



Basis of Design  
SM-06

Engineering Department  
City of Bismarck  
221 N. 5<sup>th</sup> Street  
P.O. Box 5503  
Bismarck, ND 58506  
701-355-1505

<b>For Office Use Only:</b>
Date Received:
TRAKiT #:

**POST-CONSTRUCTION STORMWATER MANAGEMENT**  
**Basis of Design & Construction Plan Submittal Checklist**

(Complete all applicable items)

<b>Project Information:</b>	
Site Address:	_____
Description of Work:	_____
Lot & Block Number:	Subdivision: _____

<b>Summary of Site Conditions</b>			
<i>The purpose of this summary is to provide a brief comparison of the SWMP Post-Construction pervious and impervious areas utilized in the Conditional Approval Review to the Design Post-Construction pervious and impervious areas. If the site coverages have changed between the Conditional Approval and the preparation of the Construction Plans please provide updated hydrologic and hydraulic modeling consistent with the requirements of the SWDSM.</i>			
	<b>Pervious Area (square feet)</b>	<b>Impervious Area (square feet)</b>	<b>Total Area (square feet)</b>
<b>SWMP Post-Construction</b>			
<b>Design Post-Construction Conditions</b>			
<b>Change in Area (+/-)</b>			

<b>Basis of Design Report</b>				
<i>All Construction Plans submitted for review and approval by the City Engineer are to include a Basis of Design Report that documents how the final designs meet the requirements of the SWDSM and the Conditionally Approved PCSMP.</i>				
<b>Item</b>	<b>Description</b>	<b>Yes</b>	<b>N/A</b>	<b>Page</b>
<b>1</b>	<b>Site &amp; Applicant Information</b>			
A	Applicant, Contact Name, Address, Phone & Email			
B	Site Address and Subdivision Lot & Block as Applicable			
<b>2</b>	<b>Summary of the Requirements of the Conditionally Approved PCSMP</b>			
A	Point(s) of Analysis and/or Point(s) of Discharge			
B	Requirements or Recommendations of the Approved SWMP			
C	Description of Deviations from the Approved SWMP			
<b>3</b>	<b>Hydrologic Analysis Summary</b>			
A	Summary of the Approved SWMP Existing & Post-Construction Hydrology, or			
B	Revised Existing and Post-Construction Hydrology following the requirements of PCSMP submittal checklist or approved SWMP outline.			
<b>5</b>	<b>Post-Construction Stormwater Management BMPs Summary</b>			
<b>5-A</b>	<b>Post-Construction Peak Flow Compliance BMP</b>			
A.1	Summary of the Approved SWMP Peak Flow Compliance BMP; or			
A.2	Revised Peak Flow Compliance BMP analysis and design following the requirements of PCSMP submittal checklist or approved SWMP outline.			

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<b>Item</b>	<b>Description</b>	<b>Yes</b>	<b>N/A</b>	<b>Page</b>
<b>5-B</b>	<b>Post-Construction Water Quality Compliance BMP</b>			
B.1	Summary of the Approved SWMP Water Quality BMP; or			
B.2	Revised Water Quality Compliance BMP analysis and design following the requirements of PCSMP submittal checklist or approved SWMP outline.			
<b>5-C</b>	<b>Post-Construction Drainage &amp; Conveyance BMPs</b>			
C.1	<b>Streets</b> Summary table listing: <ol style="list-style-type: none"> <li>1. Street Classification;</li> <li>2. Critical Design Grade;</li> <li>3. Calculated Maximum Street Flow Depth; and</li> <li>4. Maximum Encroachment.</li> </ol>			
C.2	<b>Storm Sewer</b> Summary Table of Inlets & Catch Basins reporting for each structure: <ol style="list-style-type: none"> <li>1. Location, type, size, rim elevation and depth of the proposed inlet;</li> <li>2. 5-year 24-hour design flow to the inlet;</li> <li>3. Theoretical inlet capacity;</li> <li>4. Depth of water in the gutter at the inlet;</li> <li>5. Flow intercepted and flow bypassed; and</li> <li>6. Street drainage spread width.</li> </ol> Summary Table of Storm Sewer Pipes reporting for each length of pipe: <ol style="list-style-type: none"> <li>1. Pipe calculations that state the design peak flow rates and design information for each pipe run, such as size, slope, length, material type, and Manning's coefficient;</li> <li>2. Velocities at design flow for each segment of proposed pipe;</li> <li>3. HGL at each inlet, manhole, angle point, and outlet;</li> <li>4. Depth from finish grade to pipe invert for each segment of proposed pipe; and</li> <li>5. When there is a significant change in slope of the pipe through a manhole or other structure, the EGL at the structure assuming the velocity approaches zero.</li> </ol> Detailed design calculations meeting the requirements of <b>Section 6.0</b> of the SWDSM as an attachment to this Basis of Design Report.			

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C.3	<p><b>Culverts</b> Report shall include the following information documenting the performance of the culvert:</p> <ol style="list-style-type: none"> <li>1. Complete culvert calculations that state the design peak flow rates, culvert size, slope, inverts, length, material type, wall thickness, and Manning’s coefficient.</li> <li>2. Type of end treatment.</li> <li>3. Headwater depths and water surface elevations for the design storm events.</li> <li>4. Velocities at the inlet and outlet for the design storm events.</li> <li>5. Flow control type (inlet or outlet).</li> <li>6. Roadway cross-section and roadway profile.</li> </ol> <p>Detailed design calculations meeting the requirements of <b>Section 6.0</b> of the SWDSM as an attachment to this Basis of Design Report.</p>			
C.4	<p><b>Open Channels</b> When engineered open channels are utilized as a post-construction BMP include the following information:</p> <ol style="list-style-type: none"> <li>1. The size and shape of open channels shall be based on flow quantities calculated using the hydrologic methods set forth in <b>Section 4.3.1</b> of the SWDSM.</li> <li>2. Post-Construction flows and the maximum Froude number for each design event.</li> <li>3. Calculations reporting the velocity and shear stress to support the channel lining material selection.</li> <li>4. Graphical profile of the channel longitudinal section reporting the design slope and 5-year 24-hour and 100-year 24-hour storm hydraulic grade lines.</li> </ol>			
5-D	<p>Identification of Parties Responsible for the Operations and Maintenance of the Post-Construction Stormwater Structural and Non-Structural BMPs. <i>Note: O&amp;M Manuals for each approved post-construction BMP shall be required as a condition of approval of the PCSMP.</i></p>			
6	<b>Construction Schedule &amp; Phasing</b>			
A	Narrative of proposed project construction phases and the necessary future submittal and approvals as required by the SWDSM. For example, grading project, water sewer project, final site development, etc.			
B	Summary table indicating future PCSMP application materials and approximate timing. (Updated from Approved SWMP)			

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Item	Description	Yes	N/A	Page
<b>7</b>	<b>Engineer's Statement of Compliance &amp; Seal</b>			
<b>8</b>	<b>Attachments &amp; Additional Information</b>			
A	Post-Construction Hydrologic & Hydraulic Modeling Results			
B	Post-Construction Peak Flow Compliance BMP Calculations			
C	Post-Construction Water Quality Compliance BMP Calculations			
D	Post-Construction Drainage and Conveyance Calculations			

<b>Construction Plans</b>				
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Item	Description	Yes	N/A	Page
A	Public Improvement Construction Plan – Meeting the requirements of the City of Bismarck CAD Standards.			
B	Site Plan – Meeting the requirements of the City of Bismarck Site Plan submittal requirements.			
C	Private Improvement Construction Plans			

<b>Design Engineer</b>				
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All PCSMP application materials; SWMP, Construction Plans, Basis of Design Report, Geotechnical Report and Certification Report are to be submitted under the seal and signature of a Professional Engineer registered in the State of North Dakota.

Have all items included in this PCSMP application been sealed and signed by a Professional Engineer registered in the State of North Dakota?	<b>Yes</b>	<b>No</b>	<b>Page</b>
<b>Submittal Copies:</b>			
1 PDF Copy Uploaded to TRAKiT			
Application Fee Paid			

**Comments:**

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(Complete all applicable items)

**Required Summary Tables:**

*(Recreate from Approved SWMP or update with changes as documented in the Basis of Design Report)*

<b>Project Hydrologic Modeling Summary – Existing Conditions</b>			
<b>Storm Event</b>	<b>Peak Flow (cfs) by Point of Analysis</b>		
	<i>Point 1</i>	<i>Point 2</i>	<i>Point 3</i>
2-year 24-hour			
5-year 24-hour			
10-year 24-hour			
100-year 24-hour			
<b>Project Hydrologic Modeling Summary – Existing Conditions</b>			
<b>Storm Event</b>	<b>Total Volume (acre-feet) by Point of Analysis</b>		
	<i>Point 1</i>	<i>Point 2</i>	<i>Point 3</i>
2-year 24-hour			
5-year 24-hour			
10-year 24-hour			
100-year 24-hour			
<b>Project Hydrologic Modeling Summary – Post-Construction Conditions</b>			
<b>Storm Event</b>	<b>Peak Flow (cfs) by Point of Analysis</b>		
	<i>Point 1</i>	<i>Point 2</i>	<i>Point 3</i>
2-year 24-hour			
5-year 24-hour			
10-year 24-hour			
100-year 24-hour			
<b>Project Hydrologic Modeling Summary – Post-Construction Conditions</b>			
<b>Storm Event</b>	<b>Total Volume (acre-feet) by Point of Analysis</b>		
	<i>Point 1</i>	<i>Point 2</i>	<i>Point 3</i>
2-year 24-hour			
5-year 24-hour			
10-year 24-hour			
100-year 24-hour			

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<b>Basin &amp; Outlet Sizing</b>							
	<i>Approved</i>			<i>Design</i>			
	<i>Size</i>	<i>Invert Elevation</i>	<i>Volume (acre-feet)</i>	<i>Size</i>	<i>Invert Elevation</i>	<i>Volume (acre-feet)</i>	
Outlet 1							<input type="checkbox"/> N/A
Outlet 2							<input type="checkbox"/> N/A
Outlet 3							<input type="checkbox"/> N/A
Outlet 4							<input type="checkbox"/> N/A
Outlet 5							<input type="checkbox"/> N/A
Overflow							<input type="checkbox"/> N/A