



STORMWATER MANAGEMENT

**Information • Best Management Practices •
Plan Requirements**



This packet will help you:

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LEARN ABOUT BEST MANAGEMENT PRACTICES (BMPs)	5
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Stormwater Management

WHAT IS STORMWATER?

Stormwater is rain water than does not soak into the ground and typically runs off from hard surfaces such as roofs, driveways, sidewalks, patios, and lawns into nearby waters before the ground is able to absorb and filter it. High volumes of water & sediment are washed into our lakes and streams along with pollutants (such as gasoline, oils, heavy metals, debris, bacteria) and nutrients carried by this runoff. *NOTE: Phosphorus is one nutrient often found in stormwater runoff and is especially common on fertilized lawns. In lakes and rivers, one pound of phosphorus can produce 300-500 lbs of algae growth!*

WHAT IS STORMWATER MANAGEMENT?

The goal of Stormwater management is to capture the first 1 inch of a major rain event, preventing it from flowing into lakes, rivers, and wetlands, therefor reducing nutrient loading, turbidity (suspended sediments), and debris. Capturing runoff and allowing it to filter through the ground helps clean and purify the rainwater. Stormwater management can be as complex as an engineered storage pond or as simple as a rain garden. There are many ways to manage stormwater and help reduce the amount of pollutants, nutrients, and debris that go into our waters.

HOW CAN I HELP?

Our lakes and public waters are the centerpiece of Crow Wing County. You can help by educating yourself on the flow of rainwater and melting snow on your property and learn the best ways to capture that runoff before it goes into our lakes. You can help keep Crow Wing County “Minnesota’s favorite place!”

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us



Stormwater Management

WHAT IS A STORMWATER MANAGEMENT PLAN? Stormwater Management Plans use existing natural features, constructed features, and intentionally placed Best Management Practices (BMPs) to capture the storage volume of runoff calculated by the impervious worksheet. A Stormwater management plan needs to meet the minimum requirements for permanent on-site treatment of 1 inch of stormwater runoff for all impervious surfaces on the property. A well implemented Stormwater Management Plan can not only function to protect our waters and prevent erosion, but can add beauty and property value to your home.

WHEN IS A STORMWATER MANAGEMENT PLAN REQUIRED? Crow Wing County Land Use Ordinance requires a Stormwater Management Plan for property located in the Shoreland Protection Zone (0-500 ft. from a lake, 250 ft. from a river, and 300 ft. from the Mississippi) with impervious surfaces that exceed 15%. All commercial development, Conditional Use Permits (CUPs), and Plats also require a Stormwater Management Plan. A Stormwater Management Plan may also be required as a condition of a public hearing, i.e., a variance or, for meeting other certain performance standards.

HOW DO I CREATE A STORMWATER MANAGEMENT PLAN? This packet will help you learn about Best Management Practices (BMP's are the physical elements that make up your plan), identify the areas that require treatment, help you figure out which BMPs meet requirements and are best for your property, create a site plan, submit the Stormwater Management Plan, and finally, know what to do after your plan is approved.

NOTE: You are always able to consult with or hire a professional landscaper to create a plan for you. The Crow Wing Soil & Water Conservation District at 218-828-6197 or crowwingswcd.org can also provide you with additional technical information about Stormwater Management practices and benefits.

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us



Stormwater Best Management Practices (BMPs)

Crow Wing County requires that stormwater runoff be managed onsite where feasible. BMPs, such as berms, rain gardens, infiltration basins, and swales are often easier to install, less expensive, look better, and can work as well as ponds, pipes, and larger conveyance systems. In addition, directing runoff to existing natural depressions, drainage ways, and vegetated soil surfaces is a simple way to treat runoff and prevent erosion. A number of different approaches may be necessary given lot constraints and topo-graphic limitations.

DRIPLINE TRENCH: Also called Drip Edge Landscaping or an Infiltration Trench, it is used to collect and infiltrate rooftop runoff. These systems store the runoff until it soaks into the soil and protects your house by reducing back splash.

Note: Dripline trenches work best in sand and gravel soils that can quickly disperse a large volume of water. They should not be used on structures with improperly sealed foundations, as flooding may result.



RAIN GARDEN: Intentionally placed gardens planted with native shrubs, flowers, grasses, and perennials in a shallow depression designed to hold water during a rain event.

Note: a Rain Garden should be located in a place that can collect as much runoff as possible. The best areas are where water naturally drains but doesn't hold water. It should also be located at least 5—15 feet away from your home.



GUTTERS AND RAIN BARRELS: Gutters are used to direct water from roofs to larger stormwater management areas. Rain Barrels are recommended for small scale water retention to use in gardens.

Note: Gutters need to be maintained and downspout placement is important to ensure proper management of the runoff. Runoff should be directed to an infiltration basin, rain barrels, French drain, rain gardens, or other appropriate rainwater collection system.



If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us

Stormwater Best Management Practices (BMPs)

PERVIOUS PAVEMENT: A specific type of pavement or blocks engineered with a high porosity that allows rainwater to pass through into the ground below.

Note: 100% impervious credit if engineered; designed and inspected by a licensed professional engineer (unless less than 400 sq. ft.), volume requirement of 1 inch rain event, 3 feet of separation to saturated soil, and follows Minnesota Stormwater Manual guidelines. A maintenance plan is required.



INFILTRATION BASIN: Basins where soils are typically amended to allow for infiltration of stormwater.

Note: Side slopes should be 3:1 or flatter (4:1 preferred) and inlets and outlets should be stabilized.



STORMWATER PONDS: Ponds engineered for larger sites that use settling as a way to contain sediment and pollution.

Note: Stormwater ponds are typically installed as an end-of-pipe BMP at the downstream end of the treatment train. Due to their size and versatility, stormwater ponds are often the only management practice employed at a site and therefore must be designed to provide adequate water quality and water quantity treatment for all regulated storms.



VEGETATED SWALE: Used to convey runoff from impervious surfaces to treatment areas such as rain gardens or basins.

Note: These broad and shallow channels are vegetated along the bottom and sides of the channel. Swales can be an important tool for retention and detention of stormwater runoff.



Stormwater Best Management Practices (BMPs)

SHORELINE BUFFER: A 10, 15, or 20 foot area of natural no-mow vegetation that spans the shoreline outside of the allowed recreational use area and behind any beach or rip rap.

REQUIRED IF IMPERVIOUS EXCEEDS 20%



A natural shoreline buffer can be the placement of shrubs, trees, and other native plants along a lakeshore or simply an area that is not mowed or maintained. These buffers can reinforce the natural shoreline as an additional filter for run off and lawn pollutants before it reaches your lakeshore. Natural shorelines are essential to the eco systems that sustain wildlife and fish. The roots from larger shrubs and trees can absorb nutrients and serve to slow erosion while the leaves shade your shoreline keeping water temperatures cooler for wildlife. A natural shoreline reduces runoff, erosion, and sedimentation. **Natural shoreline buffers can be filled with attractive plants and shrubs that add beauty to your landscape and shoreline and help retain your property value with practices that contribute to high water quality and less erosion.**

Note: A shoreline buffer is required if impervious surfaces exceed 20 percent of the property area. These buffers help contain stormwater and provide habitat for wildlife. A Crow Wing County Environmental Services Specialist will tell you the specific minimum width your buffer needs to be based on a Shoreline Rapid Assessment (SRAM) of your shoreline.

Appendix C: SHORELINE RAPID ASSESSMENT MODEL



Crow Wing County's Shoreline Rapid Assessment Model (SRAM) is a tool for quickly and objectively determining the degree of natural vegetation along a shoreline and the amount of natural buffer required to meet Ordinance requirements. With this model, the Shore Impact Zones (SIZ-1 & SIZ-2) are evaluated for natural vegetative cover and a cumulative score is tallied. Vegetative restoration that may be necessary must be performed according to Article 27.

Shoreline:

Condition of Shoreline	Score:
Stable shoreline	0
< 25% of shoreline is eroding or unstable	-1
25-50% of shoreline is eroding or unstable	-2
50-75% of shoreline is eroding or unstable	-3
> 75% of shoreline is eroding or unstable	-4

Ground cover:

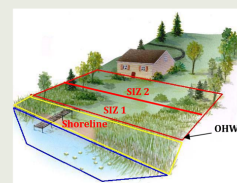
% Naturally Vegetated Cover in SIZ 1	Points:
< 25% natural ground cover	1
25-50% natural vegetative cover	3
50-75% natural vegetated cover	5
> 75% natural vegetated cover	7

% Naturally Vegetated Cover in SIZ 2	Points:
< 25% natural ground cover	1
25-50% natural vegetative cover	2
50-75% natural vegetative cover	3
> 75% natural vegetated cover	4

Trees / shrubs:

% Naturally Vegetated Cover in SIZ 1	Points:
< 25% of surface is covered by shrubs and trees	1
25-50% of surface is covered by shrubs and trees	3
50-75 % of surface is covered by shrubs and trees	5
> 75% of surface is covered by shrubs and trees	7

% Naturally Vegetated Cover in SIZ 2	Points:
< 25% of surface is covered by shrubs and trees	1
25-50% of surface is covered by shrubs and trees	2
50-75 % of surface is covered by shrubs and trees	3
> 75% of surface is covered by shrubs and trees	4



If score is 0-5:

- Leave a 20' No Mow Buffer & possible other mitigation efforts

If score is 6-10:

- Leave a 15' No Mow Buffer

If score is 11-15:

- Leave a 10' No Mow Buffer

Above buffers shall allow for an access area to lake, per Ordinance requirements

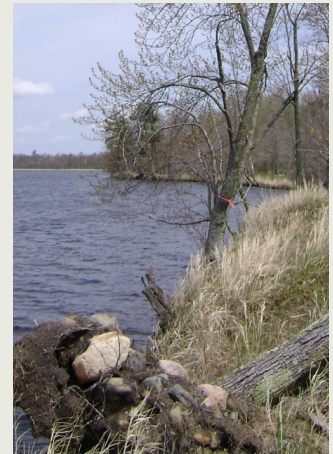
Landowner _____ Permit or Parcel Number _____
Score _____ (Max Score = 22)
Environmental Services Staff Signature _____ Date _____



Stormwater Best Management Practices (BMPs)

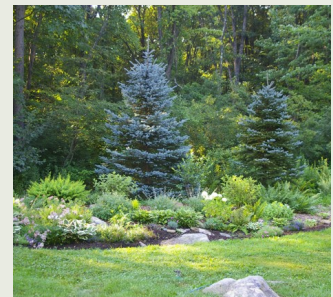
HISTORIC ICE RIDGES: A natural berm or ridge created by the action of ice over a two or more year period. Historic Ice Ridges should not be altered and portions can only be removed with a shoreland alteration permit.

Note: Ice ridges can limit the damage to water quality by acting as a filter for runoff from the yard. Because vegetation often grows on the ice ridges, these strips of land also serve as a barrier, limiting the damage from shoreline erosion.



BERMS: A mound of earth with sloping sides that is located between areas of approximately the same elevation.

Note: A constructed berm should be 6 to 12 inches in height and designed to manage stormwater through infiltration, runoff mitigation, and erosion control.



The advantages and disadvantages of each BMP must be weighed against physical site constraints, management goals (flood control and/or water quality improvements) and costs to determine the optimum approach. The physical characteristics of the drainage area make some BMPs more beneficial than others. In fully developed areas or on small sites, the use of BMPs that require a lot of land, such as ponds and basins, may not be practical. Vegetative BMPs may not be suitable for some sites due to space limitations and economic restrictions. Consult with a professional landscaper or the Crow Wing Soil & Water Conservation District for more technical advice and information on plants and trees at 218-828-6197 or crowwingswcd.org.



Stormwater Management Plan

Do's

- Design your plan so that stormwater stays on your property.
- Use a variety of BMPs to meet your goals.
- Maintain an appropriate separation between water retention areas and groundwater - 2 ft. minimum; 3 ft. is best practice.
- Make your plan aesthetically pleasing as well as functional.
- Submit your plan meeting the minimum requirements on pg. 13 of this packet.
- Implement the plan within 2 years of an approved Land Use permit, or as otherwise directed by the county.

Don'ts

- Do not direct stormwater directly into a wetland.
- Do not use a public road's ditch, Right of Way (ROW), or pond.
- Do not direct stormwater onto an adjoining property that you own that could be sold as a separate lot.
- Do not direct stormwater onto a neighbors property without a recorded stormwater maintenance easement.
- Do not run stormwater into public waters - Lakes, rivers, or streams.
- Do not direct stormwater towards septic drain fields where possible.

There are three components to a complete Stormwater Management Plan submission. The following pages will break down each step into these areas.

- 1. IMPERVIOUS WORKSHEET**
- 2. SITE PLAN**
- 3. FEE**



Stormwater Management Plan

1. IMPERVIOUS WORKSHEET

Crow Wing County requires a completed impervious worksheet to be retained for record for all permits subject to a Stormwater Management Plan. Most likely, County Staff has already completed the impervious worksheet when you applied for a permit, and is attached to your permit. This form helps calculate the amount of stormwater in cubic feet (storage volume), and the depth and dimensions desired for water retention needed to treat your property. It calculates the phosphorus reduction your Stormwater Management Plan will reduce going into our lakes and, if using rain barrels, can help you figure out how many you should have.

The top portion of the impervious worksheet lists all existing impervious structures including walk paths, impermeable landscaping and driveways.

Landowner / Parcel #: _____ Date: _____

Lot Impervious Surface Coverage & Landscaping for Stormwater Worksheet

Please use the table below to calculate your impervious surface coverage. Impervious coverage is limited to 25% of the total lot area. Calculate out all that apply to your situation. If a structure has odd dimensions or if using to size stormwater basins, multiple rows / sheets may be needed. If total imp. of irregular structure or driveway is known, just multiply by 1.

<u>Existing Structures</u>	<u>Length (ft)</u>		<u>Width (ft)</u>		<u>Total (in sq. feet)</u>
House, garage, shed Boathouse Greenhouse Other (Dog Kennel, etc.)	34 (ft)	X	30 (ft)	=	1,020 (sq ft)
	30 (ft)	X	13 (ft)	=	390 (sq ft)
	24 (ft)	X	24 (ft)	=	576 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
<i>Driveways* & Landscaping:</i>					
Driveway*, Parking Area, Apron, Boat Ramp, Sidewalk, Patio, Paving Stones, Landscaping (incl. plastic), Other	5,233 (ft)	X	1 (ft)	=	5,233 (sq ft)
	87 (ft)	X	1 (ft)	=	87 (sq ft)
	34 (ft)	X	10 (ft)	=	340 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
<i>Total Existing Impervious</i>					7,646 (sq ft)

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us



Stormwater Management Plan

The bottom portion of the worksheet lists the impervious square footage of your proposed project. Once that portion is filled out, the combined total of existing and proposed impervious surfaces is divided by the total lot area in square feet. This is your impervious percentage and when that exceeds 15%, a Stormwater Management Plan is required. When it exceeds 20%, a shoreline buffer will also be a required BMP component of your Stormwater Management Plan. Impervious surfaces cannot exceed 25% in the Shoreland District and other residential zoned areas.

NOTE: See Article 41; Tables 41.1-41.3 of the CWC Ordinance or call Land Services at 218-824-1010 for impervious limits for Commercial, Developments, Resorts, and other types of property.

<u>Proposed Structures</u>				
House, garage, shed Boathouse Greenhouse Other (Dog Kennel, etc.)	30 (ft)	X	11 (ft)	= 330 (sq ft)
	19 (ft)	X	10 (ft)	= 190 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
<u>Driveways* & Landscaping:</u>		<i>*Assumes a 12' wide driveway unless evidence to the contrary</i>		
Driveway*, Parking Area, Apron, Boat Ramp, Sidewalk, Patio, Paving Stones Landscaping (incl. plastic), Other	(ft)	X	(ft)	= 0 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
	(ft)	X	(ft)	= 0 (sq ft)
Total Proposed Impervious				520 (sq ft)
Total Lot Area (sq. ft.) = 46,173	Total existing Impervious			= 7,646 (sq ft)
	Total w/new Impervious			= 8,166 (sq ft)
	% existing impervious			= 16.6 %
	% w/new impervious			= 17.7 %

Simple Calculator for Approximating Size of Stormwater Practice & Amount of Phosphorus Reduction:

Total w/ new impervious:		Storage volume: Gal / Cu ft (= gal / 7.48)		Bottom size (sq ft) of infiltration area by depth							
				3"	6"	9"	12"	15"	18"		
8,166	x	0.623 / 0.083 Gal / Cu ft	=	5,087 Gal	678 Cu ft	2,711 cu ft x 4	1,356 cu ft x 2	901 cu ft x 1.33	678 cu ft x 1	542 cu ft x 0.8	454 cu ft x 0.67
Total exst imp	=	7,646	x	0.0000366	=	0.28	Existing phosphorous loading (lbs/yr)				
Tot w/new imp	=	8,166	x	0.0000366	=	0.30	Phosphorous reduction w/ stormwater mgmt				
For rain barrels, use this formula to determine size/amount needed:				Roof area (sq ft)		x	0.5625	=	0	Gallons generated from a 1" rain event	

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Stormwater Management Plan

Simple Calculator for Approximating Size of Stormwater Practice & Amount of Phosphorus Reduction:

Total w/ new impervious:				Storage volume: Gal / Cu ft (= gal / 7.48)		Bottom size (sq ft) of infiltration area by depth					
						3"	6"	9"	12"	15"	18"
8,166	x	0.623 / 0.083 Gal / Cu ft	=	5,087 Gal	678 Cu ft	2,711 cu ft x 4	1,356 cu ft x 2	901 cu ft x 1.33	678 cu ft x 1	542 cu ft x 0.8	454 cu ft x 0.67
Total exst imp	=	7,646	x	0.0000366	=	0.28	Existing phosphorous loading (lbs/yr)				
Tot w/new imp	=	8,166	x	0.0000366	=	0.30	Phosphorous reduction w/ stormwater mgmt				
For rain barrels, use this formula to determine size/amount needed:				Roof area (sq ft)		x	0.5625	=	0	Gallons generated from a 1" rain event	

To calculate the required stormwater storage volume – Using the impervious worksheet, take the total impervious (or the impervious portion in which you want to treat) in sq. ft. and multiply it by 0.083. This will give you the total cubic feet of rain that needs to be treated for a 1" rain event. Then, to calculate the size of the basin, take the storage volume (in cu. ft.) and follow the formula in the table under the depth of the basin desired. For example, (Cu Ft [Total Impervious Area x .0833]) x 4 for a 3" deep basin, x 2 for a 6" basin, and x 1.33 for a 9" basin etc. This will give you the required surface area in square feet for a 3", 6", or 9" basin. *NOTE: The form online auto-calculates this information as shown in the example above.* You can also calculate the amount of phosphorus loading your property generates right now and how much you can reduce by the implementation of your stormwater management plan. The very last line on the form will help determine size and amount of rain barrels needed.

2. SITE PLAN

Once you've gathered information from your impervious worksheet, you will know how much stormwater that needs to be treated and where this stormwater is already naturally flowing. Then you can start to understand what BMPs will work for your property and where the placement of these water retention areas should be placed. BMPs should be reasonably located to treat runoff. For example, gutters directing



Stormwater Management Plan

rainwater to a basin located nearby but away from the house. Plans for a Stormwater Management Plan are similar to the site plans submitted for a Land Use Permit, i.e., new house, shed, etc. They can be hand drawn, computer generated, or a mix of both. For our example, we'll hand draw a site plan using the minimum requirements listed below.

SITE PLAN - MINIMUM REQUIREMENTS

- ☐ 1. North arrow along with property boundary and information
- ☐ 2. Existing and proposed impervious areas, i.e., structures, drive ways, patios, etc.
- ☐ 3. Drainage arrows indicating the flow of water on the property and off impervious surfaces.
- ☐ 4. Location of well(s) and septic drainfields or mounds.
- ☐ 5. Location of permanent stormwater retention areas.
- ☐ 6. Indicate the required stormwater storage volume as calculated on the impervious worksheet and where/how you intend to capture runoff - The amount of stormwater each feature will capture. List the depth, width and length of permanent storm water management areas and buffers.
- ☐ 7. Identify and highlight gutter placement on structures.

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us



Stormwater Management Plan

IMPERVIOUS EXAMPLE

Landowner / Parcel #: STORMWATER EXAMPLE

Date: 2020

Lot Impervious Surface Coverage & Landscaping for Stormwater Worksheet

Please use the table below to calculate your impervious surface coverage. Impervious coverage is limited to 25% of the total lot area. Calculate out all that apply to your situation. If a structure has odd dimensions or if using to size stormwater basins, multiple rows / sheets may be needed. If total imp. of irregular structure or driveway is known, just multiply by 1.

<u>Existing Structures</u>	<u>Length (ft)</u>		<u>Width (ft)</u>		<u>Total (in sq. feet)</u>
House, garage, shed Boathouse Greenhouse Other (Dog Kennel, etc.)	32 (ft)	X	63 (ft)	=	2,016 (sq ft)
	16 (ft)	X	16 (ft)	=	256 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
<u>Driveways* & Landscaping:</u>					
Driveway*, Parking Area, Apron, Boat Ramp, Sidewalk, Patio, Paving Stones, Landscaping (incl. plastic), Other	3,332 (ft)	X	1 (ft)	=	3,332 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
Total Existing Impervious					5,604 (sq ft)
<u>Proposed Structures</u>					
House, garage, shed Boathouse Greenhouse Other (Dog Kennel, etc.)	26 (ft)	X	58 (ft)	=	1,508 (sq ft)
	10 (ft)	X	32 (ft)	=	320 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
<u>Driveways* & Landscaping:</u>					
Driveway*, Parking Area, Apron, Boat Ramp, Sidewalk, Patio, Paving Stones Landscaping (incl. plastic), Other	<i>*Assumes a 12' wide driveway unless evidence to the contrary</i>				
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
	(ft)	X	(ft)	=	0 (sq ft)
Total Proposed Impervious					1,828 (sq ft)
Total Lot Area (sq. ft.) = 42,152	Total existing Impervious =				5,604 (sq ft)
	Total w/new Impervious =				7,432 (sq ft)
	% existing impervious =				13.3 %
	% w/new impervious =				17.6 %

Simple Calculator for Approximating Size of Stormwater Practice & Amount of Phosphorus Reduction:

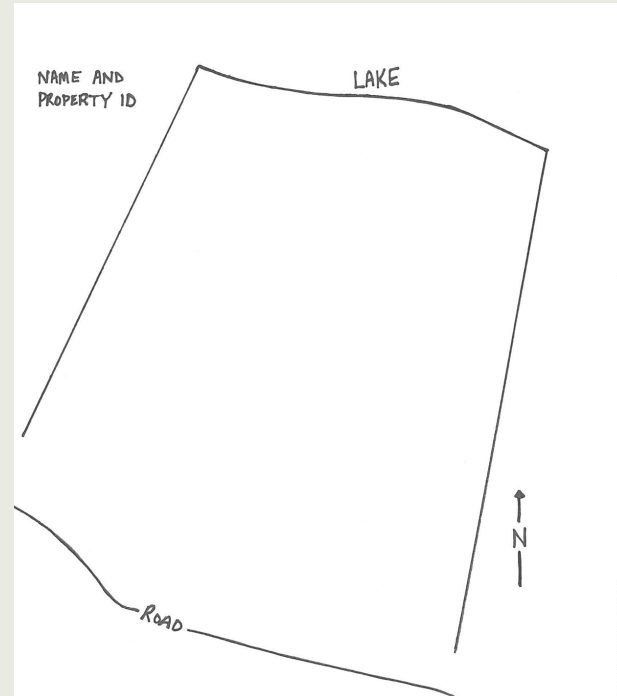
Total w/ new impervious:			Storage volume: Gal / Cu ft (= gal / 7.48)		Bottom size (sq ft) of infiltration area by depth						
					3"	6"	9"	12"	15"	18"	
7,432	x	0.623 / 0.083 Gal / Cu ft	=	4,630 Gal	617 Cu ft	2,467 cu ft x 4	1,234 cu ft x 2	820 cu ft x 1.33	617 cu ft x 1	493 cu ft x 0.8	413 cu ft x 0.67
Total exst imp	=	5,604	x	0.0000366	=	0.21	Existing phosphorous loading (lbs/yr)				
Tot w/new imp	=	7,432	x	0.0000366	=	0.27	Phosphorous reduction w/ stormwater mgmt				
For rain barrels, use this formula to determine size/amount needed:			Roof area (sq ft)		x	0.5625	=	0	Gallons generated from a 1" rain event		

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us

Stormwater Management Plan

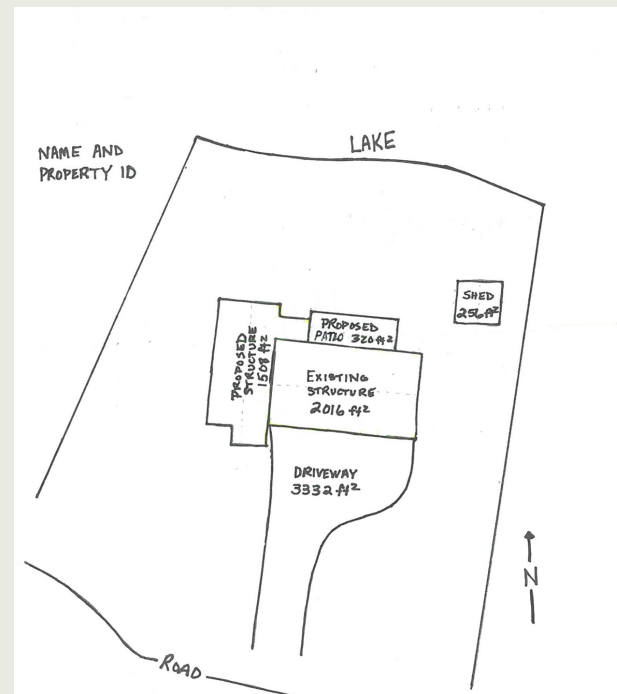
STEP ONE: North Arrow and Property Boundary

- Draw the property boundary, noting where lakes, roads, and other items are located
- Draw a North Arrow
- Write your name and property information on the site plan.



STEP TWO: Existing and Proposed Impervious Structures and Surfaces:

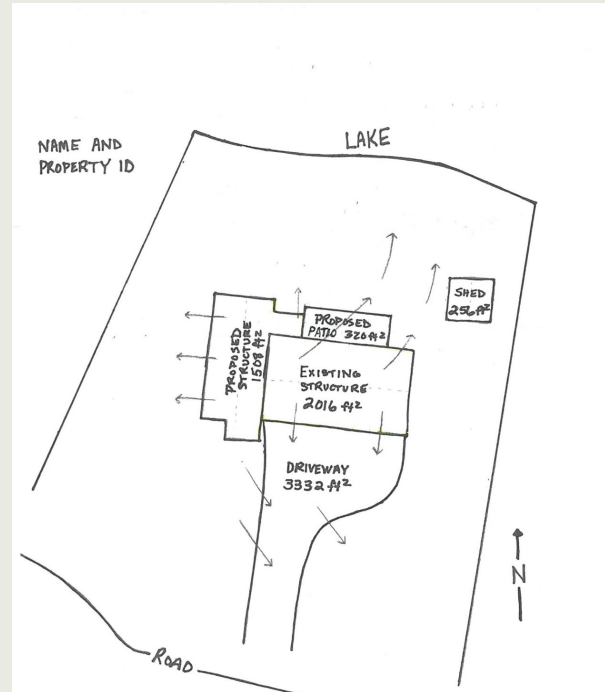
- Draw structures, driveways, walk paths, and all other impervious surfaces on your site plan.
- List dimensions and/or square footage of each item.



Stormwater Management Plan

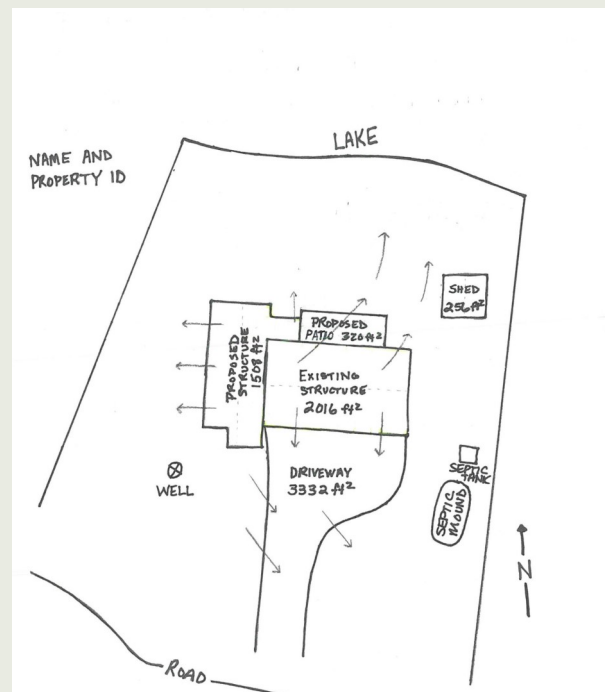
STEP THREE: Drainage Arrows

- Draw arrows on your site plan indicating the flow of water on your property and off of impervious surfaces.
- You can also add contour lines - they are helpful, but not required.



STEP FOUR: Location of any Wells and Septic Systems

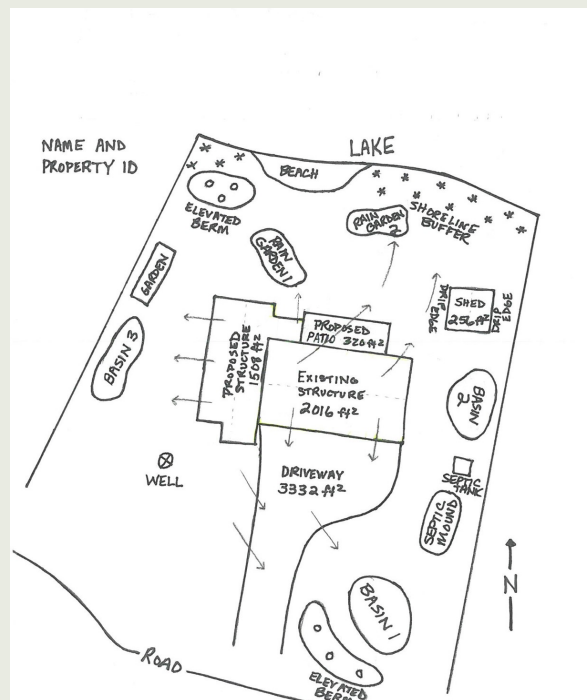
- Draw and label the location of the septic mound or drainfield and tank.
- Draw and label the location of the well.



Stormwater Management Plan

STEP FIVE: Stormwater Retention Areas and other BMPs

- Draw the location of both existing and permanent stormwater retention areas.
- Indicate what type of BMP you are using for each BMP feature.
- If your plan requires a Shoreline Buffer see additional details on pg. 7.



STEP SIX: THE AMOUNT OF STORMWATER CAPTURED INCLUDING DEPTH, WIDTH, AND LENGTH OF BMPs

Knowing the flow of water on the property, we can see that the stormwater from the driveway will spill down into basin 1. The impervious surface of the driveway is 3332 sq. ft. That number is multiplied by .083 ($3332 \times .083 = 276.55$) and equals the storage volume (in cubic feet) of stormwater needed to be treated in that area. Multiplying that number by 2 ($276.55 \times 2 = 553.10$), as shown in the table on the bottom of the worksheet, will give you the area needed for a 6 inch basin. So, the basin will need to be about 22 x 26 sq. ft. and 6 inches deep to accommodate the runoff from the driveway. Do these calculations with each impervious surface as shown below. List these calculations and any other notes on your site plan or on a separate sheet of paper and include them with your site plan. *Note: Gravel and dirt driveways are impervious.*

Stormwater Management Plan

Basin 1 - 22x26x6" Treats 286 cu. ft. from driveway runoff (3332 x .083 x 2)

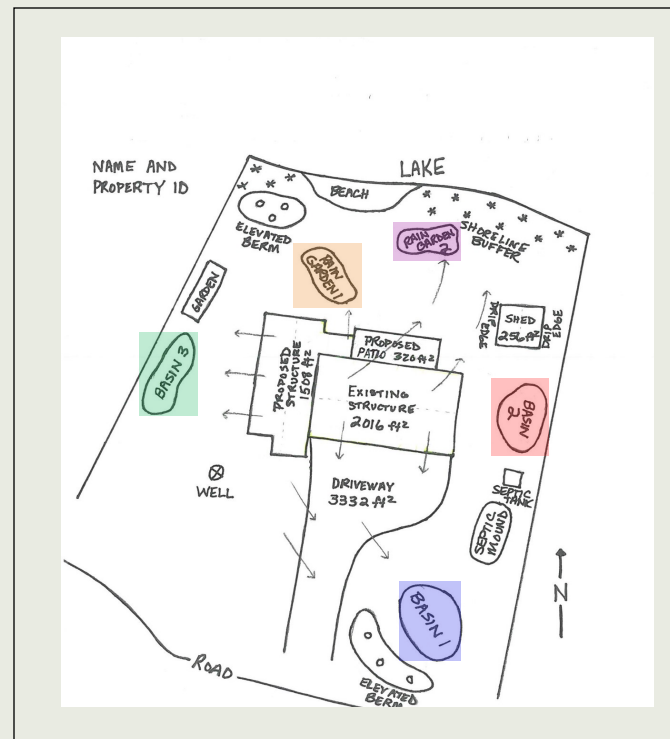
Basin 2 - 18X22X6" Treats 198 cu.ft. from house and shed (2272 x .083 x 2)

Basin 3 - 25X10X3" Treats 62.5 cu. ft. from W. side addition (754 x .083 x 4)

Rain Garden 1 - 12X12X6" Treats 72 cu.ft. from gutters lakeside (754 x .083 x 2)

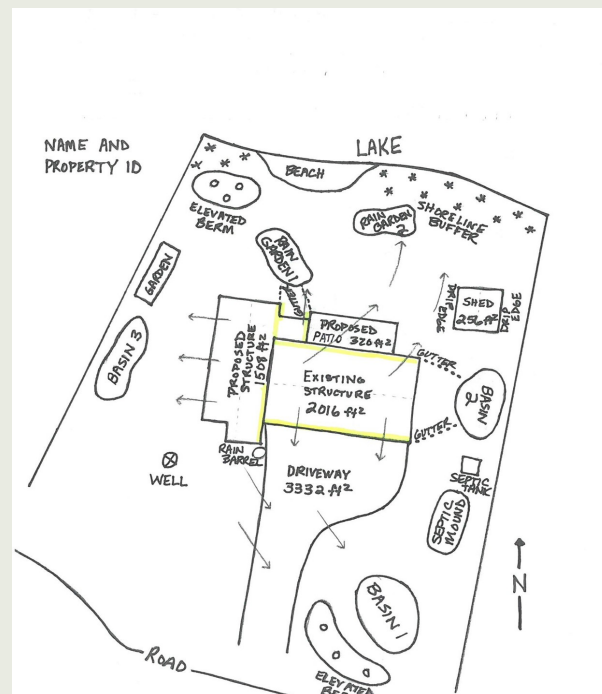
Rain Garden 2 - 8X7X6" Treats 28 cu. ft. from the proposed patio (320 x .083 x 2)

TOTALS
Treats 646.5 cu.ft. where 617 cu.ft. is required



STEP SEVEN: IDENTIFY AND HIGHLIGHT GUTTER PLACEMENTS ON STRUCTURES

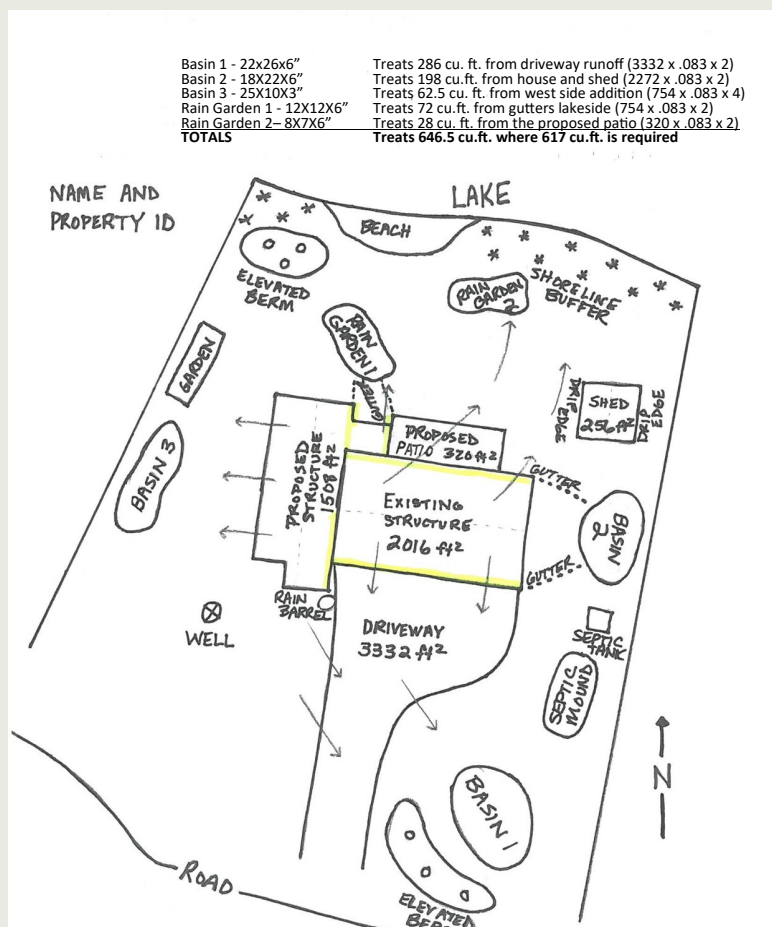
- Use a highlighter to indicate location of gutters on structures.
- Draw a dotted line indicating the flow of water from the downspouts.



Stormwater Management Plan

FINISHED SITE PLAN

- Review plan, making sure you've considered the "Do's & Don'ts" on pg. 9
- Make sure you include your calculations either on the plan or attached to the plan.
- Look over your design to make sure it meet minimum requirements.



3. FEE

There is a \$100 fee for reviewing and approving your Stormwater Management Plan and is usually paid when you apply for your Land Use Permit. If you have not paid, please remit payment to Crow Wing County Land Services. However, If you have an existing Stormwater Management Plan it can be reviewed at no cost. If it meets minimum requirements there is no fee and no further action is required. An upgrade of your plan will incur the \$100.00 fee and will be subject to standard permit approval including a site visit and follow-up by Crow Wing County Staff.

If you have questions please contact Land Services at 218-824-1010 or landservices@crowwing.us



The Next Steps - Approval & Implementation

SUBMISSION AND APPROVAL

Once your site plan has been submitted and your fee paid, an Environmental Services Specialist will review your plan and conduct a site visit before approving your plan. They will contact you if they have any questions or if your plan does not meet minimum requirements.

IMPLEMENTATION

Your Stormwater Management Plan will be required to be completely implemented by the time your Land Use Permit expires; usually two years unless otherwise directed by the County. However, it is favorable to have the implementation of your Stormwater Management Plan coincide with the completion of your project.

FOLLOW UP

Environmental Services will routinely follow up on your both your approved Land Use Permit and your Stormwater Management Plan.

VISIT

crowwing.us/waters

**FOR MORE INFORMATION ON PROTECTING OUR WATERS AND
STORMWATER MANAGEMENT**

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