



## **WATER RESOURCES/WATER SERVICES** **INTERIM STORMWATER TARGETS 2014**

This bulletin is issued to provide clarity to both the development community and City of Calgary staff as to the proper stormwater targets to be utilized for greenfield and redevelopment projects in The City of Calgary. In view of the need for consistent stormwater quantity and quality targets across the City of Calgary and to avoid stormwater infrastructure being implemented that may lead to future expensive retrofits, this bulletin outlines and clarifies interim stormwater quantity and quality targets to be utilized in The City of Calgary. The interim targets are in alignment with:

- The provincial Stormwater Management Guidelines;
- The most recent Municipal Development Plan, adopted by Council in 2009;
- Total Loadings Objectives for the Bow River, as dictated in the City's License to Operate;
- Relevant Water Management Plans, adopted by Council; and
- The 2011 Stormwater Management & Design Manual, including the 2014 amendments.

As such, the interim targets are largely a summary of targets that have been applied, albeit not necessarily on a consistent basis, for the last few years. The targets are provided from a runoff rate, runoff volume and Total Suspended Solids (TSS) or nutrient capture perspective for the respective watersheds in Calgary, see the attached Table. These targets are interim until the "City-wide Stormwater Targets" study and implementation plan has been concluded by the Strategic Services division of Water Resources and catchment-by-catchment targets have been identified by the Planning & Analysis division of Water Resources.

### **Explanation of Table**

For each watershed of interest, targets are provided for the "off-site discharge" and for the "internal drainage system". The "off-site discharge" refers to the permissible discharge conditions into the receiving water body from the outfall for an entire subdivision. The "internal drainage system" refers to the discharge conditions into the local minor system upstream of an outfall for an entire subdivision.

### **Runoff Rate**

The "off-site discharge" runoff rate target typically conforms to the rates identified in the relevant Water Management Plan for the watershed in question, or the provincial Stormwater Management Guidelines, or both.

The “internal drainage system” runoff rate targets are based on the recommended rates in the 2011 Stormwater Management & Design Manual for greenfield development. In case of redevelopment, the rates are based on a net-zero increase in runoff, or the critical unit area release rate (i.e., the lowest unit area capacity for the respective pipes downstream of the development in question), as per the 2011 Stormwater Management & Design Manual. In the Nose Creek watershed, the rates should also be lower than a rate of 1.257 L/s/ha for a 1:5 year event and 45 L/s/ha for a 1:100 year event to minimize morphological impacts on Nose Creek.

### **Runoff Volume**

For the Bow River and Elbow River watershed, the Fish Creek watershed and the Shepard watershed, the “off-site discharge” runoff volume target corresponds to a 40 mm average annual runoff volume, as per the lower limit of the 10 – 20% imperviousness target as per the 2009 Municipal Development Plan. Lower runoff volume targets are stipulated in the Nose Creek and Pine Creek watersheds.

For greenfield development, the “internal drainage system” runoff volume target should correspond to the average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases.

For redevelopment, the “internal drainage system” runoff volume target is typically an average annual runoff volume of 90 mm for multi-family residential and ICI sites, as per the upper limit of the 10 – 20% imperviousness target as per the 2009 Municipal Development Plan. An average of 300 mm absorbent landscaping shall be implemented at all single-family residential development, as per the Bow Basin Water Management Plan. Other LID practices can be substituted at the discretion of Water Resources. A net-zero increase in runoff volume, or 90 mm runoff volume target, whichever is lower, applies to the Western Headworks Canal Direct Discharge Area as per the moratorium that is in place or the 2009 Municipal Development Plan.

In case of the Bow River and Elbow River watershed, the Fish Creek watershed and the Forest Lawn Creek / Shepard Ditch watershed, for redevelopment sites that have been demonstrated (to the satisfaction of Water Resources) not to be able to meet the 90 mm average annual runoff volume target, alternative water quality enhancement may be required so that the total TSS load does not increase over the load expected from a 90 mm average annual runoff volume. A spreadsheet to demonstrate compliance with this conditions will be available at Water Resources - Development Approvals’ website, see <http://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Development-Approvals-Submissions.aspx>. The potential relaxation of the average annual runoff volume target provides the industry flexibility for the design of redevelopment sites, subject to the total TSS load condition being met.

### **Water Quality**

The “off-site discharge” target is the removal of 85% TSS for particles  $\geq 50$  microns as per the 2011 Stormwater Management & Design Manual.

The “internal drainage system” target is the removal of 85% TSS for particles  $\geq 50$  microns for private sites greater than or equal to 0.4 ha, regardless of the presence of downstream storm ponds; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.

In addition, in case of the Western Headworks Canal Direct Discharge Area, a net-zero increase in TSS, Total Phosphorus (TP) and Total Nitrogen (TN) applies for an average annual year (over the period 1960 through 2009) as per the moratorium.

The need to provide BMPs for private parcels greater than 0.4 ha provides consistency with the 2011 ESC guidelines, and with greenfield development where BMPs can be implemented at the SMDP stage for any size of development. It will also reduce the City’s overall TSS loadings to the Bow River, and reduce the deposition of excessive amounts of gravels and sediments in the storm sewer system. As such, it addresses one of the requests made by industry representatives during the recent discussions about the amendments to the 2011 Stormwater Management & Design Manual when Water Resources was asked to examine options to reduce the gravel and sediment loadings at the source.

The interim stormwater targets apply to all greenfield and redevelopment in the City of Calgary. Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while an average of 300 mm absorbent landscaping shall be applied at single-family residential development. Other LID practices can be substituted at the discretion of Water Resources. This is consistent with the targets for redevelopment areas.

In the next few years, Water Resources intends to issue on-line maps showing the distribution of these targets for use by City of Calgary staff and industry. Water Resources recognizes that there will be a transitional period and therefore will be flexible where possible in the implementation of the above interim targets, and is open to constructive alternatives provided that the intent of the above targets is met to Water Resources' satisfaction.

The above interim targets will be incorporated in the next update of the City of Calgary Stormwater Management & Design Manual.

For questions related to the above, please either contact Maggie Zhang, Leader Development Approvals at (403) 268-2855 or at [maggie.zhang@calgary.ca](mailto:maggie.zhang@calgary.ca) or Bert van Duin, Senior Development Engineer at (403) 268-6449 or at [bert.vanduin@calgary.ca](mailto:bert.vanduin@calgary.ca).

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Bow River watershed (excluding areas listed below) – greenfield development	<p><u>Off-Site Discharge:</u> net-zero increase over predevelopment conditions as per 1999 provincial Stormwater Management Guidelines. Confirm the unit area discharge rate with Water Resources.</p> <p><u>Internal Drainage System:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented as per Section 3.1.2.3 (v) of the 2011 Stormwater Management &amp; Design Manual allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> 40 mm average annual runoff volume, as per the lower limit of the 10 – 20% imperviousness target as per the 2009 Municipal Development Plan.</p> <p><u>Internal Drainage System:</u> average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases.</p> <p>Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while 300 mm absorbent landscaping shall be applied at single-family residential development. (LID practices other than absorbent landscaping can be substituted at the discretion of Water Resources.)</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq</math> 50 microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than or equal to 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>
Bow River and Elbow River watersheds (excluding areas listed below) – redevelopment	<p><u>Internal Drainage System:</u> Net-zero increase or critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question), whichever is lower</p> <p>2011 Stormwater Management &amp; Design Manual – Section 3.1.2.4, Modified Unit Area Release Rate Method</p>	<p><u>Internal Drainage System:</u> the lowest value of:</p> <ul style="list-style-type: none"> <li>a) average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases, or</li> <li>b) 90 mm average annual runoff volume for multi-family residential and ICI sites.</li> </ul> <p>300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than or equal to 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p> <p>For sites that have been demonstrated (to the satisfaction of Water Resources) not to be able to meet the 90 mm average annual runoff volume target, alternative water quality enhancement may be required so that the total TSS load does not increase over the load expected from a 90 mm average annual runoff volume.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
<p>Elbow River watershed, upstream of Glenmore Dam – greenfield development</p>	<p><u>Off-Site Discharge:</u> net-zero increase over predevelopment conditions as per 1999 provincial Stormwater Management Guidelines. Confirm the unit area discharge rate with Water Resources.</p> <p><u>Internal Drainage System:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented as per Section 3.1.2.3 (v) of the 2011 Stormwater Management &amp; Design Manual allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> 40 mm average annual runoff volume, as per the lower limit of the 10 – 20% imperviousness target as per the 2009 Municipal Development Plan.</p> <p><u>Internal Drainage System:</u> average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases.</p> <p>Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while 300 mm absorbent landscaping shall be applied at single-family residential development. (LID practices other than absorbent landscaping can be substituted at the discretion of Water Resources.)</p>	<p><u>Off-Site Discharge:</u> net-zero increase in average annual TSS loadings or 90% TSS removal for particles ≥ 50 microns, whichever is lower.</p> <p>Adapted from the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p>Contact Water Resources to discuss requirements for spill control of hazardous compounds.</p> <p><u>Internal Drainage System:</u> 90% TSS removal for particles ≥ 50 microns or greater for private sites greater than or equal to 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>Adapted from 2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
<p>Elbow River watershed, upstream of Glenmore Dam - redevelopment</p>	<p><u>Internal Drainage System:</u> Net-zero increase or critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question), whichever is lower</p> <p>2011 Stormwater Management &amp; Design Manual – Section 3.1.2.4, Modified Unit Area Release Rate Method</p>	<p><u>Internal Drainage System:</u> the lowest value of:</p> <ul style="list-style-type: none"> <li>a) average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases, or</li> <li>b) 90 mm average annual runoff volume for multi-family residential and ICI sites.</li> </ul> <p>300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Internal Drainage System:</u> the lowest value of net-zero increase in average annual TSS loadings or 90% TSS removal for particles ≥ 50 microns or greater for private sites greater than or equal to 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>Contact Water Resources to discuss requirements for spill control of hazardous compounds.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p> <p>For sites that have been demonstrated (to the satisfaction of Water Resources) not to be able to meet the 90 mm average annual runoff volume target, alternative water quality enhancement may be required so that the total TSS load does not increase over the load expected from a 90 mm average annual runoff volume.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Nose Creek watershed – greenfield development	<p><u>Off-Site Discharge:</u> 1.257 L/s/ha on Nose Creek main stem and 0.99 L/s/ha on West Nose Creek, for a 1:100 year event, as per the 2008 Nose Creek Watershed Water Management Plan</p> <p><u>Internal Drainage System:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> See Table 8.1 and Amendments #1 and #2 of the 2008 Nose Creek Watershed Water Management Plan, based on the date of the Staged Master Drainage Plan submission.</p> <p><u>Internal Drainage System:</u> average annual runoff volume targets as identified in the Staged Master Drainage Plan for the subdivision phase in question.</p> <p>Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while 300 mm absorbent landscaping shall be applied at single-family residential development. (LID practices other than absorbent landscaping can be substituted at the discretion of Water Resources.)</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq</math> 50 microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>
Nose Creek watershed – redevelopment	<p><u>Internal Drainage System:</u> The lowest values of:</p> <ul style="list-style-type: none"> <li>a) Net-zero increase</li> <li>b) Critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question),</li> <li>c) 1.257 L/s/ha for a 1:5 year event and 45 L/s/ha for a 1:100 year event</li> </ul> <p>(a) and (b) are as per the 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.4, Modified Unit Area Release Rate Method. (c) is a relaxation of the 2008 Nose Creek Watershed Water Management Plan</p>	<p><u>Internal Drainage System:</u> the lowest value of:</p> <ul style="list-style-type: none"> <li>a) average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases, or</li> <li>b) 90 mm average annual runoff volume for multi-family residential and ICI sites.</li> </ul> <p>300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan, and is the 2007-2010 target for the 2008 Nose Creek Watershed Water Management Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>



Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Fish Creek watershed – greenfield development	<p><u>Off-Site Discharge:</u> 0.14 L/s/ha, 0.35 L/s/ha, 0.58 L/s/ha, 0.93 L/s/ha, 1.06 L/s/ha, 1.63 L/s/ha and 2.42 L/s/ha, for the 1:2 year, 1:5 year, 1:10 year, 1:25 year, 1:50 year and 1:100 year return frequencies, respectively, as per 2000 Fish Creek Drainage Study</p> <p><u>Internal Drainage System:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> 40 mm average annual runoff volume, as per the lower limit of the 10 – 20% imperviousness target as per the 2009 Municipal Development Plan.</p> <p><u>Internal Drainage System:</u> average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases.</p> <p>Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while 300 mm absorbent landscaping shall be applied at single-family residential development. (LID practices other than absorbent landscaping can be substituted at the discretion of Water Resources.)</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq</math> 50 microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>
Fish Creek watershed - redevelopment	<p><u>Internal Drainage System:</u> Net-zero increase or critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question), whichever is lower</p> <p>2011 Stormwater Management &amp; Design Manual – Section 3.1.2.4, Modified Unit Area Release Rate Method</p>	<p><u>Internal Drainage System:</u> the lowest value of:</p> <ul style="list-style-type: none"> <li>a) average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases, or</li> <li>b) 90 mm average annual runoff volume for multi-family residential and ICI sites.</li> </ul> <p>300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than or equal to 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p> <p>For sites that have been demonstrated (to the satisfaction of Water Resources) not to be able to meet the 90 mm average annual runoff volume target, alternative water quality enhancement may be required so that the total TSS load does not increase over the load expected from a 90 mm average annual runoff volume.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Pine Creek watershed	<p><u>Off-Site Discharge:</u> 0.08 L/s/ha, 0.27 L/s/ha and 1.05 L/s/ha, for the 1:2 year, 1:5 year and 1:100 year return frequencies, respectively, as per 2007 Pine Creek Watershed Study</p> <p><u>Internal Drainage System:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> 17 mm average annual runoff volume as per 2009 Memorandum in addition to 2007 Pine Creek Watershed Study</p> <p><u>Internal Drainage System:</u> average annual runoff volume targets as identified in the Staged Master Drainage Plan for the subdivision phase in question.</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq</math> 50 microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>
Western Headworks Canal Direct Discharge Area	<p><u>Internal Drainage System:</u> The lowest value of:</p> <ul style="list-style-type: none"> <li>a) net-zero increase in runoff rate for 1:5 year and 1:100 year conditions as per moratorium</li> <li>b) Critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question)</li> </ul>	<p><u>Internal Drainage System:</u> The lowest value of:</p> <ul style="list-style-type: none"> <li>a) net-zero increase in runoff volume for average annual year (over period 1960 through 2009) as per moratorium</li> <li>b) 90 mm average annual runoff volume.</li> </ul> <p>At all times, 300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Internal Drainage System:</u> The lowest value of:</p> <ul style="list-style-type: none"> <li>a) net-zero increase in TSS, TP and TN loadings for average annual year (over period 1960 through 2009) as per moratorium</li> <li>b) 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</li> </ul> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Forest Lawn Creek / Shepard Ditch watershed – greenfield development	<p><u>Off-Site Discharge:</u> confirm the unit area discharge rate with Water Resources</p> <p><u>Internal:</u> 70 to 120 L/s/ha as per 2011 Stormwater Management &amp; Design Manual – Section 3.1.2.3, Unit Area Release Rate Method, unless adequate LID is implemented allowing the unit area discharge rate to be reduced to 45 L/s/ha.</p>	<p><u>Off-Site Discharge:</u> 40 mm average annual runoff volume,</p> <p>The 40 mm target corresponds to the lower limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan.</p> <p>Areas that have Staged Master Drainage Plans that currently do not call for the implementation of runoff volume targets shall implement the 90 mm runoff volume target for multi-family residential and ICI developments while 300 mm absorbent landscaping shall be applied at single-family residential development. (LID practices other than absorbent landscaping can be substituted at the discretion of Water Resources.)</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq</math> 50 microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq</math> 50 microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p>

Watershed	Runoff Rate Target	Runoff Volume Target	Water Quality Targets
Shepard watershed - redevelopment	<p><u>Internal Drainage System:</u> Net-zero increase or critical unit area release rate (i.e., the lowest unit area release capacity for the respective pipes downstream of the development in question), whichever is lower</p> <p>2011 Stormwater Management &amp; Design Manual – Section 3.1.2.4, Modified Unit Area Release Rate Method</p>	<p><u>Internal Drainage System:</u> the lowest value of:</p> <ul style="list-style-type: none"> <li>a) average annual runoff volume targets as established in SMDP and updated in SWMRs for individual phases, or</li> <li>b) 90 mm average annual runoff volume for multi-family residential and ICI sites.</li> </ul> <p>300 mm absorbent landscaping shall be implemented at all single-family residential development. Other LID practices can be substituted at the discretion of Water Resources.</p> <p>The 90 mm target corresponds to the upper limit of the 10-20% imperviousness target as per the 2009 Municipal Development Plan. The absorbent landscaping corresponds to the Bow Basin Water Management Plan – Phase 1.</p>	<p><u>Off-Site Discharge:</u> 85% TSS removal for particles <math>\geq 50</math> microns, as per the 2011 Stormwater Management &amp; Design Manual – Section 7.4 – Regulatory Requirements</p> <p><u>Internal Drainage System:</u> 85% TSS removal for particles <math>\geq 50</math> microns or greater for private sites greater than 0.4 ha; gas stations, lube and oil change facilities; vehicle maintenance and mechanical shops (including adjacent parking lots) and sites with on-site storage of fuel; heavy industrial and manufacturing sites; or any industrial/commercial sites that drain into vegetated swales/ditches.</p> <p>2011 Stormwater Management &amp; Design Manual – Section 4.13, Best Management Practices.</p> <p>For sites that have been demonstrated (to the satisfaction of Water Resources) not to be able to meet the 90 mm average annual runoff volume target, alternative water quality enhancement may be required so that the total TSS load does not increase over the load expected from a 90 mm average annual runoff volume.</p>