Guidelines for the Standard Urban Storm Water Mitigation Plan

Storm Water Best Management Practices for New Development and Redevelopment

Mendocino County

Russian River Watershed Association

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EOA, Inc.
BKF Engineers

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Acronyms, Abbreviations and Definitions

APN: Assessor's Parcel Number

Bank Full Discharge: means discharge that fills a stable alluvial channel up to the elevation of the active flood plain. Field indicators can be used for estimating the elevation of the stage associated with bank full flow. In stable channels, bank full discharge corresponds closely with effective discharge, also known as "Channel-Forming Discharge".

BASMAA: Bay Area Stormwater Management Agencies Association

Best Management Practice (BMP): means a program, technology, process, siting criteria, operational method, or engineered system, which when implemented prevents, controls, removes, or reduces pollution.

Channel-Forming Discharge: or "effective discharge" means the flow rate that transports the largest fraction of the sediment load over a period of years. For stable streams, the channel-forming discharge is considered equivalent to the "Bank Full Discharge". The channel-forming discharge generally has a recurrence interval of 1.5 to 2 years.

Constructed Channel: means all waterways that are not in closed conduits and do not meet the definition of a "Natural Waterway" or "Modified Natural Waterway". Constructed Channels also include landscaped constructed waterways. Constructed Channels do not include street gutters, roadside ditches, or drainage facilities installed in connection with the development of property.

CCRs: Conditions, Covenants and Restrictions

Development: means land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and improvements related to land subdivision.

DCIA: Directly connected impervious area means that stormwater passes over impervious surfaces, with no filtration, before discharging to a storm drain. An example is when the roof gutter discharges to a concrete driveway then into the stormdrain in a paved street.

Directly Adjacent: means within a parcel of land that includes or is contiguous with a Natural Waterway, Modified Natural Waterway, Constructed Channel, and some portion of the development on said parcel must be within 100-feet of the top of bank, and drainage from the development must flow towards and enter a waterway or channel.

Discretionary Project: A project which requires the exercise of judgment or deliberation when a public agency or body decides to approve or disapprove a particular activity, as distinguished from situations where the agency or body merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations. [1]

[1] California Secretary of Resources, September 7, 2004.

Integrated Pest Management (IPM): A decision making process for managing pests that uses monitoring to determine pest-caused injury levels and determine the best methods for their control. IPM minimizes pesticide usage by using a combination of biological controls (e.g. natural predators), physical or mechanical controls (e.g. mowing), cultural controls (e.g., alternative plant type selection), and reduced risk chemical controls (e.g. soaps or oils). The IPM method uses the least hazardous pesticides only as a last resort for controlling pests.

Maximum Extent Practicable: Refers to the technology based standard established by Congress in the Clean Water Act U.S.C. S 1342 (p)(3)(B)(iii) that municipal dischargers of storm water must meet. To achieve the maximum extent practicable standard, jurisdictions must employ whatever Best Management Practices (BMPs) are technically feasible (i.e., are likely to be effective) and are not cost prohibitive. The major emphasis is on technical feasibility. Reducing pollutants to the maximum extent practicable means choosing effective BMPs, and rejecting applicable BMPs only where other effective BMPs will serve the same purpose, or the BMPs would not be technically feasible, or the cost would be prohibitive.

Modified Natural Waterway: Means any natural waterway that has been modified while retaining significant riparian vegetation, fish, wildlife habitat, and/or scenic values. Modified natural waterways do not include artificially created channels for storm waters, such as street gutters, roadside ditches, and drainage facilities including ditches installed in connection with the development of property.

Natural Waterway: Means any natural stream of water flowing in a definite course or channel and possessing a bed and banks. It is not necessary that the flow of water be continuous throughout the year. Natural waterways do not include artificially created channels for storm waters, such as street gutters, roadside ditches, and drainage facilities installed in connection with the development of property.

NPDES: National Pollutant Discharge Elimination System

Reconstruction: Means, on an already developed site, the replacement of existing impervious surface with new impervious surface. Reconstruction includes, but is not limited to the replacement of an existing structure with a new structure, or the replacement of existing impervious surface with new impervious surface that is not part of a routine maintenance activity. Examples of roadway reconstruction include: the addition of a through lane, significant change in horizontal and/or vertical alignment, or replacement of an entire bridge or the major parts of an existing bridge (in such a manner that it is effectively a new bridge) on new vertical or horizontal alignment.[2] Excluded from this category are interior remodels and routine maintenance and repair. Routine maintenance and repair includes roof or exterior surface replacement, pavement resurfacing, repaving and road pavement structural section rehabilitation within the existing footprint, and any other reconstruction work within a public street or road right-of-way where both sides of that right-of-way are developed.

Redevelopment: Means, on an already developed site, the creation or addition of impervious surface. Redevelopment includes, but is not limited to: the expansion of a building footprint or addition or replacement of a structure; structural development including an increase in gross floor area and/or

[2] Adapted from Caltrans, July 1, 1999.

exterior construction or remodeling; replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities related with structural or impervious surfaces.

Riparian Area: Means the area between a stream or other body of water and the adjacent upland identified by soil characteristics and distinctive vegetation. It includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.[3] This vegetation is an associate of plant species which grows adjacent to freshwater watercourses, including perennial and intermittent streams, lakes and other bodies of fresh water. Riparian plant species and wetland plant species either require or tolerate a higher level of soil moisture than dryer upland vegetation, and are therefore generally considered hydrophytic. However, riparian vegetation may be distinguished from wetland vegetation by the different kinds of plant species.[4]

Road Maintenance and Repair: In general, means, on existing roadways, all work that does not fall under the definition of reconstruction and does not result in the creation of new disturbed area. Such projects include but are not limited to: pavement and structure rehabilitation projects; operational improvement projects such as signing, striping, changeable message signs, signalization, and ramp metering; environmental mitigation projects such as landscaping and noise barriers; and storm damage and emergency repair projects.[5] Grading must be to the original lines and grades of the original cross section and purpose of the facility, provided that there is no increase in roadway area and intended use of said facility.

Roadside Ditch: Means a constructed open channel paralleling a roadway embankment within the limits of the roadway right-of-way. Its primary function is to collect runoff from the roadway and areas adjacent to the right-of-way and to transport this accumulated water to an acceptable outlet point. A secondary function of a roadside ditch is to drain the base of the roadway to prevent saturation and loss of support for the pavement.[6]

Routine Maintenance: Normal maintenance practices on a pre-existing structure or facility, such as re-roofing, re-surfacing a parking lot, cleaning ditches, etc.

RWQCB: Regional Water Quality Control Board

Source Control: Means a site planning approach, a constructed component of a development project, or an operational activity that is included as part of a development project for the purpose of either 1) preventing pollutants from contacting storm water, or 2) reducing the quantity of runoff that drains from a developed site to the storm drain system. Examples of source controls include site designs that promote infiltration by reducing impervious surfaces, trash storage enclosures, connections to the sanitary sewer system for non-storm water discharges, street sweeping, and the regular inspection and cleaning of storm drain inlets.

Storm Drainage System: Any pipes, ditches, trenches, under drains, or other built facilities intended to convey rain water from one location to another location.

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[3] California Department of Fish and Game, February 1998.
[4] California Coastal Commission, February 1981.
[5] Adapted from Caltrans, July 1, 1999.
[6] Adapted from Illinois Department of Transportation, Division of Highways, April 2005.

SWMP: Storm Water Management Plan, as in Mendocino County SWMP.

Storm Water Pollution Prevention Plan (SWPPP): The Statewide Construction Activity NPDES General Permit requires the preparation of a SWPPP for projects that disturb one acre or more. A SWPPP focuses on construction-period BMPs to reduce pollutants in storm water and reduce storm water quantity during construction.

SUSMP: Standard Urban Storm Water Mitigation Plan

SWRCB: State Water Resources Control Board

Top of Bank: Means the points in a cross-section where the stream channel makes a transition to flood plain. Top of bank can be identified by a change in the slope of the land, a transition from terrestrial to riparian vegetation, and changes in the composition of substrate materials.

Treatment: Means the application of engineered systems that use physical, chemical, or biological processes to remove pollutants.

Treatment Control: Means an engineered system that is designed to remove pollutants from storm water using physical, chemical, or biological processes before the storm water is discharged to the storm drain system. Examples of treatment controls include vegetated swales, extended detention basins, vegetated buffer strips, bioretention areas, and media filters.

U.S. EPA: United States Environmental Protection Agency

WDRs: Waste Discharge Requirements

Wetlands: Means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. For official determination whether or not an area is classified as a wetland pursuant to Section 404 of the federal Clean Water Act, contact the Army Corps of Engineers.

1 Introduction and Overview

1.1 Introduction

These guidelines have been developed to assist project sponsors and county staff to implement the Mendocino County Storm Water Management Plan (SWMP) requirements that were adopted by the North Coast Regional Water Quality Control Board in December, 2005. Since the SUSMP requirements apply to both privately sponsored projects and public capital improvement projects, these Guidelines should be used by development project applicants, county development project review staff, and county staff responsible for capital improvement projects. The SUSMP requirements are part of the SWMP that has become an enforceable part of the reissued municipal storm water National Pollutant Discharge Elimination System (NPDES) permit for Mendocino County.

These Guidelines should be used by development project applicants, county development project review staff, and county staff responsible for capital improvement projects.

1.2 Background on the SUSMP

The SUSMP was developed to minimize the detrimental effects of new and redevelopment projects on storm water quality and runoff. All large and medium sized municipalities in the State of California are currently required to meet similar requirements to limit the adverse impacts of development on storm water quality and hydrology.

The types of problems associated with storm water runoff in urban and urbanizing areas include increased concentrations of pollutants, increased stream peak flows, shortened flow durations, and changes in the rate of discharge which lead to stream channel degradation or incision. Stormwater picks up pollutants, contaminants, trash and debris from ground surfaces and delivers them to a stream channel. U.S. EPA has found that development-induced increases in pollutants and in the flow and duration of runoff contribute to loss of habitat and decreases in aquatic biological diversity (U.S. EPA 1983).

1.2.1 Goals

The SUSMP's goals for new and redevelopment projects are to manage, as close to the point of origin as possible, 1) storm water quality, 2) storm water quantity, and 3) to conserve natural areas of the development site. These three goals are described further below. It should be noted that the concept of "maximum extent practical" (MEP, see definitions) applies to each of the goals.

Storm Water Quality. The first goal is to prevent pollutants generated at development and redevelopment projects from reaching the storm drainage system and other water conveyances. Projects covered by the SUSMP must be designed to minimize the introduction of pollutants.

Storm Water Quantity. The second goal is to prevent increases in storm water runoff from the two-year 24-hour storm event for Mendocino County. SUSMP projects should incorporate best management practices to limit the post-development runoff to pre-development conditions to the MEP. Best management practices are methods used to minimize pollutants in storm water and the quantity of runoff. One of the objectives of these guidelines is to provide more specific information about how MEP will be achieved.

Conserve Natural Areas. The third goal is to conserve natural areas of a development site. This goal supports the other two goals by preserving areas where storm water runoff can be purified naturally by infiltration into the soil and flow over vegetated areas. SUSMP projects should strive to maximize the amount of land left in a natural, undisturbed condition, preserve riparian areas and wetlands, limit clearing of native vegetation, and maximize trees and vegetation.

1.2.2 Geographic Areas Covered by the SUSMP

The SUSMP applies to projects within the area covered by the storm water permit boundary as shown in Figures 1 and 2. These are the unincorporated and urbanized areas surrounding the Cities of Ukiah and Fort Bragg, including all adjacent properties zoned commercial, high-density residential and industrial.

1.3 Applicable Projects

The SUSMP identifies the following four categories of new development and significant redevelopment projects that are required to design and implement source control and treatment control BMPs[7]. This SUSMP applies to applicable projects that require a discretionary [8] permit,

[7] Source control and treatment control BMPs are intended to reduce runoff and keep pollutants out of storm water throughout the life of the project. They may be described as post-construction BMPs or "post-development" control measures. Post-construction BMPs differ from construction BMPs, which are used during the construction phase to prevent erosion and keep construction-related pollutants from reaching storm water.

[8] A "discretionary project" is a project which requires the exercise of judgment or deliberation when a public agency or body decides to approve or disapprove a particular activity, as distinguished from situations where the agency or body merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations. Examples of discretionary projects include projects that require design review, a conditional use permit, or approval of a tract map.

and including any ministerial permits. Source controls will be required for all discretionary projects.

1) Development projects that disturb one acre (43,560 square feet) or more of ground surface **anywhere in Mendocino County**. This category includes development of any type on public or private land, which falls under the planning and building authority of Mendocino County, where one acre or more of ground surface, collectively over the entire project site, will be disturbed. Project phasing to decrease impervious surface area shall not exempt the project from SUSMP requirements.

2) Streets, roads, highways and freeways that create one acre (43,560 square feet) or more of new impervious[9] surface. This category includes any newly constructed impervious surface used for the transportation of pedestrians, bicycles, and motorized vehicles.

3) Redevelopment projects that are located on an already developed site and result in the addition of, and/or reconstruction of, one acre (43,560 square feet) or more of ground disturbance. Only the additional and/or reconstructed portion(s) of the site must be included in treatment design. Excluded from this category are interior remodels and routine maintenance or repair, including roof or exterior surface replacement and resurfacing.

4) Development and redevelopment projects located directly adjacent to a natural waterway, modified natural waterway, County Maintained Storm Drainage System, or constructed channel or that requires a new storm drain outfall to such waterway, **regardless of project size**. This requirement is intended to protect environmentally sensitive areas. Excluded from this category are interior remodels and routine maintenance or repair, including roof or exterior surface replacement and resurfacing.

Note: Any project that alters overland flow quantities, concentrations, or patterns shall implement appropriate controls to predevelopment conditions (California Drainage Law)

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[9] The NPDES permit defines impervious surface as "all areas where improvements result in a ground surface that significantly limits natural percolation rates including, but not limited to, asphalt, cement, pavers, buildings, and plastic liners that are associated with the project."

Figure 1: Inland Mendocino County Urbanized Area where SUSMP applies

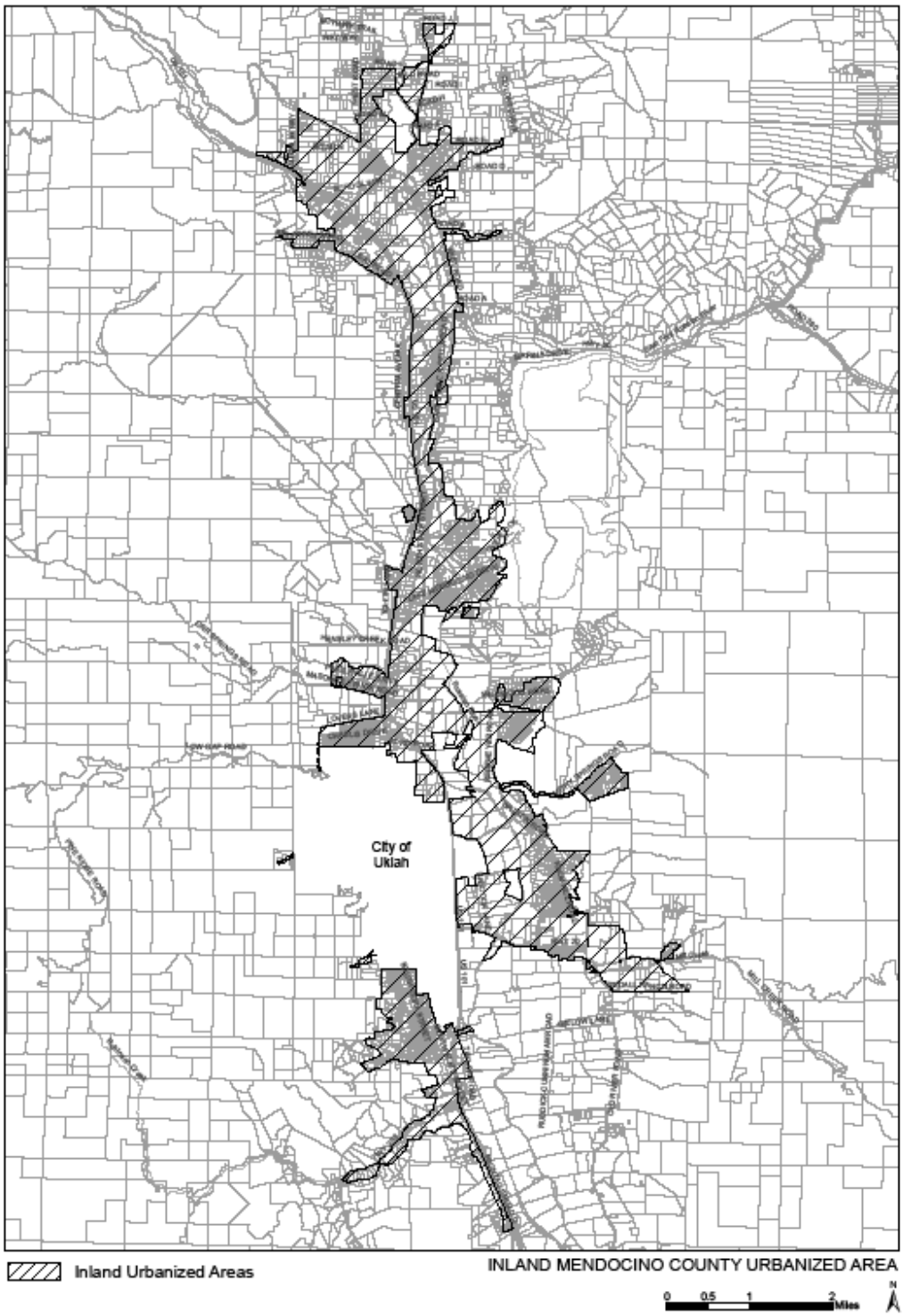


Figure 2: Coastal Mendocino County Urbanized Area

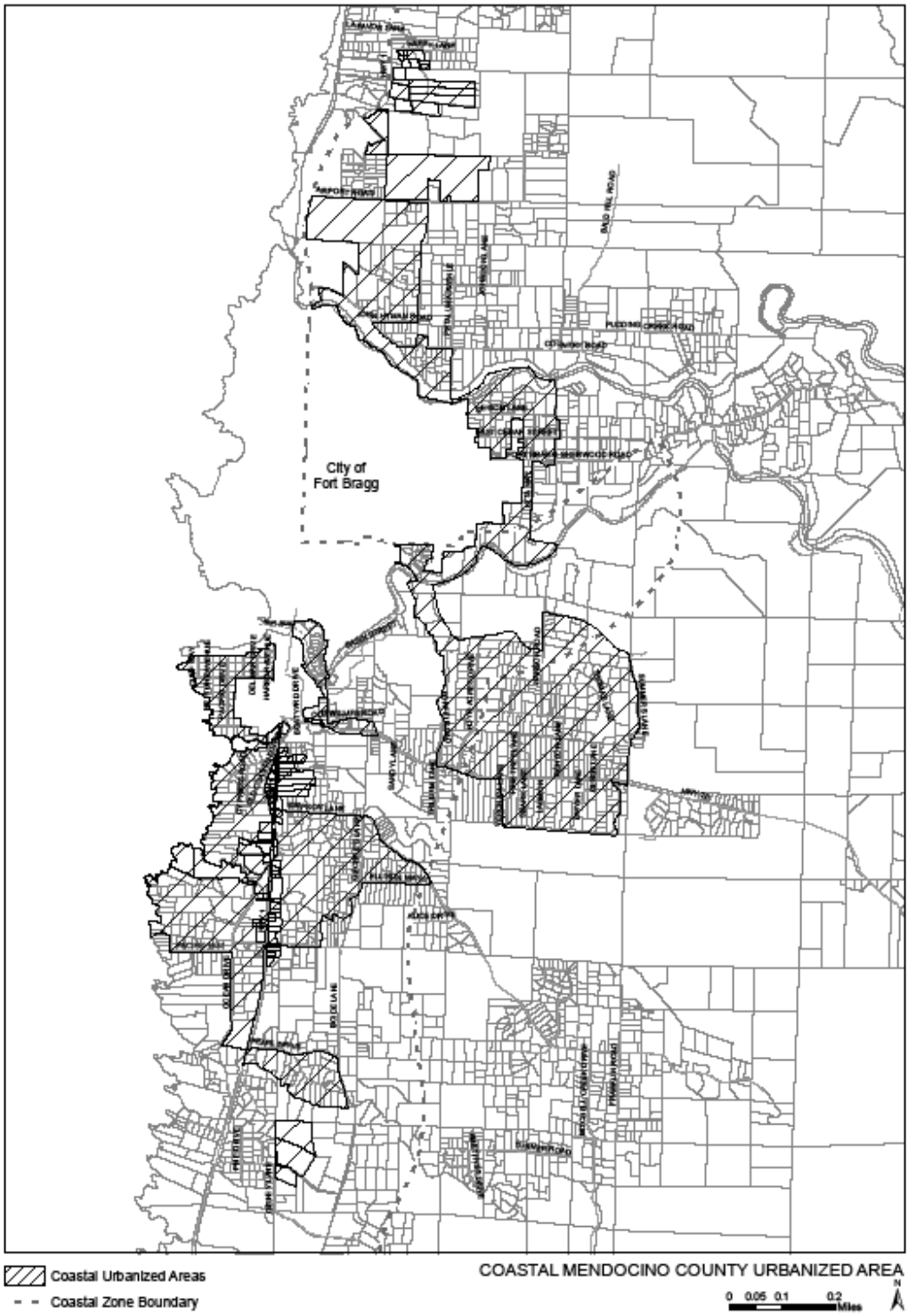


Table 1-1
Examples to Determine if a Project Meets SUSMP Applicability Criteria

Project Type	Area of Project Site (disturbed area) * New impervious surface	Type of Water Body or Channel Directly Adjacent	New Storm Drain Outfall (if any) or connection to County Stormdrain System	Applicable project? Governing criteria
Any project type within Mendocino County	*5,000 s.f.	none	none	**No**, but require source controls
One single family residential home	8,000 s.f.	Constructed Channel	None	**Yes** a) Adjacent to a constructed channel
Multifamily residence (duplex)	10,000 s.f.	None	None	**No,** but require source controls.
Multifamily residence (duplex)	10,000 s.f.	None	Yes	**Yes** a) New storm drain outfall to a waterway
Multifamily residence (duplex)	10,000 s.f.	None	Yes	**Yes** a) New storm drain outfall to a roadside ditch.
Parking Lot, anywhere in Mendocino County	5,000 s.f.	None	No	**Yes** a) parking lot threshold
Parcel Map: residential subdivision	15 acres	Constructed Channel	Yes	**Yes** a) 1 acre of disturbed area, b) 1 acre of new road, c) adjacent to a constructed channel, and d) new storm drain outfall

1.4 Storm Water Mitigation Plan

For applicable projects, the SUSMP requires the preparation and submittal of a preliminary Storm Water Mitigation Plan, final Storm Water Mitigation Plan and Written Certification of BMPs Installation during the project approval process. The Storm Water Mitigation Plan must provide specific required information regarding the post-construction BMPs that will be incorporated in the project to mitigate pollutants. The Written Certification of BMPs is a document verifying that the BMPs were installed as intended by the designer and/or as recommended by the manufacturer. Chapter 2 of these guidelines explains the specific requirements for each of these documents and offers step-by-step guidance in their preparation.

The Storm Water Mitigation Plan must provide specific required information regarding the post-construction BMPs that will be incorporated in the project to mitigate pollutants.

1.5 Source and Treatment Control Requirements

The SUSMP recognizes two types of post-development BMPs for storm water pollution control – source controls and treatment controls. Source controls include BMPs that are designed to prevent pollutants from reaching storm water runoff and minimize site runoff. Source controls include a large variety of BMPs that range from minimizing the amount of impervious surface used at a project site to specific pollution prevention BMPs such as providing a roof over waste storage areas. The municipal storm water NPDES permit characterizes source control as the first line of defense at a project site and storm water treatment as a backup or additional line of defense. Appropriate source controls should be required for discretionary projects. Source controls are described in more detail in Chapter 3.

Storm water treatment controls are engineered systems that are designed to remove pollutants from storm water. The SUSMP and NPDES permit have specific hydraulic design criteria for sizing storm water treatment controls to assure that an optimum amount of storm water receives treatment. Examples of storm water treatment controls include vegetated swales, extended detention basins, and bioretention areas. These are described in more detail in Chapter 4.

1.6 Maintenance of Source and Treatment Controls

Source and treatment controls require long-term maintenance to continue to function effectively and avoid the creation of nuisance conditions. The SUSMP requires the project applicant to provide the County a signed statement accepting responsibility for maintenance until the responsibility is legally transferred to a legally responsible entity, acceptable to the County Planning Department. The SUSMP further requires property owners to conduct maintenance inspection of all source and treatment control BMPs at least once a year or as specified by the designer or manufacturer. Chapter 5 describes the requirements for ongoing source and treatment control maintenance.

The SUSMP requires the project applicant to provide the County a signed statement accepting responsibility for maintenance …

1.7 Overview and Challenges to Controlling Storm Water Pollutants and Flows

As described previously, the SUSMP and municipal storm water NPDES permit require using either source control and/or treatment control BMPs at applicable projects. In addition, all source and treatment controls that are implemented must be maintained to be effective. Table 1-4 provides a conceptual overview and examples of how these two types of BMPs and their maintenance accomplish the SUSMP's goals related to water quality and conservation of natural areas. This table also shows how these guidelines are organized to provide a comprehensive and integrated approach to managing storm water.

1.7.1 Maximum Extent Practicable

One of challenges in implementing the SUSMP is to define what constitutes maximum extent practicable (MEP). These guidelines provide details about what constitutes MEP for purposes of meeting the SUSMP. What is considered to be MEP will continue to evolve based on national, statewide and local experience.

1.7.2 Balancing Prescriptiveness and Flexibility

These guidelines seek to strike a balance between providing detailed requirements and allowing site designers flexibility to design projects on diverse sites that will achieve the SUSMP's goals. Given the evolving nature of what is considered MEP, it is possible that future NPDES permit reissuances, SUSMPs, and guidelines may become more prescriptive.

1.7.3 Selection of BMPs

To promote greater familiarity with source and treatment controls, these guidelines include pictures with examples of BMP use and references where more information may be found. As hands on familiarity with BMPs grows, County staff and project sponsors should become increasingly knowledgeable and adept at using a variety of BMPs.

1.7.4 Channel-Forming Discharge

Urban development can increase the total volume of storm water discharged, extend the duration of elevated flows, and alter runoff flow rates. During urban development, natural vegetated pervious ground surfaces may be converted to impervious surfaces such as paved highways, streets, rooftops, and parking lots.

The runoff leaving a newly developed urban area may be significantly greater than pre-development runoff from the same area. The cumulative increase in off-site runoff may cause

downstream erosion and flooding, which can subsequently increase sediment loads to the entire storm water conveyance system.

One goal of the SUSMP is to prevent increases in storm water runoff from the two-year 24-hour storm event. For SUSMP applicable projects, the applicant is responsible for demonstrating that the post-development runoff from the project site will be limited to the pre-development runoff conditions as described in more detail in Chapter 2.

1.8 Costs

A number of the source controls described in Chapter 3 may be incorporated in a project at relatively low cost above the project's baseline costs. In general, the earlier source controls are incorporated into the project design, the more economical they are to implement. By using site planning source controls that reduce a project's total impervious area, a project applicant can reduce the amount of storm water that will require treatment and thereby reduce the size of treatment controls.

Treatment controls are generally more costly to construct and maintain than source controls. However, implementation of Low Impact Development (LID) techniques to retain natural hydrology as much as possible is often less costly than the traditional engineering approach of conveying runoff off-site as quickly as possible in drainage pipes.

The maintenance costs of treatment controls are commonly expressed as a percentage of the construction costs. Most treatment controls are reported to cost between 3 to 5% of the construction costs to maintain each year. The little data available on the maintenance of vegetated swales suggests that the annual maintenance costs would be more in the range of about 1% of the construction costs.

In general, the earlier source controls are incorporated into the project design, the more economical they are to implement.

1.9 Post-Construction Sediment and Erosion Control

Sediment is an important pollutant of concern in the North Coast Region. During construction sediment and erosion control BMPs must be implemented in accordance with the Statewide Construction Activity NPDES General Permit and the County of Mendocino grading permit programs. The design of projects must also consider potential sedimentation and erosion issues during long-term project operations and incorporate appropriate sediment and erosion controls in the project design.

Chapter 3, Source Controls, emphasizes the need to select and maintain vegetation in landscaped pervious areas to prevent runoff from contacting bare earth and conveying sediment into the storm drain system. Similarly, pervious paving materials must also be selected, designed and maintained to avoid sedimentation and erosion.

1.10 Pollutants of Concern

Information on pollutants that have been identified by the State Water Resources Control Board and the U.S. EPA as impairing local waters is summarized in Table 1.2. These pollutants of concern will need to be reduced eventually to levels that are not impairing these waterways through a process that allocates pollutant load reductions to different controllable sources.

Table 1-2: Pollutants or Stressors Listed as Impairing Local Waterways (partial list)

WATER BODY	IMPAIRMENT(S)
Pudding Creek:	Temperature
Noyo River:	Sedimentation/Siltation, Temperature
Upper Russian River Watershed:	Temperature, Sediment/Siltation

The most sensitive beneficial uses supported by the Russian River include uses associated with the cold water fishery and municipal and domestic supply. The Russian River provides habitat for coho salmon and steelhead trout, which are listed as a threatened species under the federal Endangered Species Act. Recent (1997-2009) temperature data collected in the Russian River watershed indicate that high temperature levels may be a source of impairment of cold water fisheries in the watershed. The cause of elevated temperatures is attributed to; the removal of riparian vegetation, habitat modification, flow regulation/modification, hydromodification (changes in natural flow patterns), streambank modification/destabilization, upstream impoundments, and nonpoint (widespread) sources of water pollution.

Russian River Watershed tributary sediment impairments led to listing of the entire watershed for sediment. The North Coast Regional Water Quality Control Board has identified the potential sources of sediment and siltation in the Russian River Watershed as; agriculture, channel erosion, construction/land development, drainage/filling of wetlands, erosion/siltation, habitat modification, highway maintenance and runoff, natural sources, and removal of riparian vegetation.

Table 1-3: Pollutants Impacts on Water Quality

Sediment	Sediment is a common component of stormwater, and can be a pollutant. Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can transport other pollutants that are attached to it including nutrients, trace metals, and hydrocarbons. Sediment is the primary component of total suspended solids (TSS), a common water quality analytical parameter.
Nutrients	Nutrients including nitrogen and phosphorous are the major plant nutrients used for fertilizing landscapes, and are often found in stormwater. These nutrients can result in excessive or accelerated growth of vegetation, such as algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the nitrogen forms) can be toxic to fish.
Bacteria and viruses	Bacteria and viruses are common contaminants of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming.
Oil and Grease	Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants, and waste oil disposal.
Metals	Metals including lead, zinc, cadmium, copper, chromium, and nickel are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because they are toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies.
Organics	Organics may be found in stormwater in low concentrations. Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed. In addition, deliberate dumping of these chemicals into storm drains and inlets causes environmental harm to waterways.
Pesticides	Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been repeatedly detected in stormwater at toxic levels, even when pesticides have been applied in accordance with label instructions. As pesticide use has increased, so too have concerns about adverse effects of pesticides on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds.
Gross Pollutants	Gross Pollutants (trash, debris, and floatables) may include heavy metals, pesticides, and bacteria in stormwater. Typically resulting from an urban environment, industrial sites and construction sites, trash and floatables may create an aesthetic "eye sore" in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes, and estuaries sometimes causing fish kills.
Vector Production	Vector production (e.g., mosquitoes, flies, and rodents) is frequently associated with sheltered habitats and standing water. Unless designed and maintained properly, standing water may occur in treatment control BMPs for 72 hours or more, thus providing a source for vector habitat and reproduction (Metzger, 2002).
Source: California Stormwater BMP Handbook, Municipal	

All of the pollutants listed in Table 1.3 have a number of ways that they reach local creeks. County storm water runoff may contain nitrogen and phosphorus compounds from fertilizers that are used excessively to maintain landscaping. The pesticide, diazinon, has exceeded safe levels for aquatic life and its nationwide use in urban areas for yard care and ant control is being phased out. Microbial pathogens include bacteria and viruses that cause disease. These pathogens are often found in storm water runoff from failing septic tanks, sewer overflows, and animal wastes.

Besides the pollutants listed above, storm water can mobilize and transport other pollutants from everyday activities. Some examples include tire and brake pad wear, engine combustion products, petroleum product leaks from vehicles, yard wastes, litter, pesticides, fireplace soot, and atmospheric transport of eroded soil by wind and rain.

In terms of removing pollutant from storm water, it is fortunate that most pollutants tend to become attached through adsorption onto particles, such as suspended and settleable solids. Particulate associated pollutants are easier to remove from storm water than soluble pollutants that remain dissolved.

Total suspended solids (TSS) is a measurement of the amount of sediment entrained in storm water runoff. Total suspended solids are also an indirect measure of other pollutants carried in storm water runoff because nitrogen and phosphorous compounds, pesticides, and pathogens are typically attached to sediment particles.

Pollutants listed in Table 1.3 should be considered in the BMP selection and design process as applicable depending on the type of project and associated pollutants.

1.11 Non-Compliance

The Mendocino County storm water NPDES permit requires the County of Mendocino to implement legal authority to control pollutant discharges to their respective storm drain systems. At a minimum, this legal authority empowers the County to use enforcement mechanisms, including monetary fines, to require compliance by private entities within their jurisdictions. In the event that a project applicant fails to comply with the SUSMP requirements, the County may determine that it is necessary to undertake enforcement actions, which may include a monetary fine.

In the event that a project applicant fails to comply with the SUSMP requirements, the County may determine that it is necessary to undertake enforcement actions, which may include a monetary fine.

Table 1-4 Overview: Controlling Pollutants and Increased Flows from New and Redevelopment Projects

Actions to Accomplish SUSMP & NPDES Permit Goals	**Examples of Source Control BMPs** (Chapter 3)	**Examples of Treatment Control BMPs** (Chapter 4)	**Maintenance of Source and Treatment Controls** (Chapter 5)
1. Mimic and/or retain natural absorption and purification of storm water by soil and surface vegetation	1) Minimize impervious surfaces. 2) Minimize directly connected impervious surfaces, such as by connecting roof downspouts to vegetated areas. 3) Use small detention areas throughout project site. 4) Assure that any source controls that detain water are designed to drain completely within 72 hours after rainfall has ended to minimize mosquito breeding.	1) Use landscape-based treatment controls as a first choice. 2) Design landscape within treatment controls to minimize use of fertilizers and pesticides. 3) Where soils and other conditions allow, use infiltration type treatment controls	1) Assure that planned pervious areas are not converted to impervious areas. 2) Maintain vegetation within vegetated source and treatment controls.
2. Prevent erosion in creek channels	5) All of above. 6) Decrease runoff by using pervious pavements. 7) Use bioengineering to stabilize and restore creek channels.	4) All of above. 5) Where feasible, use treatment controls that detain storm water. 6) Follow recommendations for selecting and designing treatment controls to minimize mosquito breeding.	3) Assure continued perviousness of soils in landscaped areas used as source and treatment controls.
3. Protect sensitive aquatic areas	8) All of above 9) Provide setback, buffers between project and creeks and/or wetlands.	7) Locate treatment controls as close to the point of pollutant origin as possible. 8) Do not use waters of the state, such as creeks and wetlands to treat storm water.	4) Perform sufficient maintenance of treatment controls to maintain the distinction between a treatment control and an aquatic habitat, which has additional requirements.
4. Prevent increases in pollutants to all water conveyances, especially pollutants listed as impairing local creeks	10) Design landscape to minimize use of fertilizers and pesticides. 11) Minimize disturbance of steep, erodible slopes. 12) Assure that post-construction project specific activities that generate pollutants are controlled by source controls (for example, roofing outdoor storage areas).	9) Select treatment controls that will treat pollutants of concern, such as sediment and nutrients. 10) Use the SUSMP's guidance sheets to design treatment controls. 11) Design treatment control vegetation to minimize use of fertilizers and pesticides.	5) Maintain type of landscape that minimizes need to use fertilizers and pesticides. 6) Assure maintenance of source control BMPs to minimize project specific pollutants, such as from washwaters. 7) Assure continued use of operational BMPs during life of project.
5. Prevent the discharge of non-storm water discharges and pollutants to storm drain system	13) Implement all of the above 14) Design landscaping to conserve water and minimize irrigation runoff	12) Design treatment controls to eliminate need for any prohibited, non-storm water discharges to the storm drain.	8) Make sure that maintenance activities do not result in any prohibited non-storm water discharges to storm drain.

2 Storm Water Mitigation Plan

This chapter explains the requirement for project applicants to include a written Storm Water Mitigation Plan (SWMP) in development permit applications that meet the SUSMP criteria described in Chapter 1. Following a summary of SUSMP requirements, step-by-step instructions are provided for preparing the preliminary and final Storm Water Mitigation Plan.

2.1 Summary of SUSMP Requirements

For applicable projects (as defined in Section 1.3), the SUSMP requires the preparation of a Preliminary Storm Water Mitigation Plan, Final Storm Water Mitigation Plan and a Written Certification of BMPs Installation. The SWMP requirements apply to both privately sponsored developments and publicly sponsored improvement projects that meet the SUSMP criteria. The SUSMP requirements for each of these items are described below.

The Preliminary Storm Water Mitigation Plan (Preliminary Plan) is prepared and included as part of the project's planning phase. For private projects, an adequate Preliminary Plan must be submitted for a planning application to be considered complete. For public projects, the Preliminary Plan is included with the preliminary design documents. The Preliminary Plan is submitted simultaneously with the tentative map, preliminary site plan and/or landscaping plan. The required contents of the preliminary plan are described in Section 2.2.

For private projects, an adequate Preliminary Storm Water Mitigation Plan must be submitted for a planning application to be considered complete.

The Final Storm Water Mitigation Plan (Final Plan) must be included as part of public and/or subdivision improvement plans and/or building permit application, whichever occurs first. For public projects, the final Plan is prepared as part of the final design documents. The required contents of the final Plan are described in Section 2.3.

2.2 Preparing the Preliminary Plan

This section provides step-by-step instructions for preparing the required components of the preliminary Plan.

Use the Project Description Worksheet (Attachment 2-1) to prepare a project description.

Step 1: Prepare Project Description

Use the Project Description Worksheet (Attachment 2-1) to prepare a project description. The worksheet includes:

- Site Plan
- Assessor's Parcel Number
- Street address (if an address has been assigned)
- Total area of site
- Existing land use at the site
- Detail regarding proposed land use activities (e.g., number of units of single family residential, number of units of multifamily residential, number of square feet of retail or office commercial, etc.)
- Features of the project, or potential pollutant generating activities (activities of concern) proposed on the site, which may trigger source control requirements. A list of activities of concern is provided in the Project Description Worksheet (see item no. 13 on Attachment 2-1).
- Any hydrologic features on or adjacent to project site (e.g., wetlands, seeps, springs, natural waterways, modified natural waterways, constructed channels, subsurface or surface storm drainage system)
- Any new storm drain outfall, to be constructed as part of the project, to a hydrologic feature, such as those listed above
- Name(s) of water body(ies) that will receive storm water flows from the project. Include both the immediate receiving water body, and water bodies farther downstream.
- Any sensitive natural features (e.g., riparian areas, wetlands, and steep slopes) on site that would be preserved. The project description must include the total square footage or acreage of sensitive natural features now existing and the square footage or acreage that would be preserved.

⇨ Step 2: Prepare Disturbed Area and Proximity Worksheets

Disturbed Area Worksheet (Attachment 2-2)**.** If the project disturbs one acre or more of surface area, complete the Disturbed Area Worksheet (Attachment 2-2). Measure the amount of existing disturbed area on the site and use the conceptual or preliminary project plans to calculate the amount of disturbed area that would exist on the site at completion of the project.

The Disturbed Area Worksheet and the Waterway Proximity Worksheet are used to confirm that a project is a SUSMP applicable project.

Proximity Worksheet. The Proximity Worksheet (Attachment 2-3) is completed if the project is directly adjacent (see definitions) to a natural waterway, modified natural waterway, or constructed channel, or if the project requires a new storm drain outfall to one of these resources. Proximity may be determined by conducting a site visit, consulting USGS maps, parcel maps, and/or consulting County personnel.

On the Proximity Worksheet, indicate the name, or other identifier, of any natural waterway, modified natural waterway, or constructed channel to which the project is directly adjacent or to which the project will construct a new storm drain outfall. Applicants must include on the worksheet the method used to determine proximity, including any map reference.

Include the completed worksheets and disturbed area calculations in Preliminary Plan. For projects that do not require a SWMP, attach worksheets and imperviousness calculations to the planning permit application, and use the Source Control Checklist to select source control measures.

Source controls are relatively low-technology and in many cases low-cost practices that help keep pollutants out of storm water.

⇨ *Step 3: Estimate Pre- and Post- Development Runoff*

Pre- and post-development runoff is calculated by a licensed civil engineer, architect, or landscape architect when a drainage plan is prepared. If a drainage plan is not required for a project, these calculations are prepared separately. Calculate pre- and post-development runoff. The calculations should be performed using the methods described in Chapter 4.

The pre- and post-development runoff calculations shall be based on the two-year 24-hour storm event for Mendocino County. This storm frequency has been selected for design purposes for mitigating the effects of channel-forming discharges.

The design shall then limit the post-development runoff flow volume and rate to the pre-development discharge volume and rate from the project site. BMP's intended to mitigate any increase in velocity and/or duration shall also be considered.

⇨ *Step 4: Identify Pollutants of Concern*

Applicants should refer to the Pollutants of Concern Worksheet (Attachment 2-4) to identify pollutants of concern that are anticipated to be generated by the proposed project. Identify Pollutants of Concern in the preliminary Plan.

Step 5: Select Source Control BMPs

Source control BMPs are relatively low-technology and in many cases low-cost practices that help keep pollutants out of storm water. Source controls are not intended to remove pollutants after they have entered storm water runoff. Source control BMPs must be selected to address specific activities or features that will be included in a project. Chapter 3 provides more detailed guidance on selecting appropriate source control BMPs.

To select source control BMPs that will be appropriate for a specific project, consult the Source Control Checklist, included as Attachment 3-1 of Chapter 3. The checklist identifies source control measures that apply to projects that contain specific project features (e.g., buildings, driveways, parking lots) or that will include specific activities (e.g., vehicle cleaning, food service, fuel dispensing). Use the checklist to identify the source controls that will apply to the features and activities proposed in your project and prepare a list of these source controls as a part of the preliminary Stormwater Mitigation Plan.

The project-specific list of source control BMPs needs to indicate which BMPs mitigate pollutants; which BMPs reduce the amount of impervious surfaces and thereby reduce the timing and amount of runoff; and which BMPs promote both of these objectives.

⇨ *Step 6: Select Treatment Control BMPs*

Treatment control BMP's are engineered systems designed to remove pollutants from storm water runoff before it flows offsite. Treatment controls may be categorized as landscaped-based and non-landscaped based controls. Landscaped based controls include vegetated swales, wet ponds, constructed wetlands, and various other above-ground treatment controls. The non-landscape based controls are generally subsurface systems that rely on filtering of storm water through sand or other media, or sedimentation. Landscape-based treatment controls are more visible and believed to be better maintained than non-landscape based controls. Although landscape-based controls are generally preferred, they may not be practicable for projects on small urban sites.

Each applicable project must include treatment BMPs that are appropriate given the pollutants of concern, soil conditions, slope, and other constraints associated with each project site. A BMP that is appropriate to one project may not be appropriate to another. Chapter 4 provides detailed information regarding the various types of treatment controls and guidance in selecting appropriate BMPs based on specific project and site conditions.

Attachments 4-1 and 4-2 in Chapter 4 have been developed to assist the project applicant through the process of selecting appropriate treatment control BMPs for the project. County staff has determined that the treatment controls with the widest applicability for use in Mendocino County are vegetated swales, bioretention areas, vegetated filter strips and extended detention basins.

If landscape-based treatment controls are not used, the preliminary Plan must explain why non-landscaped based treatment controls are recommended. The project-specific list of treatment

control BMPs needs to indicate which BMPs reduce pollutants; which BMPs reduce the timing and amount of runoff, and which BMPs promote both of these objectives.

Treatment controls are engineered systems designed to remove pollutants from storm water runoff before it flows offsite.

⇨ *Step 7: Locate BMPs and Prepare Conceptual Design*

Prepare drawings that show the locations of proposed source control and treatment control BMPs on the sites. The location of certain source control measures will be dictated by other considerations. For example, the plumbing of interior floor drains to the sanitary sewer will occur at the location of the interior floor drain. Locating other source control measures, such as maximizing pervious areas will require careful consideration to identify the optimal areas to maintain perviousness on site. Some guidelines in locating source controls are provided below:

- Locate pervious areas between developed impervious areas and sensitive natural features (e.g., creeks, wetlands, steep slopes). This allows for infiltration and filtration before runoff reaches these natural features.

- Locate pervious areas downslope from developed impervious areas. This will allow for infiltration and filtration before runoff leaves the site.

- Fewer but larger pervious areas generally offer greater environmental benefit than a larger number of small pervious areas.

Locate pervious areas downslope from developed disturbed areas. This will allow for infiltration and filtration before runoff leaves the site.

Considerations for identifying appropriate locations for treatment control BMPs are provided below:

- Locate treatment controls along the hydraulic grade line of the site's drainage. This will allow for gravity to provide the drainage into and out of the treatment control and avoid the need for a pumped system. Pump systems are feasible and may result in only nominal added maintenance expense, but they can lead to mosquito control problems.

- Provide access for inspection of treatment controls. If the property will be subdivided, the BMP should be in a common accessible area.

- Provide access for maintenance equipment. Access requirements for maintenance vary with the type of treatment control selected. Wet ponds and extended detention basins typically require maintenance roads that can be used by heavy vehicles. Vegetated

swales, bioretention areas, and vegetated filter strips typically require access by equipment used for landscape maintenance.

- Integrate the treatment controls with landscaping. This will make efficient use of the project site and promote aesthetic values. Mendocino County zoning codes typically require building setbacks and minimum open space allowances. It may be possible to locate a treatment control BMP in such an area.

After the locations have been selected, use the design guidance provided in Chapter 4's fact sheets to prepare conceptual design of the treatment control BMPs. Detailed construction drawings are not required at this stage, but drawings, sketches, or descriptions should be included as needed to illustrate the proposed design and to support calculations. Treatment controls are required to conform to the design guidance provided in Chapter 4. Include in the preliminary Plan the drawings showing the location of source control and treatment control BMPs, and the conceptual design drawings for treatment controls.

Treatment controls are required to conform to the design guidance provided in Chapter 4.

⇨ *Step 8: Size Treatment Control BMPs*

The size of a treatment control will depend on the size of the project area draining to the treatment control and the type of treatment control selected.

Treatment controls can be categorized as "flow-based" or "volume-based" controls. Flow-based systems, such as vegetated swales, vegetated filter strips, and media filters remove pollutants from a moving stream of storm water runoff primarily by filtration, settling, flotation and infiltration. Volume-based systems detain storm water for periods of time, typically 48 to 72 hours, and treat storm water primarily through settling and infiltration.

After determining the size of the total project area contributing to the treatment control, applicants will need to use the runoff calculations prepared in Step 3 and the hydraulic sizing requirements provided in Section 4.3 to determine the appropriate size of treatment control BMPs. Hydraulic sizing requirements are provided for both flow-based and volume-based treatment controls. After completing the sizing calculations for treatment control BMPs, the calculations must be included in the Preliminary Plan.

Waiver, If Applicable

If all treatment controls are determined to be infeasible then an applicant may request a waiver from SUSMP treatment and channel-forming discharge requirements for the project. A waiver application must be submitted to the County for consideration. The waiver application must document why treatment controls are infeasible for the project. The waiver application must also contain a dollar estimate of the work being waived. The dollar estimate shall include the cost of

planning, designing, constructing, maintaining, and replacing the BMPs subject to the waiver application. Prior to a waiver being granted, the applicant shall pay an in lieu fee to the County in an amount equal to the approved dollar estimate.

⇨ *Step 9: Assign Responsibility for Long-term Maintenance of BMPs*

Review the guidance provided in Chapter 5 regarding the requirement to maintain source and treatment controls. A maintenance mechanism, such as a maintenance agreement or comparable document, will need to be included in the Final Plan. For the Preliminary Plan, it will be adequate to include a brief statement that identifies the individual or entity that will be responsible for long-term maintenance of the proposed source control and treatment controls.

⇨ *Step 10: Submit the Preliminary Plan*

The Preliminary Plan is submitted as an attachment to the planning discretionary or building permit application. County staff will review the Preliminary Plan as part of the application submittal and may request modifications during plan review. Storm water conditions of approval will apply when administering discretionary permits, including any ministerial permits that are based on the discretionary permit.

2.3 Preparing the Final Plan

The Final Plan must be included as part of the public and/or subdivision improvement plans and/or building permit application, whichever occurs first. This section provides step-by-step instructions for preparing the required components of the Final Plan, which are shown in Figure 2-2.

> The Final Plan must be included as part of public and/or subdivision improvement plans and/or building permit application, whichever occurs first.

⇨ *Step 1: Prepare Plan View Drawings*

The plan view drawings shall be prepared to show all storm water related source and treatment control BMPs. The plan view may be shown on the grading plan, site plan, landscape plan, other related plans, or on a separate plan sheet. Include the plan view drawings in the Final Plan.

⇨ *Step 2: Calculate Final Hydrology and Hydraulic Sizing*

Prepare detailed hydrological and hydraulic calculations to determine the size of treatment control BMPs. The detailed calculations need to identify the sizing design criteria for each storm water treatment control BMP. Guidance regarding hydraulic sizing criteria is provided in Chapter 4. Include the hydraulic calculations in the Final Storm Water Mitigation Plan.

⇨ *Step 3: Prepare Construction Details*

Prepare construction details for each treatment control BMP. The drawings, sketches or descriptions submitted as part of the preliminary Plan will need to be revisited and, as necessary, updated with additional detail appropriate for use in constructing the BMP. Chapter 4 provides design guidance for specific treatment control BMPs. Construction details must conform to the design guidance provided in Chapter 4. Include the construction details in the Final Plan.

⇨ *Step 4: Prepare a Maintenance Plan*

See Chapter 5 for guidance on the preparation of the maintenance plan.

⇨ *Step 5: Confirm Incorporation of Conditions*

Review the Conditions of Approval that were issued with any planning application approval to confirm that all applicable conditions have been incorporated in the applicable components of the Final Plan.

⇨ *Step 6: Submit the Final Plan*

The Final Plan is submitted as an attachment to the subdivision or project improvement plan and/or building permit application. County staff will check the Final Plan as part of the application submittal, and may request modifications during plan check.

The Final Plan is submitted as an attachment to the subdivision improvement plan and/or building permit application.

2.4 Written Certification of BMP Installation

After the BMPs have been installed, the project designer shall prepare and sign a written certification that the BMPs were installed as intended by the designer, or for manufactured BMPs, as recommended by the manufacturer. The written certification of BMP installation must be received by the County before a) a Certificate of Occupancy or Final Inspection will be issued, or approved, for a project on private property, or b) acceptance of public improvements for BMPs located within the public right-of-way or public easements.

Attachment 2-1:

Development and Building Application Information: Project Description Worksheet

For all projects that require a Storm Water Mitigation Plan, complete this worksheet and include it with the Preliminary Storm Water Mitigation Plan. Project phasing to decrease impervious surface area shall not exempt the project from SUSMP requirements. A new development or redevelopment project must comply with SUSMP requirements if it is part of a larger common plan of development that would result in the creation, addition and/or reconstruction of one acre or more of disturbed area. (For example, if 50% of a subdivision is constructed and results in 0.9 acre of disturbed area, and the remaining 50% of the subdivision is to be developed at a future date, the property owner must comply with SUSMP requirements.)

1. Date of Application:_____
2. Type of application: ❑ subdivision ❑ site development review ❑ building permit ❑ use permit ❑other
3. Project Location or Address: _____, CA
4. Assessor's Parcel No: _____
5. Project Name (if applicable):_____
6. Property Owner's Name: _____
7. Applicant's Name: _____
   ❑ Owner ❑ Contractor ❑ Engineer/Architect ❑ Developer
8. Applicant's Address:
9. Applicant's Phone: _____ Fax_____ Email: _____

10. Total Lot Area in Sq. Ft.:_____

11. Existing Land Use
    ❑ Commercial ❑ Industrial ❑ Residential ❑ Public Agency
    ❑ Agricultural ❑ Vacant
12. Proposed Land Use
    ❑ Commercial ❑ Industrial ❑ Residential ❑ Public Agency

Detailed description (If residential, include number of single family or multifamily units. If commercial, include retail or office square footage. Include square footage proposed for industrial or public agency):

13. Activities of Concern (check all that apply):

- ❑ Vehicle cleaning for fleets or commercial facilities
- ❑ Vehicle repair/maintenance
- ❑ Fuel dispensing areas
- ❑ Food service
- ❑ Vehicle cleaning for multifamily residential developments
- ❑ Outdoor process activities (examples of businesses that have outdoor process activities include machine shops, auto repair shops, and industries that have pretreatment facilities)
- ❑ Other:_____

14. Name the of water body(ies) that will receive storm water flows from the project (Include both the immediate receiving water body, and water bodies farther downstream):

_____

_____

_____

15. Are any hydrologic features or a storm drain system on or directly adjacent to project site? (Examples of hydrologic features include wetlands, seeps, springs, natural waterways, modified natural waterways, constructed channels.)

❑ No ❑ Yes. Provide name or other identifier:

16. Will a new storm drain outfall be constructed as part of the project?

❑ No ❑ Yes. Identify outfall's receiving water:

17. Identify sensitive natural features located on site (check all that apply and indicate existing and proposed square footage.)

18.

Natural Feature	Existing square footage	Proposed square footage
❑ Riparian area [10]		
❑ Wetland		
❑ Steep slopes (10% or greater)		
❑ Areas of native vegetation		
❑ Groves of trees		
❑ Other:_____		

Attach the project site plan to the completed Project Description Worksheet. At a minimum, site plans are required to include:

- ❑ Date, Scale, Legend and North Arrow
- ❑ Lot lines
- ❑ Locations of existing buildings, structures and impervious surfaces
- ❑ Proposed buildings, structures and impervious surfaces
- ❑ Existing contours and proposed grades

- ❑ Locations of existing and proposed natural features (as identified in question 17)
- ❑ Locations of proposed landscaping
- ❑ Locations of proposed activities of concern (as identified in question 13)
- ❑ Drainage; natural waterways, modified natural waterways, constructed channels, storm drain system

Attachment 2-2

Development and Building Application Information: Disturbed Area Worksheet

Complete at both the development application stage (in order to encourage minimizing increases in the amount of disturbed area) *and* at the building application stage (to document what is actually being constructed) for all projects on lots one (1) acre or greater.

Type of Disturbed Area	**Square Feet of Disturbed Area**			
	Pre-Project (If Applicable)	**New** (Does NOT replace any pre-project disturbed area)	**Reconstructed** (Replaces pre-project disturbed area)	**Total of New and Reconstructed**
Building Footprint, including Attached Garage				
Detached Garage, Carport, Shed, Other Misc. Structures				
Patio, Decking, Pavers and Liners				
Driveway, Parking Lot				
Streets, Roads, Sidewalks and Other Defined Walkways	N/A			
Off-site improvements	N/A			
Total Disturbed Area in Square Feet				

Incorrect disturbed area calculations may delay your project application(s) and/or permit(s).

Attachment 2-3

Development and Building Application Information: Proximity Worksheet

Method for determining proximity (check all that apply):

- ❑ Conducted site visit ❑ Consulted map (name of map):_____
- ❑ Consulted agency personnel (name and agency):_____

Type of Resource	**Name of Resource or Other Identifier**	**Directly Adjacent to Project? (Y/N)**	**New Storm Drain Outfall Required to Resource? (Y/N)**
Natural Waterway			
Modified Natural Waterway			
Constructed Channel			
Storm Drainage System			

Attachment 2-4

Development and Building Application Information: Pollutants of Concern Worksheet

Check box to indicate proposed land use	**Project Pollutant Sources Potential project pollutant sources**	**Pollutants of Concern**
	Lawns, Landscaping, and Parks	Sediment (coarse and fine), Nutrients (dissolved and particulate). Pesticides, Pathogens, Trash &Debris, Pet waste
	Parking Lots and Driveways	Sediment (fine), Metals (dissolved and particulate), Total petroleum hydrocarbons (TPH), Trash
	Arterials and Highways	Sediment (coarse and fine), Metals (dissolved and particulate), TPH, Polynuclear aromatic hydrocarbons (PAHs), Trash & Debris
	Food-Related Commercial	Pathogens, Oil & Grease, Trash
	Animal-Related Commercial (e.g., dog grooming, horse stables)	Pathogens
	Auto-related Commercial	Metals (dissolved and particulate), TPH, PAHs, Surfactants
	Industrial	Sediment (coarse and fine), Metals (dissolved and particulate), TPH, PAHs, Polychlorinated biphenyls (PCBs), pH, Surfactants
	Agriculture	Sediment (coarse and fine), Nutrients (dissolved and particulate) Pesticides

If you checked a box next to a land use that may potentially generate a pollutant or stressor, explain why that pollutant or stressor is or is not anticipated to be generated by the proposed project. Identify the proposed source and treatment controls intended to reduce pollutants to the maximum extent practicable.

_____

_____

_____

_____

I declare under penalty of perjury, that to the best of my knowledge, the information presented herein is accurate and complete:

_____

Signature of Applicant Date

3 Source Controls

This chapter explains the requirement to include pollutant prevention source controls in new development and redevelopment projects. Guidance is provided to assist in selecting appropriate source controls for various types of projects. Information is also included on how to select storm water source control BMPs for inclusion in the Preliminary Storm Water Mitigation Plan.

A vehicle washing area is roofed and plumbed to the sanitary sewer.

3.1 Definitions and Purpose

Source controls act as the first line of defense for the protection of water quality by preventing pollution at the source. Source controls will be required for discretionary projects. Source control measures minimize or eliminate sources of pollution with a goal of keeping pollutants out of storm water runoff and preventing them from entering the drainage system. One important function of source controls is to minimize the runoff from the developed site. Source controls can be organized in three categories:

- Site design BMPs are incorporated in the layout of a project to prevent or reduce storm water pollution and reduce increases in the rate and volume of runoff. Examples of site design BMPs include reducing the building footprint by using multiple levels, protecting natural areas, reducing impervious surfaces, and clustering buildings and other impervious areas.

- Structural source controls are designed to control specific sources of pollutants. Examples of structural source controls include roofing vehicle washing areas and plumbing the area to the sanitary sewer, constructing enclosed storage areas for dumpsters or chemical storage, and requiring restaurants to plumb floor mat washing areas to the sanitary sewer.

Street sweeping

- Operational source controls are conducted routinely after construction is completed. Operational source controls include street sweeping, requiring sweeping at loading docks, dry-sweeping of fueling areas, and the inspection and cleaning of on-site storm drains.

3.2 Types of Pollutant Sources

Some source control measures have been developed to control widespread pollutants that may come from many sources. Other source control measures are specific to certain types of outdoor activities.

Site design measures, which limit the amount of impervious area and reduce the amount and rate of runoff from a site, are appropriate BMPs for controlling widespread pollutants.

Source Control for Widespread Pollutants

The sources of widespread pollutants are ubiquitous and include tire wear, leaks from motor vehicles, and air pollution sources. Pollutants in the air, such as mercury, copper and dioxin, enter storm water runoff through atmospheric deposition. Other pollutants such as pathogens, nutrients, and polyaromatic hydrocarbons (PAH) are pervasive in developed areas and difficult to contain at their many sources. Site design measures, which limit the amount of impervious area and reduce the amount and rate of runoff from a site, are appropriate BMPs for controlling widespread pollutants.

Source Control for Specific Sources of Pollutants

Certain pollutants are readily identified with specific activities. Examples include oil and grease from vehicle repair activities, cleaning agents in vehicle washwater, grease from food service cleaning activities, sediment from construction activities, and pesticides from landscape maintenance. Numerous structural and operational source control measures have been developed to control pollutants from specific sources. For example, sediment in storm water runoff is minimized by using site stabilization techniques such as hydroseeding graded slopes. In the case of pesticides, using native landscaping in the site design reduces both water and pesticide use.

Disconnected downspout, at Agilent Technologies in Palo Alto

3.3 Source Control Principles

Storm water pollutant prevention source control measures integrate storm water management and hydrological concepts into project design to reduce a development project's impact on storm water quality and hydrology. Five major design principles of source control are:

- **Conserve natural areas.** Define the development envelope to protect sensitive areas and minimize changes to the natural topography. In preparing a site plan, care should be taken to avoid areas that contain important trees, steep slopes, erosive soils, riparian areas, wetlands, or other sensitive areas.

- **Minimize directly connected impervious areas.** Any impervious surface that drains directly to a catch basin or storm drain is a directly connected impervious area (DCIA). These areas offer no opportunity for filtering storm water by plant material or infiltration into the soil. This increase in connectivity between rainfall and runoff also decreases the time of concentration and increases runoff, contributing to increased potential for creek channel erosion and scouring. Directly connected impervious areas can be minimized by directing roof, road and parking lot runoff to landscaped, pervious areas. Vegetation in such areas should be selected and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment into the storm drain system.

- **Maximize permeability.** Two ways to maximize permeability are by using site design techniques and semi-pervious materials. Examples of site design BMPs are constructing taller buildings with narrower footprints, or constructing a parking garage beneath a building instead of having a separate parking lot. Semi-pervious pavements include pervious concrete, porous asphalt, turf block, and unit paving with sand joints. The use of permeable pavement shall not create a new source of sediment. Dirt roads are not acceptable as a source control measure. On level areas and grades of less than five percent (5%), gravel roadways and driveways may be allowed. The structural section of the gravel road or driveway shall be at least one foot (1') of compacted Class 2 Aggregate Base. Semi-pervious roof types include vegetated roof systems ("green roofs" or "roof gardens") that retain and filter storm water, or "blue roofs," which are designed to detain or retain water.

Parking lot runoff drains To a vegetated swale, in San Leandro, California.

- **Use drainage as a design element.** Alternatives to traditional underground storm drain conveyance systems are strongly encouraged. Storm water infiltration, where deemed appropriate, can be used to convey runoff to landscaped areas, vegetated swales, extended detention basins that detain water for a couple of days, or wet ponds (permanent pools). Vegetated swale drainage systems must be designed and maintained to prevent soil erosion. These features may also be used to help meet open space requirements.

- **Minimize opportunities for pollutants to enter storm water** by controlling sources of pollutants associated with the post-construction phase of new development and redevelopment projects. This includes the use of structural source controls, such as requiring that trash areas be roofed, or requiring restaurants to drain floor mat washing areas to the sanitary sewer. These may also include operational BMPs, such as requiring street sweeping or the inspection and cleaning of on-site storm drains. Because sediment is a pollutant of concern, methods to control its discharge are commonly implemented during construction. Examples include construction staging, site stabilization, and directing runoff to avoid areas of bare ground.

By minimizing the amount of disturbed area, it may be possible to reduce the total area of disturbed surface to less than one acre and thereby avoid the SUSMP treatment control requirements.

3.4 Benefits to Using Source Controls

The primary benefits of source control BMPs are reduced water pollution and enhanced quality of local creeks and other receiving waters. Some source control measures, such as preserving natural areas and incorporating drainage swales or a wet pond in the landscaping, can act as project amenities. Studies have shown that, due to the enhanced aesthetic appeal, in many cases developers can realize additional profits and quicker sales for units that are adjacent to a wet pond (USEPA, September 1995). Studies have also shown that property values are often enhanced for land that contains or is adjacent to open space (Lerner and Poole, 1999).

Because source controls are generally less expensive than treatment controls, project sponsors should find it cost effective to incorporate source controls that reduce the total amount of runoff from the project site. By minimizing the amount of new impervious surface, it may be possible to reduce the total area of impervious surface to less than one acre and thereby avoid the SUSMP treatment control requirements. Even if that is not possible, by reducing the amount of runoff from the site, the size of treatment control BMPs may be reduced, which also represents cost savings.

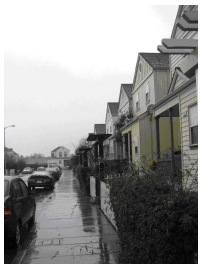
A restaurant floor matwashing area drains to the sanitary sewer, in South San Francisco.

3.5 Selecting Appropriate Source Controls

Source controls must be incorporated early in project design to maximize opportunities for source control and reduce the need for storm water treatment controls. What constitutes appropriate source controls will vary from one project to another, depending on project type, project size, specific activities that will be associated with the proposed project, and natural features of the site. This section identifies strategies for all projects to use in identifying appropriate source controls, with a focus on site design BMPs to reduce impervious surfaces, and it introduces a Source Control BMP Checklist to assist project proponents with the selection of project-specific controls.

Incorporate Source Controls Early

All projects will benefit from incorporating the source control practices into the conceptual layout of the project. It is important to define the development envelope to exclude environmentally sensitive areas such as creeks, wetlands and riparian habitats, significant trees, erosion-prone soils and steep slopes. The project layout should also identify opportunities for using drainage as a design element, incorporating vegetated swales, vegetated buffer strips and bioretention areas as project amenities.

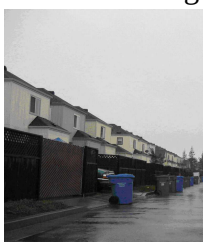


Two-story homes on small lots, Tammy Way, Santa Rosa

There are also many ways to minimize impervious surfaces, especially directly connected impervious surfaces. This may include designing multistory buildings with narrower or shorter driveways, or using narrower streets and smaller parking lots. Runoff may be directed to pervious areas, or the project may incorporate pervious pavements or green roofs. Several

source controls are highlighted, below, to assist project designers in selecting appropriate source control BMPs to minimize impervious surfaces.

- **Limit driveway pavement.** Planned developments can offer opportunities to reduce driveway length by locating garages nearer to the roadway. For denser developments, it may be feasible to construct the garages at the rear of the buildings and provide alley access. Driveway paving can be limited by using pervious paving or a "two track" design with low-growth planting between the two tracks. Where a two-car garage is provided, a flared driveway may be used, so that the driveway is one car width at the curb and two car widths at the garage.



Rear alley access eliminates driveways on Tammy Way, in Santa Rosa

- **Reduce street width where appropriate.** Streets and other transportation-related infrastructure can account for 60 to 70 percent of total impervious area (BASMAA, 1999), and they usually deliver pollutant-laden runoff directly to a storm drain system. In recent years, some municipalities have reduced the minimum street widths for specific street types or specific types of development to reduce water quality impacts and create pedestrian friendly, compact developments. Working together with County staff, applicants may explore opportunities to create some narrower streets in planned developments. One of the key considerations in planning for narrow streets is the provision of access for public safety vehicles.

- **Reduce parking lot size where appropriate.** Parking lots are typically sized based on minimum requirements. Some jurisdictions have set parking maximums, rather than minimums, or have reduced parking requirements for developments near public transit stations, or for commercial developments that stagger work hours so that the same parking space may be used by multiple vehicles throughout a longer workday.

- **Disconnect streets and parking lots.** Standard curbs and gutters are generally required for urban streets, but in rural areas, or in certain planned developments, it may be feasible to create a vegetated swale drainage system. An urban curb/vegetated swale system may be used in more densely developed areas, where a curb and gutter system can be designed to discharge to vegetated swales located along the street. Rural vegetated swale systems are designed with no curb, permitting infiltration of storm water along the entire length of roadway. Parking lots may be designed to incorporate vegetated swales in landscaped areas within or adjacent to the lot. Vegetated swale drainage systems must be designed and maintained to have a thick vegetative cover in order to prevent erosion. Vegetated swales next to roadways and paved areas must be designed so as not to saturate the structural section, leading to subgrade failure.

Interlocking pavers with sand joints.

- **Use pervious paving.** Pervious paving provides a stable load-bearing surface while allowing for storm water infiltration. Pervious paving may be appropriate in areas with well-drained soils where relatively low volumes of traffic move at slower speeds. Appropriate uses may include residential driveways, overflow parking areas, or "hybrid" parking lots, which include standard asphalt in the parking lot aisles and pervious paving

in the parking stalls. Types of pervious paving include pervious concrete, porous asphalt, crushed aggregate[1], wood mulch, and unit pavers (such as turf block, brick, natural stone and concrete pavers) with sand joints.

- **Disconnect downspouts.** There are various options for collecting rooftop drainage and allowing it to infiltrate into the soil. A gutter and downspout system can be avoided altogether by use of foundation planting, which increases infiltration opportunities while preventing soil erosion from the concentrated sheet flow. If gutters and downspouts are used, water may be collected and discharged to a dry well, where water collects underground and infiltrates slowly, or to a cistern, where water is collected above ground and may be slowly released or used for irrigation. Alternatively, the gutters may discharge directly to a landscaped area with the use of "splash blocks", to prevent erosion, or to an underground pipe that allows the water to "bubble up" to a landscaped area. Landscaping must be designed and maintained so that storm water runoff does not contact soil and convey sediment to the storm drain system.

Use the Source Control BMP Checklist

Table 3-7 is a Source Control BMP Checklist, which is designed to help project applicants and staff identify appropriate source controls for specific development projects. The project applicant must comply with other regulatory requirements at the federal, state and local levels (for example, building code requirements) when installing source controls.

The checklist is organized in two sections. The first section identifies appropriate source control measures based on features contained in a project. For example, if your project contains buildings, certain source control measures apply. Similarly, if your project contains storm drain inlets, specific source control measures apply.

Roof runoff drains to a "bubble up" outlet in landscaped area, in Livermore, California.

The second section of the checklist identifies source control measures that are appropriate for the types of activities that may occur at the site. For example, if a project will involve vehicle cleaning, certain source control measures apply; if a project will involve food service, other specific source control measures apply. Some of the source controls in the checklist suggest discharging to the sanitary sewer system. Discharge to the sanitary sewer system requires prior approval, and applicants must contact the appropriate jurisdiction to obtain the required permits.

Discharge to the sanitary sewer requires prior approval, and applicants must contact the appropriate jurisdiction to obtain the required permits.

[1] The use of crushed aggregate surfaces for roadways and parking lots is discouraged unless it is appropriate for the intended use and engineered to carry the planned vehicle traffic in a way that does not cause or contribute to soil erosion or the transport of sediment to the storm drain system.

3.6 Source Control Resources

Further information regarding source controls can be found in the publications listed below. Each source control reference includes an Internet address at which the publication may be downloaded.

BASMAA. 1999. Start at the Source: Design Guidance Manual for Stormwater Quality Protection.
http://www.scvurppp-w2k.com/basmaa_satsm.htm

BASMAA. May 2003. Using Site Design Techniques to Meet Development Standards for Stormwater Quality: A Companion to Start at the Source.
http://www.cleanwaterprogram.org/uploads/UsingSatS.pdf

California Stormwater Quality Association (CASQA). January 2003. Stormwater Best Management Practice Handbook: New and Redevelopment. www.cabmphandbooks.com

City of Santa Rosa, County of Sonoma, and Sonoma County Water District. September 4, 2002. Standard Urban Storm Water Mitigation Plan (SUSMP).
http://ci.santa-rosa.ca.us/pworks/other/SW/FinalSUSM_PLAN.pdf

Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP). 2004. Developments Protecting Water Quality: A Guidebook of Site Design Examples.
http://www.scvurppp-w2k.com/permit_c3_docs/SCVURPPP_Site_Design_Manual.pdf

3.7 Source Control BMP Checklist

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
Roofs	• Avoid connecting roof downspouts directly to the storm drain system. • Discharge roof drains to flow away from the building foundation to a landscaped area wherever practicable. Landscaped area must be designed and maintained appropriately to prevent soil erosion and the conveyance of sediment to the storm drain system. • Plumb roof top equipment to the sanitary sewer. Such discharges must be plumbed to exclude the discharge of storm water to the sanitary sewer. [1] Non-storm water discharges shall not be directed to the storm drain system. • Provide roof gardens to retain storm water. (**P**) • Use benign roof materials such as tile that are less likely to leach metals or other pollutants to storm water.
Buildings	• Design structure(s) to discourage the occurrence and entry of pests into buildings (e.g., locate dumpster areas away from buildings, screen foundation vents) to minimize the need for pesticide use. • Cluster buildings when appropriate. (**P**)[2] • Minimize building footprint by designing multi-story buildings. (**P**) *See also "Roofs"*
Paving: Patios, Private roads, Driveways, Sidewalks, etc.	• Maximize pervious area to the maximum extent practicable. Pervious areas must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system. (**P**) • Design vegetated strips between sidewalks and curbs. • Minimize directly-connected impervious areas (DCIAs) • Use vegetated open channels or other landscape measures in the street right of way to convey and treat storm water runoff from roadways, where density, topography, soils, slope and safety issues permit. Such areas must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system.
Storm Drain Inlets Storm Drain Inlets (continued)	• Clearly mark with the words "No Dumping. Drains to Creek." • Have storm water flow through landscaped area prior to reaching the storm drain. Landscaped area must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system.

[1] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.
[2] (**P**) indicates that the source control BMP maintains pervious (or permeable) surface area.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
Landscaping	• Design irrigation systems to minimize overspray and runoff. • Select plant materials that may be properly maintained with minimal water use. If a landscaping plan is required: • Design to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. • Retain and incorporate existing native trees, shrubs and groundcover to the maximum extent practicable. • Select plant materials that are appropriate to the site, including soil type, climate, etc. • Select plant materials that may be properly maintained with minimal pesticide use. • Design and operate to naturally treat storm water runoff by incorporating elements that collect, detain and infiltrate runoff where feasible. • Direct runoff from impervious areas such as rooftops, roadways, and parking lots to pervious landscaped areas prior to discharge to the storm drain system. • Incorporate Integrated Pest Management (IPM) principles and techniques for both design and maintenance. • Design and maintain landscaping to meet vector control requirements. • Design and maintain landscaping to prevent runoff from contacting bare earth and conveying sediment to the storm drain system.
Natural Areas	• Avoid disturbing steep slopes, important native landscaping, wetlands and riparian areas to the maximum extent practicable. • Provide a naturally vegetated setback from creeks, rivers, lakes, or wetlands. • Cluster buildings away from natural areas to protect such areas by using buffers or open space. (**P**)[3] • Avoid concentrating flows by proper grading design. • Have storm water flow through treatment BMPs prior to reaching natural areas/creeks. • Areas of exposed soil should be planted with appropriate vegetation to prevent runoff from conveying sediment to the storm drain system.
Pool, Fountain, or	• Avoid directly connecting discharge drains to the storm drain.

[3] (**P**) indicates that the source control BMP maintains pervious (or permeable) surface area.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
Spa	• Connect discharge drains to the sanitary sewer system only when approved by the local authority. [4, 5] • When draining is necessary, direct a hose or other temporary system into a sanitary sewer clean out (obtain approval from the sanitary sewer agency first) which is installed in a readily accessible area [4] -or- • Discharge to a landscaped area[6]. Landscaped area must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system.
Refuse or Recycling Area	• Do not discharge runoff to storm drain systems. • If drains are to be provided, the area around dumpsters should be grade and/or bermed to prevent runoff and run-on, should be roofed to minimize storm water entry, and the drain should be connected to the sanitary sewer. • Provide a roofed and enclosed area for dumpsters and recycling containers. • Design the area to prevent water run-on to the area and runoff from the area. • Contain litter and trash so that it is not dispersed by the wind or runoff during waste removal. • Provide water hookup for washing refuse area.
Air Conditioning Units Air Conditioning Units (cont.)	*Small air conditioning units:* • Direct air conditioning condensate to landscaped areas[7]. Landscaped area must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system. Large air conditioning units: • Direct condensate lines to: ➢ Landscaped areas (preferred alternative in new development or significant redevelopments). Landscaped area must be

[4] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.
[5] Subject to local requirements, swimming pool, spa and fountain water may be allowed to discharge to the storm drains if the water has been dechlorinated, the water is within ambient temperature, and no copper-based algae control products have been added to the water.
[6] If commercial and public swimming pool discharges are discharged to land where the water would not flow to a storm drain or to a surface water, the discharge may be subject to the requirements of the State Water Resources Control Board's (SWRCB) Statewide General Waste Discharge Requirements (WDRs) for Discharges to Land with a Low Threat to Water Quality.
[7] Any air conditioning condensate that discharges to land without flowing to a storm drain may be subject to the requirements of the State Water Resources Control Board's (SWRCB) Statewide General Waste Discharge Requirements (WDRs) for Discharges to Land with a Low Threat to Water Quality.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
	designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system…-or- ➢ The sanitary sewer system after obtaining permission from the owner of the sanitary sewer system.[8]
Miscellaneous Drain Water (Fire sprinkler, boiler drains)	• Drain fire sprinkler test water: ➢ to the sanitary sewer system (with approval from the local permitting authority and/or sanitary district with jurisdiction)[8] -or- ➢ to landscaped areas where feasible. Landscaped area must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system. • Directly or indirectly connect boiler drain lines to the sanitary sewer system.[8] Boiler drain lines may not discharge to the storm drain system.
Loading Dock Loading Dock (continued	• Grade (and/or cover) dock to minimize run-on to and runoff from the loading area. • Position roof downspouts to direct storm water away from the loading area. • Storm water collected at loading docks should be discharged to the sanitary sewer, not the storm drain. The area should be covered to minimize amount of storm water collected, and graded and/or bermed to prevent run-on.[8] • Install door skirts between the trailers and the building to prevent exposure of loading activities to rain. • Contain litter and trash.
Parking Lot	• Reduce parking lot size. • Reduce impervious surface in parking lots, when appropriate. • Provide spill prevention and clean-up plan. • Provide trash cans. • Sweep regularly. • Avoid discharging wash water resulting from cleaning to the storm drain. • Drain storm water to landscaped area prior to discharge. Landscaped area must be designed and maintained appropriately to prevent runoff from contacting bare earth and conveying sediment to the storm drain system.

[8] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
Parking Garage	• Design with smaller footprint. • Design to prevent run on. • Connect interior level floor drains to a water treatment device approved by the County prior to discharging to the sanitary sewer system. Treatment devices need regular maintenance to be effective. [9] *See also "Roofs."*
Outdoor Equipment/Material Storage Area	• Cover or design with BMPs to limit the potential for runoff to contact pollutants. • Roof storage areas containing non-hazardous liquids and contain by using berms, dikes, liners, vaults or similar spill containment devices. This requirement does not apply to the storage of hazardous materials. For requirements regarding the storage of hazardous materials, contact Mendocino County Environmental Health • Provide spill prevention and clean-up plan.
Vehicle Cleaning for Multifamily Residential Developments	• Discharging washwater to the storm drain system is prohibited. • Discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. • Post a sign indicating the location and allowed uses in the designated wash area. • Ensure areas are paved, designed to prevent run-on to or runoff from the area, are roofed, have an approved pretreatment device and are plumbed to drain to the sanitary sewer. [10] The pretreatment device must be maintained regularly to be effective.
Vehicle Cleaning for Fleets or Commercial Facilities	• Discharging washwater to the storm drain system is prohibited. Vehicle/equipment washing areas: • Ensure areas are paved, designed to prevent run-on to or runoff from the area, are roofed, have an approved pretreatment device and are plumbed to drain to the sanitary sewer.[10] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements. The pretreatment device must be maintained regularly to be effective. • Post a sign indicating the location and allowed uses in the designated wash area. Commercial/industrial facilities having vehicle/equipment cleaning needs:

[9] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.
[10] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
	• Provide a roofed, bermed area for washing activities –or- • Discourage vehicle/equipment washing by removing hose bibs (faucets) and installing signs prohibiting such uses. Commercial Car Wash Facilities: • Design and operate such that no runoff from the facility is discharged to the storm drain system. Discharge wastewater from the facility to the sanitary sewer.
Vehicle Repair/Maintenance	• Perform in a designated area indoors, or if such services must be performed outdoors, in an area designed to prevent the run-on and runoff of storm water. • Provide covered secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Do not install storm drains within the secondary containment areas. • Do not install floor drains in vehicle service facilities [unless the floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer, for which an industrial waste discharge permit has been obtained].[11] • Do not connect tanks, containers or sinks used for parts cleaning or rinsing to the storm drain system. Wastes from parts cleaning should be collected and hauled off by an approved hazardous waste hauler. Tanks, containers or sinks used for such purposes may be, in some instances, connected to the sanitary sewer system if connected to an approved pretreatment system and allowed by an industrial waste discharge permit. [11]
Food Service	• Ensure that facilities have a sink or other floor mat, container, and equipment cleaning area that is connected to the sanitary sewer system. [11] • The cleaning area shall be large enough to clean the largest mat or piece of equipment to be cleaned. The cleaning area shall be indoors or in a roofed area outdoors; both areas must be plumbed to the sanitary sewer. [11] • Design outdoor cleaning areas to prevent storm water run-on from entering the sanitary sewer and to prevent storm water run-off from carrying pollutants to the storm drain. • Post signs indicating that all food service equipment washing activities shall be conducted in this area. • Avoid discharge runoff from food service areas, trash enclosures,

[11] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.

Section 1: Source Controls Based on Project Features	
If the project will contain…	**Incorporate these source control BMPs as required or appropriate**
Food Service (cont.)	recycling areas, and/or food compactor enclosures or similar facilities to the storm drain system. Design trash enclosure areas to avoid run-on to the trash enclosure area. Connect any drains installed in or beneath dumpsters, compactors, and tallow bin areas serving food service facilities to the sanitary sewer. [11]

Source Control BMP Checklist *Section 2: Source Controls Based on Project Activities*	
If the completed project will involve the following activities…	**Incorporate these source control BMPs, as required or appropriate**
Outdoor Process Activities	• Perform process activities either indoors or in roofed outdoor areas. If performed outdoors, design the area to prevent run-on to and runoff from the area with process activities. • Perform washing or steam cleaning at an appropriately equipped facility that drains to the sanitary sewer. [12] • Drain process equipment areas to the sanitary sewer system. [12]
Fuel Dispensing Areas	• Ensure that fueling areas have impermeable surfaces (i.e., Portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of storm water to the maximum extent practicable. • The fueling area must be roofed and the roof's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area. • The canopy (or roof) shall use downspouts that do not drain onto the fueling area.

[12] Contact the local permitting authority and/or sanitary district with jurisdiction for specific connection and discharge requirements.

4 Treatment Controls

This chapter explains the requirement to include storm water treatment controls in new development and redevelopment projects. This chapter also provides guidance on selecting and designing appropriate treatment controls.

4.1 Definitions and Purpose

Storm water treatment controls are engineered systems that are designed to remove pollutants from storm water. Treatment controls shall be used in conjunction with source control measures.

4.1.2 Benefits of Using Treatment Controls

Storm water treatment controls are implemented to remove from storm water pollutants that are a concern to local creeks. Information on the effectiveness of different types of treatment controls in removing these pollutants is summarized in Tables 4-1 and 4-2 and information about what are the particular pollutants of concern was described Chapter one.

Storm water treatment wet pond in Fremont, California

Aside from meeting the municipal storm water NPDES permit requirement, the use of landscape-based storm water treatment controls can provide an aesthetically pleasing landscape that is viewed as a project amenity. Many well designed landscape-based treatment controls can serve a dual function. For example, they may be integrated with recreational facilities or areas used for groundwater recharge. U.S. EPA has found that increased property values can result from aesthetically landscaped storm water controls especially those that include permanent pools of water, such as wet ponds and constructed wetlands1.

Extended detention basins are sometimes designed to be used for parks and athletic fields during dry weather. For example, the City of Modesto has developed design standards that incorporate the concept of consolidated park/detention basin facilities for flood control, recreation, and water quality treatment.

Extended detention basin and athletic field in Palo Alto, California

4.2 Selecting Treatment Controls

The following overview of various treatment controls, along with design and sizing criteria, is presented to enable the engineer or project designer to select appropriate stormwater treatment controls for their specific project.

Table 4-1:

STORM WATER TREATMENT CONTROL BMPs EVALUATION MATRIX

H = High M = Medium L = Low P = Potential ※= Yes

	Effect on Pollutants of Concern				Project Size	Application to Different Types of Land		Limitations on Use					Costs		
Treatment BMPs (CA BMP Handbook Identification)	Sediment (TSS) removal	Nutrients removal	Bacteria removal	Effect on Temperature	Typical Size of Drainage Area to Treatment BMP	Ultra urban - little pervious surface onsite	Industrial, Retail Gas Outlet	Steep Slopes	Groundwater Level a Concern?	Potential for Mosquitoes	Other	Maintenance Requirements	Construction	Maintenance	Notes
Stormwater Treatment Control BMPs with Wide Applicability in Mendocino County															
Biofiltration															
Vegetated Swales (TC-30)	M	L	L	No	0.5 to 10 acres	No	※	No	P (1)	L	Slopes > 4% (2). Steep topography. Heavily gopher-populated areas. Certain industrial areas	maintain vegetation	$60,000 to $90,000 per acre contributing area. Former is mean of nationwide and Caltrans sites; latter is mean of 6 Caltrans sites.	$0.75/linear foot per year. $2,700/ 2 ha drainage area.	(1) at least 2 ft. of separation from groundwater is recommended. (2) maximum allowable slope is 4%.
Bioretention Area (TC-32)	H	M	H	P	0.25 to 1 acre	※	※	※	※ (3)	H, if clogged	Slopes > 20%. Unstable soil stratum in drainage.	landscape mainten-ance	$46,000 per acre contributing area; mean of two nationwide sites	Comparable to typical landscaping.	(3) Not suitable where groundwater is within 6 ft. of surface.
Vegetated Buffer Strip (TC-31)	H	L	L	No	< 1 acre	No	※	No	P (1)	L	Slopes >15%. Tight spaces Certain industrial sites.	maintain vegetation	$.30/sq ft. seed; $.70/sq ft. sod.	$350/ac/yr.	Suitable for roads, highways, roof downspouts, small parking lots, pervious surfaces. Vegetated buffer strip should be about as large as area it is treating.
Detention and Settling															
Extended Detention Basin (dry) (TC-22)	M	L	M	P	> 5 acres	No	※	No	※	L	Tight spaces. Areas without hydraulic head.	vegetation manage-ment	$4,000 to 63,000 per acre contributing area. Former is mean of nationwide and Caltrans sites; latter is mean of 3 Caltrans sites.	3-5% of construction cost	

Stormwater Treatment Control BMPs with Some Applicability in Mendocino County															
Detention and Settling (continued)															
Constructed Wetland (TC-21)	H	M	H	※	> 1 acre	No	※	No	No	H	Steep unstable slopes. Not in arid regions	mosquito breeding	$57,100/1 ac-ft facility; $1.47 mil/100 ac-ft facility,	3-5% of construction cost	High probability of mosquito breeding where water and aquatic vegetation occur together.
Wet Ponds (TC-20)	H	M	H	※	> 10 acres	No	※	No	No	H	Steep unstable slopes. Not in arid regions.	manage shallow vegetation (4)	$45,700/ac-ft facility; $1.17 mil/ 100ac-ft facility	3-5% of construction cost	(4) Caltrans found that vegetation management to control mosquitoes resulted in high maintenance. Requires four times the volume as extended detention basins (dry).
Filtration															
Media Filter (TC-40)	H	L	M	No	? 25 acres or ? 2 acres (5)	※	※	No	※ (6)	H (7)	Unstable soils lead to clogs. large sites>25 acres; < 4 feet head.	removal of trash and debris	Austin Sand Filter $30,000 to 230,000 per acre contributing area. Former is mean of nationwide and Caltrans sites; latter is mean of 5 Caltrans sites.	5% of construction cost	(5) surface sand filter for larger projects and perimeter or underground filters for smaller. (6) should be 2 feet of separation between bottom of filter and ground water. (7) Delaware sand filter and Multi-Chambered Treatment Train have permanent pools of water in sedimentation chamber. High solids load wil cause filter to clog (CAQA 2003)
Manufactured Media Filter (MP-40)	8	8	L	No	0.2 to 10 acres	※	※	※	P	H (9)	Unstable soils lead to clogs	product specific	$150,000 per acre contributing area;mean of 1 nationwide and 1 Caltrans site.	Variable	(8) hydraulic residence time is order of magnitude less than media TC 40 so pollutant removal should be less than latter. (9) may incorporate a permanent pool.

Stormwater Treatment Control BMPs with Limited Applicability in Mendocino County															
Infiltration															
Infiltration Basin (TC-11)	H	H	H	No	1-10 acres	No	No	No	※	H, if clogged	Slopes> 15%, fill sites, and groundwater contamination (10).	maintain to avoid clogging	$2/ft^3 for 0.25 ac basin; $18/ft^3 for 0.34 ac.ft...	5-10% of construction	(10) Risk of groundwater contamination in very coarse soils; where spills may occur; and where groundwater is not at least 3 m from basin invert.
Flow Through Separation															
Manufactured Vortex Separator (MP-51)	M	L	L	No	1 to 100 acres	※	※	※	P	H (11)		clean 2 to 4 times/year	$10,000 to 22,500/acre contributing area	$1,000 to 2,000/year	(11) Non-proprietary litter control devices developed by Caltrans do not have a permanent pool of water and may be preferable to those that incorporate a permanent pool, such as CDS.
Manufactured Drain Inserts (MP-52)	L	L	L	No	0.5 to 2 acres	※	※	※	No	M	Large areas; areas with trash/leaves.	Need timely mainten-ance	<$100-$2,000/ insert	High frequency, high costs	Use only in retrofit situations or pretreatment of other BMPs.Caltrans found generally less than 10% pollutant removal, and not technically feasible at piloted locations.

Table 4-1a: Stormwater Treatment Control BMPs Evaluation Matrix

STORMWATER TREATMENT CONTROL BMPs EVALUATION MATRIX											
	Applicability to Different Types of Soils - NRCS Hydrologic Soil Group				RWQCB Recom-mendation	Frequency of Use	Specific References				
Treatment BMPs (CA BMP Handbook Identification)	A (Gravel Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Regional Water Quality Control Board Recommendation	Number construed in Bay Area in Fys 2000/01-2002/03	BASMAA's Start at the Source (1999)	US EPA National Menu of BMPs for Stormwater Phase II (2002)	CASQA BMP Handbook (2003)	Caltrans BMP Retrofit Pilot Program (2004)	Additional Notes
Stormwater Treatment Control BMPs with Wide Applicability in Mendocino County											
Biofiltration											
Vegetated Swales (TC-30)					• (1)	173	71; 139-141	fact sheet 2002	Section 5 TC-30		(1) North Coast and San Francisco Bay RWQCBs' staffs.
Bioretention Area (TC-32)			P (2)	P (2)	• (1)	2		fact sheet 1999	Section 5 TC-32	No	(2) Backfill planting soils (sandy loam, loamy sand or loam texture) into excavated bioretention area.
Vegetated Buffer Strip (TC-31)					• (1)	2		fact sheet 2002	Section 5 TC-31		
Detention and Settling											
Extended Detention Basin (dry) (TC-22)	P (3)					88	71; 142-143	fact sheet 2002	Section 5 TC-22		(3) Unlined basins are preferred to limit resuspension except where groundwater contamination is a concern. Have an extensive history of implementation and are one of most flexible BMPs.

Stormwater Treatment Control BMPs with Some Applicability in Mendocino County											
Detention and Settling (continued)											
Constructed Wetland (TC-21)	No	✓	✓	✓	✓✓ (4)	3		fact sheet 1999	Section 5 TC-21	No	(4) North Coast RWQCB.
Wet Ponds (TC-20)	✓	✓	✓	✓	✓✓ (4)	11	71; 144-145	fact sheet 2002	Section 5 TC-20	✓	
Filtration											
Media Filter (TC-40)	✓	✓	✓	✓	✓✓ (4)	0		fact sheet 2002	Section 5 TC-40	✓	
Manufactured Media Filter (MP-40)	✓	✓	✓	✓	✓✓ (4)	16			Section 5 MP-40	✓	
Stormwater Treatment Control BMPs with Limited Applicability in Mendocino County											
Infiltration											
Infiltration Basin (TC-11)	✓	✓	P	No		3		fact sheet 2002	Section 5 TC-11	✓	
Flow Through Separation											
Manufactured Vortex Separator (MP-51)	✓	✓	✓	✓		23		fact sheet 1999	Section 5 MP-51	✓	
Manufactured Drain Inserts (MP-52)	✓	✓	✓	✓	Note (5)	75		fact sheet 2002	Section 5 MP-52	✓	(5) North Coast and San Francisco Bay RWQCB staffs have expressed reservations about the use of manufactured drain inserts unless they are part of a multi-step treatment train.

4.2.1 Types of Treatment Controls

The types of treatment controls can be categorized into two groups, landscape-based and non-landscaped based. Generally landscape-based treatment controls are non-proprietary while non-landscape- based treatment controls are proprietary. Some examples of landscape-based, non-proprietary controls include vegetated swales, bioretention areas, extended detention basins, and wet ponds. These contrast with the manufactured, proprietary treatment controls that tend to be installed below ground and operate using proprietary filtering media or vortex separation that removes litter and other larger-sized solids from storm water. Table 4-2 provides an overview of most of the common treatment controls in use in the San Francisco Bay Area.

Underground vaults, manufactured vortex separators, water quality inlets, and manufactured drain inserts have limited applicability. Underground vaults typically lack the detention time required for removal of pollutants associated with fine particles[1]. They also require frequent maintenance. Because vaults may be "out of sight, out of mind," experience shows that the required maintenance may not occur. If vaults are allowed, they must be sealed against mosquito access and must also include suitable access doors and hatches to allow for frequent inspections and maintenance. The San Francisco Bay Regional Water Quality Control Board's Executive Officer[2] concluded the following regarding the use of manufactured drain inserts (which he calls "inlet filters"): "it would be very unlikely for a proposal using inlet filters as the sole treatment measures to meet the MEP [maximum extent practicable] standard."

Table 4-2: Post Construction Storm Water Treatment Control Categories and Descriptions

Storm Water Treatment Control[3]	**Description**
Landscape-Based Treatment Controls	
Vegetated swale	Shallow, vegetated channels with flat bottoms and shallow side slopes that are designed to collect, treat through sedimentation and some infiltration, and slowly convey storm water runoff to downstream discharge points.
Bioretention area	System designed to remove pollutants through sedimentation and filtration using a combination of vegetated buffer strip, sand bed, ponding area, organic layer, planting soil, and plants.
Extended detention basin	Constructed basins with drainage outlets that are designed to detain runoff from a water quality design storm for some minimum drawdown time (e.g., use 85th percentile of 24-hour storm event for calculating the storm water volume and 40 hours as the drawdown time for sizing the outlet orifices) to allow settling of sediment and associated pollutants. Should be dry between storms and not have a permanent pool of water.
Vegetated buffer strip	Linear strips of vegetated surfaces that are designed to treat sheet runoff flow from adjacent impervious surfaces.
Constructed wetland	Constructed detention basins that have a permanent pool of water throughout the year (or at least during the wet season) and a capacity for temporary additional storage of runoff that is released via an outlet structure. They differ from wet ponds in that they are typically shallower and have greater vegetation cover.

[1] Contra Costa Stormwater Quality requirements for Development Applications. Stormwater C.3 Guidebook. 3rd Draft January 2005.
[2] Letter from Bruce H. Wolfe, Executive Officer of the San Francisco Bay Regional Water Quality Control Board to the Bay Area Stormwater Management Agencies Association (BASMAA), dated August 5, 2004.
[3] This is not an inclusive list.

Storm Water Treatment Control[3]	Description
Wet pond	Constructed detention basins that have a permanent pool of water throughout the year (or at least during the wet season) and a capacity for temporary additional storage of runoff that is released via an outlet structure. Wet ponds typically differ from constructed wetlands by being deeper and having less vegetation.
Media filter	The Austin sand filtration system is a type of non-proprietary filter that is installed at grade. It consists of a pretreatment sedimentation basin, filter bed filled with sand, and under drain piping system. Also, note that there are other, subsurface media types of filters listed in the Non Landscape-Based Treatment Controls section of this table.
Infiltration basin	Shallow impoundment that is designed to infiltrate storm water into the subsurface soils.
Non-Landscape Based, Subsurface Treatment Controls	
Media filter and Manufactured media filter	Two-chambered systems that include a pretreatment sedimentation basin and a filter bed filled with sand and/or other types of materials (such as compost). There are both non-proprietary (Washington, D.C., and Delaware sand filters) and proprietary types that use cartridge filters located in underground vaults and pipes.
Manufactured vortex separator[4]	Proprietary, cylindrical chambers that allow settling and flotation of pollutants, such as litter and other large-sized particles, and treated water exits the chamber in a swirling fashion.
Manufactured drain insert [16,5]	Drain inserts are manufactured filters or fabric placed in a storm drain inlet to remove sediment and debris.

[4] The North Coast Regional Water Board staff stated in a letter dated May 23, 2005 that these two treatment controls do not adequately treat the pollutants of concern. If these treatment controls are used, they must be combined with treatment controls that adequately treat the pollutants of concern.

[5] Not recommended by Regional Water Board staff unless part of a multi-step treatment process.

4.2.2 Evaluation of the Applicability of Treatment Controls

Tables 4-1 and 4-2 contain an evaluation of the applicability of different types of storm water treatment controls for use in Mendocino County. This evaluation focused on eleven types of treatment controls that have been used most frequently in the San Francisco Bay Area.

The evaluation criteria included the following: effect on pollutants that are impairing local creeks; project size; application to different types of land uses; limitations on use (including steep slopes, groundwater level, and potential for mosquito breeding); maintenance requirements; costs; application to different types of soil; and Regional Water Quality Control Boards staff's recommendations.

Vegetated swale in Redwood City, California

Based on this evaluation, the eleven treatment controls are categorized as to their applicability for use in Mendocino County. As shown in Table 4-3, four of the treatment controls have wide applicability in Mendocino County, four have some applicability, and three others have limited applicability.

A treatment control with limited applicability may be considered for use as a component in a multi-step treatment process, which includes a series of different types of treatment controls that remove pollutants from storm water. The use of infiltration basins is limited in Mendocino County to sites with A and B well-drained soils; sites must also be evaluated to protect groundwater from contamination in storm water runoff. Infiltration treatment controls are not recommended in areas with industrial activity and areas with high groundwater. In such areas infiltration treatment controls may be allowed if storm water is treated prior to infiltration in order to protect groundwater. Manufactured vortex separators generally perform well in removing litter and large-sized particles but should be used in a multi-step treatment process in order to remove other pollutants from storm water. Manufactured drain inserts are not recommended unless part of a multi-step treatment process.

Specific information about why these different treatment controls were determined to fit in these categories is contained in Tables 4-1 and 4-1a.

Table 4-3: Applicability of Treatment Controls in Mendocino County

Applicability	Type of Treatment Control BMP	CASQA Handbook Reference
Wide Applicability	Vegetated swale	TC-30
	Bioretention area	TC-32
	Extended detention basin	TC-22
	Vegetated buffer strips	TC-31
Some Applicability	Constructed wetland	TC-21
	Wet pond	TC-20
	Media filter	TC-40
	Manufactured media filter	MP-40
Limited Applicability	Infiltration basin	TC-11
	Manufactured vortex separator	MP-51
	Manufactured drain inserts	MP-52

4.2.3 Selection of Treatment Controls

In general, landscape-based storm water treatment controls are strongly encouraged as preferable to treatment controls that are placed underground. Landscape-based storm water treatment controls with wide applicability in Mendocino County are vegetated swales, vegetated buffer strips, extended detention basins, and bioretention areas.

The CASQA Handbook (2003) recommends that extended detention basins be used for projects that are larger than five acres in order to avoid having small diameter orifices in the outlet structure that are prone to clogging and because of economies of scale. Extended detention basins should be designed to go dry between storms.

Wet ponds are typically used on projects that have a size between ten and hundreds of acres. Wet ponds are designed to include a permanent pool of water that is equal to twice the size of the required water quality volume (see Section 4.3.2 for Volume-Based Hydraulic Sizing Requirements). Most of the other treatment controls are appropriate for smaller projects, or they could be used in larger projects if a sufficient number of the treatment units were installed over the site.

4.2.4 Mosquito Control

Increasing attention is being placed on the potential for treatment controls to breed mosquitoes. Most of the types of mosquitoes that prefer to breed in storm water treatment controls can transmit diseases, such as encephalitis and West Nile virus. Treatment controls that rely on a permanent pool of water to operate are especially susceptible to mosquito breeding.

The County of Mendocino encourages the following approach to control mosquito breeding:

1. Use a design that minimizes opportunities for mosquito breeding (see General Design Principles below).

2. Have a maintenance plan and implement the plan to make sure that treatment controls are cleaned out.

Some types of treatment controls are designed to include permanent pools of water; examples of these include wet ponds, constructed wetlands, manufactured vortex separators, some types of media filters (e.g., Delaware sand filter and Multi-Chambered Treatment Train), and some manufactured media filters.

The following design principles should be considered when selecting and designing storm water treatment controls:

General design principles

- Consider using storm water treatment controls that do not require a permanent pool of water.
- Design treatment controls so that they will drain completely within 72 hours. It is recommended that treatment controls be designed to drain within 72 hours since the

fastest breeding mosquitoes in Mendocino County would require between four and ten days to mature.

- Use the hydraulic grade line of the site to select a treatment control that allows water to flow by gravity through the structure. Pumps are not recommended because they are subject to failure and often require sumps to hold water.
- Use grouted rock energy dissipaters instead of loose rock.

Wet ponds and constructed wetlands

- Design shoreline perimeters as steep and uniform as practicable to discourage dense plant growth.
- Use concrete or liners to minimize unwanted plant growth where vegetation is unnecessary.
- Maximize the amount of area that is greater than four feet deep because deep, open areas of exposed water are typically unsuitable for mosquito rearing.
- Maximize circulation and aeration of water in ponds.
- Design shoreline to be accessible to maintenance and vector control crews for periodic inspections and maintenance.
- Use mosquito fish in ponded water.

4.3 Hydraulic Sizing Design Criteria for Water Quality

The County SUSMP contains storm water treatment control sizing criteria. Treatment controls can be divided generally into those that use flow-based and those that require volume-based designs (Table 4-4).

Table 4-4: Flow and Volume Based Treatment Control Designs

Type of Treatment Control BMPs	Sizing Type
Vegetated swale	Flow
Bioretention area	Volume or Flow
Extended detention basin	Volume
Vegetated buffer strips	Flow
Constructed wetland	Volume
Wet pond	Volume
Media filter	Flow
Manufactured media filter	Flow
Infiltration basin	Volume
Manufactured vortex separator	Flow
Manufactured drain inserts	Flow

The flow-based treatment controls remove pollutants from a moving stream of storm water runoff, such as vegetated swales and media filters. Flow-based treatment controls operate primarily by filtration, settling, flotation, and infiltration.

The volume-based treatment controls detain and treat storm water primarily through settling and infiltration. Examples of these types of treatment controls are extended detention basins and wet ponds.

4.3.1 Flow-Based Hydraulic Sizing Requirements

The County SUSMP requires that flow-based treatment controls shall be designed to treat or infiltrate storm water. The recommended method for designing flow-based storm water treatment controls is through use the California Stormwater BMP Handbook options in the "Basin Sizer"[6] software package, version 1.46 or later.

According to the Basin Sizer, the rainfall intensity that occurs during the 85th percentile hourly rainfall intensities is 0.19 inches per hour for the Ukiah area, with a modified intensity of 0.39 inches/hr after applying a 2X safety factor. Similarly, Basin Sizer shows the Ft. Bragg area 85th percentile hourly rainfall intensity to be 0.11 inches/hr, with a modified intensity of 0.22 inches/hr after applying the 2X safety factor. The design constant intensity of 0.39 or 0.22 inches per hour does not vary by type of flow-based treatment control or time of concentration.

The SUSMP shows that this method is met by applying the following equation:

$$Q = (X)(C)(A)(K)$$

Where: Q = design flow rate (cfs)
X = modified intensity (safety factor = 2X) of 85th percentile hourly storm event for area in question.
C = watershed runoff coefficient (developed condition)
A = project area (acres) that drains to the treatment control
K = k Factor

According to the Mendocino County Road and Development Standards, the k Factor is 1 for areas that receive 50 inches of mean annual precipitation or less. For higher rainfalls, divide the site rainfall in inches by 50 inches to get the K factor. The minimum K factor is 1.0.

4.3.2 Volume-Based Hydraulic Sizing Requirements

The municipal storm water NPDES permit allows three alternative numeric sizing criteria as described below:

a. The volume of runoff produced from the 85th percentile of 24-hour storm event, as determined by Basin Sizer Software, is approximately 0.86 inches in the Fort Bragg area and 1.11 inches for the City of Ukiah.

b. The volume of runoff produced by the 85th percentile 24-hour rainfall event, determined using the maximized capture storm water volume for the area, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, pp. 170-178 (1998);

[6] Rainfall intensities and runoff volumes determined with Basin Sizer Program available at http://stormwater.water-programs.com/BasinSizer/Basinsizer.htm

The SUSMP shows that this method is met by applying the following equation:

V = (0.08')(C)(K)(A)

Where: V = maximized storage volume (acre-feet)
C = watershed runoff coefficient (developed condition)
A = project area (acres) that drains to the treatment control
K = k Factor (see flow based method)

c. The volume of annual runoff based on unit basin storage water quality volume, to achieve 85 percent or more volume treatment by the method recommended in California Storm Water Best Management Practices Handbook – Industrial/Commercial (latest edition).

4.4 Technical Guidance on Design of Landscape-Based Treatment Controls

Mendocino County encourages the use of landscape-based treatment controls. The California Stormwater Quality Association (CASQA) publishes design and guidance handbooks for treating stormwater in Construction, Municipal, and Industrial applications that are recommended for design and selection assistance. Other organizations such as Caltrans publish similar guidance handbooks that will similarly be of assistance. Non-standard designs may be considered and approved by local agencies.

Subsurface treatment controls should not be used unless it is infeasible to use landscape-based treatment controls, or if there is a potential to contaminate groundwater sources. Guidance on the design and use of manufactured media filters, manufactured vortex separators, and other proprietary treatment controls should be obtained from the manufacturers and approved by the local agency.

5 Maintenance Plan

This chapter explains the requirement to maintain source and treatment controls that are constructed to comply with the municipal storm water NPDES permit. Maintenance is essential for assuring that source and treatment control BMPs continue to function effectively and that the BMPs do not become a nuisance.

5.1 Responsibility for Maintenance

The responsibility for the maintenance of source and treatment controls belongs to the project and/or property owner unless other specific arrangements have been made. The municipal storm water NPDES permit also requires that the project applicant provide a signed statement accepting responsibility for maintenance until this responsibility is legally transferred to a legally responsible entity.

In addition, where a property owner is responsible for maintenance, the SUSMP specifically requires that the property owner shall conduct maintenance inspections of all source and treatment controls at least once a year and retain proof of inspection for a period of up to five years. Upon request, documentation of the inspection is required to be provided to Mendocino County.

For residential properties where the BMPs are located within a common area which will be maintained by a homeowner's association, language regarding the responsibility for maintenance must be included in the project's conditions, covenants and restrictions (CC&Rs). The project applicant shall be required to include printed educational materials with the first deed transfer to highlight the existence of the requirement and to provide information on what storm water management facilities are present, evidence that maintenance is needed, how the necessary maintenance can be performed, and assistance that the project applicant can provide. The transfer of this information also shall be required with any subsequent sale of the property.

If source or treatment controls are proposed to be located in a public area for transfer to Mendocino County, these controls must meet these design guidelines and shall remain the property owner's responsibility for maintenance until the controls are accepted for transfer.

The County of Mendocino may conduct operation and maintenance verification inspections to make sure that storm water source and treatment controls are being maintained and are functioning properly.

5.2 Mechanisms to Assure Maintenance

There are a variety of mechanisms that municipalities have used to assure the ongoing operation and maintenance of storm water controls. Descriptions are provided below of five different mechanisms, each of would assure the ongoing operation and maintenance of source and treatment controls in accordance with the municipal storm water NPDES permit and the SUSMP. Each of the mechanisms would include the provisions described in Sections 5.2.1 and 5.2.2.

The County of Mendocino will require one of the mechanisms described below to assure the ongoing maintenance of source and treatment controls BMPs located on each property on which both source and treatment controls are constructed. Additional mechanisms may be considered provided that the requirements are as comprehensive as those listed below.

Public Entity's Signed Statement. For cases in which a public entity accepts responsibility for the maintenance of a BMP, the mechanism would be a signed statement from the public entity assuming responsibility for source and/or treatment control BMP maintenance and that it meets all local agency design standards/criteria.

Sales or Lease Agreement. Another mechanism may consist of written conditions in the sales or lease agreement that require the recipient to assume responsibility for maintenance and conduct a maintenance inspection at least once a year.

Conditions, Covenants and Restrictions (CC&Rs). For properties on which the BMPs are located within a common area that will be maintained by an association, the SUSMP states that language regarding the responsibility for maintenance must be included in the project's CC&Rs.

Maintenance Agreement. An agreement assigning maintenance responsibility to the property owner may be executed between the County and a property owner. The agreement would be recorded among the deed records at the County Recorder's Office so that it would run with the title to the land.

Special Tax District. The County may create a special tax district within which a storm water tax would be assessed for the purpose of providing a revenue stream for BMP maintenance, which would be conducted by the applicable agency.

5.2.1 Maintenance Requirements

Each of the maintenance assurance mechanisms would include: a maintenance plan, annual reporting, access to property, and remediation of problems.

Each of the maintenance assurance mechanisms would include: a maintenance plan, annual reporting, access to property, and remediation of problems.

1. **Maintenance Plan.** The project sponsor must prepare a maintenance plan, the implementation of which will keep the proposed source and treatment controls operating as originally designed and approved. At a minimum the Maintenance Plan shall include: the scope and frequency for inspection and scheduled maintenance, provisions for unscheduled maintenance, estimated design life, and costs associated with the design life including replacement.

2. **Annual Report.** Each year the entity responsible for maintenance is required to complete an annual report that includes copies of completed inspection and maintenance checklists to document that maintenance activities were conducted during the previous year. 676 The annual report shall be retained for a period of at least five years and made available upon request by the County of Mendocino.

3. **Access to Property.** Permission is granted to the County of Mendocino staff, and the Regional Water Board to enter the property to verify that maintenance is being conducted in accordance with the maintenance plan. Easements may be required.

4. **Remediation of Problems.** In the event adequate maintenance is not conducted, county staff is allowed the option to enter the property and take necessary steps to restore the BMPs to good working order. The property owner will be responsible for reimbursing the county for expenditures associated with restoring the BMPs to good working order.

5.2.2 Required Exhibits

Any of the above-described maintenance mechanisms would require the inclusion of the following exhibits:

- **Letter-sized (8 ½ x 11 inches) Reduced-scale Site Plan** that shows the locations of the source control and treatment control BMPs that will be subject to the maintenance mechanism.

- **Maintenance Plan,** that contains the schedule of activities needed to keep the proposed source and treatment controls operating as originally designed and approved. Each applicant must prepare his/her own maintenance plan, subject to the applicable municipality's approval. Resources that may assist applicants in developing their maintenance plans include:

    - Treatment control BMP fact sheets included in Chapter 4,
    - Inspection and maintenance example checklists included as Attachment 5-2, and
    - The operation manual for any proprietary system purchased by the applicant.

- **Example Source and Treatment Control Operation and Maintenance Inspection Annual Report** (Example O&M Annual Report) or an equivalent report must be prepared annually by the project and/or property owner. This annual report must be retained for a period of at least five years and made available upon request by the County of Mendocino. A copy of the Example O&M Annual Report is included as Attachment 5-1.

A copy of the Example O&M Annual Report is included as Attachment 5-1.

- **Inspection and Maintenance Checklists** for specific source and treatment control BMPs included in the project. Attachment 5-2 includes example inspection checklists for five landscape-based treatment controls. The information collected by the property owner or his or her agent can be recorded on these checklists, or other comparable methods of documenting inspections and maintenance may be used. Whatever method is used, a summary of the information must be included in the report that is retained and submitted upon request to the County. The project sponsor should ensure that the checklists correspond to the project's maintenance plan, and, if necessary, prepare additional checklists for source and/or treatment controls included in the project.

Attachment 5-2 includes example inspection checklists for five landscape-based treatment controls.

Attachment 5-1

Source and Treatment Control Operation and Maintenance

Inspection Report

This report and attached Inspection and Maintenance Checklists document the inspection and maintenance conducted for the identified storm water source and treatment control(s) subject to the Agreement between the County and the property owner during the annual reporting period indicated below.

I. Property Information:

Property Address or APN: _____

Property Owner: _____

II. Contact Information:

Name of person to contact regarding this report:_____

Phone number of contact person:_____ Email:_____

Address to which correspondence regarding this report should be directed:

_____

_____

III. Reporting Period:

This report, with the attached completed inspection checklists, documents the inspections and maintenance of the identified treatment measures during the time period from _____ to _____.

IV. Storm water Source and Treatment Control Information:

The following storm water source and treatment controls are located on the property identified above and are subject to the Agreement:

Identifying Number of Source and Treatment Control	Type of Source and Treatment Control	Location of Source and Treatment Control on the Property

V. Summary of Inspections and Maintenance:

Summarize the following information using the attached Inspection and Maintenance Checklists:

Identifying Number of Source and Treatment Control	Date of Inspection	Operation and Maintenance Activities Performed and Date(s) Conducted	Additional Comments

VI. Sediment Removal:

Total amount of accumulated sediment removed from the storm water treatment measure(s) during the reporting period: _____ cubic yards.

How was sediment disposed?

- ☐ landfill
- ☐ other location on-site as described in and allowed by the maintenance plan
- ☐ other, explain _____

VII. Inspector Information:

The inspections documented in the attached Inspection and Maintenance Checklists were conducted by the following inspector(s):

Inspector Name and Title	Inspector's Employer and Address

VIII. Certification:

I hereby certify, under penalty of perjury, that the information presented in this report and attachments is true and complete:

_____ _____

Signature of Property Owner or Other Responsible Party Date

_____

Type or Print Name

_____

Company Name

_____

Address

Phone number:_____ Email:_____

Attachment 5-2a

Inspection and Maintenance Checklist: Vegetated Swale

Property Address: _____ Property Owner: _____

Date of Inspection: _____ Type of Inspection: ☐ Pre-rainy season ☐ Monthly ☐ Quarterly ☐ Annual

Inspector(s): _____

Item	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	**Results Expected When Maintenance Is Performed**
Sediment Accumulation on Vegetation	Sediment depth exceeds 2 inches.			Sediment deposits on vegetated treatment area of the swale removed. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
Standing Water	When water stands in the swale between storms and does not drain freely.			There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of swale, removed clogged check dams, added underdrains or converted to a wet swale.
Flow spreader (if any)	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.			Spreader leveled and cleaned so that flows are spread evenly over entire swale width.
Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.			No eroded, muddy channel on the bottom. A low-flow pea-gravel drain may be added the length of the swale.
Poor Vegetation Coverage	When planted vegetation is sparse or bare or eroded patches occur in more than 10% of the swale bottom.			Vegetation coverage in more than 90% of the swale bottom. Determine why growth of planted vegetation is poor and correct that condition. Re-plant with plugs of vegetation from the upper slope: plant in the swale bottom at 8-inch intervals, or re-seed into loosened, fertile soil.

Defect	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done.)	Results Expected When Maintenance Is Performed
Vegetation	When the planted vegetation becomes excessively tall; when nuisance weeds and other vegetation start to take over.			Vegetation mowed per specifications or maintenance plan, or nuisance vegetation removed so that flow is not impeded. Vegetation should never be mowed lower than the design flow depth. Remove clippings from the swale and dispose appropriately.
Excessive Shading	Growth of planted vegetation is poor because sunlight does not reach swale.			Healthy growth of planted vegetation. If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.
Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.			Material removed so that there is no clogging or blockage in the inlet and outlet areas.
Trash and Debris Accumulation	Trash and debris accumulated in the swale.			Trash and debris removed from swale.
Erosion/ Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.			No erosion or scouring in swale bottom. For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

Attachment 5-2b

Inspection and Maintenance Checklist: Bioretention Area

Property Address: _____ Property Owner: _____

Date of Inspection: _____ Type of Inspection: ☐ Pre-rainy season ☐ Monthly ☐ Quarterly ☐ Annual ☐ Re-inspection[28]

Inspector(s): _____

Item	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	**Results Expected When Maintenance Is Performed**
General				
Trash & Debris	• Trash and debris accumulated in basin • Visual evidence of dumping			Trash and debris cleared from site.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants			**No contaminants or pollutants present.**
Vegetation	• When the planted vegetation becomes excessively tall. • When nuisance weeds and other vegetation start to take over.			Vegetation mowed per specifications or maintenance plan, or nuisance vegetation removed so that flow is not impeded. Vegetation should never be mowed lower than the design flow depth. Remove clippings from the area and dispose appropriately.
Tree/Brush Growth and Hazard Trees	• Growth does not allow maintenance access or interferes with maintenance activity • Dead, diseased, or dying trees			• Trees do not hinder maintenance activities. • Remove hazard trees as approved by the City or County. (Use a certified Arborist to determine health of tree or removal requirements)

[28] Re-inspection of a previously-noted maintenance issue.

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	Results Expected When Maintenance Is Performed
Erosion	Eroded over 2 in. deep where cause of damage is still present or where there is potential for continued erosion.			Cause of erosion is managed appropriately. Areas remulched to fill in void areas.
Sediment	Accumulated sediment affects inletting or outletting condition of the facility.			Sediment removed and area reseeded if necessary to control erosion.
Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.			Pipe repaired or replaced.
Rodent Holes	If facility acts as a dam or berm, any evidence of rodent holes, or any evidence of water piping through dam or berm via rodent holes.			• The design specifications are not compromised by holes. • Any rodent control activities are in accordance with applicable laws and do not affect any protected species.

Attachment 5-2c

Inspection and Maintenance Checklist: Extended Detention Basin

Property Address: _____ Property Owner: _____

Date of Inspection: _____ Type of Inspection: ☐ Pre-rainy season ☐ Monthly ☐ Quarterly ☐ Annual

Inspector(s): _____

Item	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	**Results Expected When Maintenance Is Performed**
General				
Trash & Debris	• Trash and debris accumulated in basin • Visual evidence of dumping			Trash and debris cleared from site.
Poisonous Vegetation and noxious weeds	Poisonous or nuisance vegetation or noxious weeds, e.g., morning glory, English ivy, reed canary grass, Japanese knotweed, purple loosestrife, blackberry, Scotch broom, poison oak, stinging nettles, or devil's club			Use Integrated Pest Management techniques to control noxious weeds or invasive species.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants			**No contaminants or pollutants present.**
Rodent Holes	If facility acts as a dam or berm, any evidence of rodent holes, or any evidence of water piping through dam or berm via rodent holes			The design specifications are not compromised by holes. Any rodent control activities are in accordance with applicable laws and do not affect any protected species.

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	Results Expected When Maintenance Is Performed
Insects	Insects such as wasps and hornets interfere with maintenance activities.			Insects do not interfere with maintenance activities.
Tree/Brush Growth and Hazard Trees	• Growth does not allow maintenance access or interferes with maintenance activity • Dead, diseased, or dying trees			• Trees do not hinder maintenance activities. • Remove hazard trees as approved by the City. (Use a certified Arborist to determine health of tree or removal requirements)
Side Slopes				
Erosion	• Eroded over 2 in. deep where cause of damage is still present or where there is potential for continued erosion. • Any erosion on a compacted berm embankment.			Cause of erosion is managed appropriately. Side slopes or berm are restored to design specifications, as needed.
Storage Area				
Sediment	Accumulated sediment >10% of designed basin depth or affects inletting or outletting condition of the facility.			Sediment cleaned out to designed basin shape and depth; basin reseeded, if necessary, to control erosion.
Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.			Liner repaired or replaced. Liner is fully covered.
Emergency Overflow/ Spillway and Berms				
Settlement	Berm settlement 4 inches lower than the design elevation.			Dike is built back to the design elevation.

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	Results Expected When Maintenance Is Performed
Tree Growth	Tree growth on berms or emergency spillway >4 ft in height or covering more than 10% of spillway.			• Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. • A civil engineer should be consulted for proper berm/spillway restoration.
Emergency Overflow/ Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.			Rocks and pad depth are restored to design standards.
Debris Barriers (e.g., Trash Racks)				
Trash and Debris	Trash or debris is plugging openings in the barrier.			Trash or debris is removed.
Damaged/ Missing Bars	Bars are missing, loose, bent out of shape, or deteriorating due to excessive rust.			Bars are repaired or replaced to allow proper functioning of trash rack.
Inlet/Outlet Pipe	Debris barrier is missing or not attached to pipe			Debris barrier is repaired or replaced to allow proper functioning of trash rack.
Fencing and Gates				
Missing or broken parts	Any defect in or damage to the fence or gate that permits easy entry to a facility.			Fencing and gate are restored to design specifications
Deteriorating Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.			Paint or protective coating is sufficient to protect structural adequacy of fence or gate.

Attachment 5-2d

Inspection and Maintenance Checklist: Constructed Wetland

Property Address: _____ Property Owner: _____

Date of Inspection: _____Type of Inspection: ☐ Pre-rainy season ☐ Monthly ☐ Quarterly ☐ Annual ☐ Re-inspection[29]

Inspector(s): _____

Item	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	**Results Expected When Maintenance Is Performed**
General				
Trash & Debris	• Trash and debris accumulated in basin. • Visual evidence of dumping.			Trash and debris cleared from site.
Poisonous Vegetation and noxious weeds	Poisonous or nuisance vegetation or noxious weeds, e.g., morning glory, English ivy, reed canary grass, Japanese knotweed, purple loosestrife, blackberry, Scotch broom, poison oak, stinging nettles, star thistle, or devil's club.			Management of poisonous or noxious vegetation. Use Integrated Pest Management techniques to control noxious weeds or invasive species.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.			**No contaminants or pollutants present.**
Rodent Holes	If facility acts as a dam or berm, any evidence of rodent holes, or any evidence of water piping through dam or berm via rodent holes.			The design specifications are not compromised by holes. Any rodent control activities are in accordance with applicable laws and do not affect any protected species.

[29] Re-inspection of a previously noted-maintenance issue

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	Results Expected When Maintenance Is Performed
Insects	Insects such as wasps and hornets interfere with maintenance activities.			Insects do not interfere with maintenance activities.
Mosquito Vector Breeding	Suitable habitats exist for mosquito production (e.g., standing water in areas accessible to mosquitoes).			Standing water no longer exists or is inaccessible to mosquitoes or mosquito fish are used to eliminate mosquito population.
Tree/Brush Growth and Hazard Trees	• Growth does not allow maintenance access or interferes with maintenance activity. • Dead, diseased, or dying trees.			• Trees do not hinder maintenance activities. • Remove hazard trees as approved by the City or County. (Use a certified Arborist to determine health of tree or removal requirements)
Side Slopes				
Erosion	• Eroded over 2 in. deep where cause of damage is still present or where there is potential for continued erosion. • Any erosion on a compacted berm embankment.			Cause of erosion is managed appropriately. Side slopes or berm are restored to design specifications, as needed.
Storage Area				
Sediment	Accumulated sediment >10% of designed basin depth or affects inletting or outletting condition of the facility.			Sediment cleaned out to designed basin shape and depth; basin reseeded if necessary to control erosion.
Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.			Liner repaired or replaced. Liner is fully covered.
Emergency Spillway and Embankment				
Settlement	Embankment settlement 4 inches lower than the design elevation.			Dike is built back to the design elevation.

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	Results Expected When Maintenance Is Performed
Tree Growth	Tree growth on berms or emergency spillway >4 ft in height or covering more than 10% of spillway.			• Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. • A civil engineer should be consulted for proper berm/spillway restoration.
Emergency Overflow/ Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.			Rocks and pad depth are restored to design standards.
Debris Barriers (e.g., Trash Racks)				
Trash and Debris	Trash or debris is plugging openings in the barrier.			Trash or debris is removed.
Damaged/ Missing Bars	Bars are missing, loose, bent out of shape, or deteriorating due to excessive rust.			Bars are repaired or replaced to allow proper functioning of trash rack.
Inlet/Outlet Pipe	Debris barrier is missing or not attached to pipe.			Debris barrier is repaired or replaced to allow proper functioning of trash rack.
Fencing and Gates				
Missing or broken parts	Any defect in or damage to the fence or gate that permits easy entry to a facility.			Fencing and gate are restored to design specifications.
Deteriorating Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.			Paint or protective coating is sufficient to protect structural adequacy of fence or gate.

Attachment 5-2e

Inspection and Maintenance Checklist: Wet Ponds

Property Address: _____ Property Owner: _____

Date of Inspection: _____Type of Inspection: ☐ Pre-rainy season ☐ Monthly ☐ Quarterly ☐ Annual ☐ Re-inspection[30]

Inspector(s): _____

Item	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	**Results Expected When Maintenance Is Performed**
General				
Water level	First cell is empty, doesn't hold water.			Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
Trash & Debris	Trash and debris accumulated in pond.			Trash and debris removed from pond.
Sediment Accumulation in the Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone.			Sediment removed from pond bottom.
Oil Sheen on Water	Prevalent and visible oil sheen.			Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effuses (soft rush) which can uptake small concentrations of oil.

[30] Re-inspection of a previously-noted maintenance issue

Item	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed; and if any needed maintenance was not conducted, note what is needed and when it will be done)	Results Expected When Maintenance Is Performed
Erosion	Erosion of the pond's side slopes and/or scouring of the pond's bottom, that exceeds 6-inches, or where continued erosion is prevalent.			Slopes stabilized using proper erosion control measures and repair methods.
Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.			Dike/berm is repaired to specifications.
Internal Berm	Berm dividing cells should be level.			Berm surface is leveled so that water flows evenly over entire length of berm.
Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.			Rocks replaced to specifications.
Mosquito Vector Breeding	Suitable habitats exist for mosquito production (e.g., standing water for more than 72 hours in areas accessible to mosquitoes; presence of excessive cattails or other vegetation precluding access for vector control purposes.)			Standing water no longer exists or is inaccessible to mosquitoes. Vegetation controlled using IPM techniques.

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