021	0.39 ± 0.44	0.12–1.4	64 ± 42
Ca (mg/L)	44 ± 6.4	32 ± 6.1	24–41	27 ± 14
Cl^- (mg/L)	5.1 ± 0.48	162 ± 80	74–228	3,000[a]
Na (mg/L)	3.1	359 ± 170	68–497	11,000[a]
P (mg/L)	0.83	0.11 ± 0.017	0.10–0.13	87 ± 2
TKN (mg/L as N)	6.9 ± 0.81	2.3 ± 0.64	1.7–3.0	67 ± 9
NO_3^- (mg/L as N)	1.3 ± 0.05	1.1 ± 0.15	0.94–1.2	15 ± 12

[a]Shows percent production.

before a backwater is created at the curb opening. Subsequently the area was planted and covered with 3 inches of shredded hardwood mulch. Figure 1 shows the bioretention area after vegetation was established.

The stormwater mixture was applied to a 50-square-foot area in the field facility at a rate of 1.6 inches per hour for 6 hours. The removal rates for several pollutants are shown in Table 1. In addition to pollutant removal, the runoff temperature was lowered approximately 12 °C as the runoff was processed and filtered through the soil mixture. Most of the pollutant removal process occurred in the mulch layer.

A similar field investigation was conducted on an 8-year-old facility, and the metals removal rate was much higher (Davis et al., 1998). This effect might be attributed to slower flow rates through the soil, which has higher clay content, as well as greater pollutant uptake by vegetation.

Inglewood Project Summary and Benefits

This study showed the feasibility of retrofitting an existing parking facility and demonstrated the consistency of laboratory and field pollutant removal performance. The retrofit cost approximately $4,500 to construct and treats approximately one-half acre of impervious surface. The bioretention retrofit was a more cost-effective way to filter pollutants than many proprietary devices designed to treat the same volume of runoff. These proprietary devices could cost $15,000 to $20,000, would be more expensive to maintain, and would not significantly decrease runoff volume or temperature. Also, bioretention areas offer the ancillary benefit of aesthetic enhancement. It is interesting to note that a drought occurred after the installation of the plants, and although many of the other plants in the parking lot died or experienced severe drought stress, the plants in the bioretention facility survived because of the retained water supply.

Florida Aquarium Project Area

The Florida Aquarium site is an 11.5-acre, asphalt and concrete parking area that serves approximately 700,000 visitors per year. Runoff was controlled using the following IMPs:

- End-of-island bioretention cells
- Bioretention swales located around the parking perimeter
- Permeable paving
- Bioretention strips between parking stalls
- A small pond to supplement storage and pollutant removal

Figure 2 is an illustration of the site that details the type and location of runoff controls.

Florida Aquarium Project Description

A total of 30 storm events were monitored for one year at the Florida Aquarium site during 1998-1999. The Southwest Florida Water Management

District measured rainfall and flow from eight of the subcatchments in the parking area and collected water quality samples on a flow-weighted basis. Comparisons between pavement areas controlled by IMPs and uncontrolled asphalt areas were made for peak runoff rate, runoff volume, runoff coefficients, and water quality. Sediment cores from swales also were collected and analyzed.

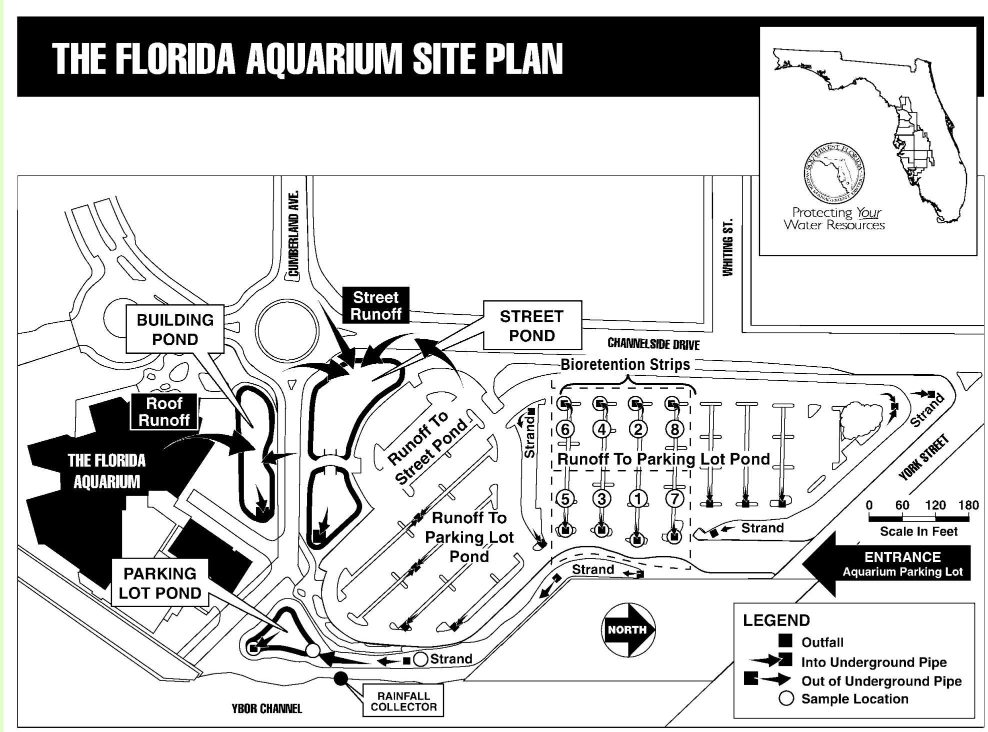

Figure 2. Layout of the Florida Aquarium site with IMPs. The eight basins outlined with dotted lines were evaluated in this part of the study.

Florida Aquarium Project Summary and Benefits

The parking areas controlled by IMPs showed a significant reduction in runoff volume and peak runoff rate. Table 2 shows pollutant load reductions for three pavement types; reduction is compared to pollutant loads in runoff from a basin without a swale. Much of the pollutant reduction is attributed to the reduced runoff in basins with swales. Because the swales are only the first element in the treatment train, even better removal efficiencies should be seen when data are analyzed for the entire system.

Table 2. Load efficiency of pollutants expressed as percent reduction for three types of pavement at the Florida Aquarium site.

Constituents	Percent pollutant reduction[a]		
	Asphalt w/swale	Cement w/swale	Porous w/swale
Ammonia	45	73	85
Nitrate	44	41	66
Total Nitrogen	9	16	42
Orthophosphorus	-180	-180	-74
Total Phosphorus	-94	-62	3
Suspended Solids	46	78	91
Copper	23	72	81
Iron	52	84	92
Lead	59	78	85
Manganese	40	68	92
Zinc	46	62	75

[a]The basins with swales were compared to a basin without a swale to determine the amount of reduction in pollutant loads possible using these small alterations. Notice that the efficiencies for phosphorus are negative, indicating an increase in phosphorus load in the basins with a swale.

References

Davis, A., M. Shokouhian, H. Sharma, and C. Minami, 1998. *Optimization of Bioretention Design for Water Quality and Hydrologic Characteristics*. Report 01-04-31032. Final report to Prince George's County, Maryland.

Rushton, B. 1999. *Low Impact Parking Lot Design Reduces Runoff and Pollutant Loads: Annual Report #1*. Southwest Florida Watershed Management District, Brooksville, Florida.

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Design Principles

for Stormwater Management on Compacted, Contaminated Soils in Dense Urban Areas

EPA's Brownfields Program is designed to empower states, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. EPA's Brownfields Program provides financial and technical assistance for brownfield revitalization, including grants for environmental assessment, cleanup, and job training.

What is Green Infrastructure?

Most development and redevelopment practices cover large areas of the ground with impervious surfaces such as roads, driveways, sidewalks, and new buildings themselves, which then prevent rainwater from soaking into the ground. These hard surfaces increase the speed and amount of stormwater that runs into nearby waterways, carrying pollutants and sediment each time it rains.

Green infrastructure seeks to reduce or divert stormwater from the sewer system and direct it to areas where it can be infiltrated, reused or evapotranspirated. Soil and vegetation are used instead of, or in conjunction with, traditional drains, gutters, pipes and centralized treatment areas. In many new and redevelopment projects, green infrastructure is implemented to manage and mitigate the polluted runoff created by precipitation that falls on rooftops, streets, sidewalks, parking lots and other impervious surfaces.

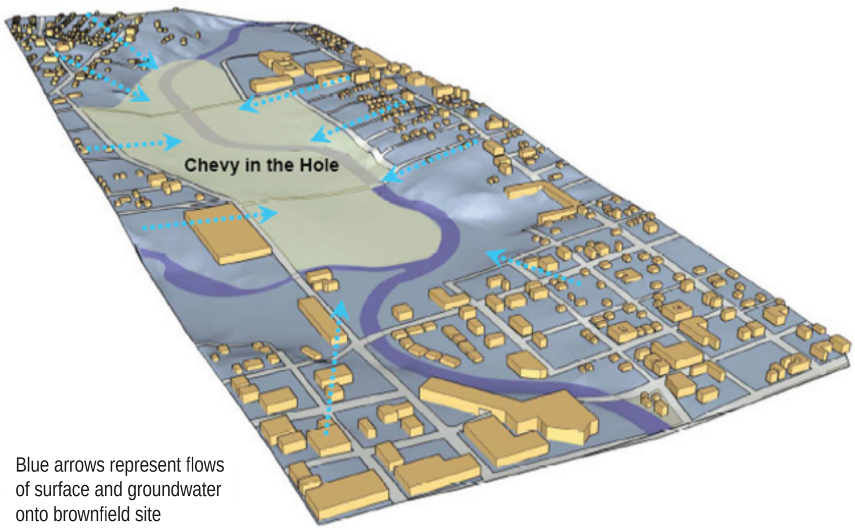
How can Green Infrastructure be Applied to Brownfield Sites?

Preparing brownfields for redevelopment often requires capping of contaminated soils, creating even larger impervious surfaces. The challenge for managing stormwater on brownfield sites is allowing this capping while mitigating the impervious surface conditions that can negatively impact local waterways.

Unlike many conventional developments, impervious footprints on brownfields cannot always be minimized through site designs that incorporate more porous surfaces to allow for infiltration. Direct infiltration on a brownfield site may introduce additional pollutant loads to groundwater and nearby surface waters. However, green infrastructure practices exist that can retain, treat and then release stormwater without it ever coming in contact with contaminated soils.

A bioswale in Wilmington, Delaware, designed to absorb and retain stormwater runoff.

The University of Michigan's School of Natural Resources and Environment developed design guidelines that use low impact development techniques on contaminated sites. Using a former industrial site in Flint, Michigan, called Chevy in the Hole, graduate students considered and refined methods to prevent residual contamination from moving with stormwater.



Blue arrows represent flows of surface and groundwater onto brownfield site

Design Considerations

A key component of using green infrastructure for brownfield sites is treatment and storage of stormwater, rather than complete infiltration. Most brownfields that have residual contamination need caps, so vegetated areas need to be located above caps and fitted with underdrain systems to remove overflow stormwater.

Development and redevelopment projects should start with keeping existing trees onsite, minimizing compaction of earth that inhibits water infiltration, and planting trees and other vegetation in areas where none exists. Retaining existing tree cover and vegetated areas helps infiltrate and evapotranspirate stormwater runoff while intercepting large amounts of rainfall that would otherwise enter waterways as runoff.

Buildings and other impervious surfaces can be strategically located to act as caps over areas with known contamination. Areas with fill caps can include soils and vegetation above the cap in the form of swales or rain gardens. If fitted with an under-drain system to release treated stormwater off site, these planted areas can safely allow filtration and evapotranspiration of stormwater. Additional features like impermeable liners or gravel filter blankets can be coupled with modified low impact development (LID) practices that safely filter stormwater without exposing the water to contaminated soils.

Green roofs are an ideal way to reduce the runoff from building roofs by encouraging evapotranspiration of rainwater. Another option for brownfield sites is the capture and reuse of stormwater for non-potable uses; this can include runoff storage in rain barrels for irrigation of green roofs or landscaped areas, or in cisterns that store rainwater for toilet flushing and other uses.

Site location within the watershed is very important. In particular, projects in groundwater recharge areas should avoid low impact development practices that promote infiltration, and use techniques that directly discharge treated stormwater instead. Furthermore, new and redeveloped sites near brownfields should use green infrastructure practices to prevent additional runoff from flowing onto potentially contaminated areas.

Overall, when developing a stormwater management plan on a brownfield, surrounding sites must be considered. *(Source: Flint Futures: Alternative Futures for Brownfield Redevelopment in Flint, Michigan.)*

The Matthew Henson Conservation Center in Washington, DC, utilizes a green roof.

General Principles for Using Green Infrastructure on Brownfield Sites

Guideline #1: Differentiate between groups of contaminants as a way to better minimize risks.

Guideline #2: Keep non-contaminated stormwater separate from contaminated soils and water to prevent leaching and spreading of contaminants.

Guideline #3: Prevent soil erosion using vegetation, such as existing trees, and structural practices like swales or sediment basins.

Guideline #4: Include measures that minimize runoff on all new development within and adjacent to a brownfield. These measures include green roofs, green walls, large trees, and rainwater cisterns.

Definitions

Bioswales are open channels with a dense cover of vegetation where runoff is directed or retained to evapotranspirate and filter.

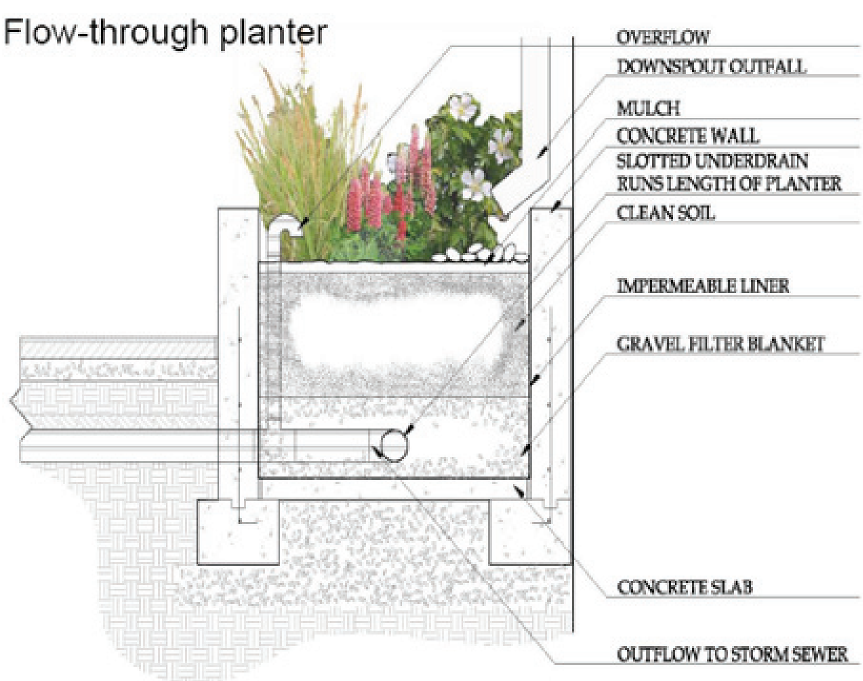
Evapotranspiration is the return of water to the atmosphere either through evaporation or by plants.

Green Infrastructure and ***Low Impact Development (LID)*** both refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate or reuse stormwater or runoff on the site where it is generated.

Green roofs can be used to effectively reduce or eliminate runoff from small and medium sized storms. A soil mixture is placed over a waterproof membrane and drainage system and then planted with water absorbent and drought tolerant plants. Most systems also have root barriers. These roofs soak up stormwater and release it back into the atmosphere through evaporation and plant respiration, while draining excess runoff.

Rain gardens serve the same purpose as stormwater planters and are appropriate where there is more area to plant vegetation. Sizing is dependent on the area of impervious surfaces draining to the rain garden, but they can be designed to only treat a portion of the runoff so they can be placed in most situations.

Stormwater harvest and reuse. Rainwater harvested in cisterns, rain barrels, or other devices may be used to reduce potable water used for landscape irrigation, fire suppression, toilet and urinal flushing, and custodial uses. Storage and reuse techniques range from small-scale systems (e.g., rain barrels) to underground cisterns that may hold large volumes of water.



Stormwater planters. Downspouts can be directed into stormwater planters. These planters are used to temporarily detain, filter and evapotranspirate stormwater using plant uptake.

Additional Resources

The Emeryville, California *Stormwater Guidelines for Green, Dense Redevelopment* provides guidance on using vegetative stormwater treatment measures for this dense, brownfield-laden city: www.ci.emeryville.ca.us/planning/stormwater.html.

EPA's *Green Infrastructure Web site* (www.epa.gov/npdes/greeninfrastructure) provides definitions, case studies and performance data for various practices that might be applicable to brownfield sites.

The Low Impact Development Center is dedicated to research, development, and training for water resource and natural resource protection issues. The Center focuses specifically on furthering the advancement of Low Impact Development technology: www.lowimpactdevelopment.org.

Green Roofs for Healthy Cities collects and publishes technical information on green roof products and services: www.greenroofs.org.

The Center for Watershed Protection's Better Site Design Tools provide links to various better site design resources and publications: www.cwp.org/PublicationStore/bsd.htm.

American Rivers' *Catching the Rain: A Great Lakes Resource Guide for Natural Stormwater Management* describes a variety of low impact development strategies that can be implemented in a wide range of built environments. Available at: www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=163

NRDC's *Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows* is a policy guide for decision makers looking to implement green strategies in their own area, including nine case studies of cities that have successfully used green techniques to create a healthier urban environment. Available at: www.nrdc.org/water/pollution/rooftops/contents.asp

Portland's (Oregon) *Trees for Green Streets: An Illustrated Guide* is a guidebook that helps communities select street trees that reduce stormwater runoff from streets and improve water quality. Available at: www.metro-region.org/article.cfm?articleID=263

Seattle's *pilot Street Edge Alternatives Project (SEA Streets)* is designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems. Good information can be found at: www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/Street_Edge_Alternatives/index.asp

EPA's *Protecting Water Resources with Higher-Density Development* report helps communities better understand the impacts of higher and lower density development on water resources. The findings indicate that low-density development may not always be the preferred strategy for protecting water resources. Available at: www.epa.gov/dced/water_density.htm.

Portland Metro's (Oregon) *Green Streets: Innovative Solutions for Stormwater and Stream Crossings* is a handbook that describes stormwater management strategies and includes detailed illustrations of "green" street designs that allow infiltration and limit stormwater runoff. Available at www.metro-region.org/article.cfm?articleID=262

EPA's *Protecting Water Resources with Smart Growth* is a report intended for audiences already familiar with smart growth concepts who seek specific ideas on how techniques for smarter growth can be used to protect water resources. The report describes 75 policies that communities can use to grow in the way that they want while protecting their water quality. Available at: www.epa.gov/dced/water_resource.htm

EPA's *Using Smart Growth Techniques as Stormwater Best Management Practices* reviews nine common smart growth techniques and examines how they can be used to prevent or manage stormwater runoff. Available at: www.epa.gov/dced/stormwater.htm

EPA's *Brownfields Program Website* (www.epa.gov/brownfields) provides information on and resources for assessing, cleaning up and redeveloping brownfields, including grant funding opportunities.

3. Development Planning

Each Copermittee must use their land use/planning authorities to implement a development planning program that includes, at a minimum, the following requirements.

a. PERMANENT BMP REQUIREMENTS FOR ALL DEVELOPMENT PROJECTS

Each Copermittee must prescribe the following BMP requirements during the planning process (i.e. prior to project approval and issuance of grading or building permits) for all pollutant-generating[14] development projects (regardless of project type or size), where local permits are issued~~, including unpaved roads and flood management projects:~~

(1) General Requirements

(a) All BMPs must be located so as to remove pollutants from runoff prior to its discharge to any receiving waters~~, and as close to the source as possible~~;

(b) Multiple development projects may use shared permanent BMPs as long as construction of any shared BMP is completed prior to the use or occupation of any development project from which the BMP will receive runoff; and

(c) Permanent BMPs must not be constructed within a waters of the U.S. or waters of the state except those that have obtained a CWA Section 401 Water Quality Certification or Waste Discharge Requirement as applicable.

(2) Source Control BMP Requirements

The following source control BMPs must be implemented at all development projects where applicable and feasible:

(a) Prevention of illicit discharges into the MS4;

(b) Storm drain system stenciling or signage;

(c) Properly designed outdoor material storage areas;

(d) Properly designed outdoor work areas;

(e) Properly designed trash storage areas; ~~and~~

~~(f) Any additional BMPs necessary to minimize pollutant generation at each project.~~

[14] Pollutant generating development projects are those projects that generate pollutants at levels greater than natural background levels.

(3) Low Impact Development (LID) BMP Requirements

The following LID BMPs must be implemented at all pollutant generating development projects where applicable and feasible:

(a) Maintenance or restoration of natural storage reservoirs and drainage corridors (including topographic depressions, areas of permeable soils, natural swales, and ephemeral and intermittent streams);[~~14~~15]

(b) Buffer zones for natural water bodies (where buffer zones are technically infeasible, require project applicant to include other buffers such as trees, access restrictions, etc.);

(c) Conservation of natural areas within the project footprint including existing trees, other vegetation, and soils;

(d) Construction of streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided public safety is not compromised;

(e) Minimization of the impervious footprint of the project;

(f) Minimization of soil compaction to landscaped areas;

(g) Disconnection of impervious surfaces through distributed pervious areas;

(h) Landscaped or other pervious areas designed and constructed to effectively receive and infiltrate, retain and/or treat runoff from impervious areas, prior to discharge to the MS4;

(i) Small collection strategies located at, or as close as possible to, the source (i.e. the point where storm water initially meets the ground) to minimize the transport of runoff and pollutants to receiving waters;

(j) Use of permeable materials for projects with low traffic areas and appropriate soil conditions;

(k) Landscaping with native or drought tolerant species; and

(l) Harvesting and using precipitation.

~~14~~ 15 Development projects proposing to dredge or fill materials in waters of the U.S. must obtain a CWA Section 401 Water Quality Certification. Projects proposing to dredge or fill waters of the State must obtain Waste Discharge Requirements.

(4) Long-Term Permanent BMP Maintenance

Each Copermittee must require the project applicant to submit proof of the mechanism under which ongoing long-term maintenance of all permanent BMPs will be conducted.

(5) Infiltration and Groundwater Protection

(a) Infiltration and treatment control BMPs ~~designed to primarily function as large, centralized infiltration devices (such as large infiltration trenches and infiltration basins)~~ must not cause or contribute to an exceedance of an applicable groundwater quality objective. At a minimum, such infiltration and treatment control BMPs must be in conformance with the design criteria listed below, unless the development project applicant demonstrates to the Copermittee that one or more of the specific design criteria listed below are not necessary to protect groundwater quality. The ~~The design criteria listed below do not apply to small infiltration systems dispersed throughout a development project.~~Permittees may establish different design criteria than those listed below for different BMP types based on the inherent degree of risk to groundwater quality (for example, dry wells versus bioretention).

(i) Runoff must undergo pretreatment such as sedimentation or filtration prior to infiltration;

(ii) Pollution prevention and source control BMPs must be implemented at a level appropriate to protect groundwater quality at sites where infiltration treatment control BMPs are to be used;

(iii) Infiltration treatment control BMPs must be adequately maintained to remove pollutants in storm water to the MEP;

(iv) The vertical distance from the base of any infiltration treatment control BMP to the seasonal high groundwater mark must be at least 10 feet. Where groundwater basins do not support beneficial uses, this vertical distance criteria may be reduced, provided groundwater quality is maintained;

(v) The soil through which infiltration is to occur must have physical and chemical characteristics (e.g., appropriate cation exchange capacity, organic content, clay content, and infiltration rate) which are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses, unless first treated or filtered to remove pollutants prior to infiltration;

(vi) Infiltration treatment control BMPs must not be used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities as designated by each Copermittee, unless first treated or filtered to remove pollutants prior to infiltration; and

(vii) Infiltration treatment control BMPs must be located a minimum of 100 feet horizontally from any water supply wells.

(b) The Copermittees may collectively or individually develop alternative mandatory design criteria to that listed above for infiltration and treatment control BMPs which are designed to primarily function as centralized infiltration devices. Before implementing the alternative design criteria in the development planning process the Copermitee(s) must:

(i) Notify the San Diego Water Board of the intent to implement the alternative design criteria submitted; and

(ii) Comply with any conditions set by the San Diego Water Board.

b. PRIORITY DEVELOPMENT PROJECTS

(1) Definition of Priority Development Project

Priority Development Projects include the following:

(a) All new development projects that fall under the Priority Development Project categories listed under Provision E.3.b.(2). Where a new development project feature, such as a parking lot, falls into a Priority Development Project category, the entire project footprint is subject to Priority Development Project requirements; and

(b) Those redevelopment projects that create, add, or replace at least 5,000 square feet of impervious surfaces on an already developed site, or the redevelopment project is a Priority Development Project category listed under Provision E.3.b.(2). Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing development, and the existing development was not subject to Priority Development Project requirements, the performance and sizing requirements discussed in Provisions E.3.c.(2) and E.3.c.(3) apply only to the addition or replacement, and not to the entire development. Where redevelopment results in an increase of more than fifty percent of the impervious surfaces of a previously existing development, the performance and sizing requirements apply to the entire development.

(2) Priority Development Project Categories

(a) New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This category includes commercial, industrial, residential, mixed-use, and public development projects on public or private land which fall under the planning and building authority of the Copermittee.

(b) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.

(c) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is 5,000 square feet or more.

(d) Hillside development projects. This category includes any development which creates 5,000 square feet or more of impervious surface which is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.

(e) Environmentally sensitive areas (ESAs). This category includes any development located within, directly adjacent to, or discharging directly to an ESA, which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10 percent or more of its naturally occurring condition. “Directly adjacent to” means situated within 200 feet of the ESA. “Discharging directly to” means outflow from a drainage conveyance system that collects runoff from the subject development or redevelopment site and terminates at or in receiving waters within the ESA.

(f) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce that has 5,000 square feet or more of impervious surface.

(g) Streets, roads, highways, freeways, and residential driveways. This category is defined as any paved impervious surface that is 5,000 square feet or more used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

(h) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

(i) Large development projects. This category includes any post-construction pollutant-generating new development projects that result in the disturbance of one acre or more of land.

(3) Priority Development Project Exemptions

Each Copermittee has the discretion to exempt the following projects from being defined as Priority Development Projects:

(a) Sidewalks constructed as part of new streets or roads and designed to direct storm water runoff to adjacent vegetated areas;

(b) Bicycle lanes that are constructed as part of new streets or roads but are not hydraulically connected to the new streets or roads and designed to direct storm water runoff to adjacent vegetated areas;

(c) Impervious trails constructed and designed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas;

(d) Sidewalks, bicycle lanes, or trails constructed with permeable surfaces.

c. PRIORITY DEVELOPMENT PROJECT PERMANENT BMP PERFORMANCE AND SIZING REQUIREMENTS

In addition to the BMP requirements listed for all pollutant generating development projects under Provision E.3.a, Priority Development Projects must also implement permanent BMPs that conform to performance and sizing requirements.

(1) Source Control BMP Requirements

Each Copermittee must require each Priority Development Project to implement applicable source control BMPs listed under Provision E.3.a.(2).

(2) Retention and Treatment Control BMP Requirements

Each Copermittee must require each Priority Development Project to implement BMPs to retain and treat pollutants onsite in the following order:

(a) Each Priority Development Project must be required to implement LID BMPs as described in Provision E.3.a.(3);

(b) Each Priority Development Project must be required to implement LID BMPs that are sized and designed to retain the volume equivalent to runoff produced from a 24-hour 85th percentile storm ~~event[15]~~ event[16] ("design capture volume").~~;~~

(c) If onsite retention using LID BMPs is technically infeasible per Provision E.3.c.(4), flow-thru LID ~~and/or conventional~~ treatment control BMPs, such as bioretention with an underdrain, must be implemented to treat the portion of the design capture volume that is not retained onsite. Flow-thru LID treatment control BMPs that are sized for the portion of the design capture volume that is not retained onsite may be used if full onsite retention is technically infeasible. Flow-thru LID treatment control BMPs must be designed for an appropriate surface loading rate to prevent erosion, scour and channeling within the BMP. ~~Additionally, project applicants must perform mitigation for the portion of the pollutant load in the design capture volume that is not retained onsite, as described in Provision E.3.c.(4)(c).~~

(d) If it is shown to be technically infeasible per Provision E.3.c.(4) to retain and/or treat with flow-thru LID treatment control BMPs sized for the portion of the design capture volume that is not retained onsite, then the project must implement conventional treatment control BMPs in accordance with Provision E.3.c.(2)(d) below and must participate in the alternative compliance program in Provision E.3.c.(4)(c).

(de) All onsite treatment control BMPs must:

(i) Be correctly sized and designed so as to remove pollutants from storm water to the MEP;

(ii) Be sized to comply with the following numeric sizing criteria:

[a] Volume-based treatment control BMPs must be designed to treat the remaining portion of the design capture volume that was not retained and/or treated with flow-thru LID treatment control BMPs sized for the portion of the design capture volume that is not retained onsiteretained or onsite; or

[b] Flow-based treatment control BMPs must be designed to mitigate (filter or treat) either: 1) the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour, for each hour of a storm event; or 2) the maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity (for each hour of a storm event), as determined from the local historical rainfall record, multiplied by a factor of two, or 3) an alternative design rate that is demonstrated to result in the treatment of a volume of stormwater equivalent to that achieved under c.(2)(e)(ii)[a].

(iii) Be ranked with high or medium pollutant removal efficiency for the project's most significant pollutants of concern. Treatment control BMPs with a low removal efficiency ranking must only be approved by a Copermittee when a feasibility analysis has been conducted which exhibits that implementation of treatment control BMPs with high or medium removal efficiency rankings are infeasible for a Priority Development Project or portion of a Priority Development Project.

[15] This volume is not a single volume to be applied to all areas covered by this Order. The size of the 85th percentile storm event is different for various parts of the San Diego Region. The Copermittees are encouraged to calculate the 85th percentile storm event for each of its jurisdictions using local rain data pertinent to its particular jurisdiction. In addition, isopluvial maps may be used to extrapolate rainfall data to areas where insufficient data exists in order to determine the volume of the local 85th percentile storm event in such areas. Where the Copermittees will use isopluvial maps to determine the 85th percentile storm event in areas lacking rain data, the Copermittees must describe their method for using isopluvial maps in its BMP Design Manuals.

(3) Hydromodification Management BMP Requirements

Each Copermittee must require each Priority Development Project to implement hydromodification management BMPs so that:

(a) (a) Post-project runoff flow rates and durations do not exceed pre-development (naturally occurring) runoff flow rates and durations by more than 10 percent (for the range of flows that result in increased potential for erosion or degraded channel conditions downstream of Priority Development Projects).

OR

The erosion potential ratio is maintained to within 10 percent of the target value from the project discharge point to a downstream receiving water that is exempt from the hydromodification management BMP requirements per Provision E.3.c.(3)(d). Erosion potential is the ratio of total long-term sediment transport capacity or channel work in the proposed condition versus the pre-development (naturally occurring) condition.

(i) In evaluating the range of flows that results in increased potential for erosion of natural (non-hardened) channels, the lower boundary must correspond with the critical channel flow that produces the critical shear stress that initiates channel bed movement or that erodes the toe of channel banks.

(ii) For artificially hardened channels, analysis to identify the lower boundary must use characteristics of a natural stream segment similar to that found in the watershed. The lower boundary must correspond with the critical channel flow that produces the critical shear stress that initiates channel bed movement or erodes the toe of the channel banks.

(iii) The Copermittees may use monitoring results pursuant to Provision D.2.b.(6) to re-define the range of flows resulting in increased potential for erosion or degraded channel conditions, as warranted by the data.

(b) (b) Post-project conditions runoff flow rates and durations must compensate manage for the loss of bed sediment supply due to the development project, should if significant loss of sediment supply occurs as a result of the development project.

(a)(c) If hydromodification management BMPs are technically infeasible per Provision E.3.c.(4), project applicants must perform mitigation for the portion of the runoff volume that is not controlled and will cause or contribute to increased potential for erosion of receiving waters downstream of the Priority Development Project, as described in Provision E.3.c.(4)(c).

~~(b)~~(d) Exemptions

Each Copermittee has the discretion to exempt a Priority Development Project from the hydromodification management BMP requirements where the project:

(i) Discharges storm water runoff into underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, ~~or~~ the Pacific Ocean, or exempt river reaches identified in Hydromodification Management Plans (HMPs) approved by the San Diego Water Board;

(ii) Discharges storm water runoff into conveyance channels whose bed and bank are ~~concrete lined~~artificially hardened all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, ~~or~~ the Pacific Ocean; ~~or~~or exempt river reaches identified in HMPs approved by the San Diego Water Board; or

(iii) Discharges storm water runoff into other areas identified by the San Diego Water Board as exempt from the requirements of Provisions E.3.c.(3)(a)-(c)~~.~~, ~~S~~such areas include those identified in HMPs approved by the San Diego Water Board.

(4) Alternative Compliance for Technical Infeasibility

At the discretion of each Copermittee, alternative compliance may be allowed for certain Priority Development Projects to comply with Provisions E.3.c.(2) and E.3.c.(3), subject to the following requirements:

(a) Applicability

Priority Development Projects may be allowed alternative compliance if:

(i) The Copermittee reviews and approves site-specific hydrologic and/or design analysis performed by a registered professional engineer, geologist, architect, or landscape architect;

(ii) The project applicant demonstrates, and the Copermittee determines and documents, that retention LID, flow-through LID treatment control BMPs, and/or hydromodification management BMPs per Provisions E.3.c.(2) and E.3.c.(3) were incorporated into the project design to the maximum extent technically feasible given the project site conditions;

(iii) The project applicant is required to perform mitigation described in Provision E.3.c.(4)(c) with a net result of at least the same level of water quality protection as would have been achieved if the Priority Development Project had fully implemented the retention LID, flow-through LID treatment control BMPs, and hydromodification management BMP requirements under Provisions E.3.c.(2) and E.3.c.(3) onsite.

(b) Criteria For Technical Infeasibility

Each Copermittee must develop, or develop in collaboration with the other Copermittees, criteria to determine technical infeasibility for fully implementing the retention LID and hydromodification management BMP requirements under Provisions E.3.c.(2) and E.3.c.(3) and include these requirements in the Permanent BMP Sizing Criteria Design Manual pursuant to Provision E.3.d. Technical infeasibility may result from conditions including, but not limited to:

(i) Locations that cannot meet the infiltration and groundwater protection requirements in Provision E.3.a.(5) due to the presence of shallow bedrock, contaminated soils, near surface groundwater, underground facilities, or utilities;

(ii) Brownfield development sites or other locations where pollutant mobilization is a documented concern;

(iii) The design of the site precludes the use of soil amendments, plantings of vegetation, or other designs that can be used to infiltrate and evapotranspirate runoff;

(iv) Soils cannot be sufficiently amended to provide for the requisite infiltration rates;

(v) Locations with geotechnical hazards;

(vi) Insufficient onsite and/or offsite demand for storm water use;

(vii) Modifications to an existing building to manage storm water are not feasible due to structural or plumbing constraints; and

(viii) Smart growth and infill or redevelopment locations where the density and/or nature of the project would create significant difficulty for compliance with Provisions E.3.c.(2) and E.3.c.(3) onsite.

(c) Mitigation

Priority Development Projects that meet the Copermittee's technical infeasibility criteria developed pursuant to Provision E.3.c.(4)(b) must be required to mitigate for the increased flow rates, increased flow durations, and/or increased pollutant loads expected to be discharged from the site. For the pollutant load in the volume of storm water not retained onsite with retention LID BMPs treated with flow-thru LID treatment control BMPs sized for the portion of the design capture volume that is not retained onsite, , tre or increased potential erosion of downstream receiving waters not fully controlled onsite with hydromodification management BMPs, the Copermittee must require the project applicant to either 1) implement an offsite mitigation project, and/or 2) provide sufficient funding for a public or private offsite mitigation project via a mitigation fund.

(i) *Mitigation Project Locations*

Offsite mitigation projects must be implemented within the same hydrologic unit as the Priority Development Project, and preferably within the same hydrologic subarea. Mitigation projects outside of the hydrologic subarea but within the same hydrologic unit may be approved provided that the project applicant demonstrates that mitigation projects within the same hydrologic subarea are infeasible and that the mitigation project will address similar potential impacts expected from the Priority Development Project.

(ii) *Mitigation Project Types*

Offsite mitigation projects must include, where applicable and feasible, retrofitting opportunities and stream and/or habitat rehabilitation or restoration opportunities identified in the Water Quality Improvement Plans, identified pursuant to Provision B.3.a. Other offsite mitigation projects may include green streets or infrastructure projects, or regional BMPs upstream of receiving waters. In-stream rehabilitation or restoration measures to protect or prevent adverse physical changes to creek bed and banks must not include the use of non-naturally occurring hardscape material such as concrete, riprap, or gabions. Project applicants seeking to utilize these alternative compliance provisions may propose other offsite mitigation projects, which the Copermittees may approve if they meet the requirements of Provision E.3.c.(4)(a).

(iii) *Mitigation Project Timing*

The Copermittee and/or project applicant must develop a schedule for the completion of offsite mitigation projects, including milestone dates to identify, fund, design, and construct the projects. Offsite mitigation projects must be completed upon the granting of occupancy for the first project that contributed funds toward the offsite mitigation project, unless a longer period is authorized by the San Diego Water Board.

(iv) *Mitigation Fund*

A Copermittee may choose to implement additional mitigation programs (e.g., pollutant credit system, mitigation fund) as a means for developing and implementing offsite mitigation projects, provided the projects conform to the requirements for project locations, types, and timing described above.

(5) Alternative Compliance for Watershed-Based Planning

Where a development project, greater than 100 acres in total project size or smaller than 100 acres in size yet part of a larger common plan of development that is over 100 acres, has been prepared using watershed and/or sub-watershed based water quality, hydrologic, and fluvial geomorphologic planning principles that implement regional LID BMPs in accordance with the sizing and location criteria of this Order and acceptable to the Regional Board, such standards shall govern review of projects with respect to Provision E.3. of this Order and shall be deemed to satisfy this Order's requirements for LID site design, buffer zone, infiltration and groundwater protection standards, source control, treatment control, and hydromodification control standards. Regional BMPs must clearly exhibit that they will not result in a net impact from pollutant loadings over and above the impact caused by capture and retention of the design storm. Regional BMPs may be used provided that the BMPs capture and retain the volume of runoff produced from the 24-hour 85th percentile storm event as defined in Provision E.3.c. and that such controls are located upstream of receiving waters. Any volume that is not retained by the LID BMPs, up to the design capture volume, must be treated using LID biofiltration sized for the design capture volume that has not been retained. Where regional LID implementation has been shown to be technically infeasible (per Provision E.3.c.(4)(b)) any volume up to and including the design capture volume, not retained by LID BMPs, nor treated by LID biofiltration, must be treated using conventional treatment control BMPs in accordance with Provision E.3.c.(2)(d) and participation in the mitigation program in Provision E.3.c.(4)(c).