

Door County Stormwater Policy

Goal: Reduce adverse stormwater runoff impacts to:
Groundwater,
Surface waters, &
Offsite landowners, (Flooding).

<http://map.co.door.wi.us/swcd/>

Door County's Fragile Setting & the Impact on Water Quality



Door County's Drinking Water



- Primary water supply: **Groundwater**
- From rain & snow
- Pollutant concerns
- Seasonal & runoff related

BEDROCK GEOLOGY OF WISCONSIN

APRIL 1981
REVISED 1995

DEVONIAN FORMATIONS

dolomite and shale

SILURIAN FORMATIONS

34 col. em. ts

ORDOVICIAN FORMATIONS


Maguaketa Formation—siltstone and dolomite

Us Snipee Group—dolomite with some limestone and shale

Qep St. Peter Formation—sandstone with some limestone shale and conglomerate

Opt Prairie du Chien Group—dolomite with some sandstone and shale

CAMBRIAN FORMATIONS

 sandstone with some columnite and shale

MIDDLE PROTEROZOIC ROCKS

Keweenaw Rocks—
ss, sandstone
v, basaltic to rhyolitic lava flows
t, gabbroic, anorthositic and granitic rocks

Wolf River Rocks—
 2. rapakivi granite, granite and syenite
 3. gneiss and gabbro.

LOWER PROTEROZOIC ROCKS

0

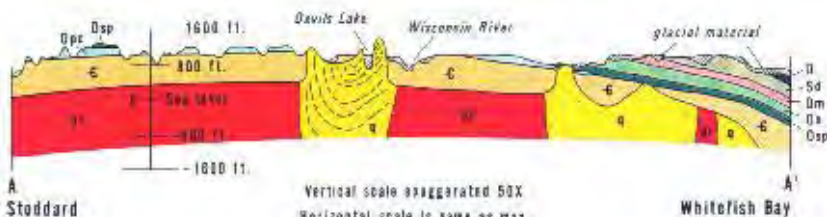
granite, diorite and mica-

5, argillite, siltstone, quartzite, graywacke, and iron formation
 60, basaltic to rhyolitic metavolcanic rocks with some mafic sedimentary rocks
 63, megacrystic and hornblende diorite

LOWER PROTEROZOIC OR
UPPER ARCHEAN ROCKS

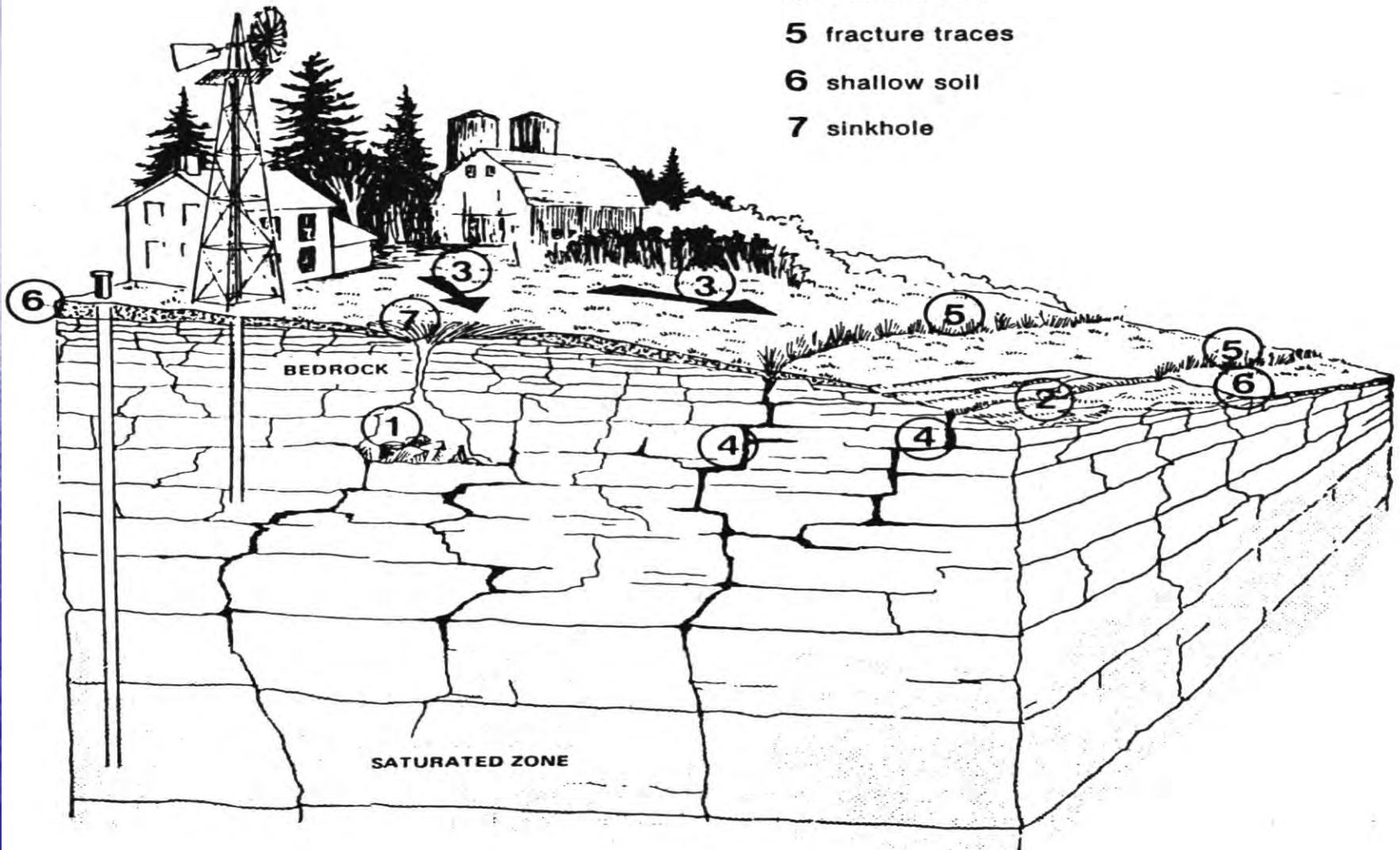
my, metavolcanic rocks
or granite, gneiss and amphibolite

UNGLACIATED



Karst Features

- 1 collapse feature
- 2 exposed bedrock
- 3 flow lines
- 4 fracture flow
- 5 fracture traces
- 6 shallow soil
- 7 sinkhole



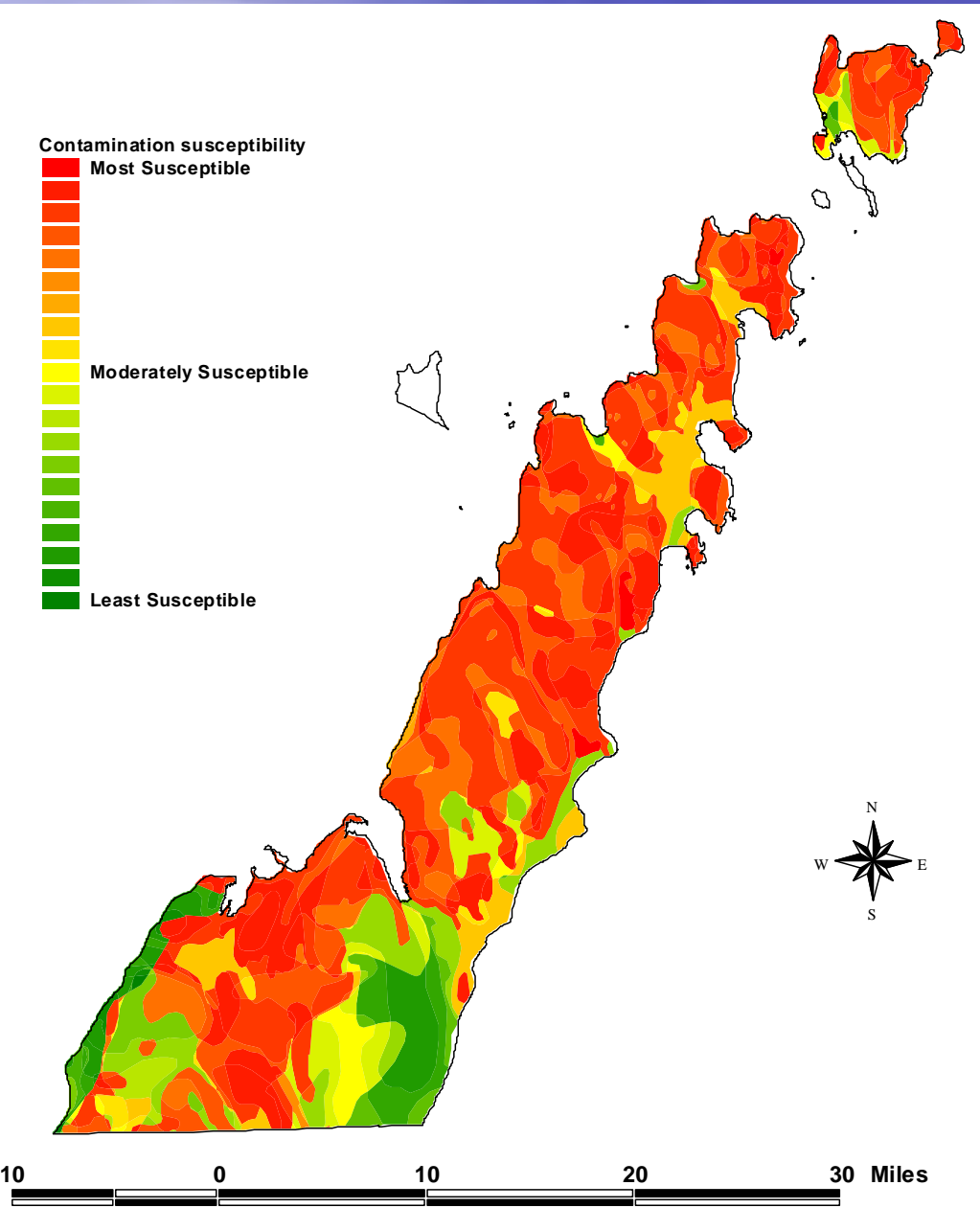


Door County Soils

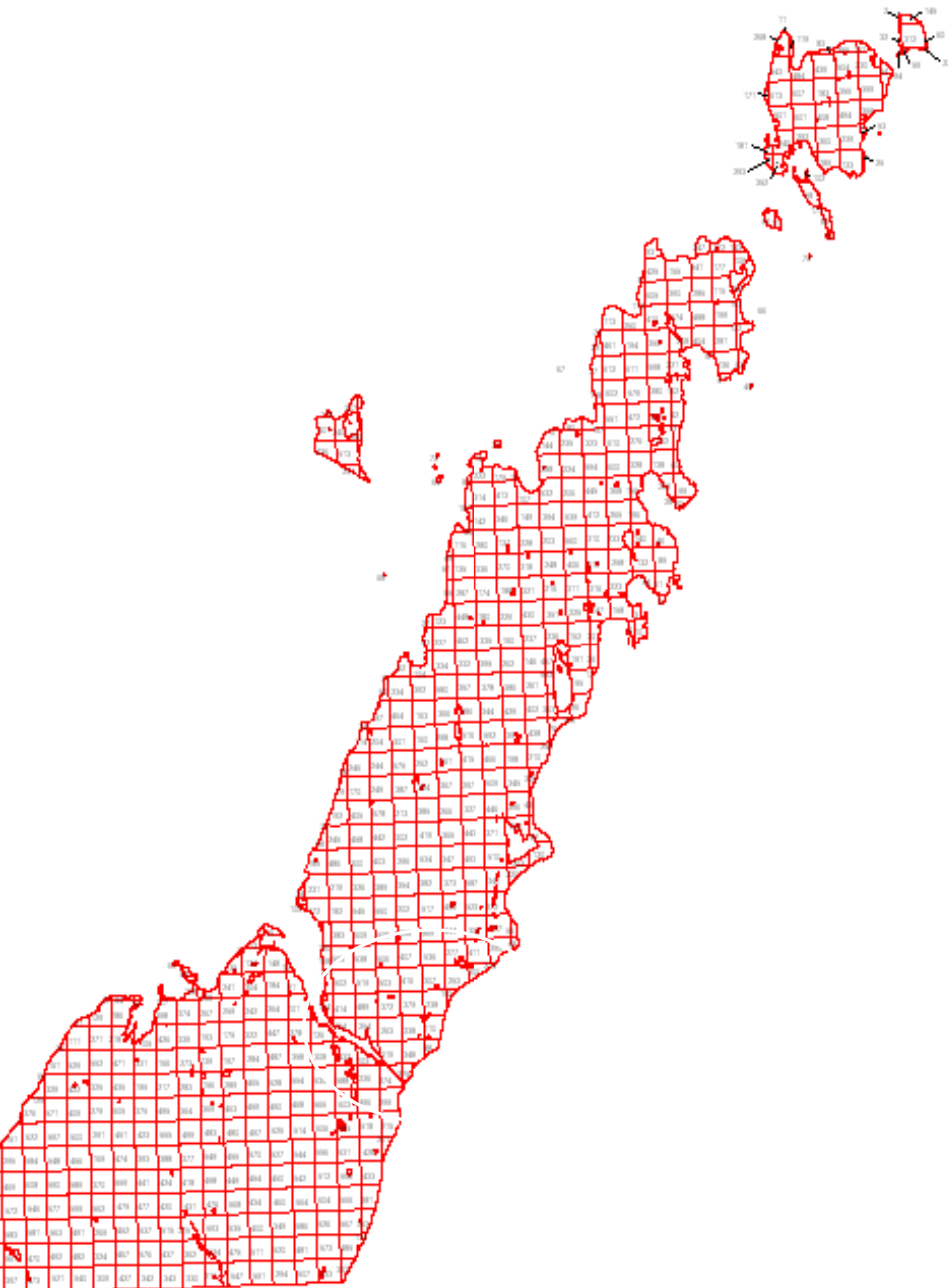


- 22% less than 18 inches to bedrock
- Additional 17% between 18 and 36 inches to bedrock
- Filter between surface activities and our drinking water

Groundwater Contamination Susceptibility in Door County

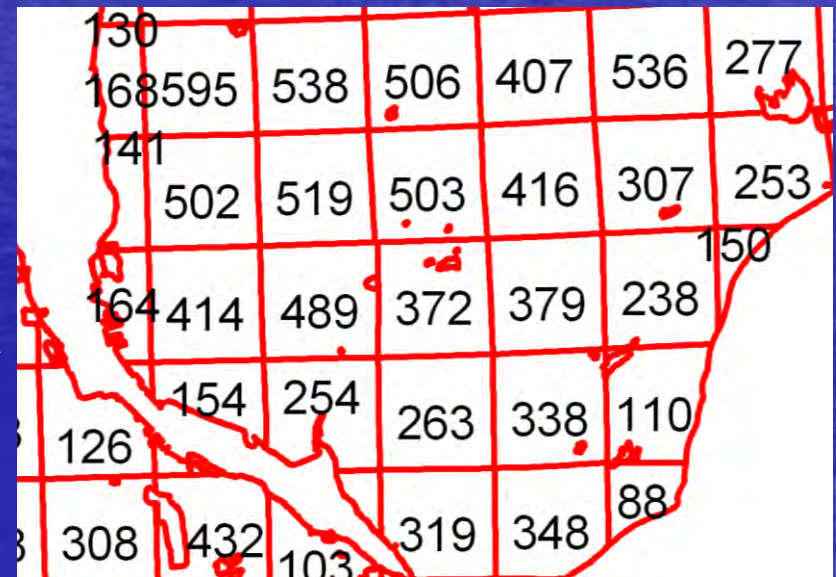


Groundwater
Contamination
Susceptibility



Ranking based on 4 criteria:

- Depth to bedrock
- Depth to groundwater
- Soil Attenuation (Ability to filter)
- Water Quality Management Areas



DNR Chapter NR151

- **Subchapter II – Agricultural Performance Standards and Prohibitions**

NR 151.01 Purpose.

The purpose of this subchapter is to prescribe performance standards and prohibitions in accordance with the implementation and enforcement procedures contained in ss. NR 151.09 and 151.095 for agricultural facilities, operations and practices.

- Door County Code Chapter 23 Agricultural Performance Standards and Animal Waste Storage Ordinance 8/24/2004

- **Subchapter III – Non–Agricultural Performance Standards**

NR 151.10 Purpose.

This subchapter establishes performance standards, as authorized by s. 281.16 (2) (a), Stats., for non–agricultural facilities and practices that cause or may cause nonpoint runoff pollution. These performance standards are intended to limit nonpoint runoff pollution in order to achieve water quality standards.

- Procedure Policy/Ordinance?

Current County Stormwater Management

- **Door County SWCD Procedure Policy**
 - Adopted by the LCC - 11/9/06.
 - Addresses minimum criteria for runoff control plans for: the Door County Land Division Ordinance & Door County Zoning Ordinance: (Rock hole alternative plans, Conditional use Permits, Major Land Divisions, Site Plan Reviews, & Land disturbance plans).
 - Meets NR 151 Non-agricultural Performance Standards.
 - Includes criteria to deal with bedrock and karst areas found in Door County.
 - **<http://map.co.door.wi.us/swcd/>**

DOOR COUNTY SOIL & WATER CONSERVATION DEPARTMENT PROCEDURE POLICY

Urban Storm Water Runoff Control Design Criteria Construction Site Erosion Control and Post Construction Storm Water

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DOOR COUNTY SOIL & WATER CONSERVATION DEPARTMENT PROCEDURE POLICY

Urban Storm Water Runoff Control Design Criteria

I. INTRODUCTION

The Storm Water Runoff Control Design Criteria Procedure Policy establishes the minimum criteria for urban storm water runoff control plans prepared by, or reviewed by, the Door County SWCD. The policy considers runoff quantity, quality, infiltration, and protective areas in the preparation of storm water runoff control plans and the design of detention and retention basins. The availability and/or adequacy of the downstream drainage system and outlet are also considered in the design. The policy meets the requirements of NR 151, Subchapter III- Non-agricultural Performance Standards. Also, criteria is included to deal with the special runoff conditions encountered in the high bedrock, karst areas found in Door County.

II. DEFINITIONS

1. "Infiltration" has two meanings depending on where it is used in the document. Generally it has the generic meaning of water running down through the soil to the ground water. In Door County this includes infiltration into the creviced limestone bedrock.

In the procedure section entitled "V.3. Infiltration" the meaning is more limited. This section sets forth criteria from NR 151 which specifies design procedures and limits for infiltration practices such as "Infiltration Basin" and "Bioretention for Infiltration". The practices standards for these practices are shown on the DNR website under Stormwater.

- "Average annual rainfall" means a calendar year of precipitation, excluding snow, which is considered typical. For purposes of using the SLAMM model, average annual rainfall means measured precipitation in Green Bay, Wisconsin between March 29 and November 25, 1969. For the use of the P8 model the average rainfall is October 1, 1968 to September 30, 1969 for Green Bay. (If DNR specified different rainfall dates for the model, use the DNR specified dates.)
- "Best management practice" or "BMP" means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize sediment or pollutants carried in runoff to waters of the state.
- "Connected imperviousness" means an impervious surface that is directly connected to a separate storm sewer or water of the state via an impervious flow path.
- "Construction site" means an area upon which one or more land disturbing construction activities occur, including areas that are part of a larger

III. GENERAL DESIGN REQUIREMENTS

1. A narrative shall be prepared for each development site discussing the conditions at the site and explaining how they will be managed in the proposed plan to adequately address the resource needs. Take particular care to set forth and discuss any unique site conditions and off-site impacts as set forth in items 2 and 3 below. State the impacts and what will be done about them.
2. The stormwater runoff control plan prepared in compliance with this procedure policy shall consider and design for conditions unique to the site. Unique site conditions may include, but are not limited to: steep slopes, active and apparent Karst features, high water table, limited downstream drainage system, no offsite drainage, previously altered conditions, shallow soils, and smaller sites with limited available space. The design criteria for such unique site conditions, and other innovative design proposals, shall be agreed upon by the designer and the governing municipality and the SWCD before the design and plan are completed.
3. All stormwater runoff control plans shall consider and design for the impacts of the development and stormwater practices to the channels and land drainage downstream. The proposed plan shall include practices to avoid downstream impacts or easements and/or permission to accommodate/permit the offsite impacts. Impacts can include:
 - Increased peak flows
 - Increased volume of runoff
 - Changes to downstream channel characteristics such as changing from dry channels to wet channels
 - Outlets sending water to new locations
 - Changes in outflow from sheet flow to concentrated flow
 - Discharges to closed depressions
 - Outletting water to different watersheds
4. All stormwater runoff control plans shall consider and design for the safety of the public. Safety shelves are required in all wet basins.
5. Sites which have an outlet without peak flow discharge limitations (i.e. some lake front sites) need not address peak flow reduction requirements. Water quality, infiltration, and protective area criteria still apply. (Note: Other regulatory agencies/units of government may still require peak flow reduction requirements and it is advised that the plan preparer confirm the status of this requirement.)
6. The design of stormwater runoff control plan facilities shall be adequately sized for the contributing drainage area. The designer may opt to include the offsite drainage area in the plan facilities or to safely divert or route the offsite drainage flow around the plan facilities. All land draining to the parcel being developed must be included in the design and analyzed using pre-settlement RCNs.

- a. The following is required:
 - (i) Reduce the total suspended solids load by 80%
 - (ii) For post-construction sites with less than 1 acre of disturbance or other projects as approved by the SWCD, the 80% suspended solids requirement may be waived by the SWCD based on site conditions. However a Plan utilizing appropriate BMP's which adequately protect water quality is required.

(6) Wet and Dry Detention basins:

Design wet detention basins according to the DNR standard, Wet Detention Basin, (1001), SLAMM, or P8.

Wet pools are more effective for pollutant removal than dry pools. Detention basins shall have wet pools where possible. Dry detention basins shall only be used as part of a water quality control system designed using SLAMM or P8. The dry detention basin must have the same extended detention storage as wet detention basins. The pool depth for wetland type basins may be less than 3 feet if approved by the Door Co. SWCD.

Design of Detention Basins:

The bottom of the detention basin shall be 3' or more above bedrock if soils have a minimum of 20% fines (>200 sieve). For coarser soils or lesser separation distances an approved liner is required. Also, if the basin is to be blasted into the bedrock, the blasting must be approved by the SWCD, and an approved liner will be required. Where liners are designed, a liner placement plan is required.

Volume for sediment storage shall be included; 100 cubic feet per acre per ten years or comparable approved alternative.

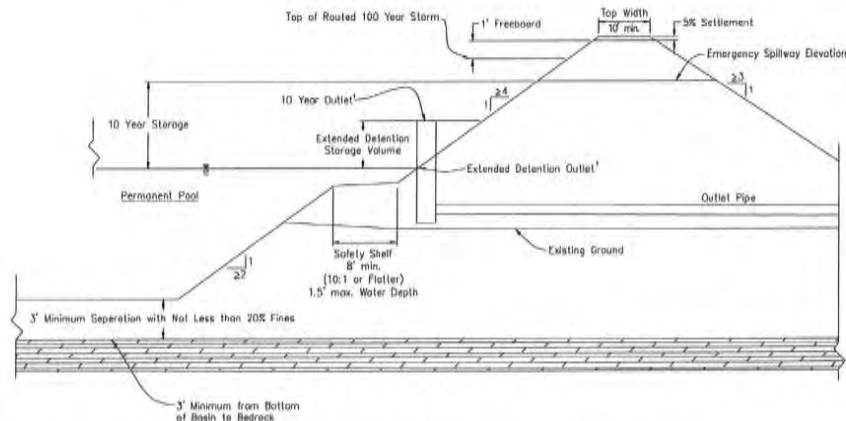
The shape of non-industrial site detention basins shall be designed to appear as natural water bodies to the extent practicable. Nonlinear undulating perimeters without extensive use of straight sections and square corners is required.

Side-slopes of non-industrial site detention basins shall be vegetative except in areas of erosion concern.

Water fountains and re-circulating systems shall not be installed unless it can be demonstrated that the water quality benefits and function of the detention basin are not compromised.

Operation and Maintenance Chemicals shall not be added to the basins unless it can be demonstrated that the water quality benefits and function of the detention basin are not compromised.

Figure 2: Typical Embankment Cross Section for Wet Detention Basin (Not to Scale)



1. These are conceptual outlet locations to indicate the need to have different outlets for different purposes. Numerous outlet designs will meet the criteria of the standard.

(7) Groundwater Protection – All infiltration and biofiltration practices shall have a minimum separation of three feet between bedrock and/or watertable and the bottom of the designed practice. The soil in the 3' separation must have at least 20% fines. If the 3' separation is achieved by blasting or rock cutting, special designs will be required to protect the groundwater quality. All practices within five feet of bedrock will be discussed and reviewed with the SWCD before being submitted as part of a design and stormwater plan.

Constructed stormwater BMP's shall not discharge directly into natural or man made bedrock openings or inflow points.

In areas of shallow soils, less than 2 feet above bedrock, the area around buildings shall have 18" of soil with 6" of topsoil for a distance of 30 feet from the building. Driveways, parking areas, roads and similar structures shall have 18" of soil with 6" of top soil for a distance of 10 feet from the downstream edge. Parking lots and similar structures shall have 2 feet of soil above bedrock for a distance of 30 feet from their downstream edge. The soil shall have a minimum of 20% fines.

In areas of shallow soil, less than 2 feet above bedrock, and where a hummocky surface indicates downward movement of rainfall into the bedrock, the surface soil and infiltration shall be maintained unless

approved by the Doer Co. SWCD. This is not required if the runoff is considered a pollutant to groundwater.

2. QUANTITY

Peak Flow Controls where a surface outlet exists

If an outlet exists, peak outflow control is required. Volume control is not. The goal is to have the runoff peak outflow after development be no larger than the pre-settlement peak outflow. Reduction of the post development runoff peaks will generally be done by maintaining large amounts of vegetation, maintaining or increasing infiltration, and by practices such as detention basins, bioretention for infiltration, and infiltration basins.

- (1) The following is required:
 - a. The peak post-development discharge rate shall not exceed the peak pre-development discharge rate for the 2-year, 10-year, and 100-year, 24-hour design storms.
 - b. TR-55 methodology shall be used for peak discharge calculations, unless the administering authority approves an equivalent methodology. The meaning of "hydrologic soil group" and "runoff curve number" are as determined in TR-55. Peak pre-development discharge rates shall be determined using the following "meadow" runoff curve numbers:

Maximum Pre-Development Runoff Curve Numbers – Meadow*				
Hydrologic Soil Group	A	B	C	D
Runoff Curve Number	30	58	71	78

*The aggregate minimum RCN for the total drainage area is 60 due to frozen conditions during spring runoff.

These curve numbers apply to the property being developed and other land draining onto it.

- (2) For sites with less than one acre of disturbance the peak post-development discharge rate standard in (1) above may be waived by the SWCD based on site conditions. However a Plan utilizing appropriate BMP's which adequately protect from adverse impacts from runoff quantity and flow is required.
- (3) An adequate outfall shall be provided for each point of concentrated discharge from the post-construction site. An adequate outfall consists of the following:
 - a. Non-erosive discharge velocity for the 10-year, 24-hour design storm.

- b. Flow capacity to convey the 10-year, 24-hour design storm.
- c. Safely pass the [100]-year, 24-hour design storm.

- (4) The storm duration shall be 24 hours. Twenty-four hour rainfall amounts are:

Frequency, years	Rainfall, inches
2	2.4
5	3.1
10	3.6
25	4.1
50	4.6
100	4.9

- (5) Peak rates of flow, runoff volumes, and detention basin designs shall be done according to methods in the USDA Technical Release No. 55, Urban Hydrology for Small Watersheds, commonly known as TR 55 and in DNR practice standard 1001, Wet Detention Basin. The models SLAMM and P8 may also be used for design.

- (6) The hydrologic group for Namur, Summerville, Longrie, Bonduel, Duell variant, and Kolberg is B rather than C or D unless there is obvious evidence of ponding on the bedrock at the site. In most cases the creviced dolomite acts as a drain rather than an impediment to flow. Areas of shallow soils, less than 2 feet above bedrock, and where a hummocky surface indicates downward movement of rainfall into the bedrock, shall have a hydrologic group of A.

- (7) Flow through or diversion channels shall be designed for a minimum capacity and, stable velocities for Q10, and flood control for Q100. Culverts will require special design criteria set and/or approved by the governing municipality or SWCD.

Volume Controls where no surface outlet exists

This is the criteria where no surface outlet exists and accumulation of increased volumes of runoff water due to development would cause flooding, erosion, or other problems on adjacent property.

- (1) The general goal is to retain (retention basins) all increased runoff on the site until the extra water evaporates, is transpired by plants, infiltrates, or is removed by pumping.

- (2) Design of RETENTION Basins (See Figure 3):

- a. Design the retention basin according to practice standard 1001, Wet Detention Basin, except the runoff storage volume shall be as specified below. Volume for sediment storage shall be included; 100 cubic feet per acre per ten years or comparable approved alternative. No credit will be given for infiltration

unless approved by the SWCD.

- b. Runoff storage for period from Nov 1 to June 1 (7 mo.) This runoff storage is in addition to the sediment storage. The top of the runoff storage volume shall be used to set the emergency outlet level (if any) and the flood pool level. Any building structures in the watershed shall be constructed 2' above the flood pool level unless approved by the SWCD. Determine pre and post RCN's based on the previous RCN table and the expected future conditions.
 - From Runoff Table find 7 month runoff depth for each RCN (Interpolate as needed)

c. RUNOFF TABLE

On Site RCN	Average Runoff (Nov 1 - June 1)
90	9.5"
85	8.0"
80	6.7"
75	5.4"
70	3.9"
65	2.6"
60	1.2"

- Subtract pre depth from post depth
- Multiply by 1.5 to account for wetter than average years and differing winter conditions.

For instance: Post Pre
 RCN 70 60

Runoff depth 3.9 - 1.2 = 2.7 x 1.5 = 4.05"

Volume = 4.05 / 12 x 43560 = 14,702 cu. ft./ac of draining area

(3) Include these items in the Operation and Maintenance Plan

- a. Basins are to be emptied in November so that they are ready to accept the winter and spring runoff.
- b. During the May -November period the water level in the basin is to be kept below the 80% volume capacity elevation level so that there is always 20% of the basin capacity available to accept the extra runoff from a storm event.
- c. The sediment is to be cleaned out every 10 years or as needed to maintain sediment storage capacity.

surface waters such as boat landings, bridges and culverts.) The storm water management plan shall contain a written site-specific explanation for any parts of the protective area that are disturbed during construction.

- b. Where land disturbing construction activity occurs within a protective area, and where no impervious surface is present, adequate sod or self-sustaining vegetative cover of 70% or greater shall be established and maintained. The adequate sod or self-sustaining vegetative cover shall be sufficient to provide for bank stability, maintenance of fish habitat and filtering of pollutants from upslope overland flow areas under sheet flow conditions. Non-vegetative materials, such as rock riprap, may be employed on the bank as necessary to prevent erosion, such as on steep slopes or where high velocity flows occur.

The seeding of non-aggressive vegetative cover shall be used in the protective areas. Vegetation that is flood and drought tolerant and can provide long-term bank stability because of an extensive root system is required. Vegetative cover can be measured using the line transect method described in the University of Wisconsin Extension publication number A3533, titled "Estimating Residue Using the Line Transect Method".

- c. Best management practices such as filter strips, swales, or wet detention basins, that are designed to control pollutants from non-point sources may be located in the protective area.

Note to Users: Other regulations, such as ch. 30, Wis. Stats., and chs. NR 103, 115, 116 and 117, Wis. Adm. Code, and their associated review and approval process may apply in the protective area.

VI. STORMWATER MANAGEMENT PLAN

1. PLAN REQUIREMENTS.

The storm water management plan for Erosion Control and Post-construction Stormwater shall contain at a minimum the following information:

- (1) A narrative explaining the site, the resource conditions, concerns, and impacts, and the BMP's employed.
- (2) Name, address, and telephone number of the landowner and responsible parties.
- (3) A legal description of the property proposed to be developed.
- (4) A pre-development site map with property lines, disturbed limits, and drainage patterns.
- (5) A post-development site map with property lines, disturbed limits, and drainage patterns including planned practices.
- (6) Total area of disturbed impervious surfaces within the site

- (7) Total area of new impervious surfaces within the site.
- (8) Performance standards applicable to the site.
- (9) Proposed best management practices with design computations.
- (10) Groundwater, bedrock, and soil limitations.
- (11) Separation distances. The stormwater management practices shall be adequately separated from wells to prevent contamination of drinking water.
- (12) Provide an operation and maintenance plan for the installed practices. Specify how it will be assured that the operation and maintenance plan will be carried out and by whom.
- (13) Easements to practices for operation and maintenance.
- (14) Location of a permanent elevation bench mark within 100 feet of a detention and/or retention basin.

VII. VARIANCES and ALTERNATIVE PRACTICES

The SWCD may grant a variance to the technical requirements of this Policy or approve an alternative practice provided surface and ground water quality is protected and runoff quantity and flow adverse impacts are prevented to an extent equal or greater than the technical requirements included in this Policy.

(NOTE: It is the proposed plan preparer's responsibility to obtain approval from any other regulatory agencies/units of government of the proposed variance and/or alternative practice.)

Why is the County Policy not enough?

- All sites < 1 acre are not addressed.
- Small projects in critical areas are not addressed.
- Current policy does not address runoff in non shore land zoned areas, unless a major land division is proposed.
- NR 151 does not adequately address stormwater runoff to groundwater.
- NR 151 does not address where runoff is discharged.
- DNR staff shortage – onsite installation inspections are minimal.
- Current review costs are not user based.

Small Projects Critical Areas



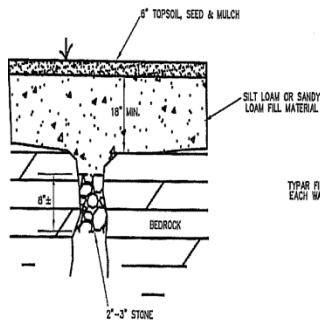
Groundwater Protection in Areas Less Than 2' to Bedrock

RockHole/Crevice Patch Options

Option #1

NO SCALE

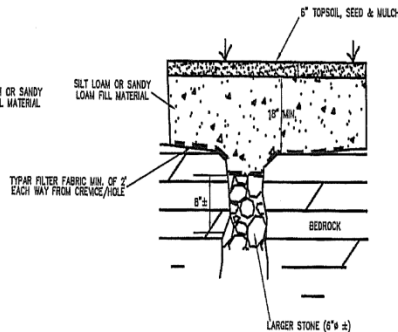
(IF HOLE/CREVICE IS LESS THAN 4" WIDE)



Option #2

NO SCALE

(IF HOLE/CREVICE IS GREATER THAN 4" WIDE)



NOTE: STONE FILL MAY BE REPLACED WITH CONCRETE THROUGHOUT PROJECT.

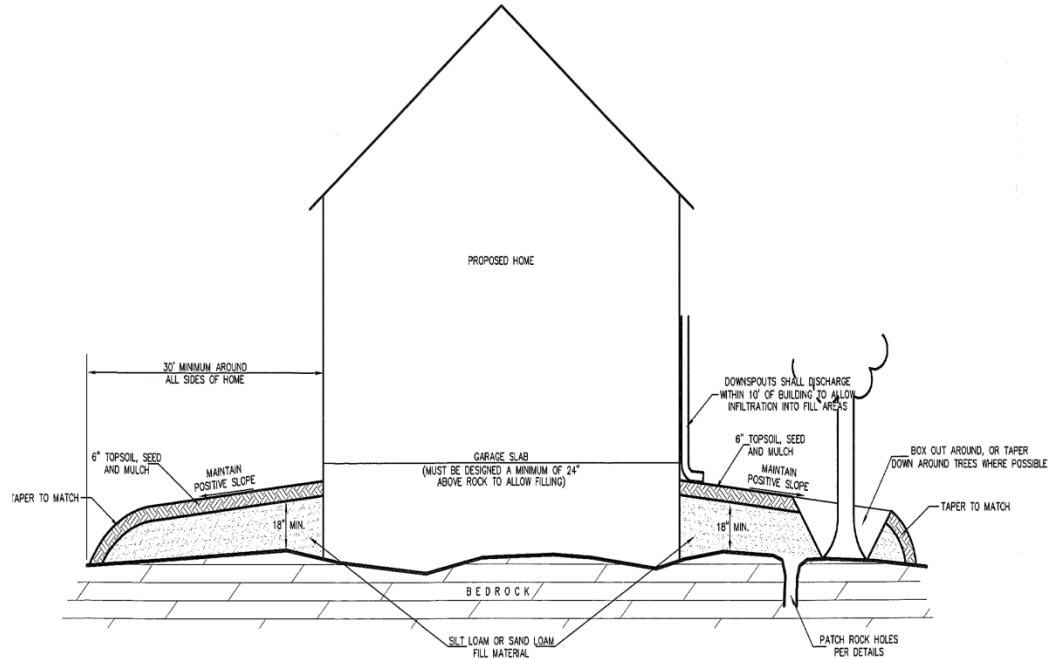
Building Pad Detail

NO SCALE

NOTES:

— THIS DETAIL DOES NOT REQUIRE CLEARING OF ALL TREES IN THE 30' FILL AREA. EXISTING TREES MAY REMAIN & GET FILLED AROUND, AND EXISTING SOIL CAN BE COUNTED TOWARD THE OVERALL 24" MINIMUM FILL DEPTH.

— THESE DETAILS ARE APPLICABLE TO ALL SITES.



The Policy Promotes Simple Solutions

- **Slow it Down** → 1. Utilize buffers
- Store it → 2. Rain barrels/ponds
- Infiltrate it → 3. Rain Gardens
- Disconnect it → 4. Route roof gutters to your lawn
- Keep it clean → 5. Clean up petroleum spills, pet wastes, etc.
- Be accountable → 6. Consider impacts to neighbors

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Thank You!

<http://map.co.door.wi.us/swcd/>

Greg Coulthurst

Door County SWCD

746-2214

