CHAPTER 2: PLANNING PRACTICES
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2.1 PLANNING - THE BASIS OF SMART DEVELOPMENT

Avoiding the adverse effects of development requires comprehensive planning. Studies by the USGS National Water Quality Assessment (NAWQA) program in the last decade have shown that the water quality and aquatic health of any given area reflect a complex combination of land and chemical use, land management practices, population density, watershed development and natural features such as soils, geology, hydrology and climate. Contaminant concentrations vary from rainy to dry season and watershed to watershed - even among seemingly similar land uses and pollution sources, different areas can have very different degrees of vulnerability (Southeast Watershed Forum, 2001).

Better site design reduces impervious cover, conserves natural areas and prevents stormwater pollution. Fitting the new home or development into the natural topography and existing landscape is an important part of the overall planning process. By following natural contours and features you can minimize clearing, reduce pollution potential, and provide more open space to enhance property values and aesthetics. In addition to structural and non-structural best management practices (BMPs), planning elements also include growth management, land use planning, long-term operation and maintenance, and public education (CH2MHill, 1998). This chapter presents planning strategies and practices that can be used during the initial phases of development to reduce nonpoint source pollution while enhancing land values.

2.2 KNOW YOUR SOILS

The first step to minimize problems involving land use and development is to know the soils and select the best possible site for the intended use. Soil properties have a strong effect on the way that people use and should use the land. With the limited flat land in the Virgin Islands (much of that subject to flooding), development will increase on steeper upland areas. Soil properties of this land need to be determined prior to development to prevent costly mistakes.

The *Soil Survey of the Virgin Islands* (USDA-NRCS, 1995) provides vital information necessary to plan development. It is a basic inventory of the soil resources of the islands. The survey includes soil maps, soil descriptions, and soil interpretations. Soil maps depict soil boundaries and other features, such as guts and roads. The Soil Survey describes the characteristics and properties of each kind of soil in the Virgin Islands, including soil texture (sand, silt or clay), slope, depth, erodibility, permeability, degree of wetness, and other information useful to land developers. It can be used as a tool in determining soil limitations for many rural and suburban uses and in selecting sites and designing structures to minimize soil related problems.

Soils are rated according to their limitations for a given use. These limitations are described as either slight, moderate, or severe. Soils with slight limitations have few problems that limit their use for a given purpose. Moderate limitations can be overcome with careful planning and design of structures. Severe limitations indicate the need for very careful consideration of a site prior to development. In some instances, the cost of overcoming a limitation may be excessive.

Some of the common soil-related limitations in the Virgin Islands are flooding, high shrink-swell potential, high erodibility, very steep slopes, shallow or stony soils, and excessively dry climate. Examples of problems resulting from these limitations include collapsing roadbeds, flooded buildings, cracking and failing building foundations, malfunctioning septic systems, excessive erosion, and sedimentation damage. Measures necessary to help overcome these problems are much easier to identify in the planning phase by using the Soil Survey. The Soil Survey can also be used to map sensitive areas, such as steep slopes and highly erodible soils, wetlands, and gut corridors. Further information on the soils of the Virgin Islands can be obtained from the USDA Natural Resources Conservation Service, the UVI Cooperative Extension Service, or the V.I. Department of Agriculture.

2.3 WATERSHED PLANNING

A ***watershed*** is the area of land that drains water, soil, and pollutants to a common outlet along the coastline (bay, lagoon or other coastal area). Watersheds are of different sizes and can be subdivided to the smallest area with an outlet. Large watersheds, like Coral Bay or Benner Bay, have many outlets into common nearshore areas. Since all land within a watershed drains to a common outlet, any activity on that land will affect downstream areas of the watershed and the bays or coastal areas the watershed drains into. Pollutants found in stormwater runoff can be easily carried from the land into a watershed's guts and drainage ways, eventually finding their way to salt ponds, and coastal and ground waters.

The Basics of Watershed-Smart Development

1. Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance and service vehicle access (widths should be based on traffic volume).
2. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.
3. Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.
4. Create a variable-width, naturally vegetated buffer system along all guts that includes critical features like floodplains, steep slopes, and wetlands .
5. Limit clearing and grading of forests and native vegetation to the minimum amount needed to build lots, allow access and provide fire protection. Manage a fixed portion of any community open space as protected green space.
6. Encourage incentives such as density compensation, buffer averaging property tax reduction, stormwater credits, and by-right open space development to promote conservation of gut buffers, forests, grass-lands, and other valuable areas.
7. Do not discharge unmanaged stormwater from new stormwater outfalls into jurisdictional wetlands, sole-source aquifers or other water bodies.

(From Southeast Watershed Forum, 2001)

Pollution due to stormwater runoff (a ***nonpoint source***) from urbanizing watersheds differs from point source pollution (discharge of pollutants from a single outlet such as a sewer pipe or a wastewater pipe) in many ways:

- Nonpoint sources generally cannot be monitored at their point of origin because their exact source is difficult or impossible to trace.
- Nonpoint source pollution is cumulative: it results from many actions by many different people, animals and/or businesses, and is often spread over wide areas.
- The extent of nonpoint source pollution may vary from place to place and from year to year, depending on geography, geology, weather and human activities.
- Nonpoint source pollution control requires more than structural solutions. Effective control requires the use of comprehensive planning and best management practices, combined with public education, economic incentives, and, in some cases, regulations.

Comprehensive planning is an effective nonstructural tool that can control ***nonpoint source pollution*** from urbanizing areas. Poorly planned growth and development have the potential to degrade and destroy entire watersheds and coastal ecosystems (Mantel et al., 1990). Where possible, growth should be directed to areas where it can be sustained with a minimal impact on the natural environment. While stormwater runoff treatment practices (those that remove or reduce pollutants in stormwater) are an important method of reducing water pollution, a combination of pollution prevention and treatment practices is most effective. Planning, design, and education practices in combination with treatment practices are generally more effective, require less maintenance, and are more cost-effective in the long-term than treatment practices alone (U.S. EPA, 1993).

The primary opportunities to control pollutants in stormwater runoff occur during the siting and design phase; the construction phase; and the post-construction phase. Before construction occurs, a number of pollution prevention options, such as setbacks, buffers, or open space requirements, are available to the property owner. Siting requirements, restrictions and other land use ordinances, such as zoning, are also more easily implemented during this period. These practices protect environmentally sensitive areas such as wetlands and vegetative buffers that filter and trap sediments, nutrients, and chemical pollutants. After construction has occurred, these options may no longer be practicable or cost-effective. Table 2.1 describes the general steps to take in developing a watershed management plan.

Table 2.1. Watershed Management: A Step-by Step Guide (Livingston and McCarron, 1992).

1. **Delineate and map watershed boundary and sub-basins within the watershed.**
2. **Inventory and map natural stormwater conveyances and storage systems.**
   (Guts, ponds, salt ponds, etc.)
3. **Inventory and map existing man-made stormwater conveyances and storage systems.**
   This includes all ditches, swales, storm sewers, detention ponds, and retention areas and includes information such as size, storage capacity and age.
4. **Inventory and map existing land uses by sub-basin.**
5. **Inventory and map detailed soils by sub-basin.**
6. **Establish a clear understanding of water resources in the watershed.**
   Analyze water quality, sediment, and biological data. Analyze subjective information on problems (such as citizen complaints). Evaluate waterbody use impairment — frequency, timing, seasonality of problem. Conduct water quality assessment — low flows, seasonality.
7. **Inventory pollution sources in the watershed.**
   Point sources — location, pollutants, loadings, flow, capacity, etc. Nonpoint sources — type, location, pollutants, loadings, etc.
   - land use/loading rate analysis for stormwater;
   - sanitary survey for septic systems; and
   - dry flow monitoring to locate illicit discharges.
8. **Identify and map future land uses by sub-basin.**
   Conduct land use loading rate analyses to assess potential effects of various land use scenarios.
9. **Identify planned infrastructure improvements — 5-year, 20-year.**
   Stormwater management deficiencies should be coordinated and scheduled with other infrastructure development projects.
10. **Analysis.**
    Determine infrastructure and natural resources management needs within each watershed.
11. **Set resource management goals and objectives.**
    Before corrective actions can be taken, a resource management target must be set. The target can be defined in terms of water quality standards; attainment and preservation of beneficial uses; or other resource management objectives.
12. **Determine pollutant reduction (for existing and future land uses) needed to achieve water quality goals.**
13. **Select appropriate management practices (point source, nonpoint source) that can be used to achieve the goal.**
    Evaluate pollutant removal effectiveness, land owner acceptance, financial incentives and costs, availability of land, operation and maintenance needs, feasibility, and availability of technical assistance.
14. **Develop watershed management plan.**
    Develop watershed management plan specific to the area, including such elements as:
    - existing and future land use plan;
    - master stormwater management plan that addresses existing and future needs;
    - wastewater management plan including septic system maintenance programs; and
    - infrastructure and capital improvements plan.

The Center for Watershed Development has developed a manual of **better site design principles** (CWP, 1998) for the national Site Planning Roundtable that proscribes innovative and effective resource management techniques to protect waterways, estuaries and coastal habitats. The principles revolve around the theory that the suburban landscape consists of three habitats: the car habitat (roads, driveways, and parking lots), the human habitat (where we live and work, including our homes and yards), and open spaces and natural areas that are relatively undeveloped (CWP, 1998). Table 2.2 describes the 22 site design principles by habitat category.

2.4 SITE PLANNING PRACTICES

Site planning practices apply to individual sites rather than watersheds or regional drainage basins. The goal of site planning is to reduce pollution generation and to minimize the impacts of stormwater runoff and associated pollutants. The basic premise is that effective site layouts and designs can reduce the need for conventional structural BMPs, reducing development costs (CH2MHill, 1998). Tables 2.3-2.6 (pages 2.7 - 2.9) contain checklists developed by EPA for use in designing stormwater pollution prevention plans for construction sites greater than 1 acre, pursuant to EPA stormwater regulations. These checklists can be used by Virgin Islands developers and contractors to design pollution prevention plans.

Table 2.2. Model development principles for better site design (CWP, 1998).

Residential Streets and Parking Lots

1. Design residential streets for the minimum required pavement width needed to support travel lands; on-street parking; and emergency, maintenance, and service vehicle access. These widths should be based on traffic volume.
2. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.
3. Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels (swales).
4. Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.
5. Where density, topography, soils, and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.
6. The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.
7. Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.
8. Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas.
9. Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.
10. Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter/buffer strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.

Lot Development

11. Advocate open space development that incorporates smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.
12. Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.
13. Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.
14. Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.
15. Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing both natural and recreational open space.
16. Direct rooftop runoff (any not captured by cisterns) to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.

Conservation of Natural Areas

17. Create a variable width, naturally vegetated buffer system along all guts that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and wetlands.
18. The riparian buffer (around guts) should be preserved or restored with native vegetation that can be maintained throughout the delineation, plan review, construction, and occupancy stages of development.
19. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to built lots, allow access, and provide fire protection. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.
20. Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native plants. Wherever practical, manage community open spaces, street rights-of-way, parking lot islands, and other landscaped areas to promote natural vegetation.
21. Incentives and flexibility in the form of density compensation, buffer averaging, property tax reduction, stormwater credits, and by-right open space development should be encouraged to promote conservation of stream/gut buffers, forests, grass lands, and other areas of environmental value. In addition, off-site mitigation consistent with locally adopted watershed plans should be encouraged.
22. New stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, sole-source aquifers, or sensitive areas.

Objectives of site planning practices

The following objectives should be incorporated into the site development process:

- Disturb the smallest area necessary for current construction activities in order to reduce erosion and soil loss;
- Avoid disturbing unstable soils or soils especially susceptible to erosion and soil loss, and favor sites where development will minimize erosion and soil loss;
- Protect and retain native plants as much as possible in order to decrease stormwater runoff, filter and/or absorb pollutants, and maintain site hydrology;
- Minimize the percentage of impervious area on the site;
- Avoid alteration, modification or destruction of guts and other natural drainage features on the site (V.I. Code (V.I. DCCA, 1979) requires a permit to cut any tree within 25 feet of the edge of a gut);
- Design sites to preserve natural buffers adjacent to guts, salt ponds and coastal waters; and
- Minimize water quality impacts from landscaping activities by applying chemicals properly (see Good Housekeeping Practices, section 2.6).

Site planning and evaluation are extremely important – they can significantly reduce sediment control practice costs by minimizing erosion and keeping sediment on the construction site. Long-term maintenance efforts and costs can also be significantly reduced. While designing the site, planners should identify sensitive areas and land forms that can provide water quality protection, target these areas for preservation or conservation, and incorporate them into the site design. Highly erodible soils should not be disturbed. By locating development away from highly erodible soils, erosion and sedimentation can be significantly reduced. Sediment loads from developing areas where new construction is occurring can be 5 to 500 times greater than loads from undeveloped areas (Gray and Leiser, 1982). Because of the adverse effects of sedimentation (as described in Chapter 1) and the many nonpoint source pollutants (including heavy metals and nutrients) that can be attached to sediment, it is important to limit the volume of sediment entering coastal waters.

What are site planning practices that can be used to reduce runoff, erosion and sedimentation?

- **Phasing and Limiting Areas of Disturbance –** Erosion potential can be reduced by **not** clearing and grading all post-development buffer zones, configuring the site plan to retain large areas of open space, and phasing construction to limit the amount of disturbed area at any given time.
- **Low Disturbance/Low Maintenance –** This site development approach allows clearing and site grading only within a carefully defined building area, preserving and protecting the surrounding natural vegetation. Landscape designs should avoid exotic plants that need large amounts of water, fertilizers and pesticides. Rare, threatened, and endangered species should be preserved. Retaining existing vegetation holds the soil in place and helps to reduce runoff volume and rate, reducing erosion. Low disturbance/low maintenance strategies also minimize fertilizers and pesticide applications that can pollute coastal waters and harm fish and reef habitats.
- **Cluster Development –** Concentrate development and construction activity on a limited area of a site, leaving the remaining area undisturbed. Clustering promotes the design of more effective stormwater runoff, erosion and sediment control practices, helps preserve environmentally sensitive areas, and reduces impervious area.
- **Site Fingerprinting –** Fingerprinting reduces the total amount of disturbed area within a site by placing development away from environmentally sensitive areas (wetlands, guts, floodplains, steep slopes, etc.). At a subdivision or lot level, ground disturbance is confined to areas where structures (buildings, septic system), driveways and roads will exist after construction is complete.

- **Setbacks and Buffers –** Setbacks provide an area between buildings, parking lots and roads and protected areas such as salt ponds, guts, shorelines, or wetlands. A buffer strip is the transitional vegetated area closest to the water body or wetland. Buffers are designed to minimize erosion, stabilize gut banks or shorelines, filter runoff pollutants from adjacent developments, preserve fish and wildlife habitat, provide privacy screening and preserve aesthetic value, and provide access for maintenance or trails (CH2MHill, 1998).
- **Preserving Natural Drainage Channels –** Natural drainage features (guts) should be preserved during development because of their ability to absorb and reduce stormwater runoff flows and to filter pollutants. V.I. Code (V.I. DCCA, 1979) requires a permit to cut any trees within 25 feet of the edge of a gut. Cluster development can be used to preserve guts and allow for incorporation of these features into a site design.
- **Minimizing Impervious Areas –** Impervious areas prevent the infiltration of rainfall into the soil, leading to increased volumes and rates of stormwater runoff. Some practices to minimize impervious areas include: reducing street and sidewalk widths; reducing the use of storm sewers, using permeable materials for sidewalk and driveway construction; requiring open spaces; and/or using porous or cellular pavement.
- **Encourage Xeriscaping –** Xeriscaping is a landscaping method that maximizes water conservation by using drought-tolerant native species. Xeriscaping can reduce landscape maintenance by as much as 50% by reducing watering requirements and fertilizer and pesticide applications (U.S. EPA, 1993). (Contact the USDA Natural Resources Conservation Service or the UVI Cooperative Extension Service for more information on xeriscaping with native plants.)
- **Development Designed to Fit Site Topography –** Creating a design that avoids the need for major grading changes will reduce project expense, soil compaction, destruction of natural drainage ways, and loss of site diversity. By varying lot sizes and building styles and by using at least limited clustering, the need for mass grading can be significantly reduced.

2.5 DEVELOPMENT PLANNING PRACTICES

Planning practices are used to avoid impacting areas that are particularly susceptible to erosion and soil loss; to preserve areas that provide important water quality benefits and/or are necessary to maintain wetland or aquatic ecosystems; and to locate development, including roads, highways, and bridges, to protect the natural integrity of water bodies and natural drainage systems. All of these practices will minimize runoff, erosion and sedimentation.

2.5.1 Pollution Prevention Management Plan

The most effective way to minimize runoff, erosion and sedimentation before and after construction is to implement a ***pollution prevention management plan***. A pollution prevention management plan is a comprehensive approach that addresses the needs of a site or watershed, including land use, stormwater, erosion and sediment control practices, pollutant reduction strategies, and pollution prevention techniques. Before developing a pollution prevention management plan you must first define site, sub-watershed and/or watershed boundaries, target sensitive areas, identify pollutants of concern, and conduct a resource inventory and information analysis. Once environmentally-sensitive areas are identified, areas essential to safeguard coastal waters and prevent nonpoint source pollution can be protected.

The components of a pollution prevention management plan

A pollution prevention management plan must have defined, measurable goals (for example, maintaining runoff volumes at a calculated level relative to undeveloped conditions) in order to be effective. Design and implementation specifications for runoff, erosion and sediment control practices are then incorporated into the plan as methods to achieve the goal. This type of planning is especially necessary when designing larger developments requiring a major permit (i.e., developments greater than 1 acre).

Pollution prevention management plan implementation

Once critical areas, land use designations and goals have been identified, defined and established, management plan implementation strategies can be developed (i.e., once you have followed the steps in Table 2.1). The following are examples of implementation tools that have been successful at controlling nonpoint source pollution:

- Infrastructure planning;
- Limits on impervious surfaces, encouragement of open space and cluster development;
- Setbacks (buffer zones);
- Slope restrictions;
- Site plan reviews;
- Mapping; and
- Environmental impact assessment statements (U.S. EPA, 1993).

Table 2.3. EPA Baseline Construction General Permit Requirements: Pre-Construction Checklist (U.S. EPA, 1992).

STORMWATER POLLUTION PREVENTION PLANS

1. **A site description, including:**
   - ☐ **The nature of the activity**
   - ☐ **Intended sequence of major construction activities**
   - ☐ **The total area of the site**
   - ☐ **The area of the site that is expected to undergo excavation**
   - ☐ **The runoff coefficient of the site after construction is complete**
   - ☐ **Existing soil or stormwater data**
   - ☐ **A site map with:**
     - ☐ **Drainage patterns**
     - ☐ **Approximate slopes after major grading**
     - ☐ **Area of soil disturbance**
     - ☐ **Outline of areas that won't be disturbed**
     - ☐ **Location of major structural and non-structural controls**
     - ☐ **Areas where stabilization practices are expected to occur**
     - ☐ **Surface waters**
     - ☐ **Stormwater discharge locations**
   - ☐ **The name of the receiving water(s)**

2. **A description of controls:**
   - 2.1 **Erosion and sediment controls, including:**
     - ☐ **Stabilization practices for all areas disturbed by construction**
     - ☐ **Structural practices for all drainage/discharge locations**
   - 2.2 **Stormwater management controls, including:**
     - ☐ **Practices used to control pollutants occurring in stormwater discharges after construction activities are complete**
     - ☐ **Velocity dissipation devices to provide non-erosive flow conditions from the discharge point along the length of any outfall**
   - 2.3 **Other controls including:**
     - ☐ **Waste disposal practices that prevent discharge of solid materials to waters of the U.S.**
     - ☐ **Practices to minimize offsite tracking of sediments by construction vehicles**
     - ☐ **Practices to ensure compliance with Federal and Territorial waste disposal, sanitary sewer, and septic system regulations**
   - 2.4 ☐ **Description of the timing during construction when practices will be implemented**

3. ☐ **Are Federal and Territorial requirements incorporated into the plans?**

4. ☐ **Are Maintenance procedures for control measures identified in the plan?**

5. ☐ **Identification of allowable non-stormwater discharges and pollution prevention practices**

6. ☐ **Contractor certification**

7. ☐ **Plan certification**

Table 2.4. Stormwater Pollution Prevention Plan: Construction/Implementation Checklist (U.S. EPA, 1992).

1. Maintain records of construction activities, including:
- ☐ **Dates when major grading activities occur**
- ☐ **Dates when construction activities temporarily cease on a portion of the site**
- ☐ **Dates when construction activities permanently cease on a portion of the site**
- ☐ **Dates when stabilization measures are initiated on the site**

2. Prepare inspection reports summarizing:
- ☐ **Name of inspector**
- ☐ **Qualifications of inspector**
- ☐ **Practices/areas inspected**
- ☐ **Observed conditions**
- ☐ **Changes necessary to the Stormwater Pollution Prevention Plan**

3. Report releases of reportable quantities of oil or hazardous materials (if they occur):
- ☐ **Notify the National Response Center 1-800-424-8802 immediately**
- ☐ **Notify DPNR in writing within 14 days**
- ☐ **Modify the pollution prevention plan to include:**
  - **the date of release**
  - **circumstances leading to the release**
  - **steps taken to prevent re-occurrence of the release**

4. Modify pollution prevention plan as necessary to:
- ☐ **Comply with minimum permit requirements when notified by EPA that the plan does not comply**
- ☐ **Address a change in design, construction, operation or maintenance that has an effect on the potential for discharge of pollutants**
- ☐ **Prevent re-occurrence of reportable quantity releases of a hazardous material or oil**

Table 2.5. Pollution Prevention Plan for Stormwater Discharge Associated with Construction Activities: Erosion and Sediment Control Checklist (U.S. EPA, 1992).

INSTRUCTIONS: THIS CHECKLIST LISTS THE MINIMUM SEDIMENT EROSION CONTROL REQUIREMENTS UNDER THE US EPA GENERAL PERMIT. CHECK EACH ITEM AND FILL IN THE BLANKS BELOW TO EVALUATE COMPLIANCE FOR EACH DRAINAGE AREA AND LOCATION.

STABILIZATION PRACTICES

☐ Stabilization will be initiated on all disturbed areas where construction activity will not occur for a period of more than 21 calendar days by the 14th day after construction activity has permanently or temporarily ceased.

Stabilization practices to be used include:

☐ Temporary Seeding	☐ Sod Stabilization	☐ Filter Fabrics
☐ Permanent Seeding	☐ Mulching	☐ Other _____

STRUCTURAL PRACTICES

☐ Flows from upstream areas will be diverted from exposed soils. Practices to be used include:

☐ Drainage Swale ☐ Diversion Dike/Swale ☐ Other _____

Drainage areas less than 10 disturbed acres	**Drainage areas of 10 or more disturbed acres**
☐ Sediment controls will be installed	☐ A sediment basin will be installed
Sediment controls include: ☐ Sediment Basin ☐ Sediment Trap ☐ Silt Fence or equivalent controls along all sideslope and downslope boundaries	☐ A sediment basin is not attainable on the site; therefore, the following sediment controls will be installed: ☐ Sediment Trap ☐ Silt Fence or equivalent controls along the sideslope and downslope boundaries

Sediment Basin Storage Calculation

_____ acres area draining to the sediment basin
X
3,600 cubic feet of storage per acre*
=
_____ cubic feet of storage required for the basin

** For further discussion of storage requirements, refer to Chapter 3 and Appendix B, **Sediment Basins**.*

Table 2.6. Stormwater Pollution Prevention Plan: Final Stabilization/Termination Checklist (U.S. EPA, 1992).

1. ☐	**All soil disturbing activities are complete**
2. ☐	**Temporary erosion and sedimentation control Practices have been removed or will be removed at an appropriate time**
3. ☐	**All areas of the construction site not otherwise covered by a permanent pavement or a structure have been stabilized with a uniform perennial vegetative cover with a density of at least 70%, or equivalent measures have been employed**

2.6 GOOD HOUSEKEEPING PRACTICES

Good housekeeping refers to keeping a clean and orderly construction site. Good housekeeping practices and common sense prevent contamination of stormwater runoff from construction site chemicals. Good housekeeping practices can reduce accidental spills, improve spill response times, and reduce safety hazards. These practices are inexpensive, relatively easy to implement, and are often effective in preventing stormwater contamination. They can also reduce costs by preventing unnecessary loss of products.

Different types of good housekeeping practices

There are three areas related to good housekeeping on a construction site that should be addressed in each watershed or site development plan. These areas are: proper disposal of building material wastes; proper storage and handling of chemicals used on the construction site; and implementation of a spill prevention and control plan.

2.6.1 Waste Disposal

Proper management and disposal of building materials and other construction site wastes is an important part of pollution prevention. Sources of pollution include surplus or refuse building materials as well as hazardous wastes. All controls and practices must meet the requirements of your Earth Change or CZM Permit and other Federal and Territorial requirements your site is subject to.

This section discusses some of the waste materials encountered at construction sites and, in general, how they should be stored and handled to minimize their exposure to stormwater. However, you should contact the Department of Public Works (DPW) to find out more about waste disposal regulations, or the Department of Planning and Natural Resources (DPNR) to find out how to safely handle, store and dispose of hazardous and toxic chemicals.

2.6.1.a Construction Wastes

Construction projects tend to generate large amounts of solid waste materials that are unique to this activity. These wastes may include, but are not limited to:

- Trees and shrubs removed during clearing and other phases of construction;
- Packaging materials (wood, paper, plastic, cardboard, etc.);
- Scrap or surplus building materials (scrap metals, rubber, plastic and glass pieces, masonry products, etc.);
- Paints and paint thinners; and
- Materials generated by structure demolition (rubble).

Steps to be taken to properly dispose of construction wastes

- Select a designated waste collection area onsite;
- Provide an adequate number of containers with covers;
- Locate containers in a covered area, when possible;
- Arrange for waste collection before containers overflow;
- Provide immediate clean-up in the event of a spill;
- Plan for additional containers and more frequent pick-ups during demolition phases;
- Make sure that construction waste is collected, removed and disposed of only at authorized disposal areas; and
- Check with DPW or DPNR for specific guidance.

2.6.1.b Hazardous Products

Many materials found at construction sites may be hazardous either to personnel or to the environment. Always read the labels of the materials and products present onsite--they may contain warning information that will help you be aware of potential problems. Hazardous products at a construction site include, but are not limited to:

- Paints;
- Acids for cleaning masonry surfaces;
- Cleaning solvents;
- Chemical additives used for soil stabilization;
- Concrete curing compounds and additives; and
- Pesticides, herbicides, fungicides, and rodenticides.

Basic management practices that can minimize or prevent contamination of stormwater from hazardous products on construction sites

Most problems involving hazardous materials result from carelessness or from not using common sense. The practices listed below will help avoid problems associated with hazardous material disposal. Section 2.6.2 contains further information on hazardous material handling and storage and section 2.6.3 discusses spill prevention plans.

- Check with DPNR to determine the requirements for hazardous material disposal.
- Use all of the product before properly disposing of the container – if you must dispose of surplus products, do not mix products together unless specifically recommended by the manufacturer.
- Do not remove the original product label from the container, it contains important information.
- Follow the manufacturer's recommended method of disposal for the product and the empty container (often found on the label).

2.6.2 Material Management

Material management is important as the best way to avoid a problem is to prevent it at its source. On a construction site, the material storage area can become a major source of pollution due to the mishandling of materials or accidental spills. An inventory of the material storage area and of the site should be made. Special care should be taken to identify any materials that have the potential to come into contact with stormwater.

There are a number of risks (other than stormwater contamination) to consider in the management of materials on a construction site, including health and safety of employees and groundwater contamination. However, this section only addresses stormwater contamination risks. Contact DPNR for information about measures to minimize other risks.

Materials to be considered when evaluating potential risks

- Pesticides;
- Petroleum products;
- Fertilizers and detergents (nutrient sources);
- Construction chemicals;
- Other pollutants; and
- Hazardous products (see previous section).

Information to be evaluated for onsite risk assessment

- What types of materials are stored onsite?
- How long will the materials be stored before they are used?
- Are you storing more than is needed?
- How are the materials stored and distributed?
- How can potential contact with stormwater be avoided?

2.6.2.a Pesticides

Pesticides include insecticides, rodenticides, and herbicides commonly used on construction sites.

How to reduce the risks of using pesticides

- Handle the materials as infrequently as possible; and
- Observe all applicable Federal and Territorial regulations when using, handling or disposing of these materials.

Management practices that can be used to reduce risks from pesticide use

Management practices that can reduce the amount of pesticides coming into contact with stormwater include the following:

- Store pesticides in a dry covered area;
- Provide curbs, dikes or berms to contain potential pesticide spills;
- Have measures on site to contain and clean up pesticide spills; and
- Strictly follow recommended application rates and methods.

2.6.2.b Petroleum Products

Petroleum products include oil, gasoline, lubricants, and asphaltic substances such as paving materials. These materials should be carefully handled to minimize their exposure to stormwater. Petroleum products usually occur in two areas:

areas where road construction of some type is occurring and vehicle storage areas or areas of onsite fueling or equipment maintenance.

Practices that can be used to reduce the risks of using petroleum products

- Provide equipment to contain and clean up petroleum spills in fuel storage areas or on maintenance and fueling vehicles;
- Store petroleum products and fuel vehicles in covered areas;
- Contain and clean up petroleum spills immediately;
- Perform preventative maintenance of equipment used onsite to prevent leakage (e.g., check for and fix gas or oil leaks in construction vehicles on a regular basis); and
- Properly apply asphaltic substances (see manufacturer's instructions) to reduce spill risks;
- Build impervious dikes or berms to contain any spills; and
- Install oil/grease separators in stormwater inlets (see Chapter 4).

2.6.2.c Fertilizers/Detergents

The proper landscaping or revegetation of construction sites often requires using fertilizers and detergents that contain nutrients such as nitrogen and phosphorus. Excess quantities of these nutrients can be washed away by stormwater runoff and become a major pollution problem. Excess nutrients in wetlands and coastal waters can cause eutrophication and other pollution problems.

Practices that can be used to reduce the risks of nutrient pollution

- Only apply fertilizers when absolutely necessary to revegetate disturbed areas;
- Apply fertilizers to a minimum area and at the minimum recommended amount and rate (time-released fertilizers can be used);
- Work fertilizers into the soil to reduce exposure of nutrients to stormwater runoff;
- Seed and fertilize in one application (see section on Hydroseeding in Chapter 3); and
- Implement good erosion and sediment control practices to help reduce the amount of sediment and fertilizers that leave the site (see Chapter 3).

2.6.3 Spills

Spills of pesticides, petroleum products, or other toxic or hazardous products can contaminate soil, water and waste materials resulting in potential health risks. Preparations should be made to deal quickly and effectively with accidental spills. A spill control plan can help you be prepared. This section discusses your additional responsibilities if there is a reportable quantity spill.

A spill control plan should include methods to:

- Stop the source of the spill;
- Contain the spill (i.e., utilizing impervious liners and collection containment systems);
- Clean up the spill (i.e., filtration systems);
- Dispose of all materials contaminated by the spill; and
- Contact qualified personnel responsible for spill prevention and control.

Specific spill prevention methods and responses that can be used

- Store and handle materials to prevent spills.
  - Tightly seal containers.
  - Make sure all containers are clearly labeled.
  - Stack containers neatly and securely.
- Reduce stormwater contact if there is a spill.
  - Have cleanup procedures clearly posted.
  - Have cleanup materials readily available.
  - Contain any liquid.
  - Stop the source of the spill.
  - Cover the spill with absorbent material such as kitty litter or sawdust.
- Discard contaminated materials according to manufacturer's instructions or according to Federal or Territorial requirements.
- Identify personnel responsible for responding to a spill of toxic or hazardous materials.
  - Provide personnel spill response training.
  - Post names of spill response personnel.
- Keep the spill area well ventilated.
- If necessary, use a private firm that specializes in spill cleanup.

2.7 CONCLUSION

The importance of proper development planning and the use of good housekeeping practices cannot be overstated. It is cheaper in the long run, for both the developer and the community, to effectively plan a development to minimize pollution than to clean-up the effects of poor planning and management after the fact.

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