



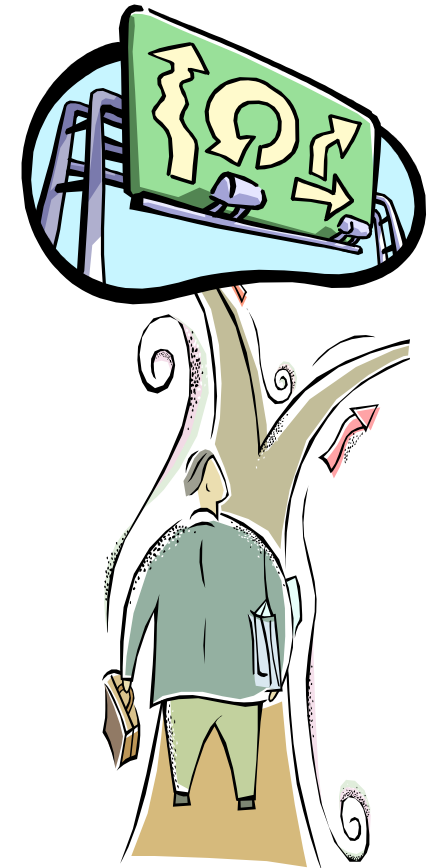
Basement Flood Risk Reduction City of Winnipeg

Charles Boulet



Outline

- **Background**
- **Winnipeg Floodway**
- **Rain Events**
- **Winnipeg Sewer System**
- **Basement Flooding**
- **Flood Reduction Measures**



Where is Winnipeg?



A Few Facts About Winnipeg



- Capital of Manitoba
- Founded in 1874
- Population of 750,000
- Area of about 500 km²

- Is at the bottom of the “Red River Valley”
- Formed by the glacial lake Agassiz
- Which is a low lying flood plain – very flat
- Has 4 major rivers:
 - Red, Assiniboine, La Salle, Seine



- 2nd largest watershed in Canada
- 1M Km²
- 7M People
- Flows into Lake Wpg; 10th Largest
- Red, Wpg, Sask. Rivers; 60% of flow
- Output via Nelson River to Hud Bay



- **Below – 1950 Flood**
- **Legislative Building**

- **Above – 1950 Flood**
- **University of Manitoba**





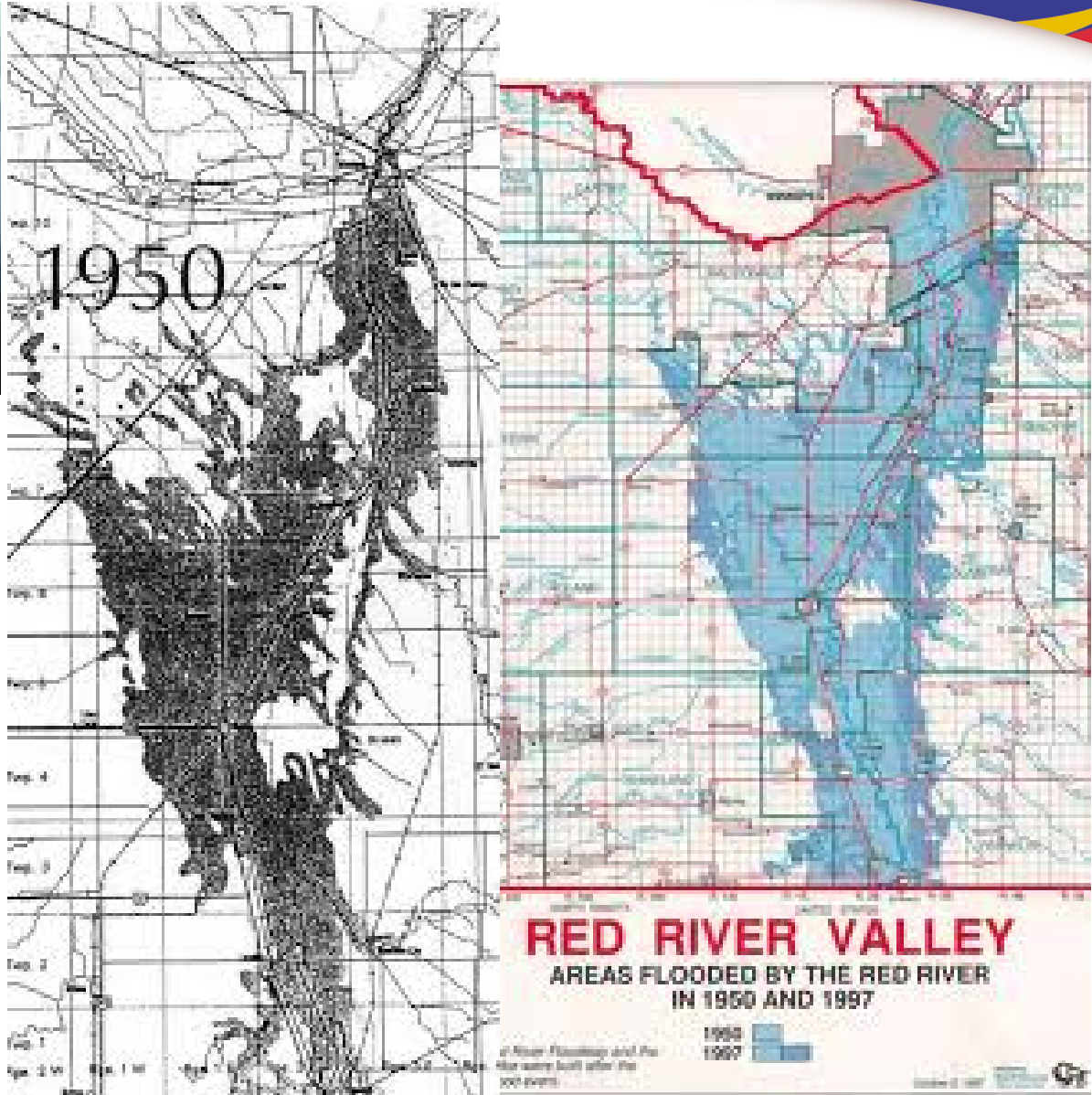
- Above – 1997 Flood
- Inlet control Structure

- Below – 1997 Flood
- South of the Inlet Control Structure





- 1997
- Red River is usually 150m (490ft) wide.
- Here it's 65Km (40.6mi) wide.



Winnipeg Floodway



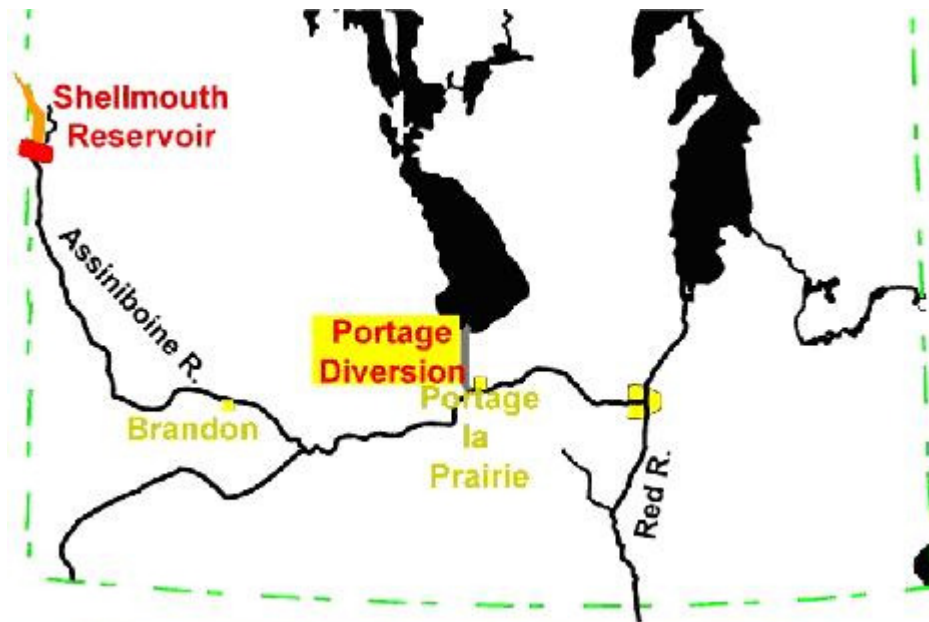
Inlet Control Structure



- Idea was born from the 1950 flood.
- Completed in 1968 at a cost of \$63M

- 1997 flood prompted a servicing review; 700 yr LOS
- Floodway expansion; 2005-2008; \$665M
- NB: 1826 flood was 40% bigger than 1997
- Est. to have saved Manitoba \$32B in Flood Damage

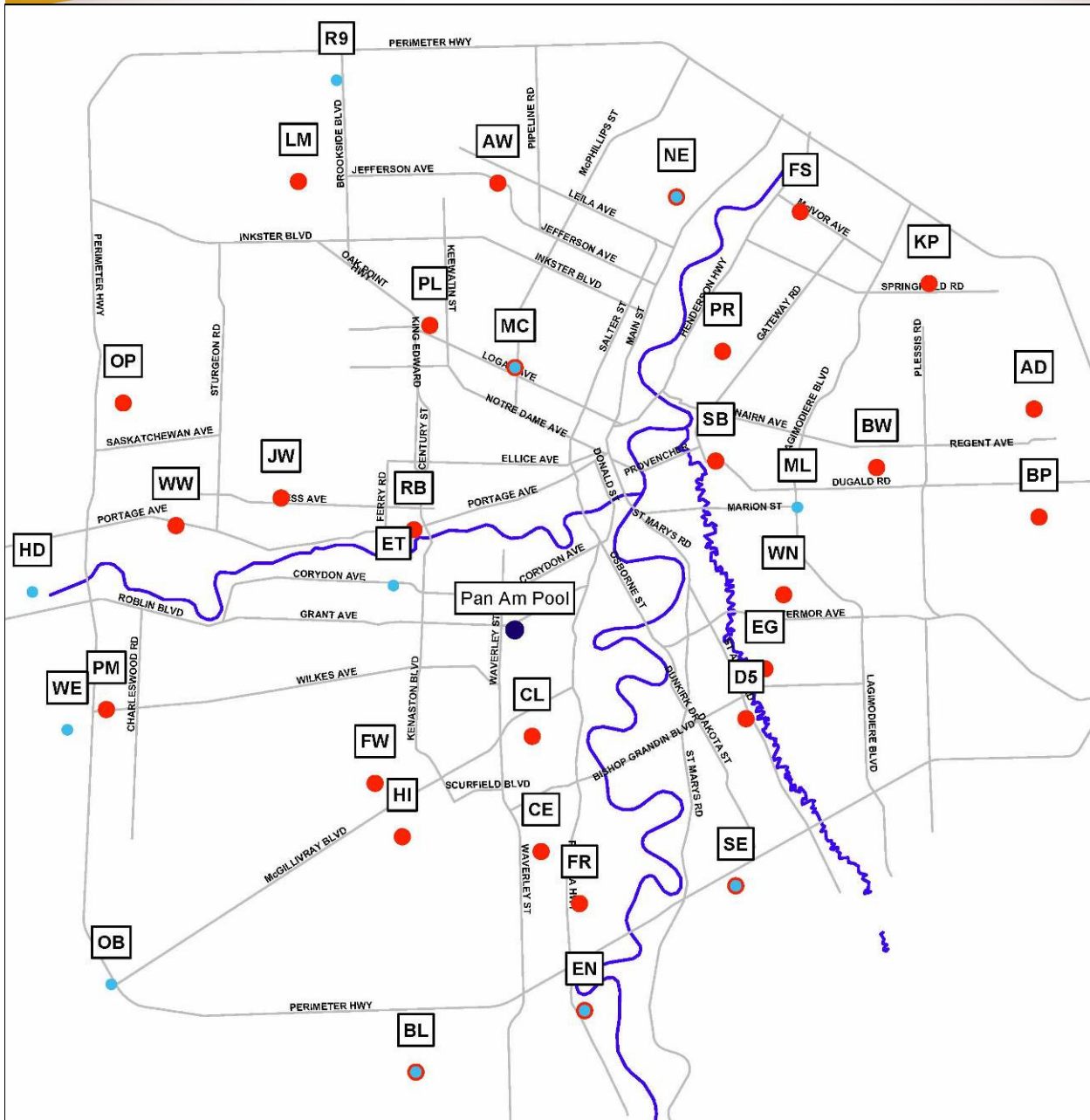
Winnipeg Flood Protection



- Shellmouth Dam
- Completed in 1972
- Controls flows along Assiniboine River
 - Reduces Flow; flood years
 - Augments Flow; dry years

- Winnipeg's Primary Dykes
- Maintains levels below 20 feet James Ave.
- Few houses need sandbagging.





City of Wpg rain gauge network

- Started in 1988
- Expanded to 32 stations
- Built system to deal with spatial variability of thunderstorms

http://www.winnipeg

Favorites Tools

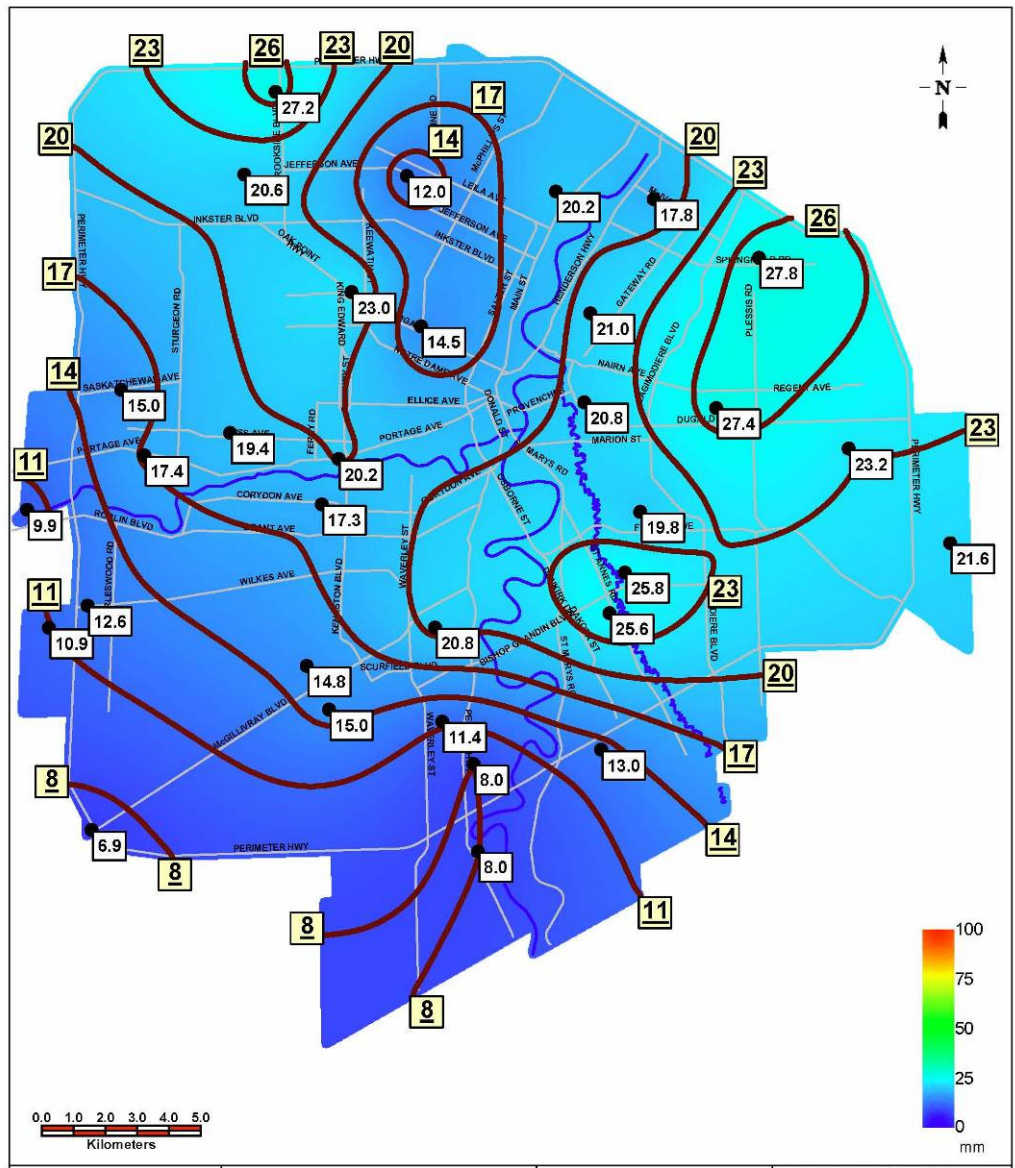
Live Search

Go

Site Map

rainfall event

Internet



<ul style="list-style-type: none"> ● Rainfall Gauge Station Location 4.2 Accumulation (mm) 4 Isohyetal Line (mm) 	<p>ALL MEASUREMENTS ARE METRIC</p> <p>MESSAGE: This information has been gathered and compiled by the City of Winnipeg for its own use. Although it is the best information available to the City at this time, the City assumes no responsibility for its accuracy and will not accept liability for any use made of it or actions taken in reliance on it.</p>	<p>WATER AND WASTE DEPARTMENT</p> <p>PRINTED: August 18, 2011 SCALE: 1:150,000</p> <p><i>Rainfall distribution for August 18, 2011 (8:00pm) to August 18, 2011 (10:30pm)</i></p>
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Since 2010, rainfall events posted on the City's website

Winnipeg
311 City Services

Residents | Business | Visitors | City Hall | 311 Self Service | Site Map

Garbage | Recycling | Water | Sewage | Drainage/Flooding | Billing | Department Info

Water and Waste

- What's new!
- Water pollution control centre compliance reports
- Rivers and small streams monitoring reports
- Brady Road Landfill winter hours
- Billed water consumption report
- Residential recycling report
- Landlord information
- Residential lot grading
- Compost bins still on sale
- Water treatment program
- Sewer cleaning and inspection program
- Residential toilet replacement credit program
- Sewer work underway until April on St. Mary's Road
- 2010 customer seminar (pdf - 3.5MB)
- Contact us

Rainfall reports

May 29, 2010 (7:30 a.m. approximate start time) to May 30, 2010 (12:00 p.m. approximate stop time)
Heavy rain event summary

- [Performance of Hawthorne lift station](#)
- [Performance of Bourmais lift station](#)

Heavy rain and high river levels put many unprotected homes at risk of basement flooding on May 28 and 29, 2010.

Heavy rain passed through the city on [Saturday, May 29](#) (pdf - 97kb). The east side of the city was hardest hit with over 100 millimetres of rain. Saturday's rain drenched ground that was already saturated by significant rainstorms on [May 27 - 28](#) (pdf - 89kb) and [May 24 - 25](#) (pdf - 122kb).

During Saturday's rainstorm the Red River was between 12.7 and 15.3 [James Avenue datum](#) and rose to 18.3 feet James by June 1 – an increase of 9.2 feet in five days. This is 11.8 feet above [normal summer water levels](#) at James and close to 18 feet above normal in the south end of the city. Creeks and streams were also noticeably higher – Sturgeon Creek overtopped Ness Avenue for a number of days and Ness had to be closed.

With heavy rains every summer, there is a significant risk of overloaded sewers backing up through house sewer lines and flowing into basements that aren't protected. Although [basement flooding](#) is a risk at any time of the year, the risk increases with high river levels because the sewer system must then rely more heavily on pumping stations rather than gravity to carry the rainfall runoff.

The [wastewater system](#) operated at full capacity (given river levels) during the storm. We maintain all the systems, including 74 lift stations and 30 plus flood pumping stations regularly on a year round basis. We respond to high level and other alarms and during storms on a priority basis. Crews worked around the clock

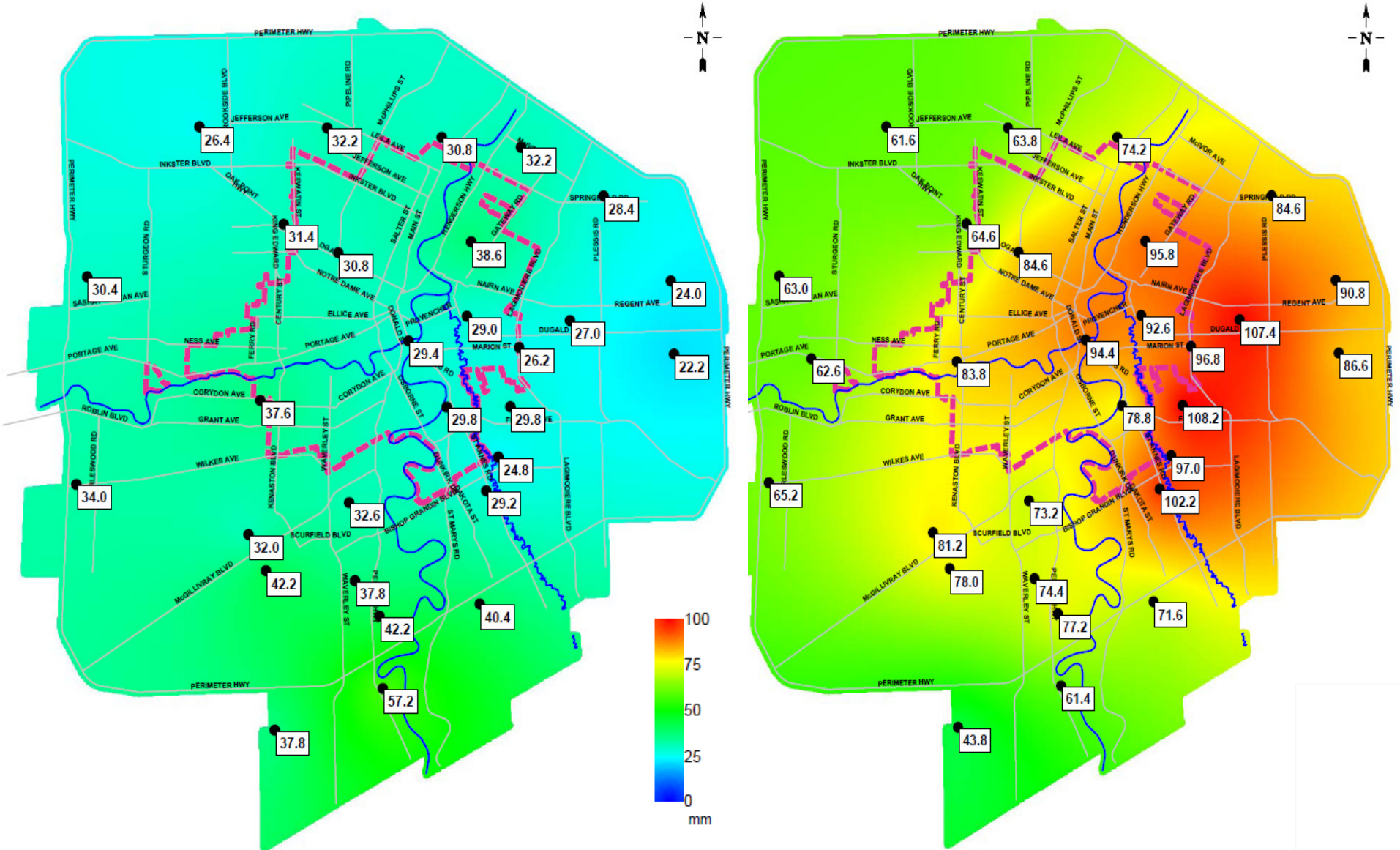
City also posts significant rains on their website and analysis

- What makes a **significant** rainstorm
 - Total amount
 - Rainfall intensity
 - Multiple rainstorms
- City has had **significant** rainstorm flooding events in 1993, 2000, 2005 and 2010 and these are posted on website

Extreme Rainfall Events

- An extreme rainfall event (like in 2000 and 2005) will cause:
 - Localized temporary street flooding
 - May cause basement flooding
- Rain Intensity & Duration is the key to flooding or no flooding; other factors are:
 - Antecedent soil conditions
 - Back to back rainstorms
 - Level of Service
 - River levels
 - BW Valve, Sump Pit, Lot Grading

May 28 & 29, 2010 Rainfall



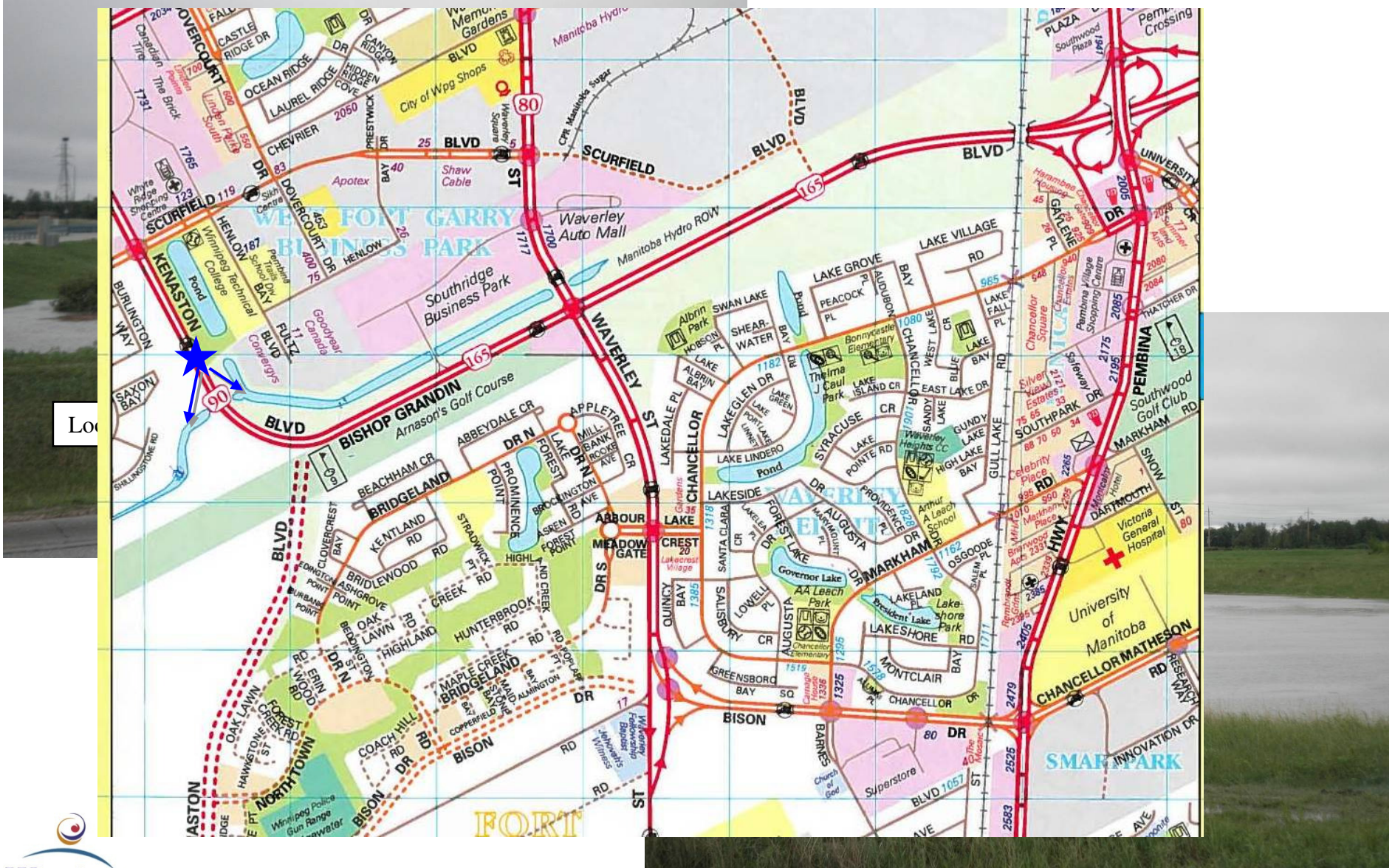
May 2010-No household flooding!



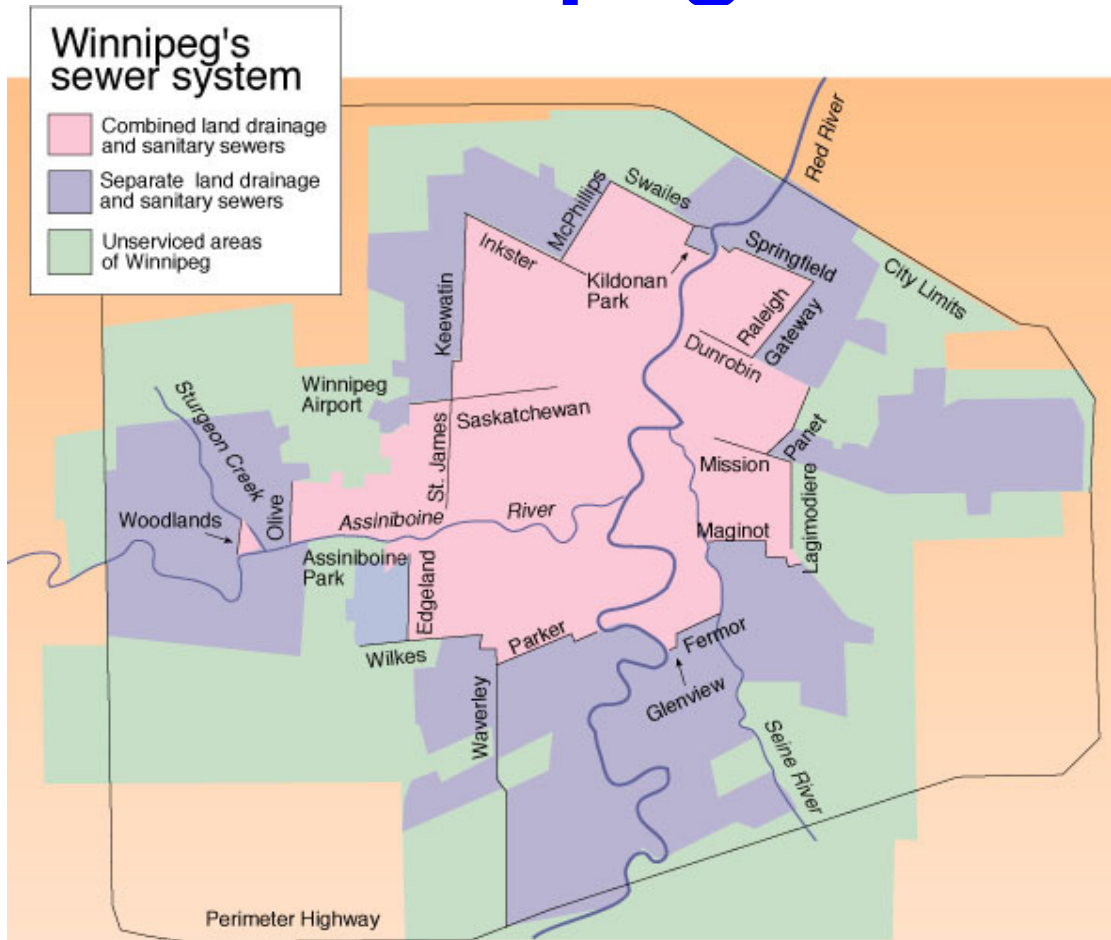
Waverley West and WhyteRidge SRB Lakes



Storm Retention Basins

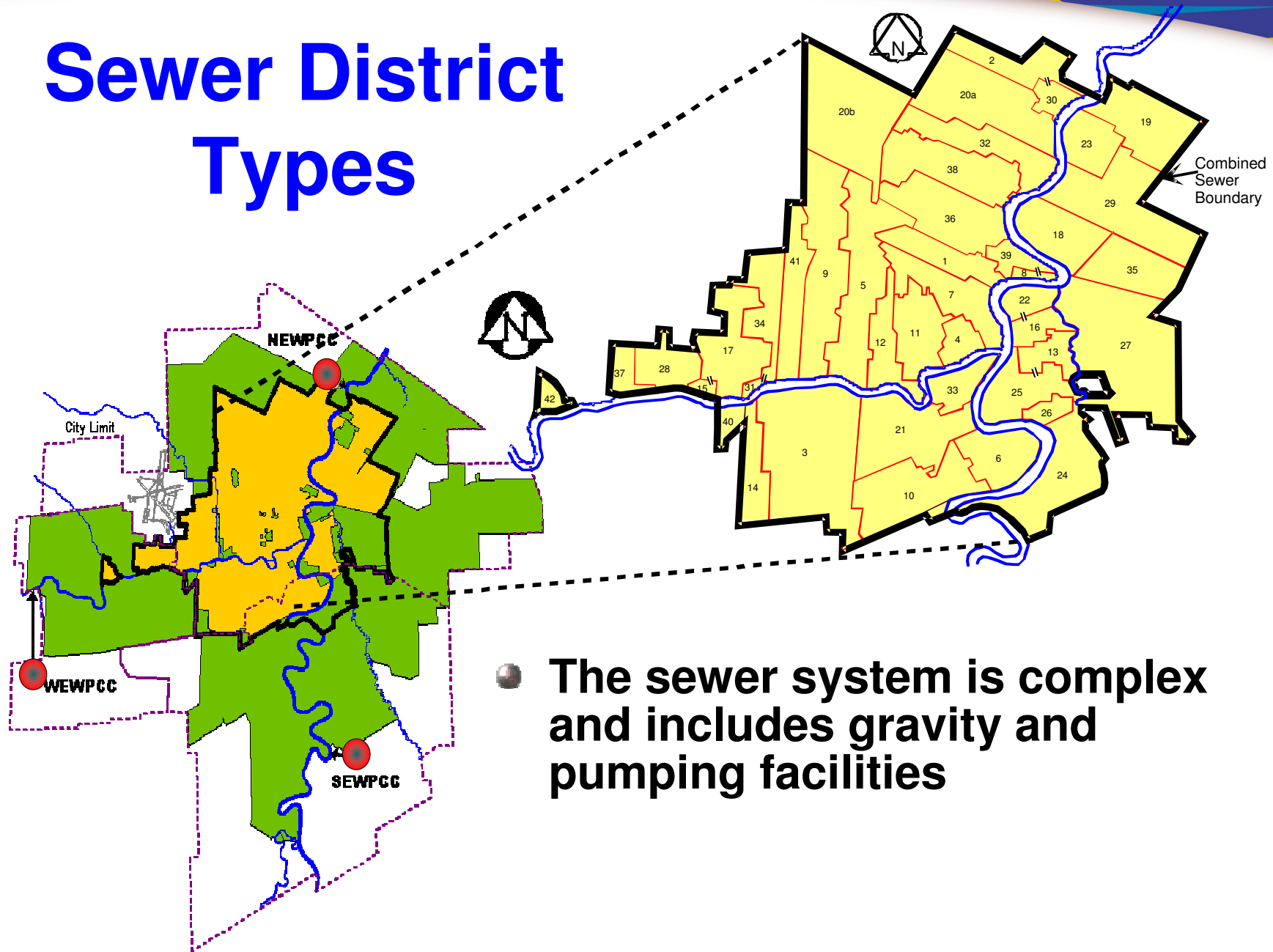


Winnipeg Sewer System



- **Combined Sewers; Pre-1960**
- **Separated Sewers**

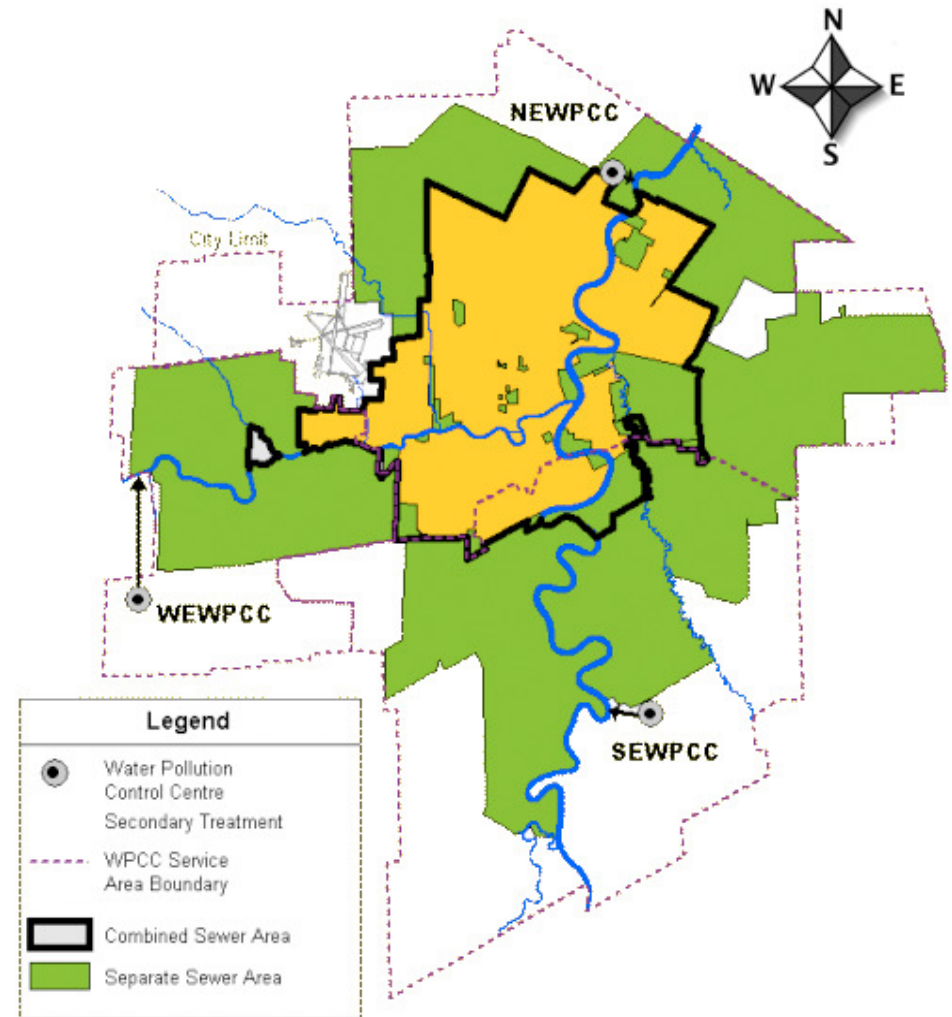
Sewer District Types



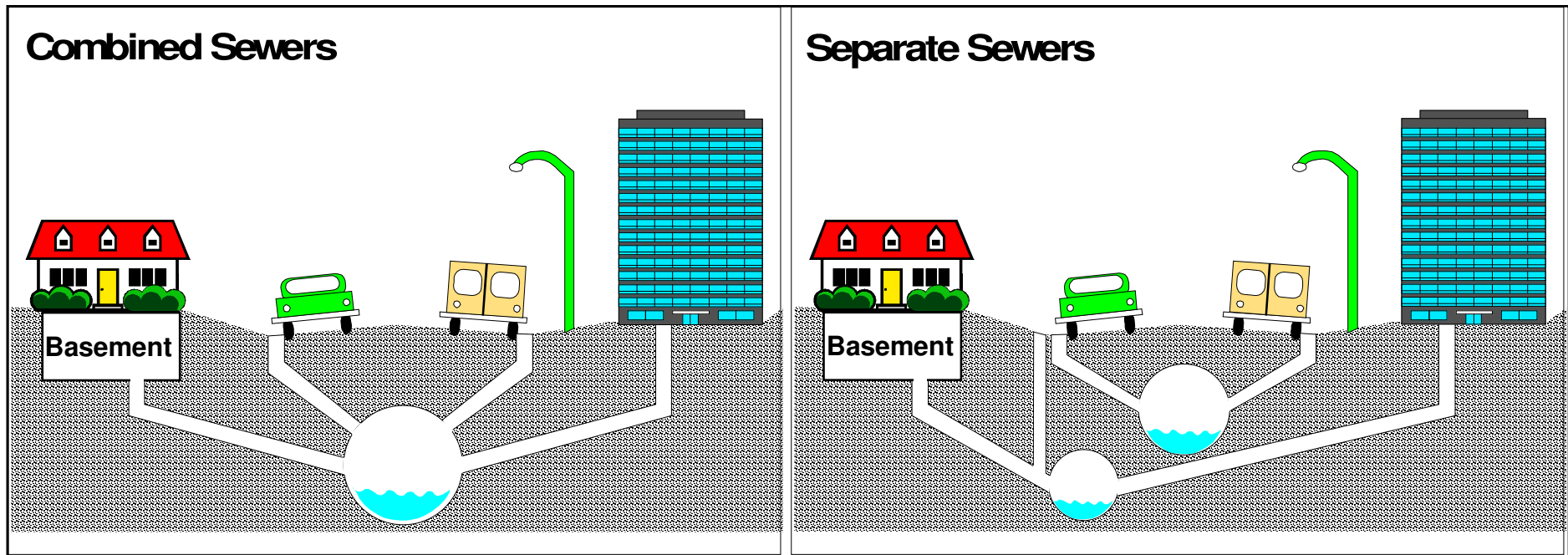
- The sewer system is complex and includes gravity and pumping facilities

Winnipeg Sewer System

- **Pollution Control Centers**
- **Interceptor Sewer systems**
- **CSO locations**
- **Land drainage outlet**
 - **Red and Assiniboine**
- **Major Rivers**



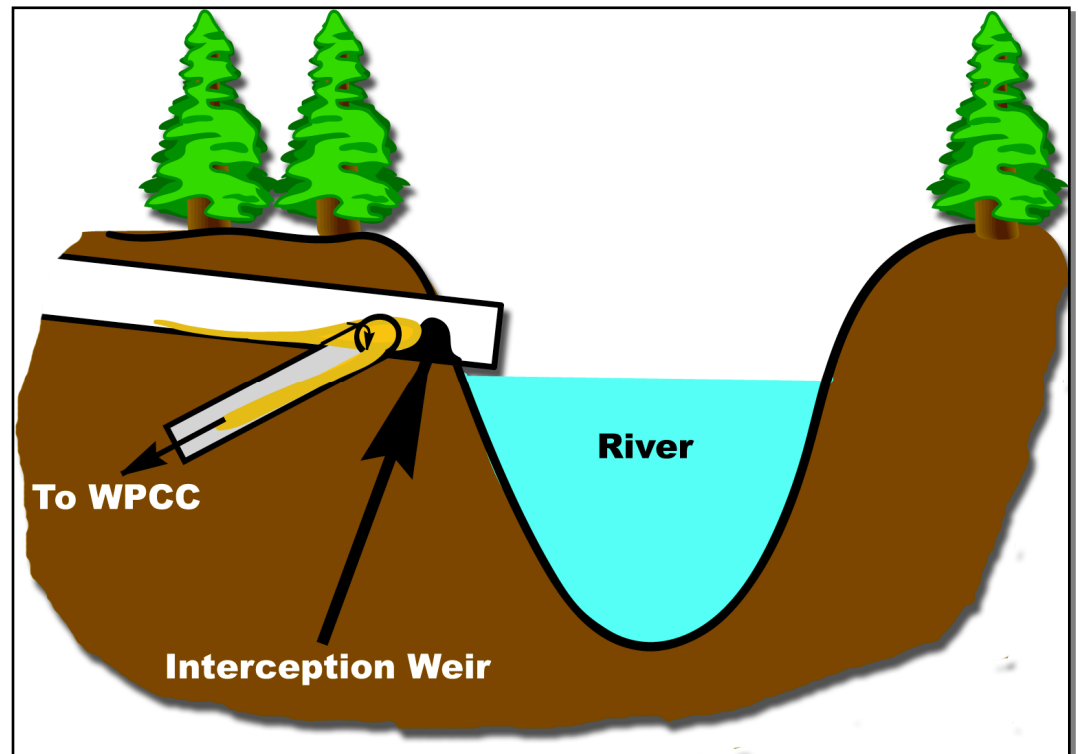
Winnipeg Sewer System



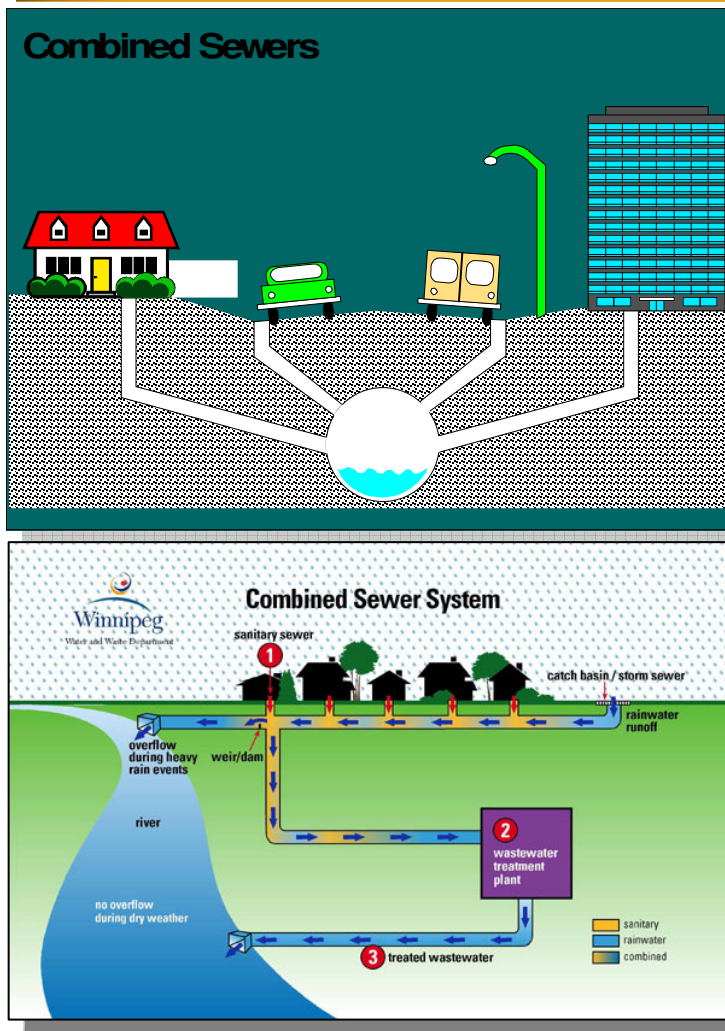
- Older parts of the city (pre-1960) are combined
- ~ 27% of the city is in a combined sewer area
- Your basement is connected to every other basement
- **BOTH systems can experience basement flooding**

Winnipeg's CS System

- During dry weather, sewage is intercepted and transported to WPCCs for treatment
- Prior to 1939 all wastewater flowed into rivers



Combined Sewers



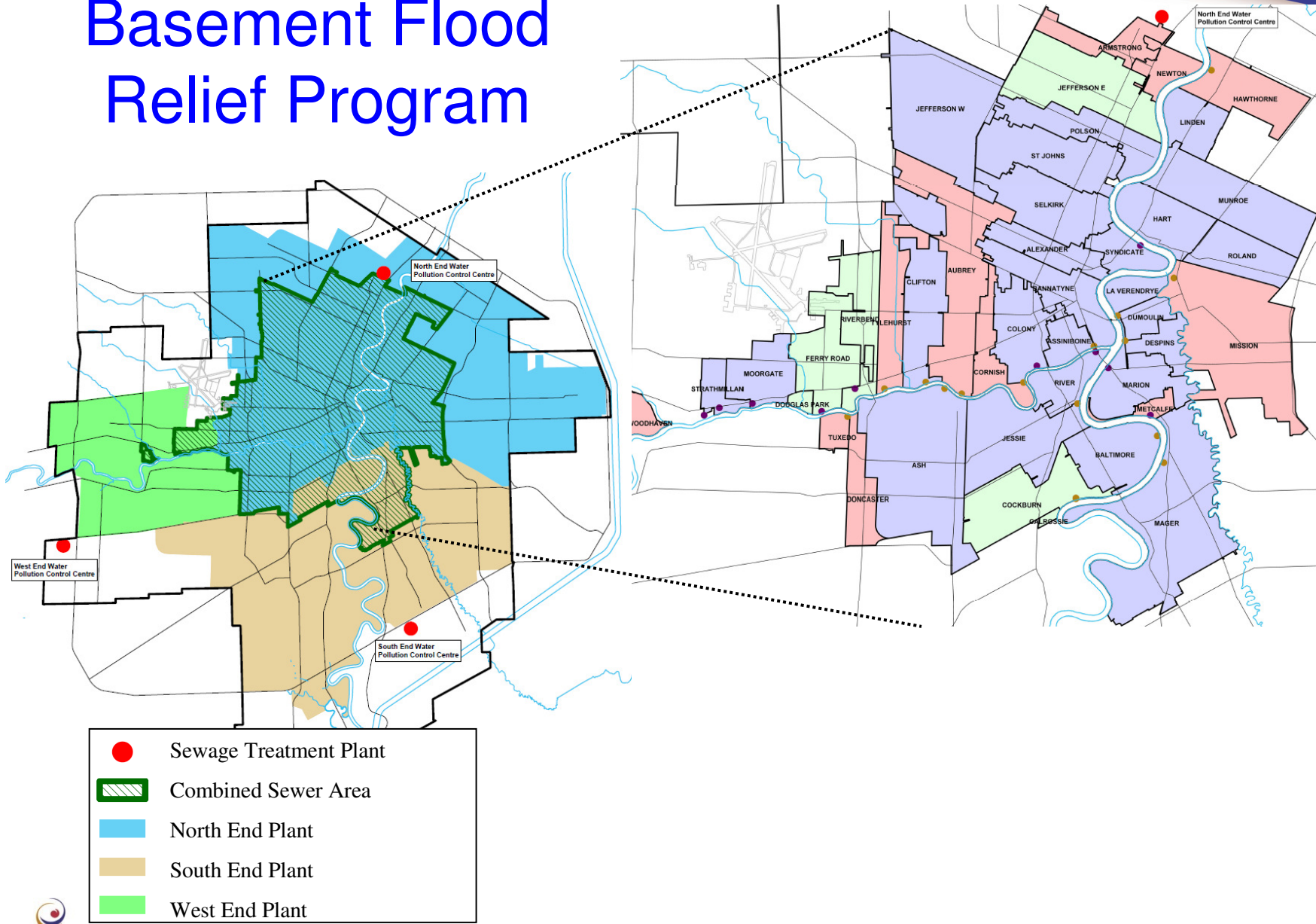
- Combined sewer areas present a number of potential issues
 - Older parts of the City (1900 to 1960)
 - A single pipe that carries both sewage and urban runoff
 - Originally flowed to rivers, interceptor sewer install in 1935, divert 2.75 x DWF to NEWPCC
 - Approximately 27% of City has combined sewers that overflow during rainfall and snowmelt events

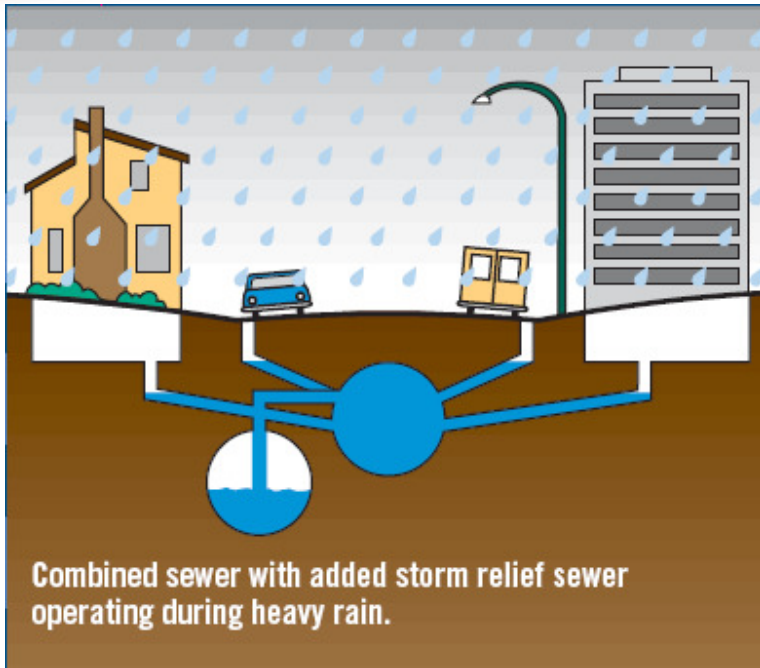
Basement Flood Relief Program

In 1977, the city adopted the current storm sewer relief program.¹ The program was to upgrade all the separate sewer districts to a 10-year level of protection and all combined sewer districts to a 5-year level of protection with relief piping, followed by further upgrading to a 10-year level by supplemental methods. Implementation was recommended to proceed successively, beginning with the most historically flood prone districts, and continuing until all districts met the prescribed level of service. The storm sewer

- **1977 – City Council adopts the current BFRP**
- **Levels of Service (LOS)**
 - **Separate sewer districts – 10 Yr LOS**
 - **Combined sewer districts – 5 Yr LOS**
 - **Followed by 10 Yr LOS to proceed successively**

Basement Flood Relief Program





The City is taking action to **REDUCE** the risk of basement flooding

- Invested more than \$300 million since 1977
- Installing storm relief sewers
- Converting combined sewers to separate storm and wastewater sewers

Who is at Risk?

Everyone with a structure below grade...

Basements

Crawl spaces

...that is connected to the sewer

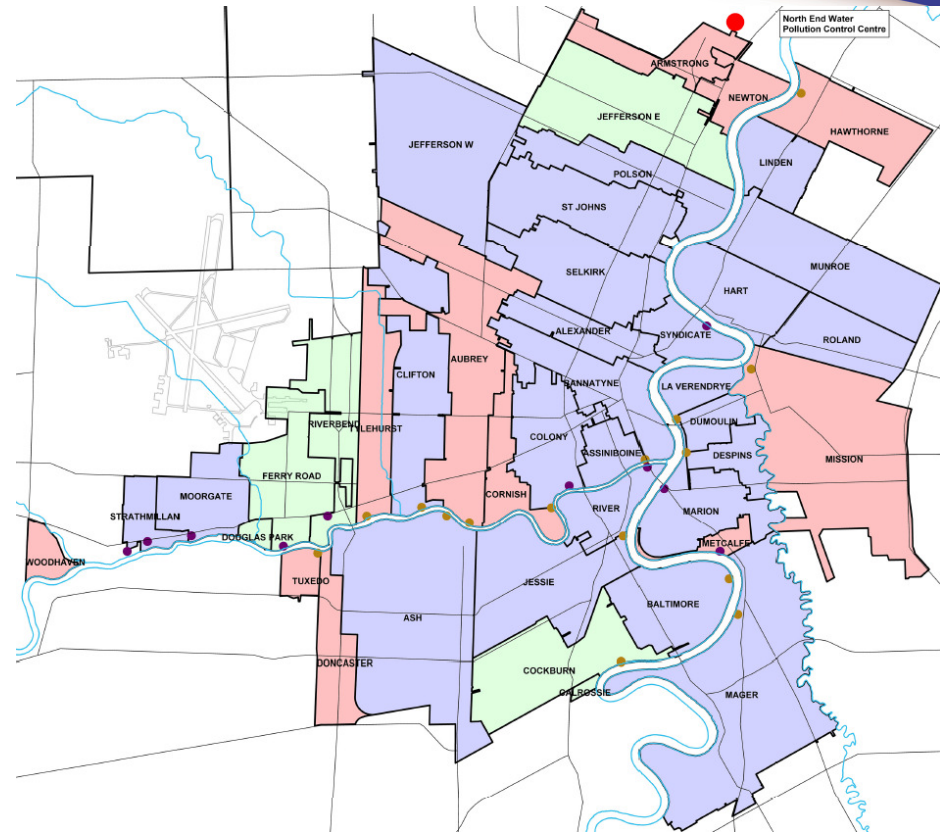
Floor drain

Toilet/sink/washing machine/showers/tubs

Weeping tiles connected to a sewer

Basement Flood Relief Program

- Spent over \$300M to date
- Budgeted annually
- Methods used
 - Increase hydraulic capability (SRS)
 - Hydraulic balancing
 - WW separation
 - LDS separation
- Prioritization B/C ratio



Basement Flood Relief Program

Customer Data

- **Based on acquired customer data:**
 - **Basements flooded due to:**
 - **Penetration of walls / foundation**
 - **Floor drains**
 - **Basement windows / openings**
 - **Weeping tiles**
 - **Source of flood water**
 - **Rainwater**
 - **Wastewater**

Flooding Reduction Measures

Flooding Risk	Source	City of Winnipeg	Residents
Overland Flooding	Flood Waters	Primary Dykes Sandbagging Flood Pumps Sewer Cleaning BFR Program	Sandbagging Flood Pumps
Overland Flooding	Intense Rain	Primary Dykes Sandbagging Flood Pumps Sewer Cleaning BFR Program	Sandbagging Flood Pumps
Foundation/Walls	Surface Water	BFR Program	Sealants/Membranes Lot Grading
Openings/Windows	Surface Water	BFR Program	Sandbagging Lot Grading
Floor Drain	Sewer	BFR Program	Backwater Valve
Weeping Tiles	Surface/Grd Water	BFR Program	Sump Pump

Things YOU Can Do...

1. Install **(and maintain!)** a backwater valve



- Intended to protect basement plumbing
- Mandated in By-law as of 1979
- National Plumbing Code of Canada provides criteria
- Different applications/properties might have specific requirements
- Work with a licensed plumber and engineer

Install (and maintain!) an in-line backwater valve

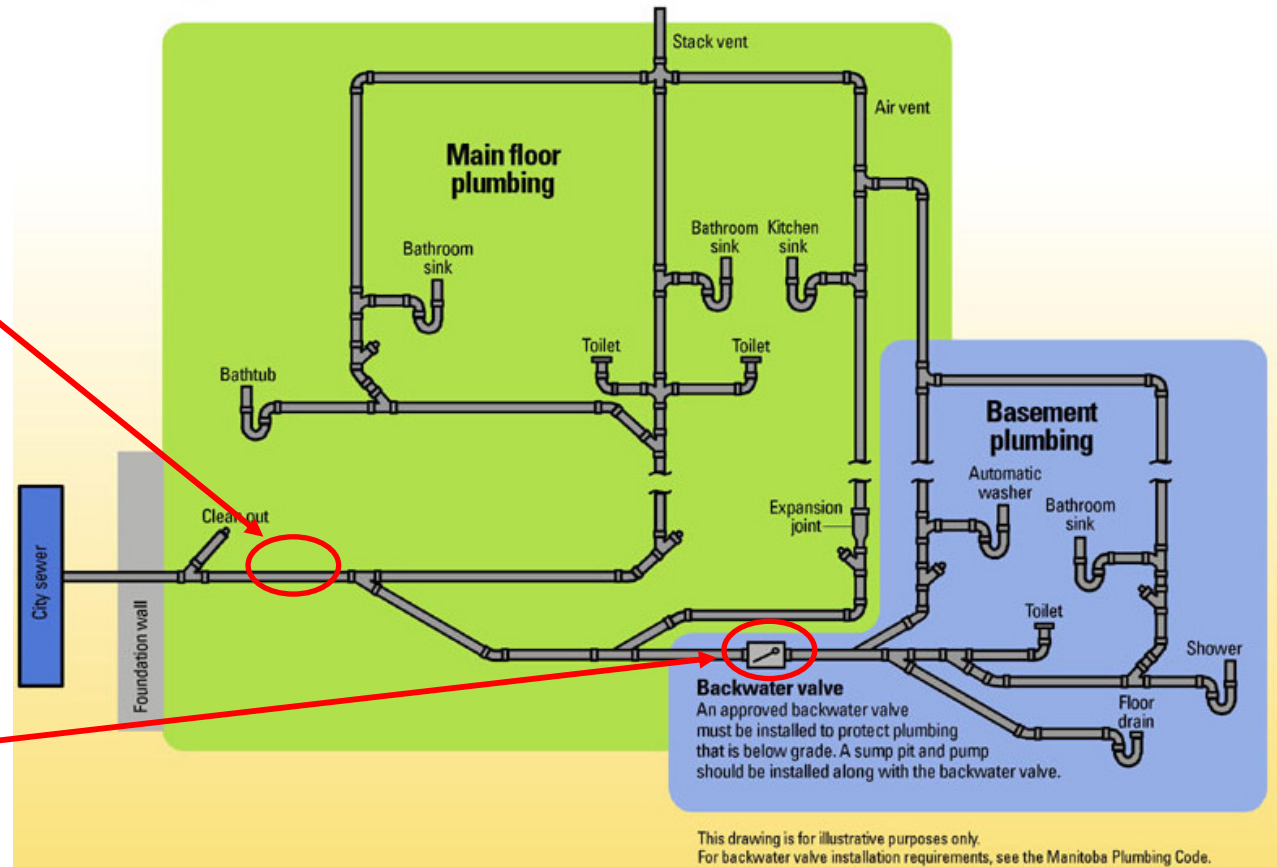
Normally open



Normally closed



Typical Household Backwater Valve Installation



Things YOU Can Do...

Backflow Prevention Devices

- installed in the basement floor drain
- are **NOT** recommended as they **ONLY** protect the floor drain from sewer backup and **NOT** the entire basement plumbing

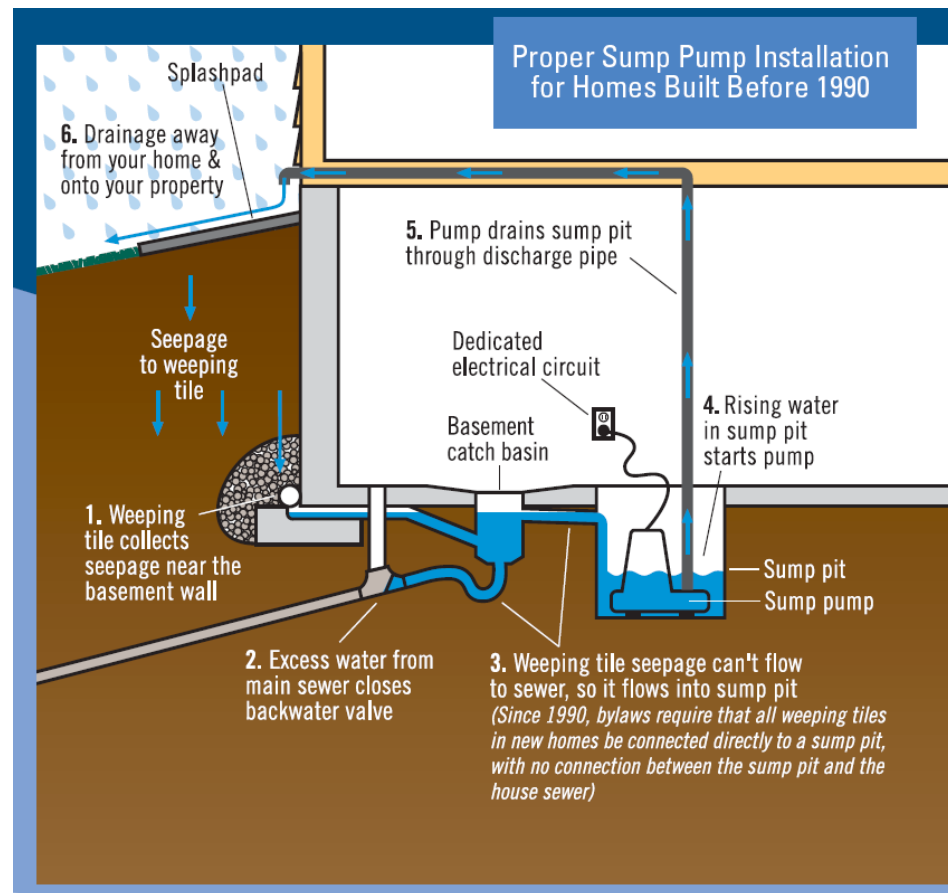


Things YOU Can Do...

2. Install a sump pit drainage system

Ensure your sump pump discharge hose is **correctly** placed!

It is **ILLEGAL** to redirect your discharge hose to **ANY** part of the building plumbing!



Things YOU Can Do...

2. Install a sump pit drainage system

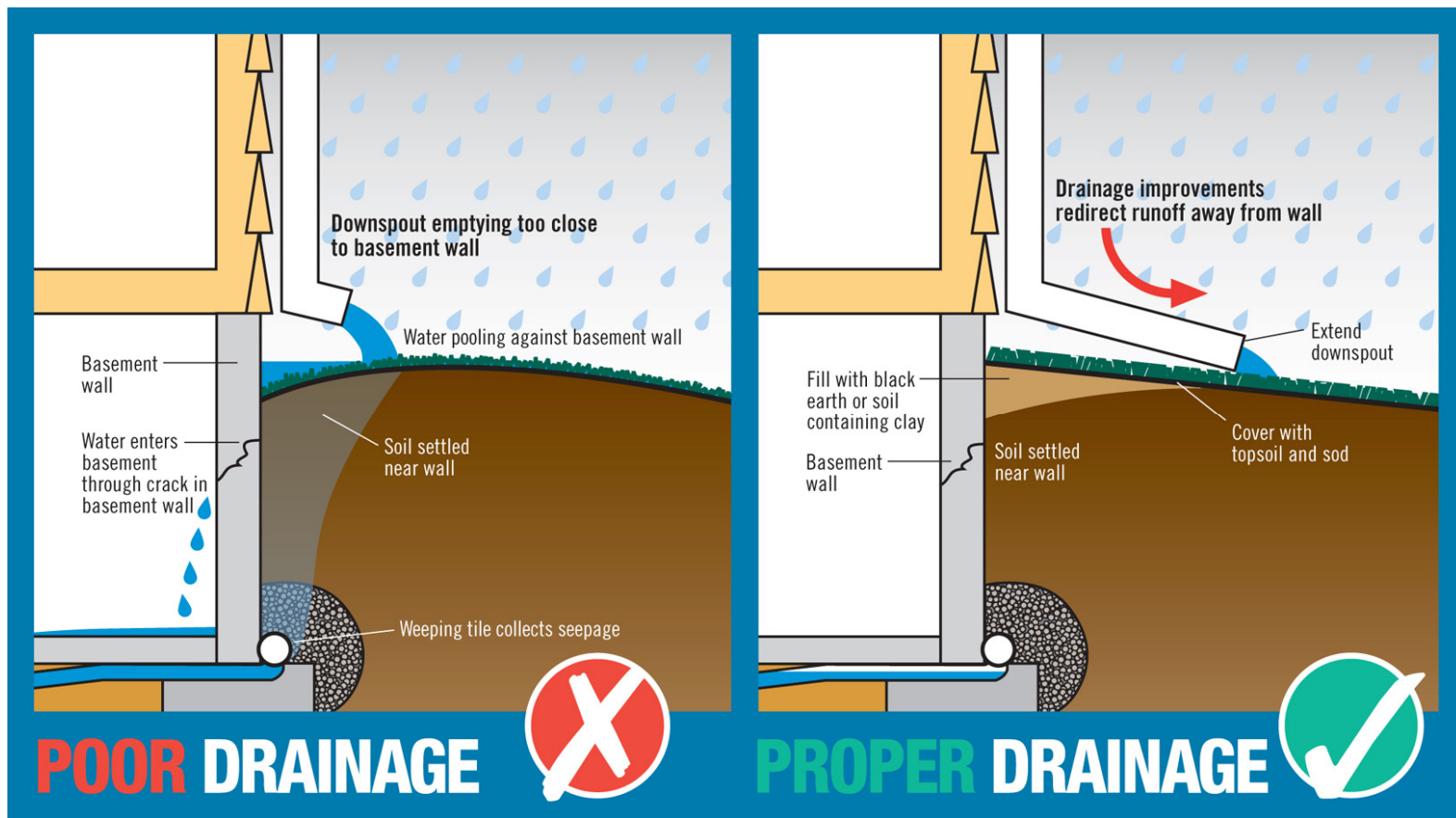
Ensure your sump pump discharge hose is **correctly** placed!

It is **ILLEGAL** to redirect your discharge hose to **ANY** part of the building plumbing!

- **Consists of a sump pit and pump**
 - Sump pit collects water from weeping tiles
 - Sump pump discharges the water outside your property
- **Mandated in By-law as of 1990**
- **Details in Building By-law**
- **Section 23 – Subsurface Drainage**

Things YOU Can Do...

3. Improve drainage around your property

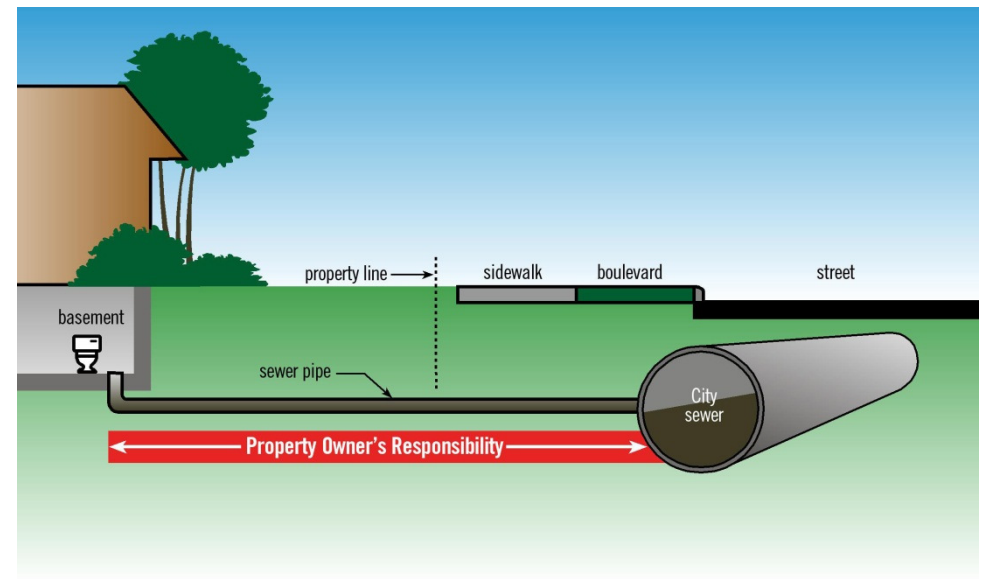


Things YOU Can Do...

4. Take care of your sewer

You own the sewer pipe from your building to the City's sewer, including the part under your property and the part under City property.

- Don't throw garbage down sinks or toilets
- Use grease traps and grit interceptors
- Keep your service pipe clear of roots
- Preventative/regular maintenance – video inspection, periodic cleaning



There is a right way and a wrong way to place your sump pump hose!

Wrong way

According to the City of Winnipeg Lot Grading By-Law, it is an offence to allow water from sump pumps to drain directly onto neighbouring properties, lanes, sidewalks, or streets.



Right way

Discharge the water from your sump pump onto your own property.



Tips!

- Direct the flow from your sump pump away from your house, preferably onto a grassy area or non-paved surface.
- Keep the end of the hose well away from your property line so that the water does not flow onto the street, lane or sidewalk.
- Move the hose often so that the ground does not become saturated.
- Use the flow from your sump pump to water grass, shrubs and trees.

If you have questions about sump pumps and sump pump discharge, contact our Customer Service Centre:

- by phone at **986-5858**
Monday to Friday, 8:30 am to 4:30 pm
- by email at wwd-customer-service@winnipeg.ca



Basement Flooding Protection Subsidy Program

- **Subsidy for eligible installations**

Category 1 – In-line backwater valve only
<ul style="list-style-type: none">• 60% of the invoiced cost, including eligible labour, materials, permit(s), and taxes, up to a maximum of \$1,000
Category 2 – Sump pit drainage system only
<ul style="list-style-type: none">• 60% of the invoiced cost, including eligible labour, materials, permit(s), and taxes, up to a maximum of \$2,000
Category 3 – Both in-line backwater valve and sump pit drainage system
<ul style="list-style-type: none">• 60% of the invoiced cost, including eligible labour, materials, permit(s), and taxes, up to a maximum of \$3,000

Subsidy Conditions

- **One time only per property for each eligible installation**
- **Applications must be received within one year of the date of final inspection**
- **Subject to available funding and provided on a first-come, first-served basis**
- **Not eligible for the subsidy:**
 - **labour by the homeowner**
 - **maintenance or replacement of an existing installation**
 - **associated interior and exterior restorations or improvements**
 - **installation of a backflow prevention device in a floor drain**

Eligibility Criteria

- **Current owner of a residential building at the time of installation**
- **No outstanding taxes or debts owed to the City of Winnipeg**
- **Final inspection date must be within one year of submission.**
- **Any plumbing or electrical contractor you hire must be licensed by the City of Winnipeg.**
- **Ensure that appropriate permits are obtained and arrange for the necessary inspection.**
- **Drain water collected in the sump pit drainage system in compliance with the City of Winnipeg Lot Grading By-law**

Flood Reduction Measures

Risk Reduction Measures Taken:

- Floodway - 1968
 - Expanded - 2005
- Basement Flood Relief Program (1977 – Ongoing)
 - Constructing Relief Works
 - Public Education
- Newly Built Homes
 - Backwater Valve Mandated in By-Law - 1979
 - Sump Pumps Mandated in By-Law - 1990
- Sewer Cleaning and Inspection (1998 - Ongoing)
- Inlet Restriction Studies
- Inflow & Infiltration Studies

Questions ?

