Chapter 3 - Preparation of Stormwater Site Plans

3.1 Introduction

The Stormwater Site Plan (SSP) is a comprehensive report containing all of the technical information and analysis necessary for regulatory agencies to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements. Preparation of an SSP constitutes 2.7.3 Core Element #2: Construction Stormwater Pollution Prevention. Contents of the SSP will vary with the type and size of the project, individual site characteristics, and special requirements of the local jurisdiction.

The scope of the SSP will also vary depending on the applicability of Core Elements (see Chapter 2 - Core Elements for New Development and Redevelopment).

This chapter describes the contents of the SSP and provides a general procedure for how to prepare the plan. The specific Best Management Practices (BMPs) and design methods and standards to be used are contained in Chapter 4 - Hydrologic Analysis and Design through Chapter 8 - Source Control. Guidelines for selecting runoff treatment and flow control BMPs are provided in Chapter 4 - Hydrologic Analysis and Design, Chapter 5 - Runoff Treatment BMP Design, and Chapter 6 - Flow Control BMP Design. The content of, and the procedures for preparing a Construction Stormwater Pollution Prevention Plan (SWPPP) are covered in detail in Chapter 7 - Construction Stormwater Pollution Prevention. Guidelines for selecting source control BMPs are provided in Chapter 8 - Source Control.

The goal of this chapter is to provide a framework for uniformity in plan preparation. Such uniformity will promote predictability throughout the region and help secure prompt governmental review and approval. Properly drafted engineering plans and supporting documents will also facilitate the operation and maintenance of the proposed system long after its review and approval.

State law requires that engineering work be performed by or under the direction of a licensed engineer in the state of Washington. Plans involving construction of runoff treatment BMPs, flow control BMPs, structural source control BMPs, or drainage systems generally involve engineering principles and shall be prepared by or under the direction of a licensed engineer in the state of Washington. Construction SWPPPs that involve engineering calculations must also be prepared by or under the direction of a licensed engineer in the state of Washington.

3.2 Stormwater Site Plans: Step by Step

3.2.1 Introduction

The development of a Stormwater Site Plan (SSP) consists of eight steps:

- 3.2.2 Step 1: Site Analysis: Collect and Analyze Information on Existing Conditions
- 3.2.3 Step 2: Prepare Preliminary Development Layout

The level of detail needed for each step depends on the project size, as explained in the individual steps. A narrative description of each of these steps follows.

3.2.2 Step 1: Site Analysis: Collect and Analyze Information on Existing Conditions

Collect and review information on the existing site conditions including topography, drainage patterns, soils, ground cover, presence of critical areas, adjacent areas, existing development, existing stormwater BMPs, adjacent on- and off-site utilities, and prior disturbance of the site. Disturbance may cause changes in soil profiles, permeability, water holding capacity and transmissivity, tilth, native vegetation, and fertility. Analyze the data to determine the site limitations, including the following:

- Areas with high potential for erosion and sediment deposition (based on soil properties, slope, etc.)
- Locations of sensitive and critical areas (e.g., vegetative buffers, wetlands, steep slopes, floodplains, geologic hazard areas, streams, etc.)
- Observation of potential runoff contribution from off-site basins
- Adjacent properties and/or projects that have a history of stormwater problems, noting whether the cause of the problem(s) has been determined
- Adjacent properties and/or projects where geotechnical investigations have identified shallow bedrock, high groundwater, seasonally perched groundwater, or clay lenses in the substrata

Delineate these areas on the site map required as part of Step 3, Prepare a Permanent Stormwater Control Plan. Prepare an existing conditions summary that will be submitted as part of the SSP. Part of the information collected in this step should be used to help prepare the Construction Stormwater Pollution Prevention Plan (SWPPP).

3.2.3 Step 2: Prepare Preliminary Development Layout

Based on the analysis of existing site conditions, locate the buildings, roads, parking lots, landscaping features, and preliminary locations of stormwater BMPs for the proposed development. Consider the following points when laying out the site:

- Fit development to the terrain to minimize land disturbance; confine construction activities to the least area necessary, and away from critical areas.
- Preserve areas with native vegetation (especially forested areas) as much as possible.
- On sites with a mix of soil types, locate impervious areas over less permeable soil, try to restrict development over more porous soils or take advantage of them by locating infiltration BMPs over them.
- Cluster buildings together.
- Minimize impervious areas.
- Maintain and utilize natural drainage patterns.
- Identify existing utilities and proposed utility corridors.

See Appendix 3-D: Additional Guidance on Low Impact Development Site Planning Principles and Design Strategies for additional guidance on site planning principles and design strategies.

3.2.4 Step 3: Perform Off-Site Analysis

An off-site analysis is required as part of 2.7.5 Core Element #4: Preservation of Natural Drainage Systems. Development projects that propose to discharge stormwater off-site are required to submit an off-site analysis report that assesses the potential off-site water quality, erosion, slope stability, and drainage impacts associated with the project and that proposes appropriate mitigation of those impacts. An initial qualitative analysis should extend downstream for the entire flow path from the project site to the receiving water, or up to 1 mile or to a point where the impact on receiving waters are minimal or nonexistent, as determined by the local jurisdiction. If a receiving water is within 0.25 miles, the analysis should extend within the receiving water to 0.25 miles from the project site. The analysis should extend 0.25 miles beyond any improvements proposed as mitigation. The analysis should extend upstream to a point where backwater effects created by the project cease. Upon review of the qualitative analysis, the local jurisdiction may require that a quantitative analysis be performed. A full description of a typical off-site analysis procedure, along with a sample checklist to aid in the preparation and review of an off-site analysis, are included in Appendix 3-A: Off-Site Analysis.

3.2.5 Step 4: Determine Applicable Core Elements

The Phase II Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) Permit for eastern Washington or local jurisdiction establishes project size thresholds for the application of Core Elements (in Chapter 2 - Core Elements for New Development and Redevelopment), to new development and redevelopment projects. The designer of the SSP should meet with local officials to agree on the applicable Core Elements, prior to proceeding to the next step.

3.2.6 Step 5: Prepare a Permanent Stormwater Control Plan

Select stormwater BMPs (all projects) and runoff treatment and flow control BMPs (projects subject to 2.7.6 Core Element #5: Runoff Treatment and/or 2.7.7 Core Element #6: Flow Control) that will serve the project site in its developed condition. The selection process for runoff treatment and flow

control BMPs is presented in detail in Chapter 5 - Runoff Treatment BMP Design and Chapter 6 - Flow Control BMP Design.

A preliminary design of the BMPs is necessary to determine how they will fit within and serve the entire preliminary development layout. After a preliminary design is developed, the designer may want to reconsider the site layout to reduce the need for construction of BMPs, or the size of the BMPs by reducing the amount of impervious surfaces created and increasing the areas to be left undisturbed. After the designer is satisfied with the BMP selection, the information must be presented in a Permanent Stormwater Control Plan, which typically consists of a drainage report and a set of construction plans.

Drainage Report

The drainage report is to be inclusive, clear, legible, and reproducible, with a complete set of drainage computations and stamped by a licensed engineer in the state of Washington. The computations are to be presented in a rational format with information included so as to allow a reviewer to be able to reproduce the same results. The computations should provide sufficient information for an unbiased third party to be able to review the report and determine that all applicable standards have been met. All assumptions and computer input and output data, and variables listed in the computer printouts, should be clearly identified. Computer printouts should clearly show which subbasin(s) they apply to and the design storm event identified thereon if multiple storm events are addressed in the design. Copies of design charts, nomographs, or other design aids used in the analysis should be included in the calculations.

All relevant geotechnical information related to the project and all site-specific soil logs and subsurface testing information should be included in the drainage report or provided in a separate report prepared and stamped by the geotechnical engineer or licensed engineering hydrogeologist.

The drainage report should also include a basin map. Under most conditions both a predevelopment basin map and a postdevelopment basin map should be provided, unless deemed unnecessary by the local jurisdiction. See Appendix 3-B: Basin Maps for a checklist of items to be included on the basin map.

The drainage report is to identify existing drainage BMPs which are clearly inadequate or need repair, such as collapsed culverts or culverts with a substantial amount of debris. The condition and capacity of existing drainage BMPs located on-site, which are proposed for use by the development, should be evaluated and disclosed in the drainage report.

Calculations for detention and infiltration ponds sized to meet 2.7.6 Core Element #5: Runoff Treatment and/or 2.7.7 Core Element #6: Flow Control may include the following: inflow and outflow hydrographs, level-pool routing calculations, a listing of the maximum water surface elevation, a pond volume rating table (e.g., stage vs. storage), and discharge rating table (e.g., stage versus discharge). Each hydrograph and level-pool routing calculation sheet is to have clearly marked: the design storm event, the applicable subbasin(s), and the pond identification name, which corresponds with the basin map and plans.

The drainage submittal should incorporate all calculations for the determination of the required size of the systems. Typical calculations include the following:

- Hydrologic computations:
    - Drainage basin (and subbasin) delineation
    - Model output reports summarizing input parameters and results
- Hydraulic computations:
    - Inlet capacities
    - Detention/retention storage capacities
    - Culvert and pipe system capacities and outlet velocities
    - Ditch capacities and velocities
- Map with the project plotted thereon

A copy of applicable floodplain maps, or studies within the project area should be included in the drainage report.

Construction Plans

Construction plans should be prepared for all open and closed drainage systems. This information should be presented in a clear, concise manner that can be easily followed, checked, and verified. All pipes, culverts, catch basins, channels, swales, and other stormwater conveyance appurtenances must be clearly labeled. The plans should call out sufficient hydraulic and physical data for construction of the system and future evaluation of the design. An example checklist describing many of the items typically shown on construction plans is included in Appendix 3-C: Stormwater Construction Plans. Designers should consult local jurisdiction requirements for specific information to include on construction plans.

3.2.7 Step 6: Select Construction Stormwater Pollution Prevention BMPs

A Construction SWPPP may be required as part of 2.7.3 Core Element #2: Construction Stormwater Pollution Prevention. Guidance is also provided for construction stormwater pollution prevention for small projects.

Large-Project Construction SWPPP

The Construction SWPPP must contain sufficient information to satisfy the local jurisdiction that the potential pollution problems have been adequately addressed for the proposed project. An adequate Construction SWPPP includes a narrative and drawings. The narrative is a written statement that explains the pollution prevention decisions made for a particular project. The narrative contains concise information concerning existing site conditions, construction schedules, and other pertinent items that are not contained on the drawings. The drawings and notes describe where and when the various BMPs should be installed, the performance the BMPs are expected to achieve, and actions to be taken if the performance goals are not achieved.

The 13 Elements listed in 2.7.3 Core Element #2: Construction Stormwater Pollution Prevention must be considered in the development of the Construction SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the Construction SWPPP. These elements are described in detail in Chapter 7 - Construction Stormwater Pollution Prevention. They cover the general water quality protection strategies of limiting site impacts, preventing erosion and sedimentation, and managing activities and sources.

On construction sites that discharge to receiving water, the primary consideration in the preparation of the Construction SWPPP is compliance with the State Water Quality Standards. The step-by-step procedure outlined in Chapter 7 - Construction Stormwater Pollution Prevention is recommended for the development of these Construction SWPPPs. A checklist is contained in Chapter 7 - Construction Stormwater Pollution Prevention that may be helpful in preparing and reviewing the Construction SWPPP.

On construction sites that infiltrate all stormwater runoff, the primary consideration in the preparation of the Construction SWPPP is the protection of the infiltration BMPs from fine sediments during the construction phase and protection of ground water from other pollutants. Several of the other elements are very important at these sites as well, such as marking the clearing limits, establishing the construction access, and managing the project.

Under current federal regulations, if a project disturbs > 1 acre and discharges to receiving water, the local jurisdiction may require review and approval of the Construction SWPPP prior to construction.

Small-Project Construction Stormwater Pollution Prevention

This guidance is recommended for small construction projects adding or replacing < 2,000 square feet (sf) of impervious surface or clearing < 7,000 sf to prevent the discharge of sediment and other pollutants to the maximum extent practicable. The following should be evaluated for small construction projects:

- Plan and implement proper clearing and grading of the site. It is most important only to clear the areas needed, thus keeping exposed areas to a minimum. Phase clearing so that only those areas that are actively being worked are uncovered. Note: Clearing limits should be flagged in the lot or area prior to initiating clearing.
- Soil should be managed in a manner that does not permanently compact or deteriorate the final soil and landscape system. If disturbance and/or compaction occur the impact must be corrected at the end of the construction activity. This should include restoration of soil depth, soil quality, permeability, and percentage of organic matter. Construction practices must not cause damage to or compromise the design of permanent landscape or infiltration areas.
- Locate excavated soil a reasonable distance behind the curb, such as in the backyard or side yard area. This will increase the distance eroded soil must travel to reach the drainage system. Soil piles should be covered until the soil is either used or removed. Piles should be situated so that sediment does not run into the street or adjoining yards.
- Backfill foundation walls as soon as possible and rough grade the lot. This will eliminate large soil mounds, which are highly erodible, and prepares the lot for temporary cover, which will further reduce erosion potential.

- Remove excess soil from the site as soon as possible after backfilling. This will eliminate any sediment loss from surplus fill.
- If a lot has a soil bank higher than the curb, a trench or berm should be installed moving the bank several feet behind the curb. This will reduce the occurrence of gully and rill erosion, while providing a storage and settling area for stormwater.
- The construction entrance should be stabilized where traffic will be leaving the construction site and traveling on paved roads or other paved areas within 1,000 feet of the site.
- Provide for periodic street cleaning to remove any sediment that may have been tracked out. Sediment should be removed by shoveling or sweeping and carefully removed to a suitable disposal area where it will not be eroded again.
- Utility trenches that run up and down slopes should be backfilled within 7 days. Cross-slope trenches may remain open throughout construction to provide runoff interception and sediment trapping, provided that they do not convey turbid runoff off-site.

3.2.8 Step 7: Complete the Stormwater Site Plan

The SSP encompasses the entire submittal to the local jurisdiction with drainage review authority. The SSP should address the following:

- **Project overview:** The project overview must provide a general description of the project, predeveloped and developed conditions of the site, site area and size of the improvements, and the pre- and postdevelopment stormwater runoff conditions. The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows.
- **Vicinity map:** This map should clearly locate the property, identify all roads bordering the site, show the route of stormwater off-site to the local natural receiving water, and show significant geographic features and sensitive/critical areas (streams, wetlands, lakes, steep slopes, etc.).
- **Site map:** This map should use at a minimum a U.S. Geological Survey 1:2,400-scale topographic map as a base and display the following:
    - Acreage and outlines of all drainage basins
    - Existing stormwater drainage to and from the site
    - Routes of existing, construction, and future flows at all discharge points
    - The length of travel from the farthest upstream end of a proposed drainage system to any proposed flow control and runoff treatment BMP
- **Soils map:** This map should show the soils within the project site as verified by field testing. It is the designer's responsibility to ensure that the soil types of the site are properly identified and correctly used in the hydrologic analysis.
- **Existing conditions summary:** This is the summary described in Step 1. If the local jurisdiction does not require a detailed off-site analysis, this summary should also describe the

following:

  - The natural receiving waters that the stormwater runoff either directly or eventually (after flowing through the downstream conveyance system) discharges to
  - Any area-specific requirements established in local plans, ordinances, or regulations or in water cleanup plans approved by the Washington State Department of Ecology

- **Off-site analysis report:** This is the report described in Step 3.
- **Permanent stormwater control plan:** This is the plan described in Step 5.
- **Construction SWPPP:** This is the plan described in Step 6.
- **Special reports and studies:** Include any special reports and studies conducted to prepare the SSP (e.g., a soils report that could include the results of soil sampling and testing, infiltration tests and/or soil gradation analyses, depth to ground water; wetlands delineation).
- **Other permits:** List conditions from other permits and regulatory agency approvals that affect the drainage plan or contain more restrictive drainage-related requirements.
- **Operation and maintenance (O&M) manual:** Submit an O&M manual for each flow control and runoff treatment BMP based on the guidelines included in 2.7.8 Core Element #7: Operation and Maintenance.
- **Declaration of covenant for privately maitained flow control and treatment BMPs:** A declaration of covenant and grant of easement may be required by the local jurisdiction for privately maintained flow control and runoff treatment BMPs to ensure future maintenance and allow access for inspection by the local jurisdiction.
- **Bond quantities worksheet:** If the local jurisdiction adopts a requirement for a performance bond (or other financial guarantee) for proper construction and operation of construction site BMPs, and proper construction of permanent drainage BMPs, the designer shall provide documentation to establish the appropriate bond amount.

3.2.9 Step 8: Check Compliance With All Applicable Core Elements

The SSP as designed and implemented should specifically fulfill all Core Elements applicable to the project. Review the completed SSP to check that these requirements are satisfied.

3.3 Plans Required After Stormwater Site Plan Approval

3.3.1 Introduction

This section includes the specifications and contents required of those plans submitted after the local jurisdiction has approved the original Stormwater Site Plan (SSP).

3.3.2 Stormwater Site Plan Changes

If the designer wishes to make changes or revisions to the originally approved SSP, the proposed revisions should be submitted to the local jurisdiction or agency with review authority prior to construction. The submittals should include the following:

- Substitute pages of the originally approved SSP that include the proposed changes
- Revised drawings showing structural changes
- Other supporting information that explains and supports the reason for the change

3.3.3 Record Drawings

If the project included construction of conveyance systems, runoff treatment Best Management Practices (BMPs), flow control BMPs, or structural source control BMPs, the applicant should submit record drawings to the local jurisdiction when the project is completed. These should be engineering drawings that accurately represent the stormwater infrastructure of the project as constructed. These corrected drawings must be professionally drafted revisions that are stamped, signed, and dated by a licensed engineer in the state of Washington.

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Appendix 3-A: Off-Site Analysis

Objective

To identify and evaluate potential off-site water quality, erosion, slope stability, and drainage impacts that may be caused or aggravated by a proposed project, and to determine measures for preventing impacts and for not aggravating existing impacts. Aggravated shall mean increasing the frequency of occurrence and/or severity of a problem.

Guidelines

Some of the most common and destructive impacts of land development are erosion of downgradient properties, localized flooding, and slope failures. These are caused by increased stormwater runoff volumes or concentrated flows, increased volumes of stormwater injected into the subsurface, increase in velocity, and/or changed runoff patterns (e.g., type and location of discharge). However, taking the precautions of off-site analysis could prevent substantial property damage and public safety risks.

The existing or potential impacts to be evaluated and mitigated shall include the following:

- Conveyance system capacity problems
- Localized flooding
- Upland erosion impacts, including landslide hazards
- Downstream impacts to protective designations, including special resource waters, sole source aquifers, and recharge areas
- Stream channel erosion at the outfall location
- Violations of surface water quality standards as identified in a basin plan or a Total Maximum Daily Load (water cleanup plan); or violations of ground water standards in a wellhead protection area

Projects are required to initially submit, with the permit application, a qualitative analysis of each downstream system leaving the site. The analysis should accomplish four tasks.

Task 1: Define and Map the Study Area

Submission of a site map showing site property lines; a topographic map (at a minimum a U.S. Geological Survey 1:24,000-scale quadrangle topographic map) showing site boundaries, study area boundaries, proposed area of disturbance, downstream flow path, and potential/existing problems.

Task 2: Review All Available Information on the Study Area

This should include all available basin plans, ground water management area plans, geotechnical reports, drainage studies, floodplain/floodway Federal Emergency Management Agency (FEMA) maps, wetlands inventory maps, critical areas maps, stream habitat reports, salmon distribution

reports, etc. Contact the local jurisdiction for assistance in locating these and other relevant or historical data.

Task 3: Field Inspect the Study Area

The designer must physically inspect the existing on- and off-site drainage systems of the study area for existing or potential problems and drainage features. As part of an initial inspection and investigation, the designer should take the following actions:

- Investigate problems reported or observed during the resource review.
- Locate existing/potential constrictions or capacity deficiencies in the drainage system.
- Identify existing/potential flooding problems.
- Identify existing/potential overtopping, scouring, bank sloughing, or sedimentation.
- Identify significant destruction of aquatic habitat (e.g., siltation, stream incision).
- Collect qualitative data on features such as land use, impervious surface, topography, geological hazards, soils, presence of streams, wetlands.
- Collect information on pipe sizes, channel characteristics, drainage structures.
- Verify tributary contributing areas identified in Task 1: Define and Map the Study Area.
- Contact the local jurisdiction with drainage review authority, neighboring property owners, and residents about drainage problems.
- Note date and weather at time of inspection.

Task 4: Describe the Drainage System and Its Existing and Predicted Problems

For each drainage system component (e.g., pipe, culvert, bridges, outfalls, ponds, vaults) the following should be covered in the analysis: location, physical description, problems, and field observations.

All existing or potential problems (e.g., ponding water, erosion, hydrologic contributions from off-site areas) identified in Task 2: Review All Available Information on the Study Area and Task 3: Field Inspect the Study Area should be described. The descriptions should be used to determine whether adequate mitigation can be identified, or whether more detailed quantitative analysis is necessary. The following information should be provided for each existing or potential problem:

- Magnitude of or damage caused by the problem
- General frequency and duration
- Return frequency of storm or flow when the problem occurs (may require quantitative analysis)
- Water elevation when the problem occurs
- Names and concerns of parties involved

- Current mitigation of the problem
- Possible cause of the problem
- Whether the project is likely to aggravate the problem or create a new one

Upon review of this analysis, the local jurisdiction may require mitigation measures to address the problems, or a quantitative analysis, depending on the presence of existing or predicted flooding, erosion, or water quality problems, and on the proposed design of the on-site drainage BMPs. The analysis should repeat Task 3: Field Inspect the Study Area and Task 4: Describe the Drainage System and Its Existing and Predicted Problems, using quantitative field data including profiles and cross sections.

The quantitative analysis should provide information on the severity and frequency of an existing problem or the likelihood of creating a new problem. It should evaluate proposed mitigation intended to avoid aggravation of the existing problem and to avoid creation of a new problem.

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Appendix 3-B: Basin Maps

Site Planning — Basin Maps Checklist

The following items should be included on predeveloped and postdeveloped basin maps:

- Site boundary
- Basin limits, both on-site and off-site areas which contribute or receive stormwater runoff onto or from the project, field verified by a licensed engineer in the state of Washington
- Drainage subbasins. All subbasins should be clearly labeled and correlated with the calculations.
- Topographic contours, which should extend beyond the project or drainage basin boundaries to the extent necessary to confirm basin limits used in the calculations; or, in the absence of topographic mapping being available, a licensed engineer in the state of Washington may field verify the basin limits, including contributing off-site areas, and should describe how the basin limits were determined.
- Significant drainage features, natural or man-made, such as creeks, seasonal drainage channels, culverts, closed depressions, maintenance holes
- Time of concentration routes, clearly labeled and correlated with the calculations
- Footprint of proposed drainage features, such as ponds, vegetated or other infiltration Best Management Practices (BMPs), pipe routes, ditches
- Indications of floodplain limits, as defined by Federal Emergency Management Agency (FEMA) or other studies
- North arrow and scale bar
- Wetlands
- Existing easements

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Appendix 3-C: Stormwater Construction Plans

Site Planning — Stormwater Construction Plans Checklist

The following items should be included on stormwater construction plans, as applicable:

- A plan profile of all key drainage systems including: streets, roads, and drainage Best Management Practices (BMPs).
- Elevation datum
- North arrow and scale bar
- Right-of-way details
- Outfall details
- Ditch details
- Invert elevations, slopes, and lengths of ditches
- Cross sections of all open ditches
- Elevations of all inlet grates
- Size, types, invert elevations, and lengths of all culverts and pipe systems
- Invert elevations of the existing or other proposed drainage system to which the drainage plan proposes to connect
- Stationing of all inlets, culverts and pipe systems angle points
- Invert elevations of pipes at all structures such as catch basins or maintenance holes
- Construction details for inlets, drywells, detention BMPs, etc. (notes referring to standard plans may suffice where applicable)
- Drainage easements shown, with key dimensions for depicting location, width, and length
- The location of existing underground and aboveground utilities
- Lot grading elevations where appropriate
- Grading plan for detention ponds. The grading plan should include:
    - existing contours
    - proposed contours
    - catch points

  A typical cross section of the pond should be provided in the plans, showing:

    - bottom of pond elevation
    - maximum water surface elevation for the design storm(s)
    - inlet and outlet elevations
    - berm elevation and slopes
    - keyway location and dimensions
- Detention ponds, pipe inlets and outlets, ditches, and drainage structures, which are serving public roads or are in single-family residential neighborhoods, should be horizontally defined with respect to property corners, street stationing, or a coordinate system.
- Drainage ditches should have their longitudinal grades defined with either a profile or elevation grades at intervals of 50 feet. Ditch centerlines and flow directions should be also be illustrated.
- Summary of short- and long-term operation and maintenance requirements