

Section 1 - Introduction

The *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties*, a series of five compact discs (CDs), provides technical guidance for construction site design and the selection of stormwater best management practices (BMPs). The catalog is a guidance document containing voluntary controls that could be formally adopted by a jurisdiction to establish standards, if desired. Measures, such as those described and other recognized equivalents, should be used to manage the quantity and quality of stormwater runoff from land development.

This information is primarily intended for design professionals (e.g., landscape architects, geologists, engineers, soil scientists, etc.) and their contractors. It is also applicable for local public officials or staff who are responsible for the review and approval of development applications.

There are several reasons why technical guidance regarding stormwater management is necessary:

- Idaho remains one of the fastest growing states in the nation. The increase in population leads to an increase in land development, a recognized source of nonpoint source pollution, more commonly termed “polluted runoff.” The catalog includes BMPs that help to prevent discharge of pollutants from developing areas, both during the construction phase and for the life of the development. The BMPs can also be used to reduce polluted runoff from existing land uses.
- Many water bodies throughout the state are not in compliance with state water quality standards. Beneficial uses such as domestic water supply, fishing, swimming, boating, and agricultural water supply can often be impaired due to excessive pollutants from stormwater runoff. The catalog provides guidance for controls to reduce “conventional” pollutants, with special consideration for phosphorus and sediment, both common pollutants in Idaho.
- Federal National Pollutant Discharge Elimination System (NPDES) stormwater regulations have mandated that some communities develop and implement stormwater management programs to ensure that pollutants in stormwater runoff are controlled to the maximum extent practicable. Because polluted runoff has the potential to contribute to the degradation of receiving water quality, improved stormwater management program implementation at the local level will play an ever-increasing role in attaining and maintaining water quality standards.

In general, there are two types of BMPs for stormwater pollution control:

1. Source control BMPs focus on minimizing or eliminating the source of the pollution so that pollutants are prevented from contacting runoff or entering the drainage system.
2. Treatment control BMPs which tend to be more expensive to implement than source control BMPs, are designed to remove pollutants after they have entered runoff. Examples of source control BMPs include spill controls and employee education, while treatment control BMPs include detention ponds and oil/water separators. Most source control BMPs tend to be non-structural, and most treatment control BMPs tend to be structural in nature, although there can be exceptions. For example, a roof over a materials storage area at an industrial site would be considered a structural source control.

The majority of the practices focus on controlling pollution at its source, before runoff enters a drainage conveyance such as a sewer system or river. However, some BMPs are also included that can be used to treat runoff and remove pollutants that have already entered the drainage conveyance. The structural measures will reduce pollutant loads in post-construction site runoff, provided that the facilities are properly designed, installed, and maintained on a periodic basis.

The catalog presents general technical guidelines. Specific conditions or local regulations may require modification of the recommended BMPs, and alternative practices that are approved by a local permitting authority may also require modification or replacement of recommended BMPs. The BMP selection matrices should be used as screening tools to assist the design professional, landowner, or reviewer in selecting the most appropriate or suitable measure based on site-specific conditions.

In order to illustrate the use and application of certain BMPs, manufacturer and product names may be used in the catalog. This does not represent an endorsement of a specific manufacturer or product.

1.1 Organization

The first volume of the CD series includes a brief discussion of stormwater runoff impacts; an overview of agencies responsible for stormwater permitting and authority in Idaho; and a step-by-step procedure for site design.

The second volume of the CD series contains construction BMPs including both erosion and sediment controls and source controls.

The third volume of the CD series introduces the concept of low-impact development and provides techniques that can minimize changes to the hydrologic functioning of a development site.

The fourth volume of the CD series contains post-construction/ permanent BMPs.

The fifth volume of the CD series provides BMPs for specific land use activities, including industrial, commercial, and residential activities.

The catalog is intended for use in conjunction with local governmental requirements, such as applicable planning and building codes. The catalog is not all-inclusive and should be used along with other reference books and manuals published by other agencies as necessary or appropriate based on local conditions and policies.

1.2 Updates

The practice of stormwater management is quickly evolving. Design information for various BMPs is expected to change as more people apply the practices and learn from their experience. New BMPs will also be added to the mix. To accommodate these changes, periodic updates and amendments will be made to the catalog. These will be posted on the Department of Environmental Quality (DEQ) Web site as they become available.

Section 2 - Stormwater Runoff Quantity and Quality Impacts

Traditionally, the objective of stormwater management has been to transport runoff efficiently through the drainage system in order to prevent flooding and protect lives and property. This is referred to as flood or quantity control. Although public health and safety are the most important goals, other objectives should be met as well. These include management of runoff quantities and flow to mimic predevelopment conditions and minimize damage to property and natural resources; management of development sites to minimize the amount of sediment and other contaminants in runoff; and management of development to preserve the stability and integrity of drainage ways and stream corridors.

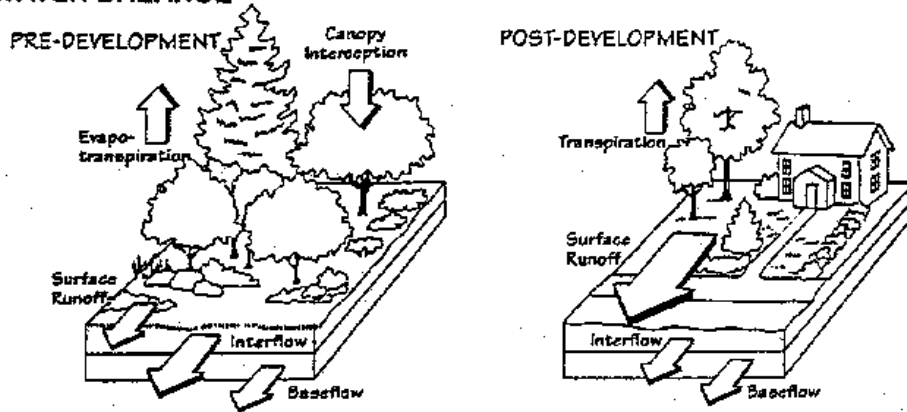
Today it is necessary to balance quantity, quality, and habitat protection objectives. This balance can be achieved by pursuing regional solutions, such as effective land use planning, which minimizes impervious areas and preserves native vegetation, especially riparian areas along streams and lakes. Local ordinances and codes can also help to reduce impervious areas and increase vegetation by limiting the extent to which a site can be developed. Quantity and quality goals can also be met at the local level through proper site planning and appropriate design that carefully considers the various impacts of development and application of best management practices (BMPs) to minimize problems.

2.1 Stormwater Runoff Quantity

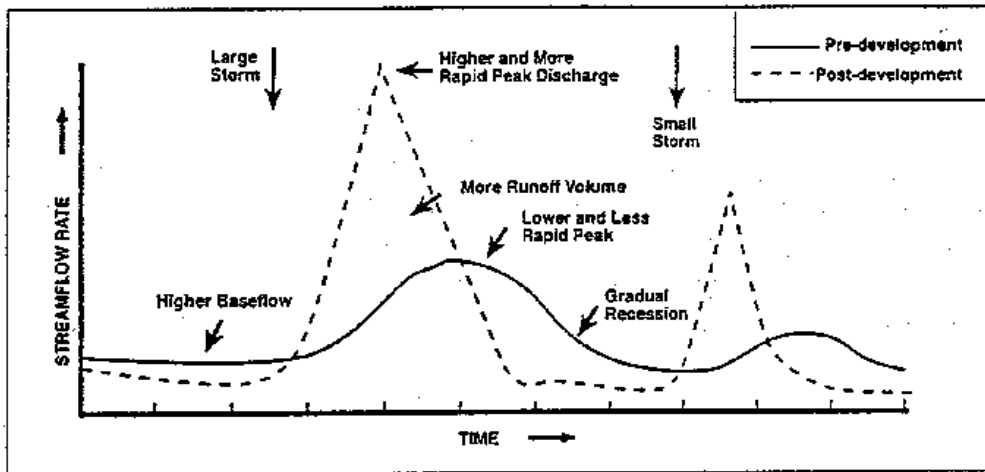
The quantity or volume of stormwater runoff from urban and suburban land uses depends on several factors: the intensity and duration of a given storm event; the basin slope; the amount and type of vegetation retained, and most importantly the amount of impervious area such as asphalt and concrete, building rooftops, and compacted soils. Urbanization increases the quantity of runoff, which has a serious impact on receiving waters. As shown in Figure 2-1, the natural water balance is disrupted when an area develops. Paved surfaces and buildings replace vegetation that once intercepted the rain, allowed it to soak into the ground, and returned water to the air through evapo-transpiration. Heavily compacted surfaces act much the same as pavement in preventing water from seeping into the ground. Snowmelt, especially when accelerated by rain, also increases the chance of flooding. As the volume and flow rate (speed) of the runoff increases, water reaches streams and lakes more quickly and typically there is less recharge to groundwater to contribute baseflow to streams.

The higher runoff volumes and rates lead to overland erosion, scouring or undercutting of streambanks, flooding, and loss of habitat.

A. WATER BALANCE



B. STREAMFLOW



C. RESPONSE OF STREAM GEOMETRY

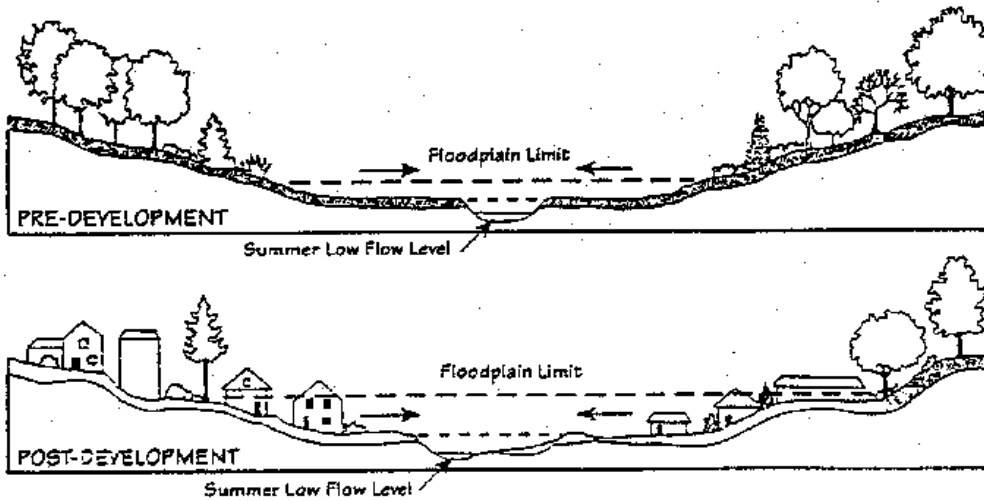


Figure 2-1. Impact of Urbanization on Watershed Hydrology

2.2 Stormwater Runoff Quality

Urbanization also adversely affects the temperature and quality of stormwater runoff, which in turn has a serious impact on receiving waters. Runoff collects and transports pollutants from impervious surfaces, including:

- Sediment, which can carry other pollutants and can smother fish eggs
- Organic debris and fertilizer containing nutrients such as phosphorus and nitrogen
- Bacteria and viruses from humans and animals
- Organic chemicals, such as pesticides, oil and antifreeze
- Heavy metals such as lead, copper, zinc and cadmium from roof runoff, worn tires and automobiles
- Oxygen-demanding substances
- Floatables, such as litter.

Sediment

The most common pollutant found in urban runoff is sediment. Sediment consists of tiny soil particles that are washed or blown into nearby waterways. Sediment can fill up river channels, lakes, wetlands, and reservoirs, creating potential flooding problems. In addition, sediment can smother aquatic life such as phytoplankton, fish, and invertebrates and make feeding or reproducing difficult for other aquatic life. Sediment can also carry other pollutants, such as nutrients, toxic chemicals, and heavy metals. These pollutants can affect water quality and potentially contaminate drinking water supplies. Sediment is associated with the following:

- Construction site runoff
- Streambank erosion
- Road maintenance
- Yard and garden landscaping

Nutrients

The most common nutrients found in urban runoff are nitrogen and phosphorus. Excessive levels of nutrients encourage undesirable algal blooms and aquatic weed growth in surface waters. When the nutrients are used up, this growth dies and uses oxygen as it decays. As a result, the lake, river, or other receiving waterway has less dissolved oxygen, creating an unfavorable environment for fish and other aquatic life. Nutrients are associated with the following:

- Automobile emissions
- Gasoline and oil additives

- Pesticides and fertilizers
- Lawn clippings and leaves

Bacteria and Viruses

Two of the most common bacteria and viruses found in urban runoff are fecal coliform and enterococcus. If high levels of bacteria and viruses in stormwater flow into a nearby waterway, human health could be jeopardized. Bacteria and viruses are associated with the following:

- Sanitary sewer infiltration into the storm drain system
- Failing septic tanks
- Pet and wildlife wastes

Petroleum-Derived Substances

The most common petroleum-derived substances found in urban runoff are oil and grease. Petroleum-derived substances contain hydrocarbons. Hydrocarbons are toxic to sensitive animal and aquatic life species. In addition, hydrocarbons degrade fish habitat and can accumulate in the food chain. Petroleum-derived substances are associated with the following:

- Parking lots and roads
- Automobile service stations
- Waste oil storage
- Illegal dumping or improper disposal of petroleum-derived substances

Toxic Chemicals

The most common toxic chemicals found in urban runoff are organic compounds. Organic compounds can be pesticides, paints, solvents, adhesives, or other similar products. Improper disposal or storage, illegal discharges, or unnecessary application of toxic chemicals can harm aquatic life. In addition toxic chemicals can accumulate in the food chain and can potentially contaminate drinking water supplies. Toxic chemicals are associated with the following:

- Automobile emissions
- Household cleaners
- Toxic chemicals storage
- Illegal dumping or improper disposal of toxic chemicals

Heavy Metals

The most common heavy metals found in urban runoff are lead, copper, cadmium, and zinc. Nickel and chromium are also frequently present in

urban runoff. As these metals corrode, dissolve, or settle out, wind or water deposits them in surface water. Heavy metals can degrade water quality because they can be toxic to aquatic life, can accumulate in the food chain, and can contaminate drinking water supplies. Heavy metals are associated with the following:

- Automobile emissions
- Automobile brake and tire wear
- Galvanizing agents
- Batteries
- Paints and wood preservatives
- Metal roof tops and pipes

Oxygen-Demanding Substances

The most common substances found in urban runoff that reduce the available oxygen in water are organic matter. When microorganisms decompose organic matter, dissolved oxygen levels become depleted. If dissolved oxygen levels in water become too low, aquatic life can become stressed or die. Oxygen demanding substances are associated with the following:

- Leaves and lawn clippings
- Small wood products (sawdust, wood chips, bark)
- Animal wastes
- Food wastes from leaking garbage dumpsters
- Street litter

Floatable Materials

The most common floatable materials found in urban runoff are street litter and industrial yard waste. Floatable materials can contain significant amounts of pollutants such as heavy metals, toxic chemicals, and bacteria. Floatable materials can also cause waterways or permanent stormwater controls, such as detention basins, to become unsightly.

Section 3 - Responsibility for Stormwater Management and Permitting

This chapter introduces an overview of current federal, state, and local government agency stormwater plans, programs, and regulations. Design professionals may have to work closely with some government agencies more than others when planning a development project. As a result, those government agencies and their requirements have been included in more detail.

Table 3-1 on the following page summarizes the current regulations for stormwater pollution control. The table identifies the government agency or special purpose district that has stormwater authority with regard to a specific project activity.

Responsibility for stormwater management is often held collectively by landowners and several agencies and special districts. Persons wishing to discharge stormwater runoff into a drainage facility should contact the appropriate agency or special district about conditions or permitting requirements that may apply.

Landowners are principally responsible for stormwater runoff from their property. In subdivisions with a stormwater facility (e.g., detention pond) that collects runoff from the entire development, the developer or local homeowners' association may assume responsibility for maintenance. Alternately, the facility could have an easement to allow for maintenance by the city, county, or local highway jurisdiction. In this case, the local agency may charge the developer or homeowners' association for the cost of such maintenance.

Local highway jurisdictions are responsible for maintaining roads in the unincorporated areas of a county, including all drainage contained in the road right-of-way. Ada County Highway District is the exception, with responsibility for all urban streets, rural roadways and associated drainage facilities (excluding state and federal roads) in Ada County. For the most part, the drainage system associated with county roads consists of natural drainages (e.g., streams), irrigation canals, and roadside ditches.

County building and planning departments are responsible for reviewing and issuing building permits in the unincorporated county. However, they may not be responsible for building permits in the impact areas. Some

building departments throughout the state may also require stormwater BMPs based on specific types of development.

District health departments, through their on-site septic system review process, work closely with county landowners outside the sewer areas. The seven District Health Departments across the state also monitor public health related water quality parameters, support the efforts of local sewer districts, and track performance of on-site systems. For centralized sewer systems, the Idaho Department of Environmental Quality (IDEQ) assumes the responsibility for review.

The Idaho Transportation Department (ITD) is responsible for building, operating, and maintaining all state roads and highways (e.g., Hwy 55, Interstate 84), including all of the approaches from county roads contained within the state highway right-of-way. Within some city limits, ITD and a given city or local highway jurisdiction may share maintenance responsibilities. ITD is responsible for maintaining the drainage systems (roadside ditches and stream, canal, and river crossings) associated with state roads. If a development project has the potential to affect a highway project in a given city limit, then design professionals should contact an ITD office. ITD incorporates erosion and sedimentation controls into its construction projects.

The IDEQ is the designated agency for implementation of the Federal Water Pollution Control Act (33 U.S.C.A. §§1251 to 1387) also known as the Clean Water Act. This responsibility involves the control and abatement of all sources of pollution to both surface and ground waters. IDEQ's delegated authority for nonpoint source control includes responsibility for both surface water and ground water pollution. The Nonpoint Source Management Program provides technical assistance and support to cities, counties, and watershed advisory groups throughout the state.

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. These standards are the benchmarks DEQ uses to know if it is doing its job to protect Idaho's surface water. Nonpoint source pollution management includes the use of Best Management Practices (BMPs) which should be designed, implemented and maintained to provide full protection or maintenance of beneficial uses (IDAPA 58.01.02, § 350.02).

Any project that requires a federal permit or license under the Clean Water Act, such as a National Pollutant Discharge Elimination System permit, or a Clean Water Act Section 404 dredge and fill permit, requires a Clean

Water Act Section 401 certification. The certification states that the project will not cause a violation of state water quality standards.

IDEQ is also responsible for protecting the quality of ground water in Idaho and relies on a combination of programs to protect ground water from pollution, clean up degraded ground water, and monitor and assess ground water quality. The IDEQ's authority for nonpoint source control of ground water pollution includes the Ground Water Quality Protection Act (Chapter 1, Title 39, Sections 120 through 127, Idaho Code), the Idaho Ground Water Quality Plan, and the Ground Water Quality Rule (IDAPA 16.01.11).

The Idaho Department of Water Resources (IDWR) has authority, in conjunction with the US Army Corps of Engineers, to regulate stream channel alterations under the Stream Channel Protection Act (Title 42, Chapter 38, Idaho Code) and to regulate the safety of most impoundment structures under the Dam Safety Act (Title 42, Chapter 17, Idaho Code). The Idaho Stream Channel Protection Act requires that the stream channels of the state and their environment be protected against alteration for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty and water quality. This means IDWR must approve in advance any work being done within the beds and banks of a continuously flowing stream. Dams 10 feet or higher or which store more than 50 acre-feet of water are regulated by the IDWR. IDWR is also involved in the coordination of permits for lakeshore encroachments.

Wastewater disposal by injection wells is regulated through the State Underground Injection Control Program, under Title 42, Chapter 39, Idaho Code. An injection well is "(1) A bored, drilled or dug hole or is a driven mine shaft or a driven well point, and (2) deeper than its largest straight-line surface dimension; and (3) used for or intended to be used for injection," Design professionals considering using injection wells for stormwater runoff disposal should contact DWR for information on proper disposal methods.

U.S. Army Corps of Engineers permits are required under Section 404 of the Clean Water Act for discharges of dredged or fill material into waters of the United States, including wetlands. This includes excavation activities that result in the discharge of dredged material and destroy or degrade waters of the United States. The Corps administers the day-to-day program, including individual permit decisions and jurisdictional determinations; develops policy and guidance, and enforces Section 404 provisions.

The Environmental Protection Agency (EPA) develops and interprets environmental criteria used in evaluating permit applications; determines scope of geographic jurisdiction, approves and oversees State assumption, identifies activities that are exempt, reviews/comments on individual permit applications, has authority to veto the Corps' permit decisions (Section 404[c]), can elevate specific cases (Section 404[q]) , and enforces Section 404 provisions.

The EPA, Region 10 (Seattle) is also the National Pollutant Discharge Elimination System (NPDES) permitting authority for the State of Idaho. As such, the agency is responsible for permitting all point source discharges to waters of the United States, including stormwater discharges. The 1987 Amendments to the Clean Water Act (CWA) prohibit the discharge of any pollutant to waters of the U.S. from non-agricultural sources unless authorized by a NPDES permit. These requirements are being implemented in two phases through the EPA's Stormwater Program. The federal stormwater regulations require permits for entities that own and operate municipal separate storm sewer systems (MS4s) that meet certain criteria, certain classifications of industrial facilities, and construction sites larger than one acre.

Boise City, Garden City, the Ada County Highway District, Ada County Drainage District 3, District 3 of ITD, and Boise State University are the only entities in Idaho subject to Phase I municipal separate storm sewer system requirements. Owners or operators of MS4s in Idaho within "urbanized areas" (UAs), based on 2000 Census data, are regulated entities under Phase II requirements. Owners or operators of MS4s outside UAs could also be regulated as more information becomes available or through petition to EPA.

Operators of Phase II-designated small MS4s are required to apply for NPDES permit coverage and develop, implement and enforce a stormwater management program designed to reduce the discharge of pollutants to the "maximum extent practicable," to protect water quality, and to satisfy the requirements of the CWA. The stormwater management program must address six minimum control measures, including public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping for municipal operations. Additional information can be accessed at <http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Region+10+Storm+Water+Program+page>.

Industrial facilities identified by EPA as needing an NPDES industrial stormwater permit must obtain an NPDES permit if they discharge stormwater either directly to surface waters or indirectly through separate municipal storm drains. Industrial facilities that must obtain coverage for their stormwater discharges can be found at http://cfpub1.epa.gov/npdes/stormwater/swcats.cfm?program_id=6.

Construction activities that disturb an area of one acre or more or that are part of a larger common plan of development (such as lots in subdivisions created since 1987) are required to submit a Notice of Intent (NOI) and prepare and implement a Stormwater Pollution Prevention Plan (SWPPP). These permit requirements are in addition to local regulations. More information can be found at <http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>.

The Bureau of Reclamation (BOR) operates dams and reservoirs and has jurisdiction over activities associated with reservoirs, such as camping and boating. Irrigation districts and ditch companies, and individual farmers operate irrigation systems primarily throughout the southern half of the state. Land development projects must seek approval from a ditch or canal company/district to discharge stormwater from pending development sites to such conveyances.

Table 3.1 Current Regulations for Stormwater Control

| Land Use Activity | Agency or Local Function | Permit, Approval Process, or Authority | Type of Construction |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Plan Review | | | |
| Stormwater Pollution Prevention Plan review | U.S. Environmental Protection Agency (EPA) | National Pollutant Discharge Elimination System (NPDES) discharge permits | Industrial, commercial, and residential over one acre or part of a larger common plan of development |
| Stormwater, erosion control or drainage plan review | Local public works, building, or planning department or local highway jurisdiction | Consult local authority | Commercial, industrial, residential, subdivision |
| Stormwater Discharges | | | |
| To a right-of-way | Local highway jurisdictions | Consult local authority | Commercial, industrial, residential, subdivision |
| To a natural waterway | EPA, Army Corp of Engineers (ACE) and/or local watershed-based authority | NPDES discharge permit | Commercial, industrial, residential, subdivision |
| To a canal or drain | Local canal or drainage district EPA, COE | Permission from local canal company or drainage district, NPDES discharge permit | Commercial, industrial, residential, subdivision |
| To a Bureau of Reclamation (BOR) canal | BOR, EPA | Permission from BOR, NPDES discharge permit | Commercial, industrial, residential, subdivision |
| From selected industrial facilities | EPA | NPDES stormwater discharge permit | Industrial |
| Stormwater Disposal | | | |
| To subsurface through an injection well | Idaho Department of Water Resources regional office Some Health Districts | Underground Injection Control Program | Commercial, industrial, residential, subdivision |
| Site Preparation/Construction | | | |
| All new development and redevelopment | Local public works, building, or planning department or local highway jurisdiction | Local or county ordinance | Commercial, industrial, residential, subdivision |
| Construction over one acre and lots in subdivisions created after 1987 | EPA | NPDES stormwater permit | Commercial, industrial, residential, subdivision |
| Development project potentially impacting an existing highway | Idaho Transportation Department, local highway jurisdictions | Idaho Code, Title, Chapter 39, Section 7-8 | Commercial, industrial, residential, subdivision |
| Development project potentially impacting an existing drainage facility | Local public works, building, or planning department, canal company, drainage district or local highway jurisdiction | Local or county ordinance, State statute | Commercial, industrial, residential, subdivision |

| Land Use Activity | Agency or Local Function | Permit, Approval Process, or Authority | Type of Construction |
|----------------------------------------------------|----------------------------------------|----------------------------------------------------|--------------------------------------------------|
| Dewatering | | | |
| Discharges to a right-of way | Local highway jurisdictions | Consult local authority | Commercial, industrial, residential, subdivision |
| Discharge to a canal or drain | Local canal company, drainage district | Permission from canal company or drainage district | Commercial, industrial, residential, subdivision |
| Other Permits | | | |
| Filling of wetlands or other waterways of the U.S. | U.S. Army Corps of Engineers | 404 (dredge and fill) permit | Commercial, industrial, residential, subdivision |

Section 4 - Development Site Planning

To ensure cost-effective site design and to reduce pollutants entering our stormwater, design professionals should work with the site developer or property owner as early as possible in the project development process to create an integrated site plan. Even before a preliminary site plan is drawn, the design professional and the developer or property owner should consider stormwater Best Management Practices (BMPs) as part of the project plan. This type of planning will not only reduce the amount of pollutants entering our stormwater system, but will also avoid costly construction delays later on.

The following process is recommended when developing a project site plan. This process can be used on small infill projects as well as large development projects. It provides a general overview of site planning considerations and choosing BMPs that most effectively fit the conditions of the site and type of development project. For assistance in the selection of the most appropriate or suitable BMP, the user should refer to Table 4.1. It is essential to check with the local permitting authority for other guidance.

Step 1—Evaluate site conditions

Gather basic information for the project site before using this catalog to select BMPs. General guidance for gathering information such as soil type, depth to the high water table, and slope is provided in Appendix C. To obtain some types of information, contacting the local permitting authority is recommended. For example, local agency staff can help by identifying locations of environmentally sensitive areas on or near the site and by providing local planning and building code requirements.

Step 2—Identify performance goals and regulatory considerations for site

Stormwater management performance goals and objectives should be identified for the development site. These goals and objectives are based on applicable regulatory requirements for quantity (flood and drainage) control and peak flow reduction; and any special local area needs such as fisheries protection, water supply watershed protection, ground water protection and other issues of local importance. While the selection of the appropriate level of control is usually a local mandate, in some cases the downstream receiving waters will influence the regulatory requirements.

Examples include Total Maximum Daily Load (TMDL) requirements, protection of endangered species, and/or federal stormwater regulations and associated NPDES Stormwater Permits conditions.

The regulatory requirements of the local jurisdiction must be considered in the selection of BMPs. Many jurisdictions have requirements for control of the rate of discharge (or peak runoff rate) from new or redevelopment to control increased flooding, channel protection or water quality. This control is usually accomplished by detention of the flow, discharging at a controlled release rate through an orifice (small opening). Other performance goals and objectives may include specific pollutant guidelines, water quality control, multi-parameter controls, including groundwater recharge and channel protection; and habitat protection strategies.

Contact the local permitting authority and obtain the permit application forms and any other applicable requirements for the project site area. These could include planning and building codes, flood control and water quality design standards, and seasonal restrictions for earthmoving and grading.

Identify the storm drain system or waterway where site runoff will drain. Identifying where your site runoff will drain will determine which requirements you will need to follow.

Check with the agency managing the receiving drainage system for the site, to learn about any special restrictions or permitting that may be required, including the maximum carrying capacity of the receiving system. Local requirements may change periodically, so remember to check with the agencies for each new construction project.

Step 3—Develop Conceptual Site Design

At the early stages of site design, identify opportunities to reduce the quantity and improve the quality of site stormwater runoff. Design sites to preserve and minimize disturbance to existing soils, vegetation and water quality sensitive areas. Consider using the following techniques on your site:

- Design the site, using innovative architectural designs, to limit impervious areas
- Design on-site water re-use facilities.
- Reduce impervious areas by using cluster development and rooftop or basement parking.
- Disconnect impervious surfaces.

- Identify preliminary stormwater disposal space allocation requirements early.

Vegetation may be one of the most cost effective resources for improving water quality. Integrating stormwater controls within the landscape saves money and keeps pollutants such as sediments, and oil and grease out of stormwater runoff. Controls such as vegetated swales and irrigated grass buffer strips can be part of the landscape with minimal construction costs. Consider using the following techniques for your site:

- Preserve existing vegetation or plant native vegetation in disturbed areas.
- Maximize and preserve vegetative canopy, particularly shrubs and coniferous trees

Prepare a preliminary construction schedule early in the development of the project. Seasonal weather conditions impact many construction activities and strategic schedule and sequence planning can facilitate construction, as well as minimize impacts on stormwater. Timing can be especially important in areas at higher elevation because of the generally limited duration of a construction season. Careful planning is needed to minimize the potential impact of construction near streams and the shoreline, for stream and river crossings (pipelines and utilities), and for projects that require revegetation during the short growing season.

Present the conceptual plan and preliminary construction schedule to the local permitting agency staff for feedback before proceeding further with the design drawings. For larger projects, this would likely take the form of a pre-application meeting. This important check-in is recommended in order to save time and money later in the process.

Step 4—Characterize Stormwater Flows (Run-on and Runoff)

Evaluate the characteristics of the run-on that enters the site from adjacent and upstream properties, as well as the runoff that will be discharged from the site following development or redevelopment. Consider the following, which will potentially influence the quantity (volume), peak flow, and quality of run-on to and runoff from the site:

- Upstream activities currently affecting the site
- Planned upstream land use likely to affect the site in the future
- Type and capacity of the downstream receiving water or drainage system
- Amount of impervious area planned for the site

- Activities that will take place on the site (e.g., industrial and commercial activities may generate different pollutants and may require different BMPs than residential activities)

Perform hydrologic calculations for both the pre-developed and post-development stages, with upstream and downstream conditions in mind. Use local design standards for flood control and water quality control, or those suggested in Appendix D if no local standards exist. Calculate the required volume and peak flow of the discharge and determine the amount of runoff to be detained and/or treated on site. Appendix D contains guidance for calculating runoff.

Step 5- Evaluate BMPs

The selection of BMPs should be based on BMP performance goals, identified in Step 2, and the physical constraints of the development site. The treatment requirements of local jurisdictions vary, and must be considered in the selection of BMPs. Site suitability is a key factor to successful BMP performance, especially for structural BMPs. Physical site constraints may include soil suitability, depth to water table, depth to bedrock, slope and watershed size. In many instances, individual BMPs may be modified to account for site constraints, while in other cases, it may eliminate a BMP facility as an option altogether.

Table 4.1 shows site selection criteria and site selection restrictions for each BMP. Use the table to give a general sense of the BMPs that could be appropriate for your site. The table also shows which BMPs should be eliminated from further consideration due to restrictive site-specific conditions. The following describes the information presented in Table 4.1

- Targeted pollutants - an indication is given of the expected pollutant removal effectiveness for typical pollutants of concern in urban stormwater runoff: sediment, phosphorus, trace metals (e.g., lead, copper, cadmium), bacteria, and petroleum hydrocarbons (e.g., gasoline, oil and grease). Estimated values are provided for phosphorus and sediment removal for most of the permanent BMPs, based on available data from other areas. For the other pollutants, a more qualitative estimate is provided through full, half, and empty circles. A full circle on the table indicates that the BMP is very effective at controlling the pollutant (70 percent or greater of the pollutants may be removed). A half-filled circle represents moderate effectiveness (greater than or equal to 30 percent and less than 70 percent of the pollutants may be removed). Finally, an empty circle indicates little or no

effectiveness (less than 30 percent of the pollutants may be removed).

- Drainage area - The maximum contributing drainage area for the BMP
- Maximum slope - The maximum allowable site slope for placement of the BMP
- Minimum depth to bedrock - The minimum allowable depth to bedrock for placement of a BMP on a site
- Depth to high water table - The minimum allowable depth to the high water table for locating a BMP on a site
- NRCS soil type - Soil type is classified as A, B, C or D. A has the best infiltration rate (e.g., sands), while D allows little or no infiltration (e.g., clays). The BMP is best suited for the soil types given on the table.
- Use with freeze/thaw cycle - BMP performance during the winter and spring freeze/thaw cycles are indicated as good, fair or poor.
- Drainage/flood control - A checkmark in this column of the table indicates that the BMP can be used to provide drainage and flood control as well as water quality control.

Pollutant removal has become one of the main objectives for using BMPs. The quantification of efficiency of BMPs has often centered on examinations and comparisons of “percent removal” defined in a variety of ways. There is no single value for percent pollutant removal for a particular BMP. Pollutant removal efficiency is site specific and highly variable between storm events even within the same area. Assuming routing and design volumes are properly designed, BMP performance will vary with influent loadings and characteristics.

BMPs do not typically function with a uniform percent removal across a wide range of influent water quality concentrations. For example, a BMP that demonstrates a large percent removal under heavily polluted influent conditions may demonstrate poor percent removal where low influent concentrations exist. Other factors that affect variability in BMP water quality performance include active pollutant removal mechanisms, BMP design characteristics, and conditions within the BMP.

The goal in watershed management should be to reduce the pollutant load either through source control (the most effective way to do it) or through multi-stage treatment (treatment trains). Although individual BMPs may be less effective on a percent basis, if they cumulatively still result in a lower effluent concentration (or load), they benefit the watershed.

Choose BMPs for the construction phase and select other BMPs for permanent control of stormwater pollution after the construction is complete. Some temporary BMPs, such as earth berms, can be converted to permanent facilities after construction is complete.

Some site situations, such as steep slopes, will severely limit options in selecting BMPs. Steep slopes will require more complex engineering and BMPs tend to be structural in nature, requiring less land space than facilities on flat sites. Plan to include slope protection and vegetative controls on the site to reduce the amount of erosion and sediments in site runoff. Also investigate upstream conditions and eliminate any off-site sources of sediment from neighboring properties. After applying these measures, if high sediment loads are still unavoidable, select a detention facility that will initially treat the stormwater through simple settling. Use stormwater filters and vegetated detention only after pretreatment settling has been applied to reduce the sediment load. Otherwise excessive sediment may clog the infiltration facilities and damage vegetation.

Where quantity control is an issue, consider an off-line water quality facility. In this situation, the water quality device is located off-line from the primary drainage facility. The water quality portion is designed only to treat a small volume of water, typically associated with smaller, more frequent storm events. The runoff from large storm events bypasses the facility to avoid flooding. In this type of combination system, stormwater runoff is directed to off-line facilities through flow-splitting and diversion structures.

Consider combining BMPs to improve effectiveness. Combination or "treatment train" facilities (i.e., several facilities in a row or series) can be designed so that upfront facilities pretreat the runoff, allowing the main device to function optimally. This concept also allows different mechanisms to clean different portions of the pollutant load. For example, sedimentation ponds are good at removing coarse particulates but are not effective with dissolved pollutants.

Incorporate source controls in your site design. Source controls are stormwater BMPs that prevent pollutants from ever entering a stormwater system. Compared to treatment controls, source controls are more cost effective for controlling stormwater pollution on a site. Some examples of source controls are as follows:

- Providing covered (roofed) structures for outdoor storage or outdoor work areas to prevent rain from washing pollutants off the site.

- Preventing run-on into storage areas by using properly designed berms or grading around storage areas.
- Using designated vehicle wash areas and disposing wash water into the sanitary sewer, where allowed.

Industrial sites can have more toxic pollutants on site compared to commercial or residential sites. Consequently, the BMPs used on an industrial site will be different from those used on a commercial or residential site. When planning for stormwater controls on an industrial site, use source controls that reduce or remove toxic pollutants before you use treatment controls. Treatment controls may still be needed, however, to treat pollutants that are not completely removed by source controls.

Treatment controls are more comprehensive and more costly than source controls. Treatment controls for industrial sites may require installing or constructing water quality controls, such as oil/water separators and water quality inlets, or hydraulic controls, such as retention ponds. Each industrial site must be evaluated to determine which BMPs (either singly or in combination) will be appropriate for a site. In addition, some controls are less costly to install during new construction than to retrofit afterwards. Therefore, design professionals should consider what potential pollutants may originate from the site throughout the life span of the facility, not just during construction.

When planning source control and treatment control BMPs for a site, consider how the controls can be used together (that is, multiple systems). Multiple systems can remove pollutants more effectively than individual source and treatment control BMPs. Also, multiple systems can provide additional secondary benefits such as controlling floods, enhancing fish and wildlife habitats, providing aesthetics and recreation, and complying with landscaping requirements.

Step 6—Prepare Preliminary Project Design (Stormwater Site Plan)

A stormwater site plan is recommended for all new developments, whether industrial, commercial or residential. A stormwater site plan should include the following elements:

- Project overview (brief description)
- Site plans (attach)
- Preliminary conditions summary, including soil types and depth to high groundwater (see Appendix C for directions on how to collect this information)

- Identification of adjacent land uses and environmentally sensitive areas (such as wetlands, natural streamside riparian areas which provide wildlife habitat, or other areas designated by the local permitting agency)
- Analysis of off-site upstream and downstream conditions, including capacity of the downstream system
- Hydrologic calculations
- Plan for design and placement of proposed construction BMPs, including erosion controls (construction BMP plan)
- Design and placement of proposed permanent stormwater BMPs (include preliminary sizing calculations)
- Operation and maintenance plan for the temporary and permanent stormwater BMPs
- Other permits for the site (either issued or planned)

An example stormwater site plan is included in Appendix E. If permanent BMPs are not planned for the site, provide a rationale for why this is not necessary (e.g., low risk) or not possible (e.g., space constraints). In such cases, the local agency staff may not agree with the rationale and may provide assistance to select and locate appropriate BMPs.

Step 7—Prepare the Preliminary Landscape Plan

When designing the site landscape plan and choosing plants for vegetated stormwater BMPs, consider using species of trees, shrubs, plants, and grasses that are native to the area. In this way, irrigation will only be required during the plant establishment period (typically one to two years, depending on the particular species). Using native plants reduces water, pesticide/herbicide, and fertilizer use. Additionally, use of native plants in stormwater BMPs will help ensure proper plant establishment and performance of the BMP.

Properly selecting the plants and preparing the site are crucial to successful plant establishment. Plants should be planted during favorable planting and seeding seasons. In addition, irrigating, mulching, and providing weed and pest control on the site may be necessary to encourage proper plant growth.

Step 8—Submit the Preliminary Project Design

Present the preliminary project design or stormwater site plan and preliminary landscape plan to the local permitting authority for approval before proceeding further. Use the opportunity to ask questions, if any, about the permit application forms or fee.

All submittals should include the preliminary design calculations to demonstrate that the facilities will meet the applicable standards. It is recommended that professionals licensed in the State of Idaho prepare the submittal or oversee its preparation.

Step 9—Complete the Design

Once the preliminary plans have been approved, complete the final plans for design and construction of the project. In addition to the plans normally required for development (e.g., grading and drainage, building), the final design package should include:

- Type and location of BMPs for use during construction (Stormwater Pollution Prevention Plan or Erosion and Sediment Control Plan)
- Size/design and location of permanent stormwater BMPs
- Landscape plan
- Maintenance plan for BMPs and vegetation during construction and after construction

Prepare a maintenance plan that outlines the scope of activities, schedule, and parties responsible for inspecting and maintaining the stormwater BMPs on the site. At a minimum, the maintenance plan should identify safety provisions, site access, sediment disposal, and vegetation maintenance.

In cases when the sediment is suspected to contain a high level of pollutants, include provisions in the maintenance plan for testing the sediment. For example, if the site is located in an area with a history of upstream industrial spills, then testing could include parameters such as oil and grease, metals, or nutrients. Store and dispose of sediments removed from stormwater BMPs in accordance with applicable local, state, and federal regulations.

Step 10—Submit Final Plan and Obtain Permits

Submit the final documents to the appropriate permitting agency for final approval and permitting. More than one permit may be required for the site and more than one agency may be involved. This will include, at a minimum, approvals from the local municipality and/or local highway jurisdictions and the filing of a Notice of Intent with the EPA and preparation of a Stormwater Pollution Prevention Plan, if the construction site is larger than one acre or part of a larger plan of development.

Step 11— Install and Maintain BMPs

Once the permits are obtained, the final construction schedule can be developed. The following points should be kept in mind when establishing the schedule:

- Comply with seasonal restrictions for earthmoving and exposed soil established by the local permitting authority.
- Schedule installation of BMPs. Some of the temporary BMPs should be installed before earthmoving activities begin.
- Implement housekeeping BMPs (e.g., covering stockpiles) as soon as possible after the project breaks ground.
- Schedule regular inspections of the site and the stormwater BMPs throughout the construction process and repair or replace BMPs as needed.
- Maintain the BMPs as specified in the maintenance plan.
- Schedule removal of the temporary BMPs (or retrofit them for permanent use) at the end of the construction project.