Design Guidelines
for
Development Site
Servicing Plans

INTRODUCTION

The 2018 *Design Guidelines for Development Site Servicing Plans* (the guidelines) are made available for use in the City of Calgary effective as of the date below.

May 1st, 2018

The guidelines are intended to provide information to architects, engineers, contractors, developers, and anyone acting on behalf of the private Lot Owner or DSSP applicant who require knowledge of the design requirements for a Development Site Servicing Plan (DSSP). The guidelines are not intended to set rigid solutions to particular design problems but rather aim to provide a guide to The City of Calgary's design requirements by indicating the applicable standards and requirements.

It is important to recognize that DSSP approval does not constitute Development Permit (DP) approval. Clearance by The City of Calgary reviewers is only one requirement within the overall development approval process and as such the approval of the DSSP must ***not*** be construed as a clearance to commence work on a project. Final Approval and Building Permit (BP) issuance will be given by Planning & Development.

These guidelines were updated May 1, 2018 to clarify the roles and responsibilities of the Engineer of Record, Lot Owner, and Water Resources as well as to change the scope of the technical review and inspection.

Questions related to the DSSP application process or requirements can be directed to: WA-ResourcesDevelopmentApprovals@calgary.ca.

Table of Contents

1 General

The City of Calgary's Water Resources and Water Services provides Utility Service including:

- The supply and distribution of potable water;
- The provision of sanitary sewer service; and
- The collection of stormwater.

Water Resources utilizes the Development Site Servicing Plan (DSSP) circulation to ensure private developments comply with applicable City standards and requirements referenced through these DSSP guidelines and also to grant permission for these developments to connect to the public water, sanitary and stormwater systems. This circulation also approves the design of City owned public infrastructure that is built to support private development.

The City of Calgary requires a review and inspection of a Development Site Servicing Plan (DSSP) for all proposed developments where new utility connections (water, sanitary and stormwater) are proposed to the municipal system or where the existing water service, metering, or on-site sewers will be changed. It is also required in situations where the proposed development will increase the stormwater release from site or where there are significant changes to the site grading. These changes must be reviewed by Water Resources to ensure that any new or altered utility service systems are designed and installed to meet the requirements of all applicable design guidelines, bylaws and specifications. As the locations and elevations of both the buildings and utilities are critical to the success and function of the project, it is imperative that plan approval from Water Resources be obtained prior to the release of any building permits.

Water Resources reviews DSSP plans submitted by the Engineer of Record, a representative of the Private Lot Owner (Lot Owner), to ensure that any utility (water, wastewater and stormwater) service connections to the municipal system meet standards and requirements, and will not adversely impact the municipal utility systems or public health and safety. Water Resources also inspects DSSP job sites, run by the Contractor, another representative of the Lot Owner, to confirm that the following five requirements are met as approved:

1. All service connections to the public system as well as any alterations of the public system, are to be performed only by an indemnified contractor, and meeting all requirements of the City Standard Specifications,

2. Stormwater flow restriction devices are present at time of construction completion;

3. Stormwater quality management devices (such as oil grit separators) are present as required;

4. Stormwater storage devices are present as required; and

5. Water service from the property line up to and including Master Control valve is installed and tested in accordance with all requirements of the City Standard Specifications for Waterworks Construction.

Review and inspection by The City is not to be considered a substitute for supervision by the Engineer of Record, Lot Owner, or Contractor.

The Engineer of Record maintains full responsibility to exercise competence and good engineering judgement for the entirety of their design. Further they must adhere to the most current published version of the DSSP guidelines, standard specifications for water and sewer construction on aspects of the design related to stormwater management, the public pipe system, and public health & safety. The Engineer of Record is also responsible for ensuring any other applicable municipal, provincial or federal requirements are adhered to (ex. National Plumbing Code) and documentation of all private site works and retention of these records for the use of their clients. The Contractor maintains full responsibility for the entirety of their construction, installation or alteration activities, ensuring their work is as per the City approved plans, and meets all of the above requirements.

Aspects of the private site design and construction that do not have an impact on public health & safety, the public system, and stormwater management, may deviate from City specifications at the discretion of the Engineer of Record. In all cases it is recommended that the private site design complies with City guidelines and specifications, however unique or complex circumstances may require design solutions not presented in these specifications. Owners and their consultants may choose to innovate and select their own methods of complying with all Codes and requirements rather than following City standards on private-owned infrastructure. Water Resources may require additional documentation to demonstrate that no adverse effect on the utility exists because of an innovative design. Be aware that any adverse effect on the utility are the responsibility of the Lot Owner and may result in direction to the Lot Owner to prevent the adverse effect. In addition, a DSSP approval does not restrict The City's enforcement powers under The City's bylaws.

For links to various bylaws, standards, and guidelines see Appendix 'B'. Please note that the most current bylaws, standards, and guidelines prevail over those listed in Appendix 'B'."

The approval of the project's DSSP is only one element of the BP approval process. This approval must not be construed as a clearance to commence work on a project. The final approval and BP is issued by the Planning & Development Department.

1.1 DSSP Requirements

DSSPs are to be submitted to The City of Calgary, at the third floor counter of the Municipal Building. The counter will do a brief cursory review of the plans and the Complete Application Requirement List to ensure all required items are included with the submission package.

Prior to submission of the DSSP the Lot Owner must have an approved DP (except where otherwise noted at the DP stage).

For complex sites, where the Lot Owner/Engineer of Record would like early feedback from Water Resources, a site servicing plan may be included with the DP application. Water Resources will provide a cursory review of the servicing strategies and provide stormwater management requirements (ex. release rate or volume control).

For simple sites, Water Resources may allow a DSSP to be submitted after the first DP Detailed Team Review (DTR). Water Resources will identify the option for an earlier submission on the DP DTR comments when the following criteria is met:

- The building, driveway, % imperviousness and site plan are relatively fixed

- Servicing is available (no main extensions)
- No stormwater management report or sanitary servicing study requirements

Water Resources reviews all legal information and service connection designs within public rights-of-way. Water Resources may at their discretion request any additional information to be supplied which may be necessary to check the proposed work. The amount of information required will depend on the complexity of the project and the area topography. All plans should be legible and drawn to a suitable scale to qualify for circulation.

The Engineer of Record is responsible for confirming grades on site. WR may at its discretion provide information on grades during design review, however this information must not be relied upon and actual grades must be surveyed. Survey data must be supplied to WR on request. If actual grades are different than shown on the approved DSSP, the Engineer of Record should submit a small format revision to Water Resources for approval.

All DSSP design drawings must comply with these guidelines and also any other relevant City of Calgary Bylaws, guidelines, and specifications, as well as any relevant provincial and federal regulations.

1.2 DSSP Complete Application Requirement List (CARL)

The DSSP CARL outlines all of the information necessary to evaluate and provide a timely decision on your application.

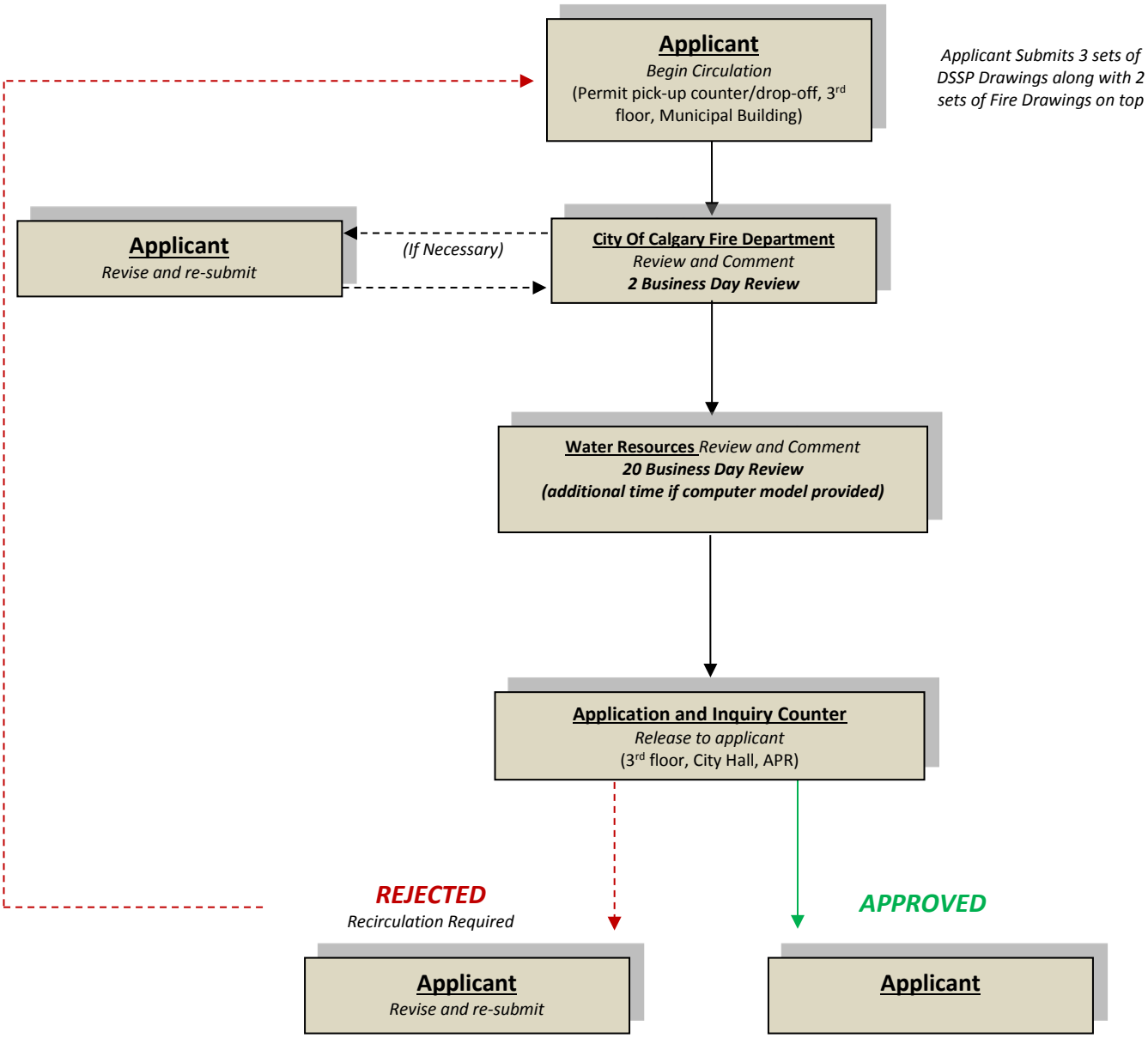
Only applications that are complete will be accepted. Applications and materials submitted must be clear, legible and precise. Plans submitted should be to a professional drafting standard. We are currently unable to accept digital applications.

To support a timely review of the application, applicants should include supporting information on the CARL or with a cover letter outlining any components that do not meet City requirements (i.e. Council approved policies, bylaw standards or technical specifications/guidelines).

For the current edition of the DSSP CARL refer to the Planning and Development resource library on the City of Calgary Website.

http://www.calgary.ca/PDA/pd/Documents/development/development-site-servicing-plan.pdf

1.3 DSSP Drawings – Circulation Chart



1.4 Circulation Block

As of May 1, 2018 every submission will require the following Circulation Block to be included on the front sheet of all DSSP submissions. The block template is available on the Calgary Approvals Coordination publications website for download.

http://www.calgary.ca/PDA/pd/Pages/Planning-and-development-resource-library/Publications.aspx#cacp

CITY OF CALGARY DEVELOPMENT SITE SERVICING PLAN			
DATE RECEIVED			
CIRCULATION TO		INITIAL	DATE
WATER RESOURCES			

REVIEW AND INSPECTION BY THE CITY IS NOT A SUBSTITUTE FOR SUPERVISION, INSPECTION, AND DUE DILIGENCE BY THE ENGINEER OF RECORD, LOT OWNER, OR CONTRACTOR.

THE ENGINEER OF RECORD MAINTAINS FULL RESPONSIBILITY TO EXERCISE COMPETENCE AND GOOD ENGINEERING JUDGEMENT FOR THE ENTIRETY OF THEIR DESIGN AND PROVIDE DOCUMENTATION FOR ALL PRIVATE SITE WORKS AND RETAIN THESE RECORDS FOR THE USE OF THEIR CLIENTS.

1.5 Small Format Review

After acceptance of a DSSP and during deep service installation a change in design may be required due to unexpected field conditions. In such a circumstance, submission of a Small Format Review may be considered.

The Small Format Review can only be initiated by the applicant after the DSSP has received approval.

The acceptance of a small format submission is at the discretion of the Water Resources reviewer. If the proposed changes are deemed to be too significant, a full DSSP submission will be required.

A Small Format Review must meet ALL of the criteria stated below:

- Be scaled and readable on 8 ½ x 11" sized paper
- Show previously approved design as well as proposed changes
- Proposed changes should be clearly identified (ex. Clouded)
- Be stamped by a Professional Engineer (P.Eng., P.L., P.Tech)
- Show the Municipal Address
- Show the legal information including the section number
- Show the DSSP circulation number
- Must be electronically submitted (pdf format)

Refer to the Figure 1 on the next page for an example of a typical small format revision drawing.

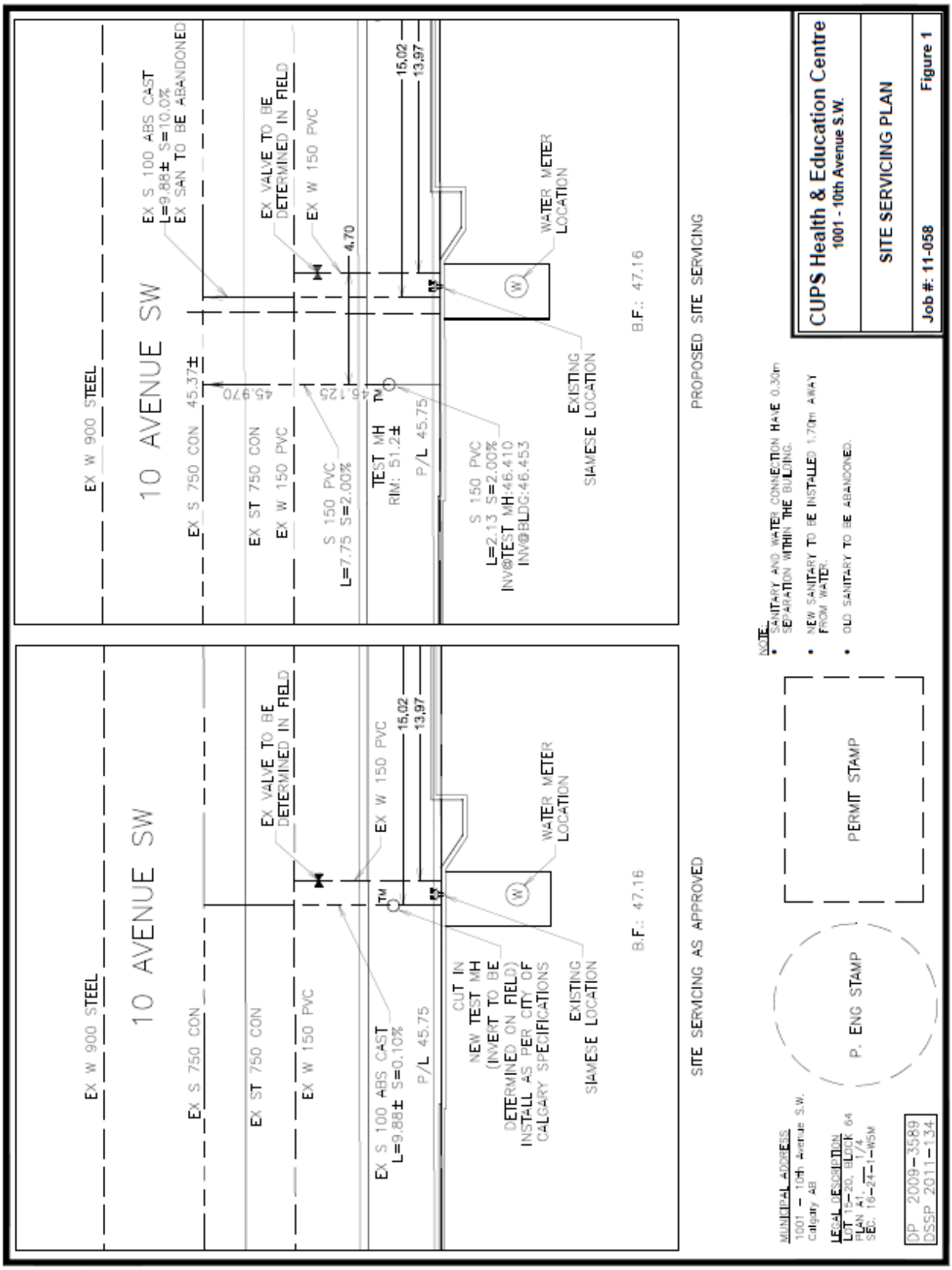
To submit a Small Format Review first pay applicable fees online at epay.calgary.ca.

Once fees have been paid, email revision drawing (pdf format) and receipt of payment to: WA-ResourcesDevelopmentApprovals@calgary.ca

Small Formats are considered a full review and subject to the appropriate fees. Once the email submission and appropriate fees have been paid, Water Resources will endeavor to complete the small format review within 3 business days. A maximum of 3 consecutive small reviews will be allowed. After which time a complete submission showing all previous changes must occur.

No further reviews are allowed once inspections on a site are complete and the file has been closed. Any revisions to a site after this time must be completed as a new DSSP submission.

Figure 1: Typical Small Format Revision Drawing



2 Drafting Standards

2.1 Drafting Requirements

For standard line weights, line types, symbols, abbreviations, etc. refer to the current edition of the “Standard Block Profile Specifications for CAD and Manual Formats”.

All DSSP submissions must be in metric units, elevations must be metric and **GEODETIC DATUM**.

When an elevation is converted from imperial datum to metric datum **35.56 feet** must be added to the imperial elevation (City Datum) prior to multiplying by 0.3048 to convert to the metric elevation (Geodetic Datum).

2.2 Drawing Requirements

a) DSSP submissions must include three (3) copies of the full drawing set including:

   a. Title blocks.
   b. Plans that are to metric scale, minimum 1:100 (Maximum 1:1000), all elevations
   c. A north arrow on the right side of the page that points to the top or left of the page.
   d. The size of the parcel (Ha).
   e. All elements of the plan labelled as existing or proposed.
   f. The municipal address (i.e.: street address) and legal description (i.e.: plan/block/lot).
   g. Uses, project name, applicant name and contact information.
   h. The name of the consultant and an original signed professional engineer’s stamp (P.Eng., P.L., P.Tech), and legible permit to practice number.
   i. Clear of any previous approval stamps and/or notations.
   j. A relevant DP number and any previous DSSP numbers for the site indicated on the coversheet.

b) All plans must be sorted into sets and shall be:

   a. Rolled and not folded.
   b. Stapled together, NOT bound by tape.
   c. On the same sized paper.
   d. Clear and legible with no colours.
   e. No larger than the maximum drawing size of 0.600m x 0.900m.

The following drawing order should be followed; Sheet 1 = Site Servicing Plan, Sheet 2 = Grading Plan, Sheet 3 = Stormwater Management Plan, and Sheet 4 = Details, Sheet 5 = Architectural floor plan showing water meter room. Where more drawings are required, ensure the first sheet is always the site servicing plan.

2.3 Required Details

a) Ensure the following required information is provided on all plans:

   a. Dimensioned property lines:
      i. Indicate elevations at back of sidewalk – at property line corners and VPIs
      ii. Indicate lane grade design elevations – at property line corners and VPIs
   b. Adjacent to parcel:
      i. City streets – Label street names
      ii. Sidewalks – City and public paths (Regional Pathway System)
      iii. Curb cuts – Medians and breaks in medians
      iv. Road widening setbacks and corner cuts – dimensioned and labelled
   c. Easements, Utility Rights-of-Way, etc:
      i. Dimension (width and location)
      ii. Label type of easement and registration number

b) Show all utilities on and adjoining the parcel (deep, shallow and overhead):
   a. Water, storm and sanitary sewer
      i. locations and full dimensions for mains, services, manholes, catch basins, hydrants and valves to property lines, buildings, and other utilities
      ii. show pipe size, type, class, material, length, slope, and bedding material
      iii. pipe inverts and rim elevations at all manholes and catch basins
      iv. proposed sanitary/storm inverts at property lines and buildings
      v. horizontal and vertical clearances at all utility crossings
      vi. locations of sanitary test manholes with details of easement if located on private property, if applicable
      vii. pipe capacity for large developments
   b. Gas
   c. Electrical (poles, fixtures, guy wires/pole anchors, transformer boxes, etc.)
   d. Cable, telephone

c) Indicate the location of all:
   a. Retaining walls and fences.
   b. Landscaping, berms, swales, slopes and other physical features which could affect utility servicing both on the site and adjoining boulevards.

d) If trees are existing on public lands adjacent to the site:
   a. Specify species and diameter of each tree
   b. Location of the centre point of the trunk of each tree
   c. Are trees to be retained or removed? (At owner's expense) Must match approved DP

e) Water servicing:
   a. Location of on-site water meter (indicated by M)
   b. Architectural floor plan showing water meter room location that matches most recent approved Development Permit.
   c. Total residential unit count
   d. State type of water service entry (wall or floor) and the relevant entry detail being used from Waterworks spec (if using a nonstandard service entry a custom detail must be shown on plans).

e. Pipe support details- required where foundation wall is 4m or less from property line. At the discretion of the Engineer of Record where foundation is greater than 4m from property line.

f) Surface Drainage:
   a. Plot existing and proposed surface grades along property lines and on site
   b. Drainage pattern indicated by boundary lines and arrows
   c. Storm drainage calculations including discharge to minor systems, ponding, and catchment boundaries
   d. Location and elevation of emergency escape routes
   e. Stormwater release rate is being controlled to the rate provided with the Development Permit submission
   f. ICD and HYDROVEX details (include all HYDROVEX details with application)
   g. Stormwater features such as storm ponds, trap lows, ICDs, oil/grit separators, BMPs, or Low Impact Development Practices

g) Floodway, Flood Fringe and Overflow:
   a. Show Floodway/Flood Fringe/Overland Flow Zone lines on the plans complete with all step elevations and labels
   b. Dimension distance to buildings and structures

h) Outline and dimension buildings:
   a. Detached buildings and structures (sheds, garages, etc.)
   b. Main floor elevations
   c. Principal entrance to building

i) Driveways & parking areas:
   a. Label surface material
   b. Label curb cuts to be removed and rehabilitated
   c. Major grade changes and ramps

3 Servicing

3.1 Approvals

A contractor must be issued a copy of an engineer-stamped drawing (P.Eng., P.L., P.Tech), which has been authenticated and approved by Water Resources prior to installation of any water, wastewater or stormwater service pipes or construction of any drainage features.

3.2 Regulatory Documents

a) Installation of sewer and water pipes shall, where applicable, follow the requirements and guidelines as contained in this manual and in the Current Editions of:
   - City of Calgary Bylaws,
   - The National Plumbing Code of Canada,
   - Standard Specifications: Waterworks Construction,
   - Standard Specifications: Sewer Construction (public right of way),
   - Design Guidelines for Subdivision Servicing,
   - Stormwater Management & Design Manual, and
   - Any relevant Provincial and Federal regulations.

   Links are provided in Appendix 'B' for these regulatory documents and other relevant reference materials.

3.3 Lot Owner and Representatives' Responsibilities

The Lot Owner or his/her representative is responsible to ensure that the location for the service pipes do not conflict with power poles, pole anchors, transformers, trees, catch basins, underground chambers or other facilities which may exist within the public right-of-way. No service connections shall be granted where such obstructions exist

The Engineer of Record maintains full responsibility for the entirety of their design, and must adhere to the most current published version of the DSSP guidelines, Stormwater Management Design Manual and standard specifications for water and sewer construction on aspects of the design related to stormwater management, the public pipe system, and public health & safety.

The Lot Owner and their representatives (ex. Engineer of Record) are responsible for ensuring contractors are constructing as per the approved plans within the private site, and adhering to the above noted requirements. Contractors working on behalf of the Lot Owner are responsible for ensuring that they are adhering to all relevant codes and regulations, enabling the outcomes of protecting public health & safety, the municipal pipe system, and supporting stormwater management. The Lot Owner maintains full ownership and responsibility for the utility site servicing installations from the property line to the building connection unless an easement granting ownership of the infrastructure to The City of Calgary is registered on title. This includes the ongoing operation, maintenance and compliance with applicable regulations.

3.4 City Responsibilities

Water Resources utilizes the DSSP circulation to grant permission for private developments to connect to the public water, sanitary and storm sewer system.

Water Resources reviews DSSP plans submitted by the Engineer of Record, a representative of the Private Lot Owner (Lot Owner), to ensure that any utility (water, wastewater and stormwater) service connections to the municipal system meet standards and requirements, and will not adversely impact the municipal utility systems or public health and safety. Water Resources also inspects DSSP job sites, run by the Contractor, another representative of the Lot Owner, to confirm that the following five requirements are met as approved:

1. All service connections to the public system as well as any alterations of the public system, are to be performed only by an indemnified contractor, and meeting all requirements of the City Standard Specifications,
2. Stormwater flow restriction devices are present at time of construction completion;
3. Stormwater quality management devices (such as oil grid separators) are present as required;
4. Stormwater storage devices are present as required; and
5. Water service from the property line up to and including Master Control valve is installed and tested in accordance with all requirements of the City Standard Specifications for Waterworks Construction.

3.5 Developer Controlled Subdivision

New subdivisions that have not been granted a Final Acceptance Certificate from The City remain in developer control. The Area Developer should be contacted for all water, wastewater and stormwater service pipe installations in the public rights-of-way, which are in a developer controlled subdivision. Installations shall be done in full accordance with current City of Calgary Standard Specifications Waterworks Construction, Standard Specifications Sewer Construction, and the Stormwater Management Design Manual. Any such installations shall be carried out only under the supervision of a City Inspector.

3.6 Indemnified Contractors

As per The City of Calgary Standard Specifications, all utility service connections within the public right of way are required to be installed by an Approved Water Indemnified Contractor. A copy of the current Approved Indemnified Contractors can be found online at http://www.calgary.ca/UEP/Water/Pages/Specifications/Water-Sewer-Connections.aspx

3.7 Service Connections

a) All new service connections (including replacements and upgrades), including the public and private portions, are at the Lot owner's expense.

b) The Lot owner or a contractor must contact an Indemnified Contractor to request and pay for the installation of The City portion of the service pipe. Installation of the new service connections (including replacements and upgrades) can proceed once the DSSP has been approved.

3.7 Setting Service Inverts at Property Line

Water Resources will review the proposed and existing grades based on the record information available. This information cannot be relied upon; therefore, it is the responsibility of the Engineer of Record to confirm the actual site grades. If changes are required due to unexpected site conditions, a small format change will be required.

When setting the service connection inverts at the property line;

- Determine invert elevation of the main
- Match crowns of pipe or add 0.06m whichever is greater
- Account for an additional 0.15m of elevation at the tie in to the main to allow for 'construction and datum error'
- Determine the distance from the main to property line and calculate the rise in elevation required from the minimum slope table
- Add vertical increase based on slope of pipe
- Allow more grade if there is a possible conflict with other utilities.
- Some sanitary sewers require a test manhole. These are usually noted on the DSSP circulation by the Engineer of Record or by Water Resources. A minimum 175 millimetres to a maximum 600 millimetres drop is required through a test manhole, unless otherwise approved. The test manhole is usually set outside of the property line.

3.8 Service Disconnection

a) Where an existing water service connection is being disconnected, the Lot Owner must make a deposit to The City to disconnect the water service pipe from the public water main prior to receiving a DSSP approval. A quote for the service disconnection from an Approved Water Indemnified Contractor should be provided with the DSSP application.

b) The minimum deposit amount of a water service pipe disconnect varies according to the location and size of pipe, and is adjusted annually.

c) Once the disconnect deposit has been made online, the applicant may book an appointment with the Water Meters Department (3-1-1) to have the water turned off and the meter pulled. It is the responsibility of the applicant to have a representative present at the time of the scheduled appointment.

d) Where the Lot Owner is approved by Water Resources to reuse the existing water service pipes, the deposit for the service pipe disconnect will be refunded upon request.

e) Where the Lot Owner is required to install new services, the Lot Owner must disconnect the existing service(s) at their cost. The Lot Owner/Engineer of Record is responsible for locating the existing service and showing it on the DSSP. It is also the Lot

Owner/Engineer of Records' responsibility to record the last known location of the existing service valve(s).

f) The deposit for the service pipe disconnect will be refunded upon request only after Water Resources has confirmed the Lot Owner completed the disconnection of the existing service(s) and installation of the new services as per the approved DSSP.

3.9 Reuse of Service Pipes

a) Where the existing structure is demolished and replaced with a new structure; a new water service (minimum 25mm PEX or copper), and new sanitary & stormwater services that meet the current Water and Sewer Standard Specifications and the sizing requirements of the National Plumbing Code (Current edition) must be installed.

b) Where additional buildings or an addition to an existing building is proposed, the applicant may request to reuse the existing water and sewer service at the Development Permit stage. Any reuse of service pipes must be approved by Water Resources.

c) To verify if the existing water service pipes are acceptable for the proposed development contact:

- Water Resources for the portion of the service pipes within the public road right-of-way; and
- Plumbing and Gas for the portion of the service pipes within the private property.

d) Water Resources will assess requests for reuse of service pipes based on the condition of the existing services (assessed by video camera inspections and/or maintenance records), and the scope of the proposed development (ie. Change in use, size of addition, change in number of units, etc).

e) Where the services are found to be unacceptable for re-use, complete replacement of the existing service(s) (including disconnection at the main(s)) is required as per item 'a' of this section.

f) All the sewer and water service pipes within the same trench must be replaced if either cannot be reused. Where sewer and water pipes are not in a common trench, permission may be granted to re-use one or more of the existing service pipes based on the condition assessment.

g) If it is determined that the existing service pipes may be reused, the Lot Owner must ensure the following conditions are met prior to the refund of the service disconnect fee:

- The existing service pipes are reused within one (1) year from the date of the payment for the service disconnect. The City shall disconnect the existing service if the Lot Owner does not connect within this one (1) year period. In this case, the Lot Owner will not be entitled to a service disconnection refund.

Consequently, the Lot Owner shall be responsible for the cost of all new service connections.

- The City may disconnect any existing service pipes before the one (1) year time period has elapsed if the pipe is leaking or adversely impacting the public utility system. In this case, the Lot Owner will not be entitled to a service disconnect refund.

4 Main Extension Requirements

4.1 General

a) Where there is no public water, sanitary or storm main adjacent to the proposed development and it is the opinion of Water Resources that it is required or where the adjacent mains are undersized for the proposed development, the Lot Owner, at their expense, shall:
   - o install all required mains and appurtenances;
   - o extend the required mains along the total frontage and/or flankage of the proposed development on the approved line assignment for the appropriate utility
   - o submit a construction drawing set for review to Calgary Approvals Coordination; and
   - o arrange for an Indemnification Agreement through Water Resources-Development Engineering (See section 4.3).

b) All work done by a Contractor in The City rights-of-way, must be made in writing and requires either a Subdivision Development Agreement or an Indemnification Agreement with The City prior to commencement of work.

4.2 Fire Flow Requirements

a) In redevelopment areas where The City's water network may not have the available fire flows to meet the requirements for the proposed development, Water Resources requires a fire flow letter in the DP review process. Water Resources will provide the available fire flow at the at The City's watermain that the development will connect to.

   It is the responsibility of the Engineer of Record to ensure that the fire flow available in The City's water network is adequate to service the proposed development.

b) When required at the DP stage the Lot Owner must submit a fire flow letter, prepared by a qualified professional engineer under seal and permit to practice stamp to the Water Resources to WA-ResourcesDevelopmentApprovals@calgary.ca. The fire flow letter shall identify the type of the development, address of the development, and the fire flow required for the developing property.

c) If the Engineer of Record determines that the available fire flow from The City's water system is insufficient to meet the fire flow required by the proposed development, the Lot Owner must upgrade the main at their expense by entering into an indemnification agreement (See section 4.3).

4.3 Indemnification Agreements

a) Where extensions of City mains are required, an indemnification agreement must be entered into to undertake the work.

b) Water Resources - Development Engineering Generalists administer Indemnification Agreements for the construction of public infrastructure within The City right-of-way.

Comments are typically provided at the DP stage and will indicate the required information and drawings prior to the preparation of the agreement.

c) Indemnification Agreements, cost estimates and construction drawing submissions must include all of the service connections (sanitary, storm and water) to the site as well as the main extension itself.

4.4 Construction Drawing Submission

a) The **Preliminary Drawing** submission through Calgary Approvals Coordination must consist of:

   a. Cover letter with development name and DP number including an $8^{1/2}$" x 11" plan indicating the construction boundaries
   b. Contact information of who will be party to the agreement
   c. Corporate registry search and a certificate of title for adjacent lands associated with the construction of the infrastructure
   d. Detailed description of the work that will form part of the agreement (cubic metres of asphalt and/or concrete, pipe diameters for sanitary, storm, and watermains and their respective lengths in lineal metres, etc.) within the City right-of-way
   e. Detailed cost estimate for the construction from a contractor for all work being done in public right-of-way.

   f. An electronic set of drawings in DWF format submitted to Calgary Approvals Coordination that contains:
      i. Coversheets
      ii. Drawing List/Index
      iii. Key Plan
      iv. Legal Plan
      v. Erosion & Sediment Control Drawing
      vi. All affected Block profiles prepared according to the current edition of the "Standard block profile specifications for CAD and manual formats".
      vii. Copy of approved DP site plan stamped "For location purposes only"
   g. All drawings must be date stamped to reflect the date submitted.

b) The **Final Drawing** submission through Calgary Approvals Coordination must consist of:

   a. Cover letter with development name and DP number including details of all concerns identified on the **Preliminary Drawing** submission and how they were addressed or resolved sorted by the City division that made the comments.
   b. Detailed cost estimate for the construction highlighting changes, if any, from the preliminary submission.
   c. An electronic set of drawings in DWF format submitted to Calgary Approvals Coordination that contains:
      i. Coversheets
      ii. Drawing List/Index
      iii. Key Plan
      iv. Legal Plan
      v. Erosion & Sediment Control Drawing

vi. All affected Block profiles
vii. Copy of approved DP site plan stamped “For location purposes only”

d. All drawings must be stamped and signed by a professional Engineer.
e. All drawings must be date stamped to reflect the date submitted.

Please follow instructions on Calgary Approvals Coordination’s website for more information on electronic drawing submission standards: http://www.calgary.ca/PDA/pd/Pages/Residential-Building-and-Development/Subdivision.aspx

For detailed instructions regarding submission of electronic Construction Drawings, setting up an online VISTA account (View Information Specific To Account), The complete Application Requirement List, eConstruction Drawings Training Manual, FAQ’s, etc.

4.5 Execution of the Indemnification Agreement

Once the final drawings and accompanying information are approved, the Development Engineering Generalist will forward the crafted Indemnification Agreement to the Lot Owner under cover letter for execution. The agreement must then be properly executed in one of two ways:

a) **If it’s by a company,** than the agreement must be signed under corporate seal.

b) **If it’s by an individual,** the individual’s signature must be accompanied by a Corporate Signing Affidavit, and witnessed and accompanied by an Affidavit of Execution worn by the witness in the presence of a Commissioner of Oaths.

4.6 Final Submission by Lot Owner

After the Indemnification Agreement has been executed, the Lot Owner will forward the following to the Development Engineering Generalist for processing:

a) **Four (4)** executed copies of the Agreement
b) Certificate of insurance with:
    a. Commercial general liability insurance amount of not less than 5 million dollars
    b. The City included as an additional insured under the policy
    c. Expiry date no less than one year from the date of issue
c) Performance security (Letter of credit)
d) Inspection fees (certified cheque or bank draft)

Once the as-builts have been accepted, the performance securities will be returned to the Lot Owner.

4.7 Deferred Servicing Agreements

Where there is no public water or sanitary mains adjacent to the proposed development and it is the opinion of Water Resources that a private potable water supply system or a septic system may be used, a Deferred Services Agreement must be executed by the Lot Owner and registered on title.

All private water and wastewater systems require approval from The City prior to submission to Alberta Environment and Parks. For more information, contact Water Resources – Regulatory Affairs & Compliance: 403-268-5374 or Wilson.chu@calgary.ca

5 Water Infrastructure

5.1 General

a) The water system is reviewed by Water Resources from the connection at The City's main to the master control valve inside the building. All design and construction, up to and including the master control valve must comply with the current version of The City of Calgary Standard Specifications Waterworks Construction and the DSSP guidelines.

b) Valves, fire hydrants, and all other appurtenances shall conform to and be designed as per the current version of The City of Calgary Standard Specifications Waterworks Construction.

c) Information and requirements for fire protection systems contained in codes other than this guideline can be obtained by contacting the Calgary Building Services and the Fire Prevention Bureau.

d) Block profiles for all existing utility rights-of-way showing the existing and proposed grades shall be provided with the DSSP submission.

e) Backflow protection shall be provided in accordance with the following codes and manuals:

- National Plumbing Code of Canada (Current Edition)
- CAN/CSA - B64.10 "Manual of the Selection and Installation of Backflow Prevention Devices" published by:

  Canadian Standards Association (CSA)
  Suite 100
  5060 Spectrum Way
  Mississauga, ON L4W 5N6
  Tel: (416) 747-4000
  Toll Free: 1-800-463-6727 or (416) 747-2661
  Fax: (416) 747-2473
  Web Address: http://www.csa-international.org

- Cross Connection Control Manual published by:

  Western Canada Section AWWA
  P.O. Box 1708
  Cochrane, AB T4E 1 B6
  Phone: 1-877-283-2003 Fax: 1-877-283-2007
  Web Address: http://www.wcsawwa.net/

f) Where approved, non-potable water (reclaimed water) systems shall comply with the Standard Specifications: Waterworks Construction (Section 504.04.01) and the current edition of The City of Calgary's Stormwater Reuse Guidelines.

5.2 Crossing Water Feedermain and Critical Distribution Mains

To ensure the safety of the public and to protect the feedermain, and critical distribution main infrastructure, any construction within 3.0m of a feedermain or critical distribution main, as defined under the Proximity Guidelines must be reviewed and approved by Water Resources. Hydrovacing is required to determine the alignment, elevation, pipe diameter, pipe support, backfill and clearances. A detail of this information is required on the DSSP with respect to working in the proximity of any feedermain. Refer to the Proximity Guidelines located under Technical Specifications on this web page for more information.
http://www.calgary.ca/PDA/pd/Pages/Planning-and-development-resource-library/Publications.aspx

Contact Water Resources at (403) 268-5752 to schedule an inspection, and consultations on notification shut down periods, and tunnelling and augering options.

5.3 Service Connections

a) Water service pipes must connect to the public water main at right angles.

b) Only one connection to a public water main is permitted for each lot with distinct certificates of title, unless dual mains are required for the development.

c) Check-valve looped water systems are required for multi-building sites with 60 units or more such as townhouses, condo complexes, and large commercial multi-building sites and where the private fire system consists of 2 or more hydrants. Dual services are permitted to service individual high-rise buildings with 80 commercial/residential units or more. Refer to the “Standard Specifications Waterworks Construction” Drawing 453.1026.001, Sheet 27. These unit numbers are for reference only, a check-valve looped service or a dual service may be required for other developments, at the discretion of Water Resources.

d) Water service pipes are not permitted to cross one property and enter into another or on any other premises as per the National Plumbing Code of Canada (Current Edition) Section #2.1.2.4.

e) Pipes are not permitted to extend from building to building on the same property except for an ancillary building. Refer to the National Plumbing Code of Canada (Current Edition) Section #2.1.2.4.

f) In the case of a Bareland Condominium, separate service connections are made to a private water main. The private water main shall have a single connection to the public watermain, except where looping is required.

g) A strata subdivision is defined as the description of a volumetric space under section 86 of the Land Titles Act and is not the equivalent of a condominium. It subdivides the volumetric spaces into separate parcels.

a. Each subdivided parcel shall have separate water, wastewater and stormwater connections directly from City mains. An approved or tentative legal plan of the strata subdivision must be included with the DSSP in order to permit additional service connections.
b. The water service pipe shall enter an exterior wall, directly into a water meter room. Water services may share a common meter room where city access is permitted.
c. A strata requires a detailed and Easements, Covenants and Restrictions (ECR) agreement.
d. Each subdivided parcel shall have their own separate valves and meter assemblies.

h) Pre-servicing is not permitted. In instances where there is certainty of location of building (meter room), fire protection requirements, service size (DP with approved Plans) and timing for completion, pre-servicing may be considered at the discretion of Water Resources.

5.4 Service Marking

Private water services shall be installed to the property line and the location marked with a 2X4 vertically placed to the pipe invert and showing one (1) metre above ground level. The letters "WI" shall be painted on the 2X4 to specify water.

5.5 Piping Material

a) Water service pipes 25 mm, 40 mm, and 50 mm in diameter are to be copper or PEX pipe (Cross-linked Polyethylene Pipe). See Standard Specification Waterworks Construction Section 503.02.18.

b) Water service pipes 100 mm, 150 mm, 200 mm, 250 mm, 300 mm, and 400 mm in diameter are to be ductile iron or PVC DR 18 AWWA C 900. See “Standard Specifications: Waterworks Construction” (Sections 503.01.00.1, 503.02.03 and 503.02.04). For PVC pipes installed in industrial areas, NBR gaskets shall be supplied as per 504.04.01.

c) All 100 mm and larger diameter service pipes passing through the exterior foundation wall or floor slab up to the master control valve shall be approved ductile iron pipe. Refer to Standard Specifications Waterworks Construction (Drawing 453.1009.009 part 2).

d) Metallic water pipes and fittings c/w NBR (nitrile) gaskets are to be used on-site in areas contaminated or potentially contaminated with organic compounds (organic solvents or petroleum products). See Standard Specifications Waterworks Construction, Sections 504.05.01 and 503.02.12.

5.6 Arrangement of Piping

a) All dual water service pipes installed in a common trench shall have a separation of 1.3 metres.

b) Water service pipes must cross public easements at right angles or as otherwise approved, but are not permitted to extend lengthways within the easement.

c) There shall be a minimum vertical separation of 300mm between water, sanitary and storm mains at crossings in the public right-of-way and at City utility crossings. This minimum vertical separation for the water service will be required and inspected on the private site.

d) A water service pipe located between two buildings must have a minimum clearance of 3.0m from the foundation of each building.

e) See Figure 2 for the minimum horizontal separation between a water service pipe and other utilities and infrastructure.

Figure 2: Horizontal Separation Chart

Utilities and Infrastructure	≤ 50 mm diameter water service pipe	≥100 mm diameter water service pipe	Within Public Right of Way	Within Private Property
Foundation or building wall	3.0m	3.0m	Required	Required
Property line	2.0 m	3.0 m	Required	Required
Storm pipe	2.0 m	2.0 m	Required	Recommended
Sanitary pipe	0.3 m (same trench)		Required	Recommended
Shallow utility pipe	2.0 m	2.0 m	Required	Recommended
Telus Cable pedestal, power pole, or streetlight std.	2.5 m	2.5 m	Required	Recommended
Trees	3.0 m	3.0 m	Required	Recommended
Edge of transformer or pull box/junction terminal	3.0m	3.0 m	Required	Recommended
Catch basin	3.0 m	3.0 m	Required	Recommended

f) Water service pipes 50 mm and smaller are to be installed in the same trench as the sanitary sewer, except where prohibited by code (hospitals, chemical plants, etc.) and are to be shown in the same trench.

g) Location of foundation piling in relation to the water service pipe at water service entry to building must be shown on the DSSP and must have a minimum separation of:

   a. 4.0m (100mm service or larger),
   b. 3.0m (50mm service or smaller),
   c. 2.0m (any service size) when the foundation wall or piles extend vertically a minimum of 2.0m below the invert of the water pipe.

   Any deviation from these separations is not permitted without written consent from the Engineer of Record.

h) Service valves shall be located on the approved line assignment as specified in Section II, C of the Design Guidelines for Subdivision Servicing where standard road widths are applicable. In other instances valve location is subject to the approval of Water Resources.

i) On-site distribution systems shall have the appropriate number and location of valves to provide a separation between fire hydrants and to limit the number of dwelling units affected by a shutdown to a maximum of 60 units.

j) It is the responsibility of the Engineer of Record to ensure that the location for the water service pipe within the public right-of-way does not conflict with power poles, pole anchors, transformers, trees, catch basins, structures, underground chambers or other facilities which may exist within the public right-of-way.

k) Water service pipes shall be provided with a master control valve immediately where the pipe enters the building. All branched water supply shall be downstream of this valve. Refer to the Standard Specifications Waterworks Construction (Drawing 453.1009.008 and 453.1009.009 part 2).

5.7 Water Service Entry

a) Water service connections into buildings 100mm and larger are to follow sheet 33 of the Standard Specifications: Waterworks Construction. The DSSP plans must reference whether the “anchorage through floor” or “anchorage through wall” detail is being used.

b) Deviation from the entry details shown on sheet 33 of the Standard Specifications: Waterworks Construction requires a site specific drawing be included with the DSSP submission for review and is subject to the approval of Water Resources.

5.8 Piping Support

a) Where the foundation wall is 4 meters or less from the property line and the water service enters through the wall of the building, the Lot Owner/Engineer of Record must provide adequate pipe support from the building to undisturbed soil. Include in the DSSP submission a structural design drawing signed and stamped by a Professional Engineer (P.Eng., P.L., P.Tech) showing the details of this pipe support/ grade beam. Refer to Sheet #39 of the Standard Specifications: Waterworks Construction for more details.

b) The Lot Owner shall install the service pipe in conjunction with the support grade beam through the wall to a point 250 mm beyond the end of the support beam. The pipe may be supported with lean concrete placed between the pipe and the original undisturbed soil.

c) Where the foundation wall is more than 4 meters from the property line and the water service enters through the wall of the building it is recommended that the Lot Owner/Engineer of Record provides adequate pipe support from the building to undisturbed soil, however not a requirement for approval or inspection by Water Resources.

5.9 Size and Capacity

a) Water service pipes with private fire hydrants shall not be less than 150 mm in diameter, and no leg shall be greater than 180 meters in length to the fire hydrant otherwise it is required to be looped.

b) It is the responsibility of the Engineer of Record to ensure that the fire flow available in The City's water network is adequate to service the proposed development.

c) A water service pipe shall be sized according to the peak demand flow and shall not be less than 25mm size. Refer to the National Plumbing Code of Canada (Current Edition) Section 2.6.3.4.

d) Where static pressure exceeds 550 kpa, a pressure reducing valve must be installed as per the Standard Specifications: Waterworks Construction (Sheets 30A, 31, and 32). In addition, refer to the National Plumbing Code of Canada (Current Edition) Section 2.6.3.3, and the Design Guidelines for Subdivision Servicing (Section III, B - 3) for pressure zone maps and details.

e) No new water service pipes shall be larger in diameter than the water main in which it connects.

5.10 Protection of Service Pipes and Public Water Mains

a) On-site water service pipes shall be installed with a minimum cover of 2.7 metres below final grade in clay, and 3.3 metres when the strata is gravel. Refer to the Standard Specifications: Waterworks Construction – Section 504.04.13.

b) It is the responsibility of the Lot Owner to repair, at their expense, any damage to public water mains adjacent to their site during their construction. All repairs will be congruent with the current Standard Specifications: Waterworks Construction.

5.11 Fire Protection & Hydrants

a) All codes and regulations of the Fire Prevention Bureau and the Insurance Underwriters Organization must be complied with in designing the private water supply system.

b) In redevelopment areas the Water Resources may require a Fire Flow letter from the Engineer of Record confirming the available fire flow is adequate for the proposed development. Available fire flows can be requested from Water Resources.

c) All piping and private fire hydrants must be shown on the DSSP.

d) A separate service connection is not permitted for private fire hydrants. Hydrants must be connected to a service pipe where there is a constant draw of water.

e) Siamese connections require the nearest Fire Hydrant to be located within 45m.

f) Public hydrants are not permitted to be connected to private service lines.

g) Hydrant pumper ports shall face the carriageway and set to grade as per the Standard Specifications: Waterworks Construction Drawing 453.1002.001.

h) Hydrants shall be located a maximum distance of 2.0 meters from the curb or edge of asphalt carriageway as per the Fire Prevention Bureau requirements.

i) The minimum separation between a hydrant and a Telus and cable pedestal, power pole, or street light standard shall be 2.5 meters. The minimum separation between a hydrant and the edge of a transformer or pullbox/junction terminal shall be 3.0 meters.

j) The Lot Owner must receive approval from the Fire Prevention Bureau for on-site hydrant requirements as per Alberta Building Code 1997, Section 3.2.5.5, prior to approval of the DSSP submission from Water Resources.

k) The Lot Owner shall ensure public fire hydrants servicing the development shall be equipped with a pumper port.

l) Two hydrants are not permitted on a dead-end main. A looped connection will be required.

5.12 Public Water Mains on Private Property

a) All grade changes within a public water main right-of-way must be approved by Water Resources. The Lot Owner must provide a profile showing the existing and proposed grades prior to approval of the DSSP.

b) Buildings are not permitted over existing public water mains.

5.13 Cross Connection Control

a) No private water supply system shall be interconnected with the public water supply system. See National Plumbing Code of Canada (Current Edition) Section #2.6.2.5.

b) If a municipal water supply is required as a backup supply to an auxiliary or private water supply then an approved air gap separation of two pipe diameters shall be provided between municipal water outlet and the flood level rim of the vessel into which the outlet discharges and never less than 25mm.

c) Multi-family, residential, industrial, commercial and institutional facilities are required to have a premises-isolating cross connection control device installed on the incoming water service(s) (i.e. for domestic potable water, fire protection, and/or specific or dedicated uses).

d) The premises-isolating cross connection control device installed on the domestic potable water shall be located where the water service enters the building immediately downstream of the water meter setting.

    - A parallel cross connection control device arrangement is required for installations with more than 12 residential units or for services that require a 24 hour uninterrupted water supply. See the "Standard Specifications: Waterworks Construction" for further design details.

    - If the water service supplies both domestic potable water and fire protection systems, the premises-isolating cross connection control device on the fire system shall be located as close as possible to the domestic potable water branch tee.

5.14 Metering

a) All consumers must make provisions for the installation of water meters in accordance with the Standard Specifications: Waterworks Construction manual.

b) Each unit must be individually metered.

c) Water meters shall be installed at the point of entry into the building and shall be installed in accordance with the applicable City of Calgary Meter Standard.

d) Water meters shall be installed in mechanical rooms or meter rooms with a floor drain. In no case shall a meter be installed in a bathroom, bedroom, or under a stairwell.

e) A water meter room is required adjacent to an exterior wall where water service pipes 100 mm and larger enter the building. This applies to buildings that have levels below ground. A service pipe may enter the building under the slab for a single level underground parkade; otherwise the service must enter the building through an exterior wall. The water meter room must be indicated on the DSSP plans and match the location shown on the DP plans on record.

f) A water meter room is required to be located where water service pipes 50 mm and smaller enter a building. The water service pipe may enter through an exterior wall or from under the slab of the building. The water pipe must be joint-free when entering the building from under the slab. The water meter room/area must be indicated on the DSSP plans and match the location shown on the DP plans on record.

g) All water meters which are used exclusively for irrigation water shall be shown and noted on the DSSP and shall be labelled on the meter piping as "Irrigation Meter". A City Parks irrigation meter cannot be used for a private site.

h) All water service pipes shall be metered except those pipes dedicated for fire protection.

i) A minimum of 2.0 metres of headroom is required at the meter location.

j) When a meter cannot be installed in a building, the Lot Owner must provide a meter building or a meter vault located 2 metres inside the property line in accordance with the "Standard Specifications Waterworks Construction" manual.

k) Pressure reducing valves are required to be installed downstream of the meter or meter assembly on all domestic supplies when the static pressure exceeds 80 psi. The valves shall be shown and identified on the DSSP.

l) The City shall supply and install all water meters. Contact 3-1-1 to make arrangements.

6 Sanitary Sewer Design

6.1 General:

a) The sanitary sewer system is reviewed and inspected by Water Resources from the connection at The City's main to the property line of the public-right-of-way or sanitary test manhole (if required and located on private property), whichever is further. The design and construction of sanitary infrastructure must comply with the current version of The City of Calgary Standard Specifications Sewer Construction and the DSSP guidelines within the public right-of-way or up to the sanitary test manhole (if required and located on private property), whichever is further.

b) It is recommended that the sanitary sewer design and installation on the private site (between the property line and the building) complies with the current version of The City of Calgary Standard Specifications Sewer Construction and the DSSP guidelines. Any deviation from these specifications and guidelines are at the risk and discretion of the Engineer of Record. Any aspects of the private site design that are deemed to have an adverse effect on stormwater management, the public pipe system, or public health & safety will not be approved by Water Resources. All designs and construction must adhere to the National Plumbing Code of Canada (current edition).

c) Manholes, catch basins, and any other appurtenances within the public right-of-way shall conform to and be constructed as per The City of Calgary Standard Specifications Sewer Construction.

d) Within private sites it is recommended that all manholes, catch basins, and any other appurtenances conform and are constructed as per The City of Calgary Standard Specifications Sewer Construction. Deviation or use of products not listed in these specifications within the private sites, is at the risk and discretion of the Engineer of Record.

e) Block profiles shall be provided with the DSSP submission for all existing utility rights-of-way showing the existing and proposed grades.

f) No portions of private sewer systems are permitted in bylaw setback areas except for service connections.

g) It is the Engineer of Record's responsibility to confirm existing and proposed grades at the connection to City mains. Any discrepancies that result from unexpected site conditions should be addressed through a small format submission to Water Resources.

6.2 Crossing Sewer Forcemains and Critical Collection Mains

To ensure the safety of the public and to protect the forcemain, and critical collection main infrastructure, any construction within 3.0m of a forcemain or critical collection main, as defined under the Proximity Guidelines must be reviewed and approved by Water Resources. Hydrovacing is required to determine the alignment, elevation, pipe diameter, pipe support, backfill and clearances. A detail of this information is required on the DSSP with respect to

working in the proximity of any forcemain. Refer to the Proximity Guidelines located under Technical Specifications on this web page for more information.
http://www.calgary.ca/PDA/pd/Pages/Planning-and-development-resource-library/Publications.aspx

Contact Water Resources at (403) 268-5752 to schedule an inspection, and consultations on notification shut down periods, and tunnelling and augering options.

6.3 Peak Flows

Since peak sewage flows vary greatly with type and density of development, each case must be considered on an individual basis. Contact Water Resources for more information.

When calculating sanitary peak flows, use table 5.1(2) of the most recent version of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems by Alberta Environment and Parks and refer to The City's Sanitary Servicing Study Guidelines to estimate the average volume of sanitary sewer flow per day for a specific type of development/land use.

6.4 Capacity

The capacity and the size of the service leaving the building shall meet the National Plumbing Code of Canada (Current edition) requirements. Sizing of the sanitary service is the responsibility of the Engineer of Record. Service pipes must be designed to meet a minimum of 0.6 m/s cleansing velocity.

6.5 Sanitary Servicing Studies

A sanitary servicing study may be required to demonstrate the adequacy of the existing and proposed sanitary sewer systems to satisfy the demands of a proposed development or redevelopment. This requirement will be applied to the applicant's Development Permit comments by Water Resources. For more information refer to the following The City's Sanitary Servicing Study Guidelines:

http://www.calgary.ca/PDA/pd/Documents/development/west-memorial-sanitary-servicing-study-guidelines.pdf

6.6 Pipe Sizes

Sanitary service sizing is the responsibility of the Engineer of Record. The capacity and the size of the service leaving the building shall meet the National Plumbing Code of Canada (Current Edition) requirements.

A minimum sanitary sewer service size of 100mm will be considered, provided there is adequate capacity as verified by the Engineer of Record.

6.7 Cover

The minimum cover for sanitary sewers within the public right-of-way shall be 2.5 meters from pipe crown to finished grade. Where minimum cover cannot be achieved, an adequate insulation design must be submitted with the DSSP for approval.

Deviation from the minimum cover on the sanitary sewer within the private site is at the risk and discretion of the Engineer of Record.

6.8 Arrangement of piping

a) Maintain 3.0m minimum clearance from the centre of sewer lines to all property lines and buildings. Manholes must also be installed maintaining the 3.0m minimum clearance. Sanitary and storm may be permitted in common trench when vertical separation is less than 1.0m for the entire length of the trench.

b) There shall be a minimum vertical separation of 300mm between water, sanitary and storm mains at crossings in the public right-of-way and at City utility crossing. This minimum vertical separation is required to be maintained for the water service on the private site. The vertical separation for the sanitary and storm are recommended on private property between privately owned utilities and any deviation is at the risk and discretion of the Engineer of Record.

c) See Figure 3 for the minimum horizontal separation between a sanitary/storm sewer pipe and other utilities and infrastructure.

Figure 3: Sanitary Sewer Horizontal Separation Chart

Utilities and Infrastructure	Sanitary Sewer pipe	Within Public Right of Way	Within Private Property
Foundation wall or piles which support a building	3.0 m	Required	Recommended
All property lines	3.0 m	Required	Required
Water pipe	See Figure 2	Required	Recommended
Storm sewer pipe	1.8 m	Required	Recommended
Shallow utility pipe	2.0 m	Required	Recommended
Telus Cable pedestal, power pole, or streetlight std.	2.5 m	Required	Recommended
Trees	3.0 m	Required	Recommended
Edge of transformer or pull box/junction terminal	3.0 m	Required	Recommended
Catch basin	2.0 m	Required	Recommended

6.9 Slopes

See Figure 4 for minimum slopes for sanitary and storm sewers, these slopes are required to be met within the public right-of-way.

Deviation from these minimums within the private site is at the risk and discretion of the Engineer of Record.

Figure 4: Minimum Design Slopes for Sanitary Sewers

Diameter of Service	Sanitary Sewers Minimum Design Slope (%)	
	Concrete (n = 0.013)	PVC (n = 0.013)
100mm	2.00	2.00
150mm	1.00	1.00
200mm	0.80	0.80
250mm	0.40	0.40
300mm	0.32	0.32
375mm	0.24	0.24
450mm	0.18	0.18
525mm	0.16	0.16
600mm	0.12	0.12
675mm	0.10	0.10
750mm	0.10	0.10
900mm and Greater	0.10	0.10

All concrete pipe, manholes and appurtenances shall be manufactured using type HS (type 50) sulphate resistant cement. Anchoring is required when pipe slope is greater than 33% or where velocities exceed 3.0 m/s.

6.10 Service Connections

A manhole is required on a main for a sewer connection when:

- The diameter of the connection line is greater than one half the diameter of the main, or
- The length of the service connection from the building to the main is greater than 30m.

When connecting to an existing manhole, indicate the size and type of the manhole.

Service connections shall not be installed to sewer mains deeper than 6m. A secondary sewer may be required to allow for servicing.

Sanitary servicing from building to building is not permitted except for auxiliary buildings that are required and form an integral part of the development. Show the invert elevation at building and site elevation at or near the location where the sanitary sewer enters the building.

6.11 Test Manholes and Drop Manholes

a) Test Manhole

a. A Sanitary Sewer Test Manhole (Test MH) is required to service proposed Industrial, Commercial and Institutional (ICI) developments, as per Section 7 of the Sewer Service Bylaw 24M96, unless it falls into an exempt use.

b. A test MH is required on all new ICI developments.

c. Change use applications require a test MH on sites that have been identified as having moderate to high risk of effluent containing restricted substances. The following types of change of use applications are considered moderate to high risk and a test MH will be required where one does not already exist:

Asphalt, Aggregate and Concrete Plant
Auto Body and Paint Shop
Auto Service – Major
Breweries
Bulk Fuel Sales Depot
Car Wash – Multi Vehicle
Community Recreation Facility
Crematorium
Dry-cleaning and Fabric Care Plant
Equipment Yard
Extensive Agriculture
Fertilizer Plant
Funeral Home
Gas Bar
General Industrial – Heavy
General Industrial – Light
General Industrial – Medium
Hide Processing Plant
Hospital
Indoor Recreation Facility
Inter-City Bus Terminal
Large Vehicle Service
Large Vehicle Wash
Motorized Recreation
Municipal Works Depot
Natural Resource Extraction
Park Maintenance Facility – Large
Park Maintenance Facility – Small
Power Generation Facility – Large
Power Generation Facility – Medium
Power Generation Facility – Small
Print Centre
Printing, Publishing and Distributing
Recreational Vehicle Service
Refinery
Salvage Processing – Heat and Chemicals
Sawmill
Slaughter House
Specialized Industrial
Supermarket
Utility Building
Waste Disposal and Treatment Facility

d. On sites encompassing more than one business, a separate sanitary test manhole is required on those businesses that require one.

e. The test MH must be installed on the private service line, not on a public main to allow for an uncontaminated test. The test MH is to be located outside the property line on public property (off driveways and streets) and must be accessible to City staff. If the access point cannot be located on public property an easement access is required. The easement is to be a minimum 5m x 5m surrounding the test MH and include a 5m wide access easement from the site entry point to the manhole to allow City forces to access the manhole.

i. Where an access easement is required the applicant may submit the easement agreement with the DSSP submission.

ii. Water Resources will verify the submitted agreements follow City standard templates and that the attached location plans match the DSSP. If acceptable the agreements will be sent to Water-Resources-Development Engineering for processing.
iii. The DSSP plan will not be approved until the executed agreement(s) have been received by Water Resources and any additional comments from Water Resources are addressed.

f. Provide a minimum of 175 millimetres to a maximum of 600 millimetres fall through a test manhole. (See current edition of "Standard Specifications Sewer Construction").

b) Interior/Exterior Drop Manhole

i. In the public right-of-way where the difference in elevation between the incoming pipe invert and the outgoing pipe centreline is greater than 760 millimetres an interior/exterior drop manhole must be provided. No interior drop manholes will be allowed when the incoming pipe exceeds 300 millimetres in diameter. current edition of "Standard Specifications Sewer Construction"
ii. On private property interior/exterior drop manholes are recommended for maintenance purposes, and are at the risk and discretion of the Engineer of Record.

Note: Sanitary manholes should be located outside of trap lows. For any sanitary sewer manholes located in trap lows, sanitary seals are required to reduce infiltration. Sanitary manholes within stormwater ponds are not permitted.

7 Storm Sewer Design

All designs are to be in accordance with the current edition of the Standard Specifications: Sewer Construction and the Stormwater Management & Design Manual. See Sections 3.0 and 4.0.

7.1 General

a) The storm sewer system is reviewed by Water Resources from the connection at The City's main to the property line of the public-right-of-way, as well as infrastructure on the private site system related to stormwater release to The City's public utility system (water quality, release rate or volume control). The design and construction must comply with the current version of The City of Calgary Standard Specifications Sewer Construction, the DSSP guidelines and the Stormwater Management & Design Manual within the public right-of-way.

b) It is recommended that the private sites storm sewer design complies with the current version of The City of Calgary Standard Specifications Sewer Construction, the DSSP guidelines and the Stormwater Management & Design Manual. Any deviation from these specifications and guidelines are at the risk and discretion of the Engineer of Record. Any aspects of the private site storm sewer design deemed to have an adverse impact on the public stormwater management system, adjacent properties or public health and safety will not be approved. All designs and construction must adhere to the National Plumbing Code of Canada (current edition).

c) Manholes, catch basins, and any other appurtenances within the public right-of-way shall conform to and be constructed as per The City of Calgary Standard Specifications Sewer Construction.

d) Within private sites it is recommended that all manholes, catch basins, and any other appurtenances conform and are constructed as per The City of Calgary Standard Specifications Sewer Construction. Deviation or use of products not listed in these specifications within the private sites, is at the risk and discretion of the Engineer of Record.

e) Block profiles shall be provided with the DSSP submission for all existing utility rights-of-way showing the existing and proposed grades.

f) Where outfalls to waterways or drainage courses are required, the consultant will be required to obtain approval from Alberta Environment and Parks prior to approval of the DSSP. The design details of the outfall shall be shown on a standard City of Calgary block profile as part of the DSSP submission.

g) Where storm ponds are required, the consultant will supply design drawings to Water Resources and complete the required check sheet(s). In addition, an approved stormwater management report is required prior to submission of a DSSP. Contact Water Resources for more information.

h) No portions of private sewer systems are permitted in bylaw setback areas except for service connections.

i) It is the Engineer of Record's responsibility to confirm existing and proposed grades at the connection to City mains. Any discrepancies that result from unexpected site conditions should be addressed through a small format submission to Water Resources.

7.2 Crossing Sewer Forcemains and Critical Collection Mains

To ensure the safety of the public and to protect the forcemain, and critical collection main infrastructure, any construction within 3.0m of a forcemain or critical collection main, as defined under the Proximity Guidelines must be reviewed and approved by Water Resources. Hydrovacing is required to determine the alignment, elevation, pipe diameter, pipe support, backfill and clearances. A detail of this information is required on the DSSP with respect to working in the proximity of any forcemain. Refer to the Proximity Guidelines located under Technical Specifications on this web page for more information.
http://www.calgary.ca/PDA/pd/Pages/Planning-and-development-resource-library/Publications.aspx

Contact Water Resources at (403) 268-5752 to schedule an inspection, and consultations on notification shut down periods, and tunnelling and augering options.

7.3 Pipe Sizes

The following minimum pipe sizes will be considered, provided they have adequate capacities, as verified by the Engineer of Record:

a) Minimum storm sewer service size for weeping tile only connections is 75mm diameter.

b) Minimum size of catch basin leads is 250mm diameter with the following exceptions:

- Where the pipe is directly involved in a storm water retention system or is upstream of the ICD (Inlet Control Device) a minimum size of 150 millimetres diameter is acceptable.
- Where the public mains are less than 525 millimetres in diameter, pipe sizes 150 millimetres to 250 millimetres in diameter are considered for connection.

c) The recommended minimum size of area drain lead is 100mm and they must be designed to accommodate maintenance and cleaning by the owner.

7.4 Cover

The minimum cover for storm sewers within the public right-of-way shall be 1.2 meters from pipe crown to finish grade. Where minimum cover cannot be achieved in the public right of way, frost protection is required as per the Standard Specifications Sewer Construction drawing 452.2002.001

Deviation from the minimum cover on the storm sewer within the private site is at the risk and discretion of the Engineer of Record.

7.5 Arrangement of piping

a) Maintain 3.0m minimum clearance from the centre of sewer lines to all property lines and buildings. Manholes must also be installed maintaining the 3.0m minimum clearance. Sanitary and storm may be permitted in common trench when vertical separation is less than 1.0m for the entire length of the trench.

b) There shall be a minimum vertical separation of 300mm between water, sanitary and storm mains at crossings in the public right-of-way and at City utility crossing. This minimum vertical separation is required to be maintained for the water service on the private site. The vertical separation for the sanitary and storm are recommended on private property between privately owned utilities and any deviation is at the risk and discretion of the Engineer of Record.

c) See Figure 3 for the minimum horizontal separation between a storm sewer pipe and other utilities and infrastructure.

Figure 3: Storm Sewer Horizontal Separation Chart

Utilities and Infrastructure	Storm Sewer pipe	Within Public Right of Way	Within Private Property
Foundation wall or piles which support a building	3.0 m	Required	Recommended
All property lines	3.0 m	Required	Required
Water pipe	See Figure 2	Required	Recommended
Sanitary sewer pipe	1.8 m	Required	Recommended
Shallow utility pipe	2.0 m	Required	Recommended
Telus Cable pedestal, power pole, or streetlight std.	2.5 m	Required	Recommended
Trees	3.0 m	Required	Recommended
Edge of transformer or pull box/junction terminal	3.0 m	Required	Recommended
Catch basin	2.0 m	Required	Recommended

7.6 Slopes

See Figure 4 for minimum slopes for storm sewers, these slopes are required to be met within the public right-of-way.

Deviation from these minimums within the private site is at the risk and discretion of the Engineer of Record.

Figure 4: Minimum Design Slopes for Storm Sewers

Diameter of Service	Storm Sewers Minimum Design Slope (%)	
	Concrete (n = 0.013)	PVC (n = 0.011)
75mm Weeping Tile	2.00	2.00
100mm Weeping Tile	1.00	1.00
150mm Weeping Tile	0.48	0.35
200mm Weeping Tile	0.32	0.24
250mm Weeping Tile	0.24	0.18
100mm	2.00	2.00
150mm	1.00	1.00
200mm	0.80	0.60
250mm	0.56	0.40
300mm	0.44	0.32
375mm	0.32	0.24
450mm	0.26	0.18
525mm	0.22	0.16
600mm	0.18	0.12
675mm	0.15	0.11
750mm	0.13	0.10
900mm and Greater	0.10	0.10

All concrete pipe, manholes and appurtenances shall be manufactured using type HS (type 50) sulphate resistant cement. Anchoring is required when pipe slope is greater than 33% or where velocities exceed 3.0 m/s.

7.7 Service Connections

For storm sewer service connections to public mains please refer to The City of Calgary Stormwater Management & Design Manual (Section 4.0) for information on:

- Servicing,
- Location, and
- Grades.

A manhole is required on a main for a sewer connection when:

- The diameter of the connection line is greater than one half the diameter of the main, or

- The length of the service connection from the building to the main is greater than 30m.

When connecting to an existing manhole, indicate the size and type of the manhole.

Service connections shall not be installed to sewer mains deeper than 6m. A secondary sewer may be required to allow for servicing.

7.8 Catch Basins

a) City standards recognize four types of inlet structures for use in the public right-of-way.

   a. Type "C" catch basin with storm back
   b. Type "K2" catch basin
   c. Type "K3" catch basin
   d. Grated top (GT) manhole

   These products are recommended for use on private property, the use of any other products are at the risk and discretion of the Engineer of Record.

b) Grated top manholes are recommended instead of catch basins when:

   a. The depth from the rim to pipe invert exceeds 2.5 meters,
   b. A 3 or 4 way junction occurs,
   c. The total sum of incoming pipe diameters is > 600 mm, or
   d. The CB lead is longer than 30m.

7.9 Weeping Tile

a) Refer to City of Calgary Stormwater Management & Design Manual

b) Surface drainage is not permitted to drain to a weeping tile system by any means other than infiltration from the surface. Window wells and area drains must not have a direct connection to the weeping tile system.

c) Weeping tile drain is NOT permitted to tie to the sanitary sewer.

7.10 Storm Redevelopment Area

a) As per the Storm Redevelopment Bylaw (#8320), a storm redevelopment fee ($84/m frontage) will be required at the service connection stage.

b) If the subject property requires a storm sewer connection where no storm mains are available (main extension), is within the storm redevelopment levy area, and **the parcel is smaller than 700m^2**; the applicant may:

   a. Provide a drywell design at the DSSP stage sized to store the 1:100 year storm event in the gravel drainage rock. The volume must be restored within 72 hours through infiltration and/or re-use.

b. Submit payment for the storm redevelopment fee ($84 / m frontage) at the DSSP stage. Payment can be made online (LINK), and is required prior to DSSP approval, and

c. Provide block profiles that conform to the "Standard Block Profile Specifications for CAD and Manual Formats" for the proposed storm sewer extension as a part of the DSSP submission for approval by Water Resources. Onsite storm service must be stubbed by the Lot Owner to the property line adjacent to the proposed main extension. The main extension and service to the stub will be done by the City of Calgary.

If the applicant would like to pursue a main extension at their expense, they must enter into an indemnification agreement for work within the City Right-of-way. This must be completed prior to the DSSP application.

c) If the subject property requires a storm sewer connection where no storm mains are available (main extension), is within the storm re-development levy area, and **the parcel is larger than 700m^2** the applicant has the following options:

a. Enter into Indemnification Agreement for the storm sewer extension, at their expense.
b. Provide documentation that extension is completed and the storm redevelopment fee ($84 / m frontage) will be waived.
c. The subject property is required to control the stormwater to the specified release rate and volume targets.

OR, if the applicant believes that they can prove a temporary drywell system can adequately handle the flows from site **(Note: Water Resources does not recommend this option as previous tests on very small sites have shown that the calculations cannot be proven)**, they may:

a. Conduct a percolation test and provide results to Water Resources for review and approval (contact Water Resources for testing protocols 403-268-6449)
b. If the percolation test confirms that a drywell system is adequate to service the site in the interim then refer to 8.3 b) for site requirements.

If the percolation test proves that a drywell system is inadequate to service the site in the interim, the storm main extension must be done at the applicant's expense and the subject property is required to control to stormwater release rate and volume targets specified in the DP and/or DSSP.

8 Stormwater Management

Stormwater retention and management requirements must be designed in accordance with the current edition of the Stormwater Management & Design Manual. See Sections 3.0 and 4.0 for technical requirements. All sites must adhere to City of Calgary “Guidelines for Erosion & Sediment Control”.

8.1 Stormwater Retention

On-site stormwater retention is generally required on all sites (normally indicated at the time of the DP circulation). When stormwater retention is required, the DSSP submission should indicate the method of retention, along with drainage area plans and stormwater retention design calculations. Plans should delineate drainage boundaries and ponding areas. Provide all calculations for stormwater storage including trap lows, stormwater ponds, and roof control flow data. Design for the storm system must include the total site area and account for future development

8.2 Stormwater Retention Calculations

a) A Stormwater Management Report (SWMR) is required for sites listed below.

   a. Sites without servicing by a storm sewer system.
   b. Zero discharge sites.
   c. Sites with a stormwater retention pond.
   d. Any developments flagged by Water Resources to require a SWMR in the Development Permit.

   A SWMR must be submitted to Water Resources online for review.
   https://vista.calgary.ca/

   Approval of the SWMR is required prior to submitting the DSSP. Sites that require a SWMR must indicate the report name on the first drawing of their DSSP submission.

b) A technical memo and computer generated storm model is required, with the DSSP submission for the scenarios listed below.

   a. Where the public storm system is in surcharge conditions.
   b. Sites where Best Management Practices (BMPs) and Source Control Practices (SCPs) are proposed to reduce on-site storage requirements, control runoff volume, and/or enhance water quality.

   For sites where volume control targets must be met, provide a completed Water Balance Spreadsheet or an approved equivalent with the DSSP submission. Refer to the Water Resources website for information how to complete a water balance spreadsheet.
   http://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Development-Approvals-Submissions.aspx

   Note: applications including a technical memo and computer storm model require an additional 10 business days to review.

c) A computer generated storm model is required, with the DSSP submission for the following scenarios:
    a. Designs with more than 5 catchments excluding free flow areas (overland flow to public roadway major system).
    b. Designs with inlet control devices (ICD's) in series.
    c. Where trap lows spill at different elevations.

    Refer to section 3.2.2 of the Stormwater Management and Design Manual for computer model requirements.

    Note: applications including a computer storm model require an additional 10 business days to review.

d) Sites not requiring a SWMR or computer storm model may use the rational method. Sites using the rational method for storage calculations should refer to sec 9.3 for more information. Models can be used in place of the rational method at the discretion of Engineer of Record.

e) Where the public storm sewer system is surcharged, ensure that the flow control is sized for free flow conditions, and the Hydraulic Grade Line (HGL) and trap low storage requirements within the site are sized based on the HGL of the public storm sewer system.

f) For a custom Inlet Control Device (ICD) refer to section 5.4.1 of the Stormwater Management and Design manual to calculate the flow and provide a detail with the DSSP submission.

g) Surcharging of the weeping tile system is not permitted.

h) Trap Lows are to be clearly outlined with the 1:100 year elevation and the spill elevation clearly labelled on the drawing.

i) Emergency escape routes for trap lows are to be directed away from buildings and towards public roadways with grading clearly shown to demonstrate such.

8.3 Storm Retention Calculations for DSSPs

a) Water Resources uses the following method verify stormwater release rates from private sites (DSSPs) based on Rational Method Design. In order to use this method ensure that the design of the site does not meet any of the conditions requiring a Stormwater Management Report or a computer generated model listed in sec 8.2 (a&b). Upon review of the calculations Water Resources may determine that the complexity or design of the storm system maybe require a computer-generated model.

    Prior to proceeding with calculations Refer to Development Permit (DP) Detailed Team Review (DTR) document for allowable release rate from site. If a release rate is not provided contact Development Engineering Generalist or Development Approvals Area Technologist.

b) Steps for calculating stormwater release rate:

Retention

Q1= allowable discharge to City main (L/s) from Development Permit DTR

Qa= actual discharge to City main through Inlet Control Device (L/s) (Qa < Q1)

C1= allowable runoff coefficient

C1'= runoff coefficient controlled by Inlet Control Device (ICD)

C2= actual runoff coefficient from site based on imperviousness

i= intensity: 82.55 mm/hr for areas captured by private storm system
168 mm/hr for free flow (overland flow to public roadway major system)

A= area of site (ha)

n= roughness coefficient (PVC=0.011, concrete= 0.013)

H= head on pipe (m): top of pond elevation – (pipe invert + ½ pipe diameter)

V100= storage volume required for 1:100 year event (m^3)

SVF= storage volume factor

Hydraulic Slope

HS= hydraulic slope

H1= pipe obvert elevation (m) at end of retention system (pipe invert + diameter)

H2= top of pond/trap low elevation (m)

L= length of retention pipe (m)

Impervious Surface values

Type of Surface	Runoff Coefficient (C)
Roof (R)	1.0
Pavement (P)	0.9
Gravel (G)	0.5
Landscaping (L)	0.3
Absorbent Landscaping (AL)	0.15

To use absorbent landscaping plans must specify a minimum depth of topsoil of 0.3m for sodded areas and 0.6m for shrub and tree beds.

1) Calculate allowable discharge to City main (Q1):

   $Q1(L/s) = C1 \times 82.55 \times A \times 2.78$

2) Calculate actual runoff coefficient from site based on imperviousness (C2):

$$C2 = \frac{(1.0 \times R\ Area) + (0.9 \times P\ Area) + (0.5 \times G\ Area) + (0.3 \times L\ Area) + (0.15 \times AL\ area)}{A}$$

   $C2(L/s) = C2 \times 82.55 \times A \times 2.78$

3) Calculate Hydraulic Slope:

$$HS = \frac{H2 - H1}{L}$$

4) Calculate Qa using Manning's Equation to determine if ICD is required:

   $Q_a = [(1/n) \times (pipe\ dia./4)^{2/3} \times HS^{1/2} \times (\pi\ (pipe\ dia.)^2/4)] \times 1000$

5) If Qa is greater than Q1 an ICD is required to control the

   Calculations for typical of ICDs:
   - R30 ICD: $Q_a = 17.10\ H^{0.5}$
   - R50 ICD: $Q_a = 30.05\ H^{0.5}$
   - R70 ICD: $Q_a = 49.40\ H^{0.5}$
   - R100 ICD: $Q_a = 89.80\ H^{0.5}$

   To use a custom ICD refer to the orifice calculation equation in section 5.4.1 of the stormwater management and design manual.

   If using a custom ICD product such as HYDROVEX VHV/SVHV a product sheet or calculation from the manufacturer must be provided to demonstrate how the controlled flow rate is calculated.

6) Calculate C1':

$$C1' = \frac{82.55 \times A \times 2.78}{Qa}$$

7) Calculate Storage Volume Factor (SVF):

   $SVF = (0.369 \times (C2/C1')) - 0.4$

8) Calculate V100 (m^3):

   $V100 = SVF \times A \times C1' \times 1000\ (m^3)$

   V100 must be less than or equal to the amount of storage provided on the site.

9) Refer to Figure 5 for example of how to show storm calculations on a DSSP.

Figure 5: Rational Method Calculations for DSSPs

STORM CALCULATIONS

Catchment Area #_____

Input Variables

C1 = X.XXX (Coefficient of runoff to main)

I = 82.55 mm/hr. (Intensity)

= 168 mm/hr. (For Free Flow Areas)

100 yr. Storm runoff

Ar = X.XXX ha. (Area of Roof)

Ap = X.XXX ha. (Area of Paving)

Ag = X.XXX ha. (Area of Gravel)

Al = X.XXX ha. (Area of Landscaping)

Aal = X.XXX ha. (Area of Absorbent Landscaping)

Allowable Discharge to Main

Q1 = C1 x I x A x 2.78

= XX.XX l/s

Actual Run-off From Site

$$C2 = \frac{(Ar \times 1)+(Ap \times 0.9)+(Ag \times 0.5)+(Al \times 0.3)+(Aal \times 0.15)}{\text{ENTIRE SITE AREA}}$$

= XX.XX l/s

Q2 = C2 x I x A x 2.78

= XX.XX l/s

Hydraulic Slope Calculation

H1 = XXXX.XXX m (Pipe obvert @ lower end)

H2 = XXXX.XXX m (Top of Pond)

L = XX.XX m (Length of pipe)

$$HS = \frac{H2 - H1}{L}$$

= XX.XX % (Hydraulic Slope)

Manning's Formula

Ø = XXX mm (Diameter of pipe)

n = X.XX % (Conc. = 0.013%, PVC = 0.011%)

$Qa = [(1/n) \times (Ø/4)^{2/3} \times HS^{1/2} \times (\pi(Ø)^2/4)] \times 1000$

= XX.XX l/s

Determine ICD from Sect. 3.3.5 of the SWMR Manual

H = XX.XX m (Head on ICD)

Qaf = XX.XX l/s (ICD Discharge rate)

Storage Volume Requirement Calculation

$$C1' = \frac{Qaf}{82.55 \times A \times 2.78}$$

= X.XX (Runoff coefficient of discharge)

C2/C1' = X.XX

SVF = (3.69 x (C2/C1')) – 0.4

V100 = SVF x A x C1' x 1000

= XXX.XX m^3

8.4 Western Headworks Canal Catchment

Areas located in the Western Headworks (WH) Canal Catchment fall under the 1980 Moratorium of Stormwater Discharges into the WH Canal. Any development is required to implement BMPS to yield, at a minimum, a net-zero increase in run-off rate, runoff volume and pollutant loading to the WH Canal. Refer to section 4.7.3 of the Stormwater Management and Design Manual for guidance.

8.5 Precautionary Measures that must be taken

a) Ensure elevations of building slab and/or any building openings are 0.3m minimum above critical trap low spill elevations or the 100 year elevation, whichever is higher for all trap lows located within the subject parcel or adjacent to it.

b) Ensure the hydraulic grade elevations are taken into account.

c) Ensure pipe sizes are not less than 100 millimetres in diameter for area drains.

d) Ensure building structural design accounts for water loading where roof retention is used.

e) Ensure the on-site pipe system has adequate capacity to convey the 1 in 5 year peak flow rate.

8.6 Drainage and Grading Requirements

a) All on-site grading and drainage must be in accordance with Lot Grading Bylaw 32M2004 and the Stormwater Management & Design Manual.

b) All open areas shall drain to the storm sewer. When storm sewers are not available, a temporary drywell system may be required. (See current edition of Standard Specifications Sewer Construction and Stormwater Management & Design Manual).

c) Drainage from roof areas shall be contained on-site. Control flow roof drain specifications as well as location of roof drains shall be shown. Drainage boundaries for roof shall be shown where the roof encompasses a large area. All roof drain locations and roof top storage provisions must match the approved DP plans.

d) Where roof top storage is provided, the following information should be provided on the drawings or plans:

   - Roof boundary and any drainage boundaries where the roof encompasses a large area.
   - Roof top storage volume(s).
   - Location of roof drain(s).
   - Number and type of roof drains.
   - Type of inlet control and flow per roof drain (L/s and L/s/ha).
   - Total flow from drain (L/s and L/s/ha).
   - Nature and elevation of emergency overflow drains and/or scuppers.

e) On-site grading must be shown with spot elevations and grade arrows with % grade shown (adhering to minimum grades for surface materials used as per City design guidelines). All building and parking lot corners must have design spot elevations shown. Contours are not acceptable for site grading.

f) For commercial and Industrial sites where storm sewers are not available a zero discharge pond is required. (See Section 4.7.2.2 of the Stormwater Management & Design Manual)

8.7 Water Quality

Water Quality is to be in accordance with the most recent edition of The City of Calgary Stormwater Management & Design Manual.

8.8 Oil/Grit Separators

Use of an oil/grit separator (See Section 4.13 of the Stormwater Management & Design Manual) is recommended for all sites; however they are required for the following:

- Sites over 0.4 ha; this requirement applies regardless of the inclusion of a storm pond in the downstream.
- Sites with petroleum products on-site.
- Heavy industrial and manufacturing sites.
- Sites discharging runoff to City owned ditches.
- Sites subject to runoff volume targets.

8.9 Stormwater Ponds

Where stormwater ponds are required (dry ponds, wet ponds, wetlands, and zero discharge ponds), they are to be designed in accordance with The City of Calgary Stormwater Management & Design Manual and a Stormwater Management Report will be required. All ponds (including all impoundments deeper than 0.5m) need to be registered by the Lot Owner with Alberta Environment and Parks, following approval by Water Resources.

8.10 Best Management Practices

Refer to The City of Calgary Stormwater Management & Design Manual for more information.

9 Floodway, Flood Fringe and Overland Flow Zones

Developments in the Floodway, Flood Fringe and Overland Flow Zone areas are subject to the regulations described in City of Calgary Land Use Bylaw 1P2007 Division 3 and the Stormwater Management & Design Manual (Section 3.5) for more information.

Please note that the most up-to-date regulations shall prevail.

a) Flood Regulations or Advisory Guidelines shall be followed by all landowners or developers proposing construction within the Floodway, Flood Fringe, or Overland Flow Zones of the Bow and Elbow Rivers, Nose Creek, and West Nose Creek drainage basins.
b) Copies of the Floodway, Flood Fringe, and Overland Flow Zone maps approved by Council are available at online at www.calgary.ca through a search for “flood maps”.
c) Under the land use bylaw, rules on building design and alterations shall apply to all buildings; however some exemptions apply which are described in the Land Use Bylaw. Special provisions apply to Roxboro Road SW, Erlton, Quarry Park, and Inglewood.
d) The City of Calgary may recommend a higher designated flood elevation based on information gathered in the 2013 flood event, and analysis contained in the “Bow and Elbow Hydraulic Model Update” (2012, City of Calgary and Alberta Environment & Water).

9.1 Flood Fringe

If the subject property is within the 1:100 year Flood Fringe it is mandatory that the following Special Regulations be adhered to:

- The minimum first floor elevation shall be constructed at or above the designated flood elevation. All electrical and mechanical equipment shall be located at or above this elevation as well.
- The building shall be designed so as to prevent structural damage by floodwaters, which includes damages due to elevated groundwater levels.
- Onsite access roads shall be constructed at or above the designated flood level.
- For the development or redevelopment of single detached, semi-detached or duplex dwellings in the Flood Fringe that are infill or existing, Council has approved advisory guidelines. These were approved under the “Calgary River Valleys Plan (1984)” and must be followed.
- Proposed drive down garages must indicate a gravity connection to the storm sewer system complete with a backflow prevention valve located in a separate manhole on public property. Note that no sump pumps are allowed (drainage should be by gravity) and it is recommended that the first two feet in front of the garage slopes at 2.0% away from the garage door towards the drainage swale.
  Note: Roads should be contacted to ensure that existing and future road grades are compatible with on-site grades.
- Minimum building openings should be above the designated 1:20 year flood elevation.
- Foundation dewatering should be discharged to ground above the designated 1:100 year flood elevation. The system should account for high groundwater that may accompany floods.

9.2 Floodway

If the subject property is within the 1:100 year Floodway it is mandatory that the following Special Regulations be adhered to:

- No alterations shall be made and no structures including, but not limited to, rip-rap, berms, fences, walls, gates, patios, docks, decks shall be constructed on, in or under a Floodway unless in the opinion of the Approving Authority there will be no obstruction to floodwaters and no detrimental effect on the hydrological system or water quality, including the natural interface of the riparian and aquatic habitats.
- No replacement of, external alterations or additions to existing buildings that might increase the obstruction to flood waters on that site, or have a detrimental effect on the hydrological system or water quality, shall be allowed.
- No new building or other new structures shall be allowed except for the replacement of existing single family, semi-detached, duplex dwellings and accessory buildings on the same footprint.
- No outside storage is permitted.

9.3 Overland Flow Zone

If the subject property is within the 1:100 year Overland Flow Zone it is mandatory that the following Special Regulations be adhered to:

- The first floor elevation and all electrical and mechanical equipment shall be 0.3m minimum above the highest adjacent street centre line grade for all buildings.
- Indicate that the access to the underground parkade is 0.3m above the highest adjacent street centre line grade or the critical downstream spill elevation, whichever is higher.

9.4 Calgary River Valleys Plan (July 1984)

The following advisory guidelines from the “Calgary River Valleys Plan” will be provided to all Lot Owners or developers proposing construction in the Flood Fringe areas in The City of Calgary.

9.4.1 General

- Where it is desirable to have a single detached, semi-detached or duplex family dwelling with a basement below the designated flood level, this floor should not contain any bedrooms.
- Basements should not be utilized for storage of immovable or hazardous materials that are flammable, explosive or toxic.
- Footings and foundation walls should be cast-in-place concrete.
- The top of the basement walls should be a minimum of 0.3m above the designated flood level.
- Basement walls should be provided with at least two open-able windows located on opposite sides of the building. The windows should be at least 0.15m above the designated flood level.
- Where applicable, stable fill material may be used to raise the lowest portion of the building above the designated flood level, provided the building is not raised to a height

which is not in keeping with surrounding buildings or conflict with the current Land Use Bylaw.
- Where possible, buildings should be constructed with the longitudinal axis paralleled to the direction of flow.

9.4.2 Anchorage

In order to resist floatation and lateral movement, the basement floor joists should either have the ends embedded in the basement concrete wall or the header joist mechanically fastened to the required anchor bolts for the sill plate, or any other system providing similar protection.

9.4.3 Basement Drainage System

- A sump pump must be provided in the basement.
- The outflow pipe should be looped and discharge above the designated flood level.
- A separate electrical circuit should be provided for the sump pump with the operating switch located above the designated flood level.
- Basement walls should be made water tight through the use of paints, membranes and mortars to minimize seepage.
- Installation of cut-off valves on sewer lines or the elimination of gravity flow basement drains.

10 Grade Calculations

10.1 Building Grades or Lot Grades

a) If a curb or sidewalk exists in front of lot, then the 'building' or 'lot' grade is the elevation of curb or back of walk, plus a 2% slope rise to the property line. The existing curb or sidewalk elevation should be within 25 to 50 millimetres of the design elevation shown on block or sidewalk profiles.

b) If the curb or sidewalk does not exist, then the design elevation of future curb must be calculated from block, Sidewalk, or paper profiles, usually opposite the corners of a small lot or every 15.0 metres in the case of a large lot. To this top of curb elevation a figure must be added, calculated at 2% up, to arrive at property line elevation. Therefore, the proposed distance from face of curb to property line must be known.

c) In some cases, a setback grade is required. These are given where street widening is proposed. It is important to know whether the curb and walk remains on its existing line assignment or if it will be moved back. If the curb and walk are to be moved, it is usually back from existing and at the same elevation (except for major roads). The setback grade is given on the setback line 2% up from the design on profiles or, in some cases, from existing.

10.2 Lane Grades

a) Dished Lanes: From the lane or block profile, the centre line elevation is calculated. The property line elevation is higher depending on the width and cross section on the lane in a specific area. Dished lanes rise from centre line to edge at 2% for concrete and paved lanes and 4%, 6% and 8% for gravel lanes (depending on the area).

b) Flat Lanes: Centre Line elevation is calculated, and to this, add 75 millimetres for property line elevation on a 6.1 metre wide lane and 150 millimetres for property line elevation on a 9.0 metre wide lane. Variations may arise where an odd width lane is encountered.

c) Some existing flat lanes which are to be paved or poured concrete, will require the addition of 61 mm to the centre line elevation to obtain property line elevation for a 6.1 metre wide lane and 91 mm in the case of a 9.1 meter wide lane.

Ensure lanes conform to City of Calgary "Standard Specifications Roads Construction"

11 Erosion & Sediment Control

If an Erosion and Sediment Control (ESC) Plan is requested for review and acceptance by Water Resources, the Lot Owner or project manager, and their site designates, shall ensure a timely and complete implementation, inspection and maintenance of all practices specified in the ESC Plan. Any amendments to the ESC Plan must be reviewed and approved by Water Resources in advance by contacting the ESC Inspector that reviewed the documents. Documents submitted shall conform to the requirements detailed in The City of Calgary's Standard Specifications for Erosion and Sediment Control (current edition, www.calgary.ca/esc) and The City of Calgary's Instruction Manual for Erosion and Sediment Control Plan Application current edition, www.calgary.ca/esc) and shall be prepared, signed and stamped by a qualified designer, and holding current professional accreditation as a Professional Engineer (P. Eng.), Professional Licensee (P.L.), Professional Agrologist (P. Ag.) or Certified Professional in Erosion and Sediment Control (CPESC).

For each stage of work where soil is disturbed or exposed, the ESC Plan must clearly specify the location, installation, inspection, maintenance and removal details and requirements for all temporary and permanent controls and practices.

For other projects where an ESC Plan has not been required at the Prior to Release stage, the Lot Owner, or their designates, shall, as a minimum, develop an erosion and sediment control drawing and implement good housekeeping practices. These practices will protect onsite and offsite storm drains and prevent or mitigate the offsite transport of sediment by the forces of water, wind and construction traffic (mud-tracking) in accordance with Section 100, General Requirements of The City of Calgary's Standard Specifications for Erosion and Sediment Control (current edition, www.calgary.ca/esc). Some examples of good housekeeping include stabilization of stockpiles, stabilized and designated construction entrances and exits, lot logs and perimeter controls, dust control and onsite storm inlet protection. Written approval is required, from Water Resources, to install any storm inlet protection on City property. Contact your area's City ESC Inspector or 3-1-1 to request approval for offsite storm inlet protection on good housekeeping sites.

For all soil disturbing projects, the Lot Owner, or their representative, shall designate a person to inspect all erosion and sediment control practices a minimum of every seven (7) days and during, or within 24 hours of, the onset of significant precipitation (> 12 mm of rain in 24 hours, or rain on wet or thawing soils) or snowmelt events. Note that some practices may require daily or more frequent inspection. Erosion and sediment control practices shall be adjusted to meet changing site and winter conditions.

Refer to Appendix 'B' below for links to the Erosion & Sediment Control documents and other relevant documentation.

12 Encroachments

All expenses, costs, liabilities, or other risk associated with an authorized Encroachment shall be borne by the owner. Furthermore, an authorized encroachment agreement does not release an applicant from the responsibility to comply with other Provincial or Federal requirements or municipal bylaws.

The Encroachment Guidelines can be found on:

http://www.calgary.ca/CS/realestate/Pages/Encroachment/Encroachments.aspx

13 Waste & Recycling Requirements

Waste & Recycling Requirements are looked at under the Development Permit Submission. To obtain all the detailed specifications as set out by Development Building Approvals or review the Complete Applications Requirement List (CARL) for Waste & Recycling go to:

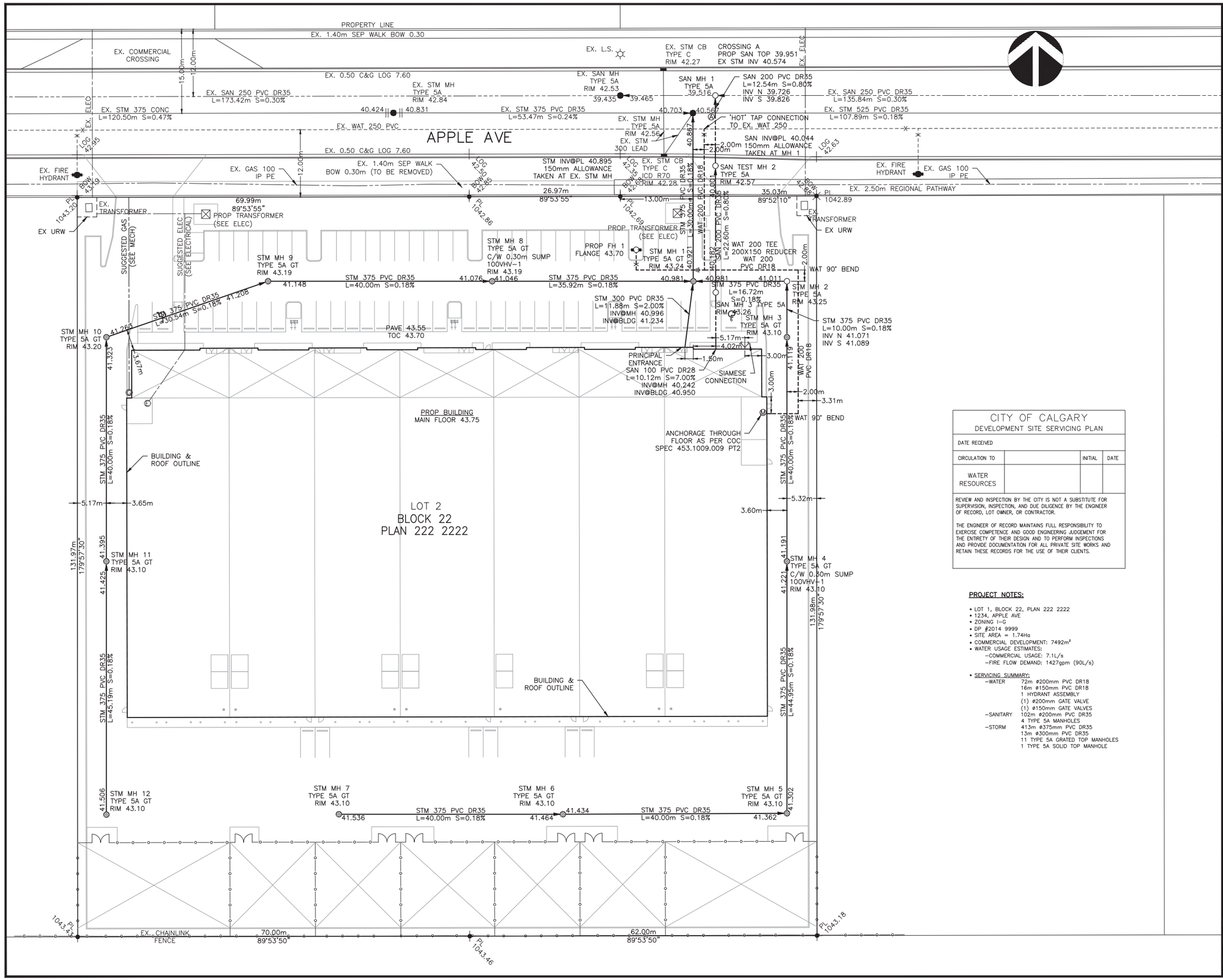
http://www.calgary.ca/UEP/WRS/Documents/WRS-Documents/Development-Reviews-Design-Standards-for-Storage-and-Collection-Waste.pdf

Appendix ‘A’ – Development Site Servicing Plan Example

The following drawings are intended to form an example DSSP submission, title blocks and site specific information have been removed. This example submission consists of the following;

Sheet 1 – Site Servicing Plan
Sheet 2 – Grading Plan
Sheet 3 – Stormwater Management Plan
Sheet 4 – Details Sheet

Note: The intent of the example that follows is to provide applicants with a clear understanding of what a typical submission package looks like. The details included are for illustration purposes only.



CITY OF CALGARY
DEVELOPMENT SITE SERVICING PLAN

DATE RECEIVED			
CIRCULATION TO		INITIAL	DATE
WATER RESOURCES			

REVIEW AND INSPECTION BY THE CITY IS NOT A SUBSTITUTE FOR SUPERVISION, INSPECTION, AND DUE DILIGENCE BY THE ENGINEER OF RECORD, LOT OWNER, OR CONTRACTOR.

THE ENGINEER OF RECORD MAINTAINS FULL RESPONSIBILITY TO EXERCISE COMPETENCE AND GOOD ENGINEERING JUDGEMENT FOR THE ENTIRETY OF THEIR DESIGN AND TO PERFORM INSPECTIONS AND PROVIDE DOCUMENTATION FOR ALL PRIVATE SITE WORKS AND RETAIN THESE RECORDS FOR THE USE OF THEIR CLIENTS.

PROJECT NOTES:

- LOT 1, BLOCK 22, PLAN 222 2222
- 1234, APPLE AVE
- ZONING I-G
- DP #2014 9999
- SITE AREA = 1.74Ha
- COMMERCIAL DEVELOPMENT: 7492m²
- WATER USAGE ESTIMATES:
  - –COMMERCIAL USAGE: 7.1L/s
  - –FIRE FLOW DEMAND: 1427gpm (90L/s)

- SERVICING SUMMARY:
  - –WATER 72m ø200mm PVC DR18; 16m ø150mm PVC DR18; 1 HYDRANT ASSEMBLY; (1) ø200mm GATE VALVE; (1) ø150mm GATE VALVES
  - –SANITARY 102m ø200mm PVC DR35; 4 TYPE 5A MANHOLES
  - –STORM 413m ø375mm PVC DR35; 13m ø300mm PVC DR35; 11 TYPE 5A GRATED TOP MANHOLES; 1 TYPE 5A SOLID TOP MANHOLE

EXISTING UTILITIES
- SANITARY SEWER
- STORM SEWER
- WATER LINE
- CHAIN LINK FENCE
- TYPE 5A MANHOLE
- TYPE 1S MANHOLE
- CATCH BASIN
- HYDRANT
- X WATER VALVE
- U/G ELECTRICAL
- GAS

PROPOSED UTILITIES
- SANITARY SEWER
- STORM SEWER
- WATER LINE
- CHAIN LINK FENCE
- TYPE 5A MANHOLE
- CATCHBASIN/MANHOLE
- TYPE 1S MANHOLE
- CATCH BASIN
- HYDRANT
- X WATER VALVE
- Ⓜ WATER METER LOCATION
- CONCRETE SWALE
- Ⓔ ELECTRICAL METER LOCATION
- Ⓖ GAS METER LOCATION

REVISIONS

NO.	day yy/mm	DESCRIPTION	BY	APP'D
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-

SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE

1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-0999

DEVELOPMENT SITE SERVICING PLAN

SCALE: NTS

DES: - | STAMP:

DWN: -

DATE: -

CHK: -

P. ENG: -

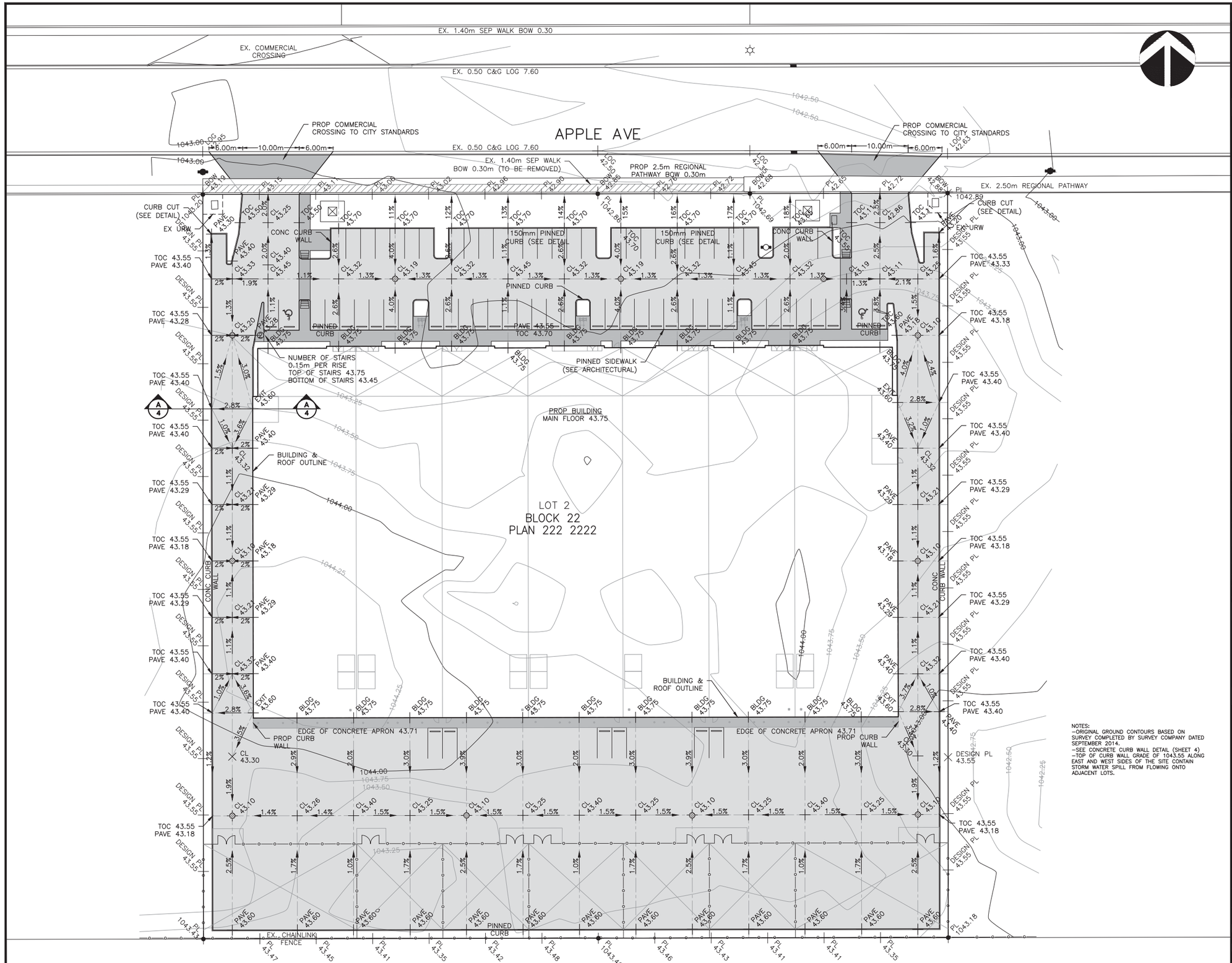
PROJECT No. -

SHEET - OF -

DESTROY ALL PRINTS PRIOR TO

DRAWING NAME -

R -



NOTES:
- ORIGINAL GROUND CONTOURS BASED ON SURVEY COMPLETED BY SURVEY COMPANY DATED SEPTEMBER 2014.
- SEE CONCRETE CURB WALL DETAIL (SHEET 4)
- TOP OF CURB WALL GRADE OF 1043.55 ALONG EAST AND WEST SIDES OF THE SITE CONTAIN STORM WATER SPILL FROM FLOWING ONTO ADJACENT LOTS.

GRADING FEATURES

- PROPOSED CONCRETE SWALE
- PROPOSED CATCH BASIN
- PROPOSED MANHOLE
- PROPOSED CB/MANHOLE
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE
- PROPOSED RETAINING WALL
- PROPOSED GRASS SWALE
- PROPOSED CHAINLINK FENCE
- PROPOSED POST & CABLE FENCE
- PROPOSED SCREEN FENCE
- PROPOSED FINISHED GRADE
- EXISTING PL GRADE

REVISIONS

NO.	day yy/mm	DESCRIPTION	BY	APP'D
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-

SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE

1234 APPLE AVE

LOT 1, BLOCK 22, PLAN 222 2222

SEC 35-23-29-04

DP #2014-0999

SITE GRADING PLAN W/ OG CONTOURS

SCALE: NTS

DES: - | DWN: - | DATE: - | CHK: -

STAMP:

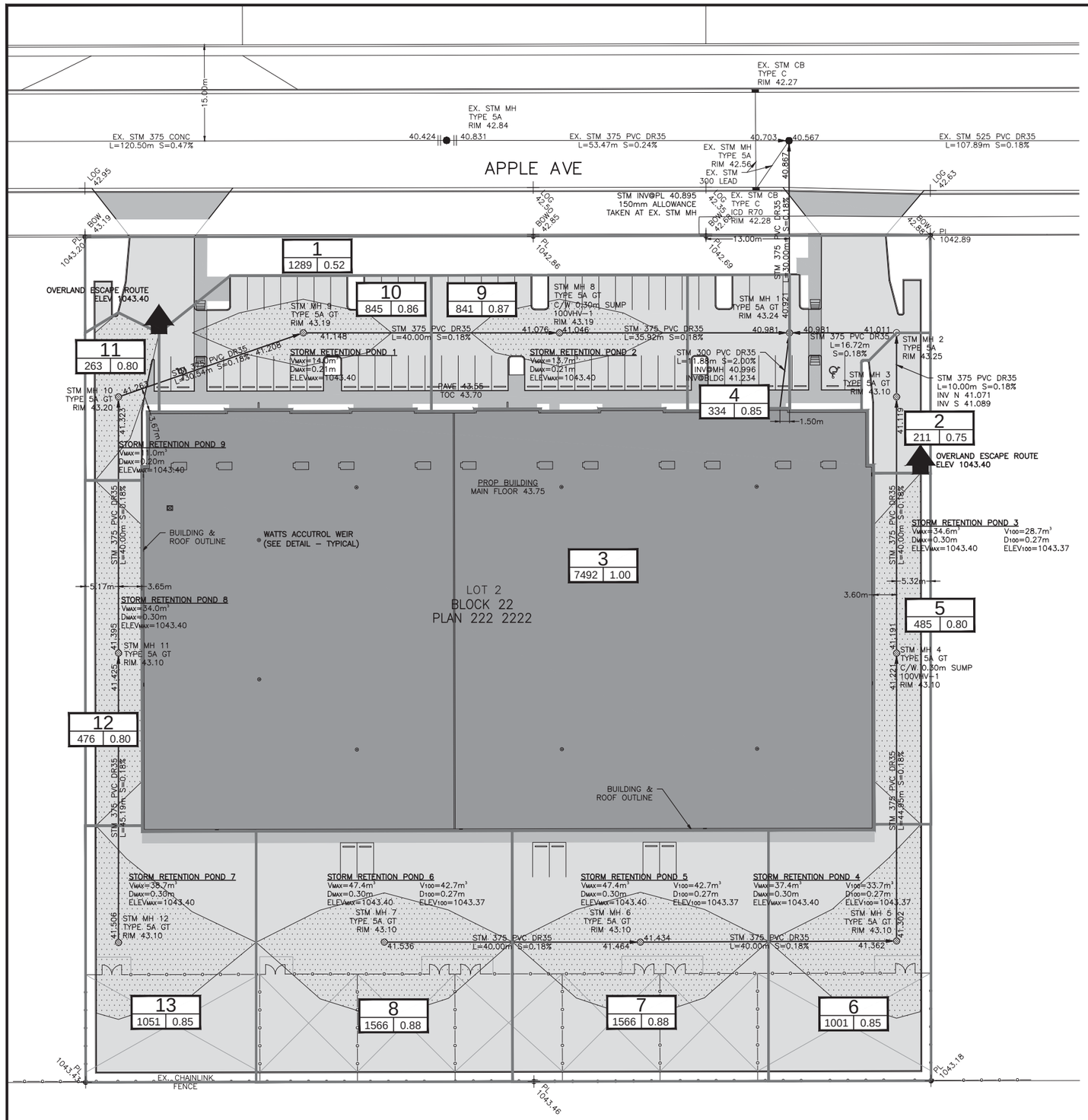
P. ENG: -

PROJECT No. -

SHEET - OF -

DRAWING NAME -

DESTROY ALL PRINTS PRIOR TO R -



STORMWATER MANAGEMENT CALCULATIONS

OVERALL SITE CONDITIONS

SURFACE	AREA (m²)	C FACTOR
BUILDING	7492	1.00
PAVEMENT	8439	0.90
LANDSCAPE	1489	0.30
TOTAL	17420	0.89

ALLOWABLE FLOW = 45L/s/Ha
(FROM STORM DRAINAGE PLAN FOR STARFIELD INDUSTRIAL PREPARED BY THE CITY OF CALGARY)
Q = 45L/s (1.7419Ha)
= 78.4/s

UNRESTRICTED FLOW FROM SITE:

- CATCHMENT AREA 1
- OVERLAND FLOW TO 61ST AVENUE SE DUE TO GRADING.

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	478	0.90
LANDSCAPE	811	0.30
TOTAL	1289	0.52

CATCHMENT AREA 1
Q_1 = 2.78ciA
= 2.78(0.52)(168.00)(0.1289) = 31.3L/s

- CATCHMENT AREA 2 AND 4 FLOWS ARE INTERCEPTED BY MANHOLES, ALTHOUGH NOT RESTRICTED

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	464	0.90
LANDSCAPE	81	0.30
TOTAL	545	0.81

CATCHMENT AREA 2 AND 4
Q_1 = 2.78(0.81)(82.55)(0.0545) = 10.1L/s

ALLOWABLE RESTRICTED FLOW FROM SITE:

ALLOWABLE FLOW – UNRESTRICTED FLOW
78.4L/s – (31.3 + 10.1)L/s = 37.0L/s

STORM RETENTION CALCULATIONS:

CATCHMENT AREAS 5–8

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	4336	0.90
LANDSCAPE	282	0.30
TOTAL	4618	0.86

VHV100–1 IN STM MH 3 RESTRICTS FLOW

ACTUAL DISCHARGE FROM AREAS 5–8:

EMERGENCY ESCAPE ROUTE – NEAR NORTHEAST ENTRANCE @ ELEVATION 1043.40

MAX HEAD – SPILL ELEVATION = 1043.40 – CENTER OF ORIFICE @ OUTLET
1041.089 (INVERT AT OUTLET)
0.188
1041.28
MAX HEAD = 1043.40 – 1041.28 = 2.12m

$C_1 = \frac{10.8}{2.78(82.55)(0.4618)} = 0.10$

$\frac{C_2}{C_1} = \frac{0.86}{0.10} = 8.60$

BECAUSE THE C2/C1 FACTOR IS ABOVE 5.0 WE USE FOLLOWING FORMULA
SVF =(0.369x(C2/C1))–0.4
=(0.369x(0.86/0.10))–0.4
=2.8

SURFACE RETENTION REQUIRED
V_{RR} =SVF x A x C1' x 1000
V_{RR} =2.8(0.4618)(0.10)1000 = 129.3m³

TOTAL SURFACE RETENTION PONDS PROVIDED = 166.8m³
(SEE POND CALCULATIONS ON THIS PLAN)

STORM RETENTION CALCULATIONS:

CATCHMENT AREA 2 (BUILDING ROOF)

SURFACE	AREA (m²)	C FACTOR
BUILDING	7492	1.00
PAVEMENT	0	0.90
LANDSCAPE	0	0.30
TOTAL	7492	1.00

ROOF DRAIN WEIRS RESTRICT FLOW

ACTUAL DISCHARGE FROM AREA 2:

–ROOF DRAINAGE (FLOW RESTRICTORS ON ROOF DRAINS)
–CONNECTED INTERNALLY TO 300mm BUILDING SERVICE AT NORTH SIDE OF BUILDING
–WATTS FLOW RESTRICTING WEIRS (5USgpm/INCH DEPTH)
–150mm MAXIMUM DEPTH AT DRAINS

8 ROOF DRAINS @ 1.89L/s EACH = 15.1L/s

$C_1 = \frac{15.1}{2.78(82.55)(0.7492)} = 0.09$

C_2 (ABOVE) = 1.00

$\frac{C_2}{C_1} = \frac{1.00}{0.09} = 11.1$

BECASUE THE C2/C1 FACTOR IS ABOVE 5.0 WE USE FOLLOWING FORMULA
SVF =(0.369x(C2/C1))–0.4
=(0.369x(1.00/0.09))–0.4
=3.7

SURFACE RETENTION REQUIRED
V_{RR} =SVF x A x C1' x 1000
V_{RR} =3.7(0.7492)(0.09)1000 = 249.5m³

STORAGE VOLUME PROVIDED ON THE ROOF:
MAXIMUM DEPTH = 150mm DEPTH
(OVERFLOW PROTECTION – OVERFLOW SCUPPERS, SEE ARCHITECT PLANS)
MAXIMUM STORAGE PROVIDED = 374.6m³
AVERAGE DEPTH 249.5m³/7492m² = 33mm

STORM RETENTION CALCULATIONS:

CATCHMENT AREAS 9–13

SURFACE	AREA (m²)	C FACTOR
BUILDING	0	1.00
PAVEMENT	3161	0.90
LANDSCAPE	315	0.30
TOTAL	3476	0.85

100VHV–1 IN STM MH 8 RESTRICTS FLOW

ACTUAL DISCHARGE FROM AREAS 9–13:

EMERGENCY ESCAPE ROUTE – NORTHWEST ENTRANCE @ ELEVATION 1043.40

MAX HEAD – SPILL ELEVATION = 1043.40 – CENTER OF ORIFICE @ OUTLET
1041.046 (INVERT AT OUTLET)
0.188
1041.23
MAX HEAD = 1043.40 – 1041.23 = 2.17m

$C_1 = \frac{10.0}{2.78(82.55)(0.3476)} = 0.13$

$\frac{C_2}{C_1} = \frac{0.85}{0.13} = 6.54$

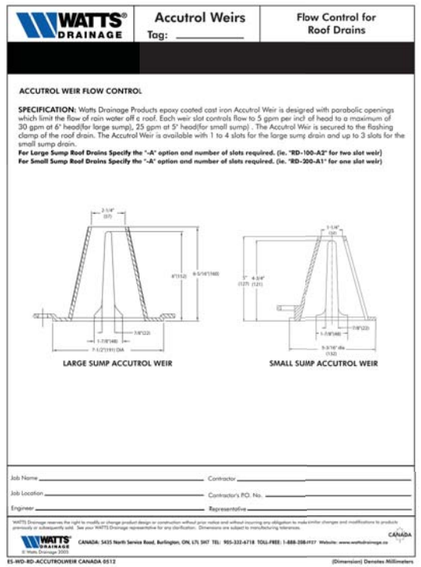
BECASUE THE C2/C1 FACTOR IS ABOVE 5.0 WE USE FOLLOWING FORMULA
SVF =(0.369x(C2/C1))–0.4
=(0.369x(0.85/0.13))–0.4
=2.0

SURFACE RETENTION REQUIRED
V_{RR} =SVF x A x C1' x 1000
V_{RR} =2.0(0.3476)(0.13)1000 = 90.4m³

TOTAL SURFACE RETENTION PONDS PROVIDED = 111.4m³
(SEE POND CALCULATIONS THIS SHEET)

ALLOWABLE FLOW FROM SITE:

UNRESTRICTED FLOW + RESTRICTED FLOW (ROOF + PIPE)
(31.3 + 10.1)L/s + (10.8 + 15.1 + 10.0)L/s = 77.3L/s
ALLOWABLE FLOW = 78.4L/s



STORMWATER FEATURES

- PROPOSED CONCRETE SWALE
- EXISTING CATCH BASIN
- EXISTING MANHOLE
- PROPOSED MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED STORM
- PROPOSED GRASS SWALE
- PROPOSED CATCHMENT AREA
- PROPOSED PONDING AREA
- PROPOSED ASPHALT PAVING
- PROPOSED CONCRETE
- PROPOSED BUILDING AREA
- PROPOSED OVERLAND ESCAPE ROUTE
- PROPOSED FLOW DIRECTION
- 2 / 1242 | 0.431 — CATCHMENT NUMBER / "C' FACTOR / AREA (m²)

REVISIONS

NO.	day yy/mm	DESCRIPTION	BY	APP'D
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-

SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

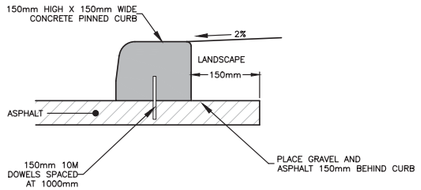
CLIENT

PROJECT

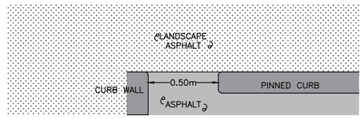
BUSINESS CENTRE
1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-0999

STORMWATER MANAGEMENT PLAN

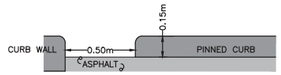
SCALE: NTS
DES: -
STAMP:
DWN: -
DATE: -
CHK: -
P. ENG: -
PROJECT No. -
SHEET OF - -
DRAWING NAME -
DESTROY ALL PRINTS PRIOR TO
R -



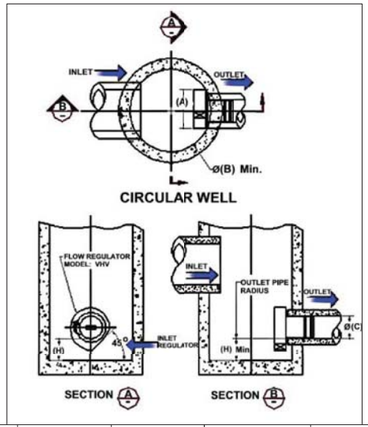
0.15m PINNED CURB
NTS



CURB CUT DETAIL (PLAN VIEW)
SCALE 1:20

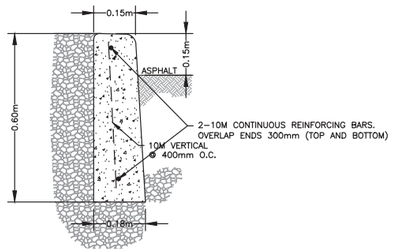


CURB CUT DETAIL (SECTION VIEW)
SCALE 1:20

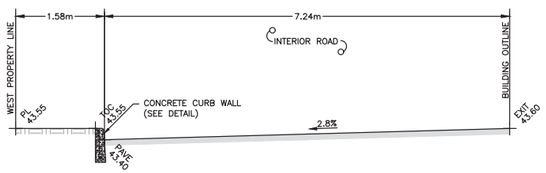


Model Number	Regulator Diameter A (mm)	Manhole Diameter B (mm)	Minimum Outlet Pipe C (mm)	Minimum Clearance H (mm)
100VHV-1	356	900	150	203

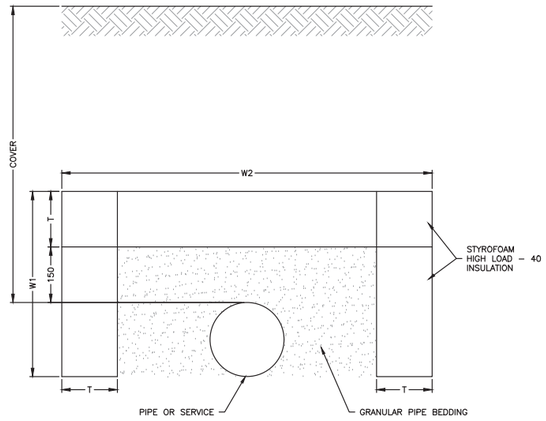
TYPICAL HYDROVEX DETAIL
SCALE NTS



CONCRETE CURB WALL
SCALE 1:10



WEST CROSS SECTION AA
SCALE 1:50



INSULATION DETAIL FOR SANITARY MAINS WITH LESS THAN MINIMUM COVER
C. of C. SPEC 453.1044.001
NTS

PIPE COVER (m)	MINIMUM INSULATION THICKNESS T (m)	MINIMUM INSULATION WIDTH W=2W1+W2 (m) PIPE DIAMETER 150–200mm CLAY	MIX	GRAVEL	PIPE DIAMETER 250–300mm CLAY	MIX	GRAVEL	PIPE DIAMETER 400mm CLAY	MIX	GRAVEL	MINIMUM INSULATION THICKNESS T (m)	MINIMUM INSULATION WIDTH W (m) SERVICES, HYDRANT LEADS, DEAD END MAINS CLAY	MIX	GRAVEL
1.6–1.7	75	2.4	3.0	3.6	2.5	3.1	3.7	2.6	3.2	3.8	100	3.2	3.5	3.8
1.8–1.9	50	2.0	2.6	3.2	2.1	2.7	3.3	2.4	2.8	3.4	100	2.8	3.1	3.4
2.0–2.1	50	1.8	2.2	2.8	2.1	2.3	2.9	2.4	2.4	3.0	100	2.4	2.7	3.0
2.2–2.3	50	1.8	1.8	2.4	2.1	2.1	2.5	2.4	2.4	2.6	75	2.0	2.3	2.6
2.4–2.5	50	0.8	1.8	2.0	0.9	2.1	2.1	1.0	2.4	2.4	75	1.6	1.9	2.2
2.6–2.7	50	0.4	1.8	1.8	0.5	1.1	2.1	0.6	1.2	2.4	75	1.2	1.5	1.8
2.8–2.9	50	–	0.6	1.8	–	0.7	2.1	–	0.8	2.4	50	0.8	1.1	1.4
3.0–3.1	50	–	–	0.8	–	–	0.9	–	–	1.0	50	–	0.7	1.0
3.2–3.3	50	–	–	0.4	–	–	0.5	–	–	0.6	50	–	–	0.6

NOTES:
1. STYROFOAM HIGH LOAD – 40 COMPRESSIVE STRENGTH = 40PSI
2. MINIMUM OF 0.25m OF COMPACTED BACKFILL MATERIAL (AS PER CURRENT STANDARD SPECIFICATIONS ROADS CONSTRUCTION) IS REQUIRED OVER THE INSULATION PRIOR RO TRAFFIC LOADING
3. BOTTOM OF VERTICAL STYROFOAM LEGS SHOULD BE LEVEL WITH BOTTOM OF PIPE
4. APPROVAL REQUIRED AS PER CURRENT STANDARD SPECIFICATIONS WATERWORKS SEC 504.0415
5. WHERE PIPE IS INSTALLED IN SOLID ROCK, PIPE IS TO BE BOXED IN COMPLETELY, PRIOR TO APPROVAL IS REQUIRED FOR SUCH INSTALLATIONS.

REFER TO GEOTECHNICAL EVALUATION FOR PAVEMENT DESIGN AND TYPE OF CEMENT PRIOR TO PLACING ANY CONCRETE. REFER TO ARCHITECTURAL PLANS FOR LOCATION OF HEAVY AND LIGHT DUTY ASPHALT AREAS.

REVISIONS

NO.	day yy/mm	DESCRIPTION	BY	APP'D
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-

SUBMISSIONS

NO.	DESCRIPTION	DATE (yy/mm/dd)
1	FOR DP	-
2	FOR APPROVAL	-
3	FOR ARCHIVE	-

CLIENT

PROJECT

BUSINESS CENTRE
1234 APPLE AVE
LOT 1, BLOCK 22, PLAN 222 2222
SEC 35-23-29-04
DP #2014-0999

DETAIL SHEET

SCALE: AS NOTED
DES: -
DWN: -
DATE: -
CHK: -
STAMP:
P. ENG: -
PROJECT No. -
SHEET OF - -
DRAWING NAME -
DESTROY ALL PRINTS PRIOR TO R -

Appendix ‘B’ – References & Links

Refer to the following links for more information and reference material.

Relevant Bylaws:

Calgary Land Use Bylaw 1P2007
http://www.calgary.ca/PDA/pd/Documents/Calgary-Land-Use-bylaw-1P2007/bylaw_1p2007.pdf

Calgary Land Use Bylaw 2P80
http://www.calgary.ca/PDA/pd/Documents/bylaw-2P80/bylaw2p80.pdf

Utility Site Servicing Bylaw 33M2005
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/33m2005-UtilitySiteServicing.pdf

Water Utility Bylaw 40M2006
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/40M2006-WaterUtility.pdf

Wastewater Bylaw 14M2012
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/14M2012-Wastewater.pdf

Drainage Bylaw 37M2005
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/37m2005-Drainage.pdf

Lot Grading Bylaw 32M2004
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/32m2004-LotGradingBylaw.pdf

Waste and Recycling Bylaw 20M2001
http://www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/20M2001-WasteAndRecycling.pdf

Water Resources Links:

Development Site Servicing Plan (DSSP) Complete Applications Requirement List (CARL)
http://www.calgary.ca/PDA/DBA/Documents/carls/DSSP-CARL.pdf

Stormwater Management and Design Manual
http://www.calgary.ca/PDA/pd/Documents/urban_development/bulletins/2011-stormwater-management-and-Design.pdf

Standard Specifications for Waterworks Constructions
http://www.calgary.ca/PDA/pd/Documents/urban_development/publications/Waterworks-Construction-Standard-Specifications.pdf

Standard Specifications for Sewer Construction
http://www.calgary.ca/PDA/pd/Documents/urban_development/publications/Sewer-Construction-Standard-Specifications.pdf

Design Guidelines for Subdivision Servicing
http://www.calgary.ca/Transportation/Roads/Documents/Contractors-and-Consultants/design-guidelines-for-subdivision-servicing-2014.pdf

Development Approval Submissions (Stormwater Reports, Construction Drawings, & Ponds)
http://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Development-Approvals-Submissions.aspx

Sanitary Servicing Study Guidelines
http://www.calgary.ca/PDA/DBA/Documents/development/west-memorial-sanitary-servicing-study-guidelines.pdf

Floodway, Flood Fringe and Overland Flow Zone Maps
http://www.calgary.ca/PDA/pd/Pages/Calgary-Land-Use-bylaw-1P2007/Floodway-flood-fringe-maps.aspx

National Plumbing Code of Canada (Can be purchased at the following link)
https://www.nrc-cnrc.gc.ca/eng/publications/codes_centre/2015_national_plumbing_code.html

Calgary River Valleys Plan – July 1984
http://www.calgary.ca/PDA/pd/Documents/pdf/calgary-river-valleys-plan.pdf

Water Services Information Page
http://www.calgary.ca/SitePages/cocis/Scripts/SubCategory-WaterServices-Grid.aspx

PVC Main Break Study – Cause Analysis
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/PVC_Failure_Presentation_Sept_-202010.pdf

Design and Construction of Flexible Thermoplastic Pipe
http://www.calgary.ca/PDA/pd/Documents/urban_development/publications/standard-practice-for-design-and-construction-flexible-pipe.pdf

Erosion and Sediment Control:

Erosion and Sediment Control Guidelines
http://www.calgary.ca/UEP/Water/Pages/Watersheds-and-rivers/Erosion-and-sediment-control/Erosion-Sediment-Control-documents-for-review.aspx

Erosion and Sediment Control Field Manual
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/ESC-2017-Field-Manual.pdf

Standard Specifications for Erosion and Sediment Control
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/ESC-2017-Specifications.pdf

Instruction Manual for Erosion and Sediment Control Plan Applications
http://www.calgary.ca/UEP/Water/Documents/Water-Documents/ESC-2017-Instructions-for-Erosion-and-Sediment-Control-Applications.pdf

General Links:

Calgary Approvals Coordination Bulletins
http://www.calgary.ca/PDA/pd/Pages/Urban-Development/Urban-Development.aspx

Servicing Guidelines for new Single Family/Semi-detached/Duplex dwellings in the Developed Area
http://www.calgary.ca/PDA/pd/Documents/carls/building-permit/application-for-residential-grades.pdf

Standard Specification for Roads Construction
http://www.calgary.ca/Transportation/Roads/Documents/Contractors-and-Consultants/Roads-Construction-2015-Standard-Specifications.pdf

Standard Specifications for Landscape Construction
http://www.calgary.ca/PDA/pd/Documents/urban_development/publications/Landscape2018.pdf

Standard Block Profile Specifications for CAD and manual formats
http://www.calgary.ca/PDA/pd/Documents/urban_development/publications/BlockProfile2008.pdf

Consulting Engineers Field Services Guidelines
http://www.calgary.ca/PDA/pd/Documents/urban_development/CEFSG/Consulting-Engineers-Field-Services-Guidelines-6th-edition.pdf

Standard Specifications for Street Lighting Construction
http://www.calgary.ca/Transportation/Roads/Documents/Traffic/Traffic-signals-and-streetlights/Design-Guidelines-For-Street-Lighting.pdf