



TOWN POLICY

POLICY NUMBER: 3701

REFERENCE:
Council 328.05.93

ADOPTED BY:
Town Council

PREPARED BY: Engineering

DATE: 5 May 1993

TITLE: Stormwater Management Policy

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Policy Statement

The Town of Strathmore will provide guidance and direction for storm water management for builders and developers undertaking projects within the municipal boundaries of the Town of Strathmore.

1. **Definitions**

- 1.1. **Minor Storm System** means those ditches, pipes, manholes, catch basins and outfall structures that convey flows to receiving waters for events up to the 1 in 5 year return period.
- 1.2. **Major Storm System** means the street system, drainage courses, detention and retention facilities that convey runoff from events up to the 1 in 100 year return period to receiving waters in a manner so that there is no significant damage to property during the return event.
- 1.3. **Watercourse** means any natural drainage course or source of water, whether usually containing water or not, including any lake, river, creek, spring, ravine, swamp, gulch or source of groundwater.
- 1.4. **Detention (Dry) Ponds** are the ponds which are normally dry and temporarily store storm runoff, and release it at a controlled rate. They may form part of both the minor and major storm systems.

- 1.5. Retention (Wet) Ponds are ponds which have permanently wet bottoms and store water during a storm by allowing the surface level to rise above its normal level and release it at a controlled rate. They form part of both the minor and major storm systems.
- 1.6. Receiving Waters means the water course or body of water, into which storm waters are ultimately discharged.
- 1.7. Run Off Coefficient (C) is the impermeability factor of the surface over which runoff flows. The lower the number, the more pervious is the surface. The higher the number, the more impervious is the surface.
- 1.8. Town Manager means the manager of the Town of Strathmore or his designate as employed or retained by the Town of Strathmore.
- 1.9. Storm Water Management means the planning, analysis, collection, storage, controlling, and release of storm runoff. The storm system drainage may involve the use of on-site storage via either:
 - 1.9.1 permanently wet bottom ponds, which store water during a storm by allowing the pond level to rise above the normal water level; or
 - 1.9.2 dry bottom ponds which store water when the storm pipe system capacity is exceeded above the normal ground level.

2. **General**

- 2.1 This Policy shall complement the Town of Strathmore General Municipal Plan generally and specifically with regard to development of a Storm Water Management System for the Town.
- 2.2 All storm waters are to be controlled within the Town boundaries. No discharge to roads, ditches, water courses and other conveyances that exit the Town of Strathmore is permitted except as detailed in this Policy.
- 2.3 All storm waters, including those from the 1:100 year event, are to be confined within the development and drainage cells identified in this Policy unless specifically otherwise permitted by the Town.
- 2.4 Each new subdivision or development with the Town of Strathmore shall be accompanied by a drainage and/or detention plan which will be approved by the Town Manager.

- 2.4.1 The drainage plan will show how storm waters are to be handled in both the minor and major systems.
- 2.4.2 The storm drainage system shall be adequately sized to comply with all local and Provincial requirements, and allow for future expansion if necessary.
- 2.4.3 These drainage and/or detention plans shall ensure that surface waters are directed away from building and those habitable portions of buildings are not subject to flooding even in the 1:100 year event.
- 2.5 No natural drainage course or water course shall be altered or diverted unless it is done in accordance with the approved drainage plan mentioned in Section 2.4.
- 2.6 Each new subdivision or development within the Town of Strathmore shall have paved roads, curb and gutter and a piped minor storm system unless otherwise approved by the Town.
- 2.7 Developers and builders are encouraged to be creative with their storm water management plans.
- 2.8 The rate of post development storm water runoff shall not exceed the rate established for each development and drainage sell within the Town and described in Section 3 following.
- 2.9 Developers may continue to use the present overland drainage courses that convey storm flows from the Town to road ditches in Wheatland County surrounding Strathmore, provided that discharge from any new development does not exceed present natural flows at the Town boundaries and with permission received from the County. The C factor for these new developments will be 0.10.
- 2.10 The storm water collection system shall be designed and constructed to minimize the time and costs of maintenance of the systems by the Town of Strathmore.
- 2.11 Developers and builders shall ensure that environmentally sensitive areas are protected.

- 2.12 The Town shall direct the developer to install weeping tile drains that connect to a storm sewer unless a report from a qualified soils consultant states otherwise.
- 2.12.1 The weeping tiles shall be connected to a separate weeping tile storm sewer main. This weeping tile storm sewer main shall be connected to the storm sewer system at a manhole located such that the rim of the manholes is at least 0.3 m below the lowest habitable areas of any building connected to this weeping tile system.
- 2.12.2 When a new development takes place in an existing built-up area of the Town and weeping tile drains are required, but it is not possible nor practical to connect to or install a weeping tile storm sewer main, the developer may install sump pumps and pump water from the weeping tiles to the grade within the side.
- 2.13 For the purposes of designing storm sewer systems and preparing drainage plans for projects in Strathmore, developers and builders shall follow the design criteria set forth in Storm Management Guidelines for the Province of Alberta and those established by the City of Calgary.
- 2.14 The City of Calgary IDF curve and format for the calculation of storm water flows and storm water retention are adopted for use in the Town of Strathmore. Those items are attached as Appendix “A”.
- 2.15 All stormwater collection and detention costs shall be borne by the developer and matters of oversizing and boundary conditions will be dealt with at the Development Permit/ Agreement stage.
- 2.16 The Storm System design is to reduce the chances of flooding, and therefore to:
- 2.16.1 minimize damage to property, physical injury and loss of life resulting from infrequent or unusual “major” storms, and
- 2.16.2 minimize hazard and inconvenience or disruption of activities resulting from runoff of more frequently occurring, although less significant, “minor” storms.
- 2.17 The Storm System is to encourage evolution of stormwater management solutions which will minimize detrimental impacts on downstream water quality from residential surface drainage.

- 2.18 The Storm System design is to promote drainage systems which will reduce potential soil erosion and reduce sediment deposition in streams and water bodies.
- 2.19 The Storm System design is to achieve economical design of systems through multi-use facilities which will minimize capital and environmental costs to the community.
- 2.20 Developers shall ensure that stormwater drainage studies assess the relative impacts of alternative design solutions within both the proposed subdivision and the overall basin wide drainage system.
- 2.21 Evolve designs that will improve aesthetic, recreational and environmental features of urban developers.

3. **Development Cells**

3.1 Cell No.1

- 3.1.1 This cell is presently the site of the Strathmore Golf Course, contains two large ponds and drains to Pond #2.
- 3.1.2 Should any development occur in this cell, post development discharge shall be limited to pre-development levels.
- 3.1.3 Present $C = 0.10$
- 3.1.4 Future $C = 0.10$

3.2 Cell No. 2

- 3.2.1 This cell contains Ponds No. 1 and No. 2 as well as a mobile home park, residential subdivisions, a proposed commercial site and multi-family development (Freeman Property) and a municipal park.
- 3.2.2 There is no extensive piped storm sewer system within Cell No. 2 and water from Cells No. 2B, and 2D travel overland to Pond #2 via paved streets with curb and gutter. Storm waters in Cell No. 2 flow overland via paved streets with curb and gutters to the intersection of Lakeside Boulevard and Waddy Lane where they are collected and piped under the abandoned CPR right of way to Pond #2. Cell No. 2E shall drain to Pond No. 2 via a piped storm sewer system, but

there are no plans to install such a system within Cell No. 2A, No. 2B, No. 2C or No. 2D.

3.2.3 Throughout Cell No. 2, the runoff coefficient shall be as follows:

3.2.3.1 Cell No. 2A - Present C = 0.10
- Future C = 0.10

3.2.3.2 Cell No. 2B - Present C = 0.50
- Future C = 0.50

3.2.3.3 Cell No. 2C - Present C = 0.25
- Future C = 0.25

3.2.3.4 Cell No. 2D - Present C = 0.25
- Future C = 0.25

3.2.3.5 Cell No. 2E - Present C = 0.10
- Future C = 0.50

3.2.3.6 Cell No. 2F - Present C = 0.10
- Future = 0.25

3.3 Cell No. 3

3.3.1 This old “core” area of Strathmore contains the central business district, residential areas, schools, parks and Kinsmen Lake (Pond #3).

3.3.2 The only portion of this core area served with storm sewer is 3rd Avenue from Kinsmen Lake to the Co-op Parking lot. The balance of the area drains overland via streets and lanes to Lakeside Boulevard. Two outfalls, one at 4th Avenue and another at 6th Avenue direct these waters to Kinsmen Lake.

3.3.3 2nd Avenue, between Lakeside Boulevard and 2nd Street, is scheduled for reconstruction in the future and a storm sewer will be installed as part of the reconstruction. The storm sewer will discharge to Kinsmen Lake.

3.3.4 The only other plans would be for surface drainage improvements such as adding curb and gutter to those streets without it, and installing drainage swales across roads where necessary.

3.3.5 Several new commercial buildings have recently been built in the downtown core, and more are planned in the near future. Also, the General Municipal Plan is encouraging businesses to restore, redevelop and provide in fill developments in this core area. These developments could dramatically increase the storm runoff from the core area. As a result, it is imperative that post development storm discharge not exceed pre-development levels.

3.3.6 The composite runoff coefficients established for the core area shall be as outlined below:

3.3.6.1 Cell No. 3A - Present C = 0.25
- Future C = 0.25

3.3.6.2 Cell No. 3B - Present C = 0.65
- Future C = 0.75

3.3.6.3 Cell No. 3C - Present C = 0.25
- Future C = 0.25

3.3.6.4 Cell No. 3D - Present C = 0.10
- Future C = 0.10

3.4 Cell No. 4

3.4.1 This cell presently drains overland to Pond #4.

3.4.2 As this cell develops, the new minor and major storm water systems will continue to direct the stormwater to Pond #4.

3.4.3 Present C = 0.10

3.4.4 Future C = 0.25

3.5 Cell No. 5

3.5.1 This small cell, east of Lakeside Boulevard and north of the Trans Canada Highway, encompasses Leroy's Motel and the adjacent vacant lot.

3.5.2 A 450 mm diameter storm sewer along Centre Street serves this area and discharges to Pond #5. The grades of the pipes are not known

and the capacity cannot be determined. At the present time, a runoff coefficient of 0.25 has been set until such time as the pipe grades can be determined and the capacity of the main calculated. Should there be extra capacity in this main, it can all be dedicated to this drainage cell.

3.6 Cell No. 6

3.6.1 This cell, fronting the Trans Canada Highway, is already serviced with paved roads, curb and gutter and a piped storm system that presently deadends at Spruce Park Drive. The Town of Strathmore intends to extend this system from Spruce Park Drive to Pond #5.

3.6.2 Present $C = 0.25$

3.6.3 Future $C = 0.50$

3.7 Cell No. 7

3.7.1 This cell presently drains to Pond #5 and the Eagle Lake Ditch, and this outfall must remain unchanged.

3.7.2 The small slough at the SE corner of this cell is not considered environmentally sensitive and may be filled during development.

3.7.3 Present $C = 0.10$

3.7.4 Future $C = 0.50$

3.8 Cell No. 8

3.8.1 The Spruce Industrial Park is fully developed with paved roads, curbs, gutters and a piped storm water system that discharges to Eagle Lake Ditch at Slater Road. The existing storm sewer in Slater Road will be extended west through Cell No. 9 to Cell No.11.

3.8.2 Present $C = 0.50$

3.8.3 Future $C = 0.50$

3.9 Cell No. 9

3.9.1 This cell is presently undeveloped with the exception of the W.I.D. offices and shops in the northeast corner of the cell.

- 3.9.2 The General Municipal Plan proposes highway commercial and industrial development in the future.
- 3.9.3 On site storm sewer system constructed as this cell develops will connect to the existing system in Slater Road. There is the possibility a flow restriction exists in the main west of Spruce Park Drive. The slope of the existing pipe will have to be confirmed in order to calculate the capacity of that particular leg of the system. If such a flow restriction does exist the flows from Cell No. 9 will have to be detained so as to not overload the system in Slater Road.
- 3.9.4 Present C = 0.10
- 3.9.5 Future C = 0.50
- 3.10 Cell No. 10
- 3.10.1 Cell No. 10 is a fairly complex cell comprising areas of undeveloped land, commercial and residential use.
- 3.10.2 This cell is presently drained by means of a piped system north of the Trans Canada Highway to a series of small ponds, drainage ditches and natural stream courses south of the Trans Canada Highway and then into a small creek bed which flows south through the feedlot and then onto Eagle Lake.
- 3.10.3 Cell No. 10 has been broken down into four sub-cells. Post development discharge shall not exceed pre-development levels north of the Trans Canada Highway. As cells south of the Highway are planned for commercial and industrial use, higher future runoff coefficients have been proposed for these areas.
- 3.10.4 The Town of Strathmore has no objection to the pond east of the ~~County of Wheatland~~ **Wheatland County** offices being dredged, reshaped, relocated or filled in, to accommodate development so long as flows in the small creek flowing south from Cell No. 10 do not exceed pre-development levels.
- 3.10.5 Pre-development flow levels are to be maintained in the small creek south from Cell No. 10.

3.10.6 Excess flows from Cell No. 10 are to be directed east via a piped system through Cell No. 9 to connect the existing piped system in Slater Road in Cell No. 8. A new pond on the south Town boundary complete with control and diversion structures will have to be provided by the developers in Cell No. 10 to maintain downstream flows at present levels in the creek, direct the balance of storm water through Cell No. 9, Cell No. 8 and eventually Pond #6 and detain any excess water.

3.10.7 Cell No. 10A = Present C = 0.50
Future C = 0.50

3.10.8 Cell No. 10B = Present C = 0.35
Future C = 0.35

3.10.9 Cell No. 10C = Present C = 0.10
Future C = 0.50

3.10.10 Cell No. 10D = Present C = 0.10
Future C = 0.50

3.11 Cell No. 11

3.11.1 Cell No. 11 is comprised of three distinct components. Cell No. 11A is land that lies outside the present Town boundaries, but drains into Town. This cell is also part of a proposed golf course/residential subdivision now in the design stage. Annexation of this land is a possibility and it should therefore be included in this Policy. This cell drains to Cell No. 11B.

3.11.2 Cell No. 11B is presently undeveloped land within the Town boundary and is also part of the proposed golf/residential subdivision described above. This cell drains northward into ponds along the abandoned CPR right of way.

3.11.3 Cell No. 11C is the existing Westmount Subdivision complete with paved roads, curb and gutter, and a piped storm water system. This cell discharges northward into Cell No. 11B at Wheeler Street.

3.11.4 Cell No. 11 eventually discharges to Cell No. 1 and then to Pond #2.

3.11.5 Post development discharge from Cell No. 11A, No. 11B and No. 11C is not to exceed pre-development levels.

3.11.6 With the exception of rear yard drainage from lots abutting Cell No. 11C, all other roof and surface drainage within Cells No. 11A and No. 11B is to be confined within the boundaries of these cells. This includes surface water in the 1:100 storm event as well. The existing storm sewer in Cell No. 11C (Westmount Subdivision) is sized only to handle storm water generated within that cell.

3.11.7 The Town of Strathmore has no objection to the ponds in Cell No. 11A and 11B being dredged, reshaped or relocated to accommodate proposed development so long as storage capacities are not reduced from what is required to control storm waters generated on site.

3.11.8 Cell No. 11A = Present C = 0.10
 Future C = 0.10/Golf Course Portion
 Future C = 0.25/Residential Portion

3.11.9 Cell No. 11B = Present C = 0.10
 Future C = 0.10/Golf Course Portion
 Future C = 0.25/Residential Portion

3.11.10 Cell No. 11C = Present C = 0.25
 Future C = 0.25

3.12 Cell No. 12

3.12.1 Cell No. 12 is comprised of a number of distinct components. The area west of Wheatland Trail and North of the W.I.D. canal is presently used for the Golf Course with possible future residential north of the Golf Course. The area north of Brent Boulevard and east of Wheatland Trail is a combination of parkland and recreational areas. A small portion east of Wheatland Trail and south of Brent Boulevard is future residential/commercial development. Presently this all drains overland to the W.I.D. canals.

3.12.2 As this cell develops flows are to be directed to Pond No. 1 via an under crossing of the W.I.D. canal in the vicinity of Wheatland Trail.

3.12.3 Curbs, gutters and a stormwater collection system shall be installed in future developments with the exception of Wheatland Trail which is to remain a rural section with ditches.

3.12.4 Present C = 0.10

3.12.5 Future C = 0.25 - Commercial/Residential
Future C = 0.10 - Golf Course

3.13 Cell No. 13

3.13.1 This cell is virtually built as a residential only development and drains to the W.I.D. canal under an agreement between the Town of Strathmore and the W.I.D.

3.13.2 Should any redevelopment to a higher density or land use occur, post redevelopment discharge from the sites shall not exceed pre-development levels.

3.13.3 Present C = 0.25

3.13.4 Future C = 0.25

3.14 Cell No. 14

3.14.1 This cell contains residential, light industrial and school uses, and is fully developed with paved roads and curbs and gutters. Drainage is to Pond #1 via a pipe under the W.I.D. canal.

3.14.2 It is recommended that when the vacant light industrial lots are developed, post development discharge from the sites be limited to C = 0.25. Drainage and detention calculations shall be submitted with a Development Permit or Building Permit Application as the case may be.

3.14.3 Present C = 0.25

3.14.4 Future C = 0.25

3.15 Cell No. 15

3.15.1 This cell comprises land that is nearly completely developed or has designs in place for an adequate storm sewer system.

3.15.2 There is a triangular piece of land bounded on the south by East Lake Road, on the east by Maplewood Drive, and on the west by the Brentwood Industrial Subdivision that is presently being developed with churches, etc. The post development discharge from these sites

shall be limited to $C = 0.25$. On-site detention will have to be provided on roof tops, parking lots, or landscaped areas.

3.15.3 Drainage and detention calculations will have to be submitted with any Development Permit or Building Permit as the case may be.

3.15.4 Present $C = 0.25$

3.15.5 Future $C = 0.25$

3.16 Cell No. 16

3.16.1 Presently drains overland to East Lake Road and the ditch along the north-south road on the east Town boundary.

3.16.2 As this cell develops, flows are to be directed to the existing storm sewer system at the intersection of East Lake Road and Green Meadow Drive.

3.16.3 Curbs, gutter and a stormwater collection system shall be installed in future developments with the exception of the extension of Brent Boulevard to the east Town boundary and East Lake Road, east of the Maplewood Subdivision. These two roads are to remain rural sections until development warrants the installation of curb and gutter, and such installation will be the responsibility of the developer.

3.16.4 Present $C = 0.10$

3.16.5 Future $C = 0.25$. However, the discharge from this cell will be restricted by the capacity of the existing storm sewer system at East Lake Road and Green Meadow Drive. Appropriately sized and located detention ponds must be constructed at the developer's expense to handle storm water in excess of the capacity of the present piped system.

4. **End of Policy**

APPENDIX "A"**STORMFLOW & RETENTION
CALCULATION FORMAT****STORM SEWER RETENTION****Revised March, 1989**

Subject to Change, Without Notice

The following is the method the City of Calgary currently utilizes to check storm retention systems:

Retention:

Q1 = allowable flow to main (m³/sec)Q2 = realistic runoff from site (m³/sec)

C1 = coefficient used to design public main

C2 = actual coefficient of runoff from site, include future development

i = intensity (82.55 mm/hr.)

A1 = area of site in hectares

 $Q1 = (c1) (i)(A1)(2.78)$ $Q2 = (c2) (i)(A1) (2.78)$

If Q1 is equal to or greater than Q2, retention will not be required.

Hydraulic Slope

SH = hydraulic slope

H1 = interior top of pipe elevation at lower end of retention system.

H2 = top of pond elevation

L = length from center of manhole to end of pipe

 $SH = \frac{H2 - H1}{L}$ **Storage**

Z = constant

a = 1651

C2 = overall coefficient of runoff, include future development

A = drainage area (hectares)

V = volume (cu. m.), required storage to limit flow to Q1 or Q3

T = time in minutes

$$\text{Step 1 } Z = \frac{a C_2 A}{6}$$

$$\text{Step 2 } T = -10 + \frac{183.44 C_2 A}{2 Q_1}$$

$$\text{Step 3 } V = Z T [T + 10]^{-1} - [60 \times Q_1 \times T]$$

General Notes

Design storm system to include total site area and account for future development.

Ensure floors, doors, windows, sanitary manholes rims, etc. elevations are above peak pond elevations.

Design site with emergency overland escape routes.

Retention systems shall be designed basing the design on the 5 year storm, having an intensity of 3.25" in the 10 minute period (82.5 mm/hr.).

Area No.: _____ Designed By: _____ Date: _____
 Page _____ of _____

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|---|--|--|--|--|--|--|--|--|--|--|--|--|
| Capacity of Pipe | | | | | | | | | | | | |
| Time of Flow Minutes (min) | | | | | | | | | | | | |
| Length of Line Metres (m) | | | | | | | | | | | | |
| Velocity of Flowing Full (m/s) | | | | | | | | | | | | |
| Diameter of Pipe (mm) | | | | | | | | | | | | |
| Slope | | | | | | | | | | | | |
| $C = 2.78 C:A$ ($\text{cm}^3/\text{s} = \text{ /s}$) | | | | | | | | | | | | |
| Intensity I(mm/h) | | | | | | | | | | | | |
| Time of Concentration Minutes (min) | | | | | | | | | | | | |
| Total Area C = 100% Hectares | | | | | | | | | | | | |
| Equivalent Area C = 100% Hectares | | | | | | | | | | | | |
| Runoff Factor "C" | | | | | | | | | | | | |
| Increment Area Hectares (ha.) | | | | | | | | | | | | |
| Increment Area Number | | | | | | | | | | | | |
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APPENDIX "B"

DEVELOPMENT AND DRAINAGE CELLS