# DESIGN GUIDELINES

## SANITARY FLOW GENERATION FOR NEIGHBOURHOOD DESIGN REPORT (NDR), WATER CONSUMPTION AND FIRE FLOW FOR HYDRAULIC NETWORK ANALYSIS (HNA)

**August 2026**

# TERMS OF USE

The “Design Guidelines” is made available for use by developers and consultants in the City of Edmonton effective as of August 01, 2024 and is based on the most recent water use trends observed in the City of Edmonton. The “Design Guidelines” align with the zoning types introduced in the City of Edmonton Zoning Bylaw 20001. Should any user have questions as to the intent or accuracy of guidelines, the user is advised to seek clarification by sending an email to boundaryconditions@epcor.com.

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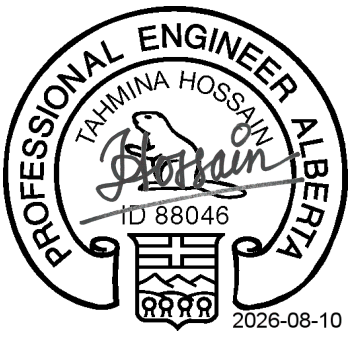
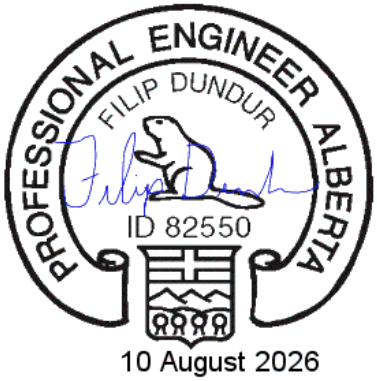
|  |  |
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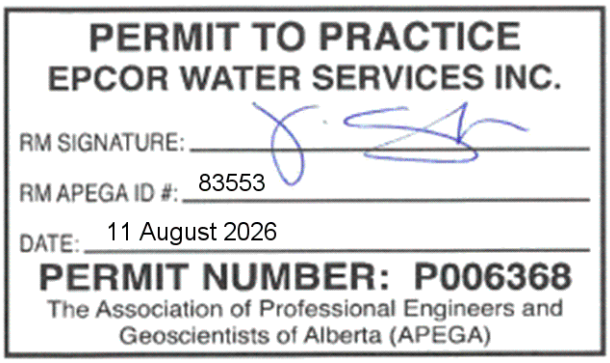
|  |
| Jenna Cunningham, P.Eng.<br>Associate Director, Linear Asset Engineering |

The following is a list of revisions in the Design Guidelines.

| Section | Description (Change) | Date |
|---|---|---|
| Section 1.1.1 | Reduction in residential sanitary flow generation for all new and infill development | August 2024 |
| Section 1.6 | Reduction in Inflow and Infiltration (I&I) allowance for all new and infill development | August 2024 |
| Section 1.6 | No separate inflow allowance for maintenance hole in sag location subject to certain conditions | August 2024 |
| Section 1.6 | Allowance for foundation drain added | August 2024 |
| Section 1.7 | No concurrent addition of peak dry weather flow as generated by population and land use in determination of peak design flow | August 2024 |
| Section 2.0 | Restructure the HNA section to make requirements more concise. State only minimum report requirements to give consultants the ability to present outcomes how they see fit. Change the report naming to provide consultants with opportunities to submit planning reports without hydraulic analysis if it is not deemed necessary. | August 2024 |
| Table 2.1 | Align ICI demand assumptions with this document. Clarify demand scenario pressure criteria to align with current practice. Include reference to AWWA C900 for maximum pipe velocity to align with current practice | August 2024 |
| Table 2.2 | Align fire flow requirements to Addendum #1 Volume 4: ZBR Fire Protection Updates | August 2024 |
| Section 1.2 | Changed bullet points into table | September 2024 |
| Section 1.6 | Minor text change to table for clarity | September 2024 |
| Table 1.2 | Changed to correct reference to Table 1.3 | September 2024 |
| Section 1.7 | Minor clarification | November 2024 |
| Section 1.8 | The table for *Residential Unit Density by Zoning* has been removed | August 2026 |
| Section 1.1.2 | Updated to reflect removal of the table for *Residential Unit Density by Zoning* | August 2026 |
| Section 1.1.3 | Updated the table numbers for Tables 1.1, 1.2, and 1.3. | August 2026 |
| Table 2.2 | Update fire flow requirements to include the additional zonings identified in EFRS-SAZ-MEMO-0001 v4 | August 2026 |
| Table 2.2 | Minor text changes to table for clarity | August 2026 |
| Table 2.2 | Update the "Fire Flow for All Other Zoning" parameter to direct applicants to contact EFRS | August 2026 |

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## 1.0 SANITARY SEWER DESIGN FLOW

This section outlines the design criteria to assist the developers and the consultants in preparation of Neighbourhood Design Report or any subsequent amendments. The section applies to the design of sanitary sewage conveyance systems for all new and infill developments. The emphasis of this section is on those criteria that determine the size and profile of sanitary sewers. Refer to Volume 3-03 Section 1.0 for other design considerations such as alignments and the detailed design of appurtenances.

### 1.1 Estimating Sanitary Flows

1.1.1 Residential sanitary flow (population-generated)

The peak sanitary sewage flow for a residential population shall be determined by the following formula:

$$Q_{PDW} = \frac{G \times P \times PF}{86400}$$

where: $Q_{PDW}$ = the peak dry weather flow rate (L/s)

and: G = the per capita daily sewage flow generation

| G (L/day/person) | Context |
|---|---|
| 160 | For design of all new and infill developments |
| 220 | For analysis of an existing sewage network OR contact EPCOR Water Services (For lower value) at boundaryconditions@epcor.com |

and: PF = a "peaking factor" determined as follows:

The peaking factor (PF) shall be the larger of 1.5 or:

$$PF = 2.6P_{pf}^{-0.1}$$

where $P_{pf}$ = the design contributing population in 1,000's

1.1.2 For the design of sanitary sewers to serve a small number of properties, such as a single typical subdivision, refer to the City of Edmonton Neighbourhood Structure Plan (NSP) Terms of Reference (Procedure Area Neighbourhood Structure Plans) for determining people per unit by land use. For larger service areas comprising several typical subdivisions or more, trunk sewers and pump stations are to be sized to accommodate average population densities as proposed in preceding statutory plans, including General Municipal Plans, Area Structure Plans and Neighbourhood Structure Plans. Any questions regarding the population density assumptions to be discussed with the City Administration team.

1.1.3 Commercial, institutional and industrial sanitary flow generation

For detailed system design, the average sanitary sewage flow from commercial, institutional and industrial land use areas is to be estimated on the basis of, in order of preference:

- Average daily flow generation computed using rates per business type, as set out in ***Table 1.1*** and ***Table 1.2*** at the end of this section;
- Average daily per area flow generation in accordance with proposed ultimate zoning, as set out in ***Table 1.3*** at the end of this section;
- Projected flows justified by the designer with specific and reliable information relating the projected land uses to flow generation characteristics;
- For high water consumption land uses, refer to **Section 1.4**.

### 1.2 Average Flow Generation Estimates for Planning

For system planning purposes, when specific land uses and zoning are unknown and the requirements of ***Section 1.1*** cannot be defined, the recommended lower limits for estimation of average flow

generation, to be used for preliminary planning unless the use of other values is justified with more specific or reliable information, are as follows:

| Generation (m3/day/ha) | Context |
|---|---|
| 20 | Commercial and institutional land uses – lower limit for average flow generation |
| 8 | Industrial land uses – lower limit for average flow generation |

### 1.3 Determination of Peak Dry Weather Flow Rates

Peak dry weather flow rates for specific design for non-residential areas are to be determined by application of a peaking factor (PF), related to the average flow rate ($Q_{AVG}$ in L/s) in accordance with the following expression to a maximum value of 25.0 and a minimum value of 2.5:

$$PF = 10Q_{AVG}^{-0.45}$$

### 1.4 High-Water-Consumption Land Uses

The foregoing guidelines do not apply to high-water-consumption land uses, for instance heavy industry, meat packing plants and breweries. Detailed analysis of the design requirements specific to each development proposal is required in such cases. Please contact EPCOR Water Services at boundaryconditions@epcor.com for further guidance.

### 1.5 Residential Components of Commercial Developments

Where proposed commercial developments include discretionary residential components, the sanitary flow generation from the residential component shall be determined in accordance with ***Section 1.1.1*** and is to be included in the determination of the total generation for the development.

### 1.6 Extraneous Flow Allowance - All Land Uses

In computing the total peak flow rates for design of sanitary sewers, the designer shall include allowances as specified below to account for flow from extraneous sources.

- General Inflow/Infiltration Allowance

A general allowance of I&I L/s/ha shall be applied, irrespective of land use classification, to account for wet-weather inflow to maintenance holes and for infiltration into pipes and maintenance holes.

| I&I (L/s/ha) | Context |
|---|---|
| 0.14 | For design of new developments |
| 0.28 | For analysis of an existing sewage network OR contact EPCOR Water Services (For lower value) at boundaryconditions@epcor.com |

- Inflow Allowance – Maintenance holes in Sag Locations

No separate allowance for inflow to maintenance holes located in street sags is required (for design of all new and infill developments). Instead, following is required:

  - All such maintenance holes cover shall have one pick hole only. Open pick hole to be sealed with HDPE plug and silicon (Type 6D – Refer Vol 3-06: DR-06-18-13)
  - Seal or line the top 1.5m section of the maintenance hole (from bottom of the maintenance hole frame)
  - Add prefix ‘SAG’ to such maintenance holes on the design drawings

- Foundation Drain (Weeping Tile) Allowances

Connection of foundation drains (weeping tile) to sanitary sewer systems is not permitted. Therefore, for new development areas a specific allowance for foundation drain flow to sanitary sewers is not

required. However, the designer is required to include an allowance of 0.6 L/s/ha[1] for foundation drain flow when computing sanitary design flows from areas developed prior to 1990 where such connections may be present.

[1] *From RWMB Wastewater Collection System Master Plan*

## 1.7 Total Design Peak Flow Rates for Sanitary Sewers

| Scenario | Sum of | | |
|---|---|---|---|
| #1<br>Mixed Use | Peak dry weather flow rates as generated by population | Average dry weather flow rates as generated by land use | All extraneous flows |
| #2<br>Residential Only | Peak dry weather flow rates as generated by population | ---- | |
| #3<br>Non-Residential Only | ---- | Peak dry weather flow rates as generated by land use | |

## 1.8 Tables of Sanitary Design Factors

**Table 1.1: Sanitary Flow Generation Design Rates by Business Type**

| Business Type | Flow Generation Per Business ($m^3$/day)[1] |
|---|---|
| **Commercial Services** | |
| Automotive Servicing<br>Oil changes, lubrication, and general repair | 2 |
| Family Services and Places of Assembly<br>Child care services, funeral homes, places of assembly and temporary shelters | 3 |
| Medical Services<br>Clinics, dentists and rehabilitation services | 3 |
| Offices<br>Administrative activities such financial services, insurance, general consulting, contracting offices, government offices and research and development offices | 4 |
| **Other Services** | |
| Public Safety Services<br>Police, fire services and ambulance dispatches | 7 |
| **Accommodations** | |
| Hotels | 50 |
| Motels | 30 |
| Nursing Care Facilities | 50 |
| Continuing Care and Homes for the Elderly | 20 |
| **Education** | |
| Elementary and Junior Grade Schools | 5 |
| Senior Grade Schools | 20 |
| **Industrial Services** | |
| Small Manufacturing and Machining<br>Businesses related to the manufacturing of physical materials such as machine shops, structure fabrication and metal works | 3 |
| Warehousing, Storage, Commercial Sales and Logistics<br>Dedicated towards the storage of bulk goods such as refrigerated and general warehousing, freighting services, courier and shipping services, and industrial sales | 4 |
| **Retail Services (Shopping Centers/Districts)** | |
| Car Washes, Food Services, Gas Bars, Personal Care Services and Retail Shopping Outlets | See Table 1.3 |
| **High Water Use Facilities** | |
| Events and Attractions | Contact EPCOR |
| High-rise Towers | |
| Hospitals | |
| Secondary Education Institutions and Buildings | |
| Sports and Recreation Facilities | |
| Other High Water Users (heavy industry, meat packing plants and breweries) | |

[1] *Flow generation per business is based on 2019 water use records. If it is expected that the business will have unique uses or is uniquely sized, EPCOR can be contacted for further guidance at boundaryconditions@epcor.com.*

**Table 1.2: Sanitary Flow Generation Design Rates by Business Type for Retail Services Common to Neighborhood Shopping Centers**

| Neighborhood Shopping Centers (developments of 2 to 15 ha in approximate size) | | | | |
|---|---|---|---|---|
| Neighborhood Shopping Center | Business Type | | | Flow Generation Per Business ($m^3$/day)[1] |
| | Anchor Stores | Building Footprint | Large > 1.0 ha | 22 |
| | | | Small 0.5-1.0 ha | 15 |
| | Mid-size General Retail *(0.2 – 0.5 ha Building Footprint)* | | | 4 |
| | Small Retail & Personal Services | | | 2 |
| | Sit Down Restaurant & General Food Service | | | 10 |
| | Take Out Restaurant | | | 8 |
| | Gas Bar Only | | | 2 |
| | Carwash | | | 23 |

[1] *Flow generation per business is based on 2019 water use records. If it is expected that the business will have unique uses or is uniquely sized, EPCOR can be contacted for further guidance at boundaryconditions@epcor.com*

**Table 1.3: Commercial/Institutional and Industrial Sanitary Flow Generation Factors by Zoning**

| Land Use | Zone | Typical Lot Area (ha)[1] | Flow Generation ($m^3$/day/ha)[1,2,3] |
|---|---|---|---|
| Industrial | IM | 0.3-1.5 | 10 |
| | IH | 0.3-2.0 | 10 |
| | BE | 0.3-1.5 | 10 |
| Commercial | CG | 0.3-2.0 | 40 |
| | CB | | |
| | CN | 0.03-0.4 | 40 |
| Mixed Use | Mixed Use (MU, MUN) | 0.03-0.2 | 60 |

[1] *Contact EPCOR at boundaryconditions@epcor.com for assistance with atypical lot sizes and for assistance with high consumption land uses.*
[2] *Where water use for residential purposes is anticipated, flow generation is to be determined based on population and may be additive to other use generation.*
[3] *Flow generation is for Net Area that is assumed to be 80% of Gross Area.*

## 2.0 HYDRAULIC NETWORK ANALYSIS (HNA)

In general, a hydraulic network analysis (HNA) is required for any new development for which a hydraulic analysis has not been previously reviewed, or for any development that significantly alters the servicing scheme such that a previously reviewed hydraulic network analysis is no longer applicable. A report, authenticated and validated by a registered engineering professional, shall be submitted to boundaryconditions@epcor.com for review for each of the below:

### 2.1 High-Level Water Network Planning

High-level water network planning includes planning at a neighbourhood level and larger. Area Structure Plan (ASP) and Neighbourhood Structure Plan (NSP) level planning are the responsibility of the developer along with any associated analysis required by EPCOR Water Services (EWS).

Water Planning Report (WPR)

A Water Planning Report (WPR) is required to propose a water network to meet Table 2.1 and 2.2 where ASP and/or NSP are proposed or amended. A Water Planning Report (WPR) requires hydraulic analysis to be completed to support the water network and the report must be reviewed by EWS prior to support of ASP and NSP Land Development Applications (LDA).

Every submission of a WPR must include, at minimum, the following:

- A digital version of a report, authenticated and validated by a registered engineering professional
- Hydraulic grade line(s) at existing water network connection points, provided by boundaryconditions@epcor.com, used to complete the analysis
- Analysis of the following based on Table 2.1 and 2.2:
    - Average Day Demand (ADD)
    - Maximum Day Demand (MDD)
    - Peak Hour Demand (PHD)
    - Maximum Day Demand plus Fire Flow
- Digital files of the hydraulic model used for the report
    - The water network in .shp, or equivalent format, in NAD83 3TM 114 GRID containing water main diameter, roughness and length.
    - Node data in a .dbf, or equivalent format, containing elevations and demands at each node.
    - Alternate formats can be discussed by contacting boundaryconditions@epcor.com
- Hydraulic modelling output tables are not required within the report, but must be provided upon request.
- Water Main diameter within every identified roadway within the structure plan that requires water infrastructure
- Location and assessment of water infrastructure appurtenances (check valves, pressure reducing valves, pump stations and reservoirs) as required
- Ground elevations consistent with Area Master Plans (AMPs) for ASP and Neighbourhood Design Reports (NDR) for NSP:
    - Highest and lowest ground elevations within the development boundary identified and analyzed for customer servicing
    - Lowest ground elevation, like creek crossings, where pipe pressure may exceed typical water main material specifications
- Water demands consistent with Table 2.1
- Staging or identifying how development will grow/expand
- Proposed Land Use

## 2.2 Local-level Water Network Planning

Local-level development includes proposed development planning that leads to detailed design. Examples can include, but not limited to, greenfield subdivision circulations and block-level infill.

Water Servicing Report (WSR)

A Water Servicing Report (WSR) is a comprehensive report showing the proposed water network for providing servicing and required fire protection meeting Table 2.1 and 2.2 along with the rest of Volume 4 of the City of Edmonton Design and Construction standards.

Every submission of a WSR must include, at minimum, the following:

- A digital version of a report, authenticated and validated by a registered engineering professional
- A statement confirming proposed water infrastructure meets Table 2.1 and 2.2 or discusses mitigations in detail
- A detailed map showing proposed water main sizing, existing infrastructure as required
- Any pertinent water infrastructure appurtenances (check valve, pressure reducing valve, etc.) as required
- Identifying lots being serviced and total number of lots
- Proposed Land Zoning

Greenfield Subdivision WSRs also require the following:

- A WSR is required to be reviewed by EWS prior to support of any Subdivision LDA which proposes new water infrastructure.
- Confirmation that proposed network aligns with applicable WPR
- Phasing plans, if applicable, including infrastructure required to support each phase
- If hydraulic modelling is completed as part of the WSR, output tables are not required within the report but must be provided upon request.

**Table 2.1: Water Servicing Guidelines for Hydraulic Network Analysis**

| Parameter | Value |
|---|---|
| Residential Average Day Demand (ADD) | 220 L/c/d |
| Residential Maximum Day Demand (MDD) | 330 L/c/d |
| Residential Peak Hour Demand (PHD) | 660 L/c/d |
| Industrial/Commercial/Institutional (ICI) Demand | Section 1.8 |
| | |
| Minimum Ultimate Servicing Pressure (PHD) | 280 kPa |
| Minimum Interim Servicing Pressure (MDD) | 280 kPa |
| Minimum Residential Fire Sprinklers Pressure (MDD) | 350 kPa |
| Maximum Servicing Pressure (ADD) | 550 kPa |
| Maximum Allowable Pressure in Distribution System (ADD) | 700 kPa |
| | |
| Maximum Hazen-William's Coefficient | 120 |
| Maximum PVC Pipe Velocity | AWWA C900 |

**Table 2.2: Fire Protection Guidelines for Hydraulic Network Analysis***

| Parameter | Value |
|---|---|
| Minimum MDD+Fire Flow Pressure | 140 kPa |
| | |
| Fire Flow for RS, RSF, RR, GLD, GLDF, SLD. | 100 L/s |
| Fire Flow for RSM, MUN, CN, CG, CB, IM, A, PS, PSN, PU, UF, GRH, EIM, ECB, SRH, SRA, BP, BRH, RVRH. | 180 L/s |
| Fire Flow for RM, RL, MU, BE, IH, UI, AJ, GVC, GLRA, GMRA, EIB, BLMR, BMR, RTCC, RTCR, RTCMR, MRC, MMUT, MMS, MED. | 300 L/s |
| Fire Flow for NA | 33 L/s |
| Fire flow for all other Zoning | ** |

**Based on "Fire Flows for Zoning Bylaw Renewal – A Status Quo Approach, 2023" and "EFRS-SAZ-MEMO-0001 v4"*
***Please contact EFRS Engineering (fireflowinquiries@edmonton.ca) for zoning fire flow assignment.*