Engineering Design and Construction Guidelines

February 2025

Town of Canmore | 902 7 Avenue | Canmore, AB | T1W 3K1

Table of Contents

List of Figures

List of Tables

Appendices

SECTION 1 - INTRODUCTION

TERMS OF USE

The “2025 Engineering Design and Construction Guidelines, Section 1” is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The “2025 Engineering Design and Construction Guidelines – Section 1” is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers’ or suppliers’ recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

1.0 Introduction

The *Engineering Design and Construction Guidelines* (EDCG) are intended to aid Developers, Consulting Engineers, Landscape Architects and Contractors in the design and construction of infrastructure and amenities.

This document is a consolidation of engineering design standards, landscape design standards and solid waste standards for the construction of public infrastructure and amenities owned or maintained by the Town of Canmore and provides guidance for the development of private sites. This document covers topics ranging from approval processes for development and subdivisions, surface and underground infrastructure design guidelines, transportation system guidelines, to steep creek hazards and other local conditions.

1.1 Reference Documents

The documents listed below are intended to form the reference material for the EDCG. A list of reference material is hosted on the Town's website. From time to time, new reference material may become available and will be listed on the Town's website and included in the EDCG as subsequent updates are made, for this reason the reader is directed to the website for the comprehensive listing. Please note that this list assumes the most recent edition of the document, except in cases where a specific edition is referenced.

1.1.1 Province of Alberta

Consulting Engineers must be familiar and comply with all Provincial guidelines and regulations. The following is a brief list of Provincial documents relevant to the content of the EDCG:

- Alberta Transportation and Economic Corridors. *Highway Geometric Design Guide*
- Alberta Environment. *Standards & Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*
- Alberta Environment. *Municipal Policies and Procedures Manual*
- Alberta Environment. *Stormwater Management Guidelines for the Province of Alberta*
- Alberta Environment. *Alberta Guide to Wetland Construction in Stormwater Management Facilities*
- Alberta Health Services. *Public Health Guidelines for Water Reuse and Stormwater Use*
- Province of Alberta. *Municipal Government Act - Canmore Undermining Review Regulation* (AR34/2020)
- Province of Alberta. *2020 Guidelines to Evaluate Proposed Development over Designated Undermined Lads in the Town of Canmore, Alberta*
- Province of Alberta. *Municipal Government Act - Canmore Undermining Exemption from Liability Regulation* (AR 113/1997)
- Province of Alberta. *Financial Administration Act - Canmore Undermining Indemnity Regulation* (AR 112/1997)
- Province of Alberta. *Traffic Safety Act* (RSA 2000, T-6)
- Province of Alberta. *Environmental Protection and Enhancement Act* (RSA 2000 E-12)

- Province of Alberta. *Water Act* (RSA 2000 W3)
- Alberta Ministry of Municipal Affairs. *Accessibility Design Guide*.

1.1.2 City of Calgary

Unless otherwise noted in the EDCG, the Town of Canmore follows the latest versions of the City of Calgary's standard specifications for water, sanitary, stormwater and transportation systems and the full suite of design guidelines maintained by the City, along with Industry Bulletins released from time to time by the City of Calgary to amend these guidelines. This includes, but is not limited to, the most recent version of the following City of Calgary documents:

1.1.2.1 Standard Specifications

- Standard Specifications for Waterworks Construction
- Standard Specifications for Sewer Construction
- Standard Specifications for Roads Construction
- Standard Specifications for Landscape Construction
- Standard Specifications for Erosion and Sediment Control

1.1.2.2 Guidelines

- Design Guidelines for Subdivision Servicing
- Design Guidelines for Development Site Servicing Plans
- Design Guidelines for Street Lighting
- Guide to Lot Drainage – Residential Development
- Geotechnical Guidelines for Land Development Applications
- Wastewater Lift Station Design Guidelines
- Stormwater Management and Design Guidelines
- Low Impact Development Modules 1, 2, 3, and 6
- Principles for Stormwater Wetlands Management
- Guidelines for Supply of Stormpond Water for Irrigation Use
- Guidelines for Erosion and Sediment Control
- Fire Department Access Standard
- Transportation Impact Assessment Guidelines
- Consulting Engineer's Field Services Guidelines
- Design Guidelines for Erosion and Flood Control: Streambanks and Riparian

1.1.2.3 Industry Bulletins

Development Engineering

- Wheelchair ramp design (September 2023)

- Test Manhole (January 2017)

Water Development

- Updates to the Stormwater Management and Design Manual (January 2024)
- Dead end Watermains in New Subdivisions (February 2021)
- Test Manholes (June 2019)

Inspection Services

- Portland Limestone Cement (December 2022)

Provincial Standards and Guidelines take precedence, followed by the Town of Canmore then City of Calgary where discrepancies occur.

1.1.3 Town of Canmore Statutory Documents

The following statutory documents are referenced in these guidelines and are to be respected and considered:

- Municipal Development Plan
- Land Use Bylaw
- Area Structure Plans and Area Redevelopment Plans

1.1.4 Town of Canmore Bylaws

Developers, Builders and their Consulting Engineers and Contractors must comply with relevant bylaws, as amended from time to time, that may include provisions and requirements supplementary to those included in this document (EDCG). Where revised or updated, the most recent version will be used.

Note that the list may be amended from time to time as new and revised bylaws are adopted. The reader is advised to consult the Town of Canmore website for a comprehensive listing.

- Traffic and Road Use Bylaw 2020-03
- Building Permit Bylaw 2022-31
- Regulating Blasting Explosives Bylaw No. 32-96
- Fire Bylaw 2013-08
- Offsite Levy Bylaw 2020-27
- Parks Bylaw 2019-09
- Recyclables and Waste Bylaw 2016-11
- Sewerage Use Bylaw 2015-18
- Water Bylaw 2003-39
- Land Use Bylaw current version
- Protection of Municipal Improvements and Lands Bylaw No. 15-2001

- Tree Protection Bylaw 2019-10
- Community Standards Bylaw 2022-16

In addition to bylaws, the Town maintains several Policies, some of which should be considered. For a complete list please refer to www.canmore.ca.

1.1.5 Town of Canmore Guiding Documents

Town Guiding documents of particular relevance to the content of the EDCG include the following and should be referenced in the preparation of development related applications:

- Council Strategic Plan
- Integrated Parking Management Plan
- Integrated Transportation Plan
- Canmore Local Transit Service Review
- Canmore Wayfinding Program – Design Intent
- Stormwater Master Plan
- Climate Emergency Action Plan
- Guidelines for Subdivision and Development in Mountainous Terrain
- Open Space Development Guidelines
- Open Space and Trails Plan
- Recreation Master Plan
- Urban Forest Management Plan
- Utilities Master Plan
- Wildfire Mitigation Strategy
- Human Wildlife Coexistence Implementation and Action Plan

1.1.6 Other Agencies

The following publications have been considered in the development of the EDCG and should be used as reference material for Consulting Engineers.

- American Society of Civil Engineers. *Flood Resistant Design and Construction.* Standards ASCE/SEI 24-14. ASCE. 2014.
- ANSI/AWWA C651. *Disinfecting Water Mains*.
- ANSI/AWWA C605. *Underground Installation of Polyvinyl Chloride Pipe (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings*.
- British Columbia Ministry of Transportation and Infrastructure. *Active Transportation Design Guide*.
- City of Edmonton. *Access Management Guidelines*.
- CSA Group. *Construction of bioretention systems*. CSA W201.
- CSA Group. *Design of bioretention systems*. CSA W200.
- CSA Group. *Guideline on Basement Flood Protection and Risk Reduction*. CSA Z800-18.

- Fire Underwriters Survey. *Water Supply for Public Fire Protection – A Guide to Recommended Practice in Canada* (2020).
- Illuminating Engineering Society of North America, ANSI/IES RP-8-22. *Recommended Practice: Lighting Roadway and Parking Facilities*.
- National Fire Protection Association. *Standard for Wildland Fire Protection.* NFPA 1140.
- Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*.
- Transportation Association of Canada. *Manual of Uniform Traffic Control Devices for Canada*.

The EDCG as well as the City of Calgary's standard specifications shall form part of all contract documents for the installation of all new infrastructure and amenities and for maintenance work on all existing infrastructure and amenities within the Town of Canmore. Where bylaws, acts, regulations, policies, codes, standards, and other documents are referred to within this document, the most recent edition or amendment applies.

1.2 Document Revisions

The first edition of the EDCG was developed in 1998. Since then, numerous revisions have been made with major revisions completed in 2005, 2010 and 2020.

1.2.1 Future Updates and Amendments

Change is a constant and as such the EDCG will need to be updated. The process for future updates and amendments is described below:

1.2.1.1 Initiating a Change

a. Either the Town of Canmore (through Engineering Manager), the building and development industry, represented by Bow Valley Builders and Developers Association (BOWDA) or a private party may propose a change to EDCG.
b. Either Town, BOWDA or private party submits a written request to the other party noting the EDCG section that is proposed to be changed, how it is recommended to be changed, with supporting rationale. The Town will maintain an inventory of proposed changes.
c. Town and BOWDA EDCG Committee representatives to meet and/or discuss via email the proposed changes and come to a consensus on the changes.
d. Town to update EDCG through a bulletin notification or wholesale update.

1.2.1.2 Periodic Review

a. Town and BOWDA EDCG Committee to meet annually to review EDCG and identify any issues with EDCG or sections of EDCG that need to be amended or improved.
b. Town and BOWDA EDCG Committee to determine best approach to the identified issue and come to consensus on any changes to EDCG.
c. Town to update EDCG through a bulletin notification or wholesale update.

1.2.1.3 Full Review of EDCG

a. A full review of the EDCG is to occur every five years to ensure that the guidelines are up to date, cost effective and are using industry best practices.
b. The Town, the BOWDA EDCG Committee and other relevant stakeholders to review EDCG and come to consensus on any changes or updates to EDCG.
c. Town and BOWDA EDCG Committee review the Process for Changing and Reviewing, and Dispute Resolution Process.
d. Town to update EDCG accordingly.

1.2.1.4 Dispute Resolution

a. If Town Engineering Manager and BOWDA or other stakeholders cannot come to a consensus on a proposed change to EDCG, then:
    i. Issue to be escalated to Town of Canmore General Manager of Municipal Infrastructure for a decision;
    ii. Decision can be appealed to Town of Canmore Chief Administrative Officer.

1.3 Organization of Document

Readers may not be familiar with some of the abbreviations and terms used in the EDCG - Refer to Appendix A for a complete list of abbreviations (Table 1) and a glossary of terms (Table 2) used in the EDCG.

Figures are located at the end of the document.

1.4 Terms of Use

The EDCG is presented as accurate and complete as of the date of issue. Use of these guidelines does not absolve any user from the obligation to exercise their professional judgement and to follow good practice. Should any user have questions as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and this manual, the user is advised to seek clarification from the Town Engineer.

It is recommended that the private sites storm, sanitary and water design comply with the current version of the EDCG. Any deviation from these specifications and guidelines on private sites are at the risk and discretion of the Engineer of Record. Any aspects of private site design deemed to have an adverse impact on Municipal Improvements, adjacent properties or public health and safety will not be approved.

1.5 Terminology

The use of the words should and shall in this document has been carefully considered with the following definitions as guidance:

The EDCG establishes desired outcomes in support of the Council Strategic Plan, Town's Guiding Documents, and Bylaws. Should clauses in the EDCG are designed to achieve these outcomes and are intended as a minimum requirement, however are not meant to stifle innovation. Where Should is used, Consulting Engineers and Landscape Architects may propose alternatives to the guidelines by providing a

description of the alternative and how this accomplishes the goals of the EDCG and the Town's Guiding Documents. This information is to be provided in the design narrative and authenticated by the Engineer of Record.

The EDCG also outlines certain requirements which are supported by Bylaws, Codes, Provincial Regulations and Standards. These are typically strict requirements to protect public safety and health and will be identified by the use of the word Shall. Any rationale for deviations from shall clauses will require comprehensive technical studies and/or written narratives authenticated by the Engineer of Record.

1.6 Deviations from Guidelines

These guidelines are intended to be the minimum standards. Where conditions dictate and good engineering practice requires, higher standards than those indicated should be incorporated into the design.

While the goal of this document is to provide a comprehensive set of guidelines that result in effective, reliable and economical systems that align with Council priorities and guiding documents, the guidelines are not meant to stifle technological innovation and evolution, nor eliminate design approaches that may be appropriate for local conditions.

Alternative approaches may be considered if it can be demonstrated that there are better ways of achieving the same objectives. Similarly, the Town of Canmore has the discretion to grant relaxations from the guidelines when, to the satisfaction of the Town, all other options are exhausted and safe and satisfactory operation is still ensured. At all times the Consulting Engineer remains responsible for the design as Engineer of Record.

The Town of Canmore will maintain a registry of relaxations requested by Consulting Engineers or deviations required by the Town. This registry will be consulted regularly to inform future updates to the guidelines.

SECTION 2 APPLICATIONS AND PERMITS

TERMS OF USE

The “2025 Engineering Design and Construction Guidelines, Section 2” is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The “2025 Engineering Design and Construction Guidelines – Section 2” is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers’ or suppliers’ recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

2.0 Applications and Permits

This section of the Engineering Design and Construction Guidelines (EDCG) provides Developers, Consulting Engineers, Contractors and Builders with guidance on the Engineering aspects of applications for subdivision approval, development permit (DP) or building permit (BP). This section also outlines acceptance procedures of a completed development. Lastly, information about commonly required permits for various construction activities is provided.

Subdivision, Development Permit and Building Permit applications are made through the Town of Canmore's Planning and Development Department. The Planning and Development Department will coordinate the necessary reviews and requirements with other Town departments including Engineering, Public Works and Emergency Services.

Permits listed in Section 2.6 are applied for through the Town's Engineering Department, unless otherwise noted.

2.1 Contractual Relationships

This section is intended to provide an overview of the roles and responsibilities of parties involved in the development process.

2.1.1 Developer/Town

The Developer may be required to enter into an agreement (subdivision servicing agreement or development agreement) with the Town to complete the construction of a subdivision or other development in accordance with Canmore's Land Use Bylaw and the EDCG. The Developer is, and shall remain, responsible to the Town for the full and proper performance of all obligations and municipal improvements under the agreement. When, in the opinion of the Town Engineer, the work being performed is not receiving full-time inspection (or the otherwise-approved level of inspection), or it can be reasonably shown that the work is not being completed in accordance with the applicable standards, the Town may issue a stop order to the Developer. The stop order will specify the reason for the stoppage and provisions for remedy. The Town, with reasonable cause and as specified in the agreement, may stop construction and installation of municipal improvements at any time. A copy of the stop order will also be given to the Contractor to stop work on the municipal improvements. Any work on municipal improvements that is completed while a stop order is in effect may be rejected by the Town Engineer.

2.1.2 Developer/Consulting Engineer

The Developer must retain a Consulting Engineer for Intermediate and Large Developments, and sometimes for small developments as defined in Section 2.2.3. Landscape Architect is required in cases where landscaping on Municipal lands will be constructed. The role of the Consulting Engineer and Landscape Architect is to ensure Municipal Improvements conform to, or exceed, all standards and guidelines. It is the responsibility of the Developer to inform the Town Engineer of the engagement of a Consulting Engineer and/or Landscape Architect for Field Inspection Services, where required as defined above. In these cases, the Consulting Engineer and/or Landscape Architect must complete and submit to the Town Engineer a notice of engagement as described in Submission Requirements.

2.1.3 Developer/Contractor

The Developer shall enter into a contract with the Contractor(s), to complete the construction of a subdivision or development in accordance with the designs and specifications approved and accepted by the Town. The Contractor is responsible to the Developer for the quality of municipal improvements and for conformance with the EDCG.

2.1.4 Town/Contractor/Consulting Engineer

There is no direct contractual relationship between the Contractor and the Town. In the interests of efficiency and clear communication, any communication from the Town Engineer regarding ongoing work should be communicated directly to the Consulting Engineer/Landscape Architect and Developer unless otherwise agreed upon in writing.

There is no direct contractual relationship between the Town and the Consulting Engineer and/or a Landscape Architect in the construction process. The Consulting Engineer and/or Landscape Architect liaises with the Town Engineer as required, including but not limited to commencement of construction, construction meetings, design/construction changes and issuance of Construction Completion Certificates (CCCs) and Final Acceptance Certificates (FACs), all with copies to the Developer. As the Consulting Engineer and/or Landscape Architect is a representative of the Developer, the Town Engineer has the right to request through the Consulting Engineer and/or Landscape Architect that observed deficiencies be corrected. In the interests of clear communication, the Town Engineer must copy the Developer on such instructions when issued. It is the Developer's responsibility to review and understand the full scope of the obligations of the Consulting Engineer.

Any verbal communication must be followed up with a written or digital (i.e., email) record of the communication, by one or more of the parties.

2.2 Classification of Project and Engineering Requirements

When applications are received, the Town Planning and Development department designates the application into one of four development/project categories: very small, small, intermediate and large developments. Fees and level of engineering review for a development will be determined by the project category in accordance with the fee schedule approved by Council and posted on the Town's website. The project categories and typical projects described below are both general and subjective and the Town reserves the right through the Planning and Development Department to reasonably determine a project's category. The project fee schedule can be found on the Town of Canmore website: www.canmore.ca.

Note that subdivisions are considered developments. In this section, subdivision refers to a specific area of land characterized by the splitting of larger parcels of land into smaller blocks, lots, reserves, roadways, rights-of-way, etc., and may include the installation of related municipal improvements on or adjacent to those lands to service developments on those lands.

Development in this section refers to buildings, structures or works located on one or more parcel of land in a new or existing subdivision and the related municipal improvements on or adjacent to the parcel to be developed.

The Town reserves the right to reasonably determine additional engineering requirements for any development application, should the application warrant such additional work. The engineering requirements for each development/project category are defined below.

2.2.1 Application of Project and Engineering Requirements

Acknowledging that standards and specifications, including the EDCG, change over time, the guidelines and specifications applicable to a submission to the Town for a project, development or subdivision will be those guidelines and specifications in effect and officially published at www.canmore.ca (or www.calgary.ca for referenced specifications as the case may be) on the date of submission to the Town (including fee payment) of a complete application.

2.2.2 Very Small Development

Very small developments typically refer to renovations, balconies, porches and accessory buildings with no new, or altering of, existing services, grades or drainage.

Although there is typically no engineering component involved, the Town reserves the right to have any project reviewed by the Town Engineer, or to ask that a Consulting Engineer be engaged should the Town feel that the project requires specialized knowledge (e.g., structural retaining walls, fuel storage tanks, etc.).

Typically requires no additional engineering permits or agreements.

2.2.3 Small Development

Small developments are defined as detached single-family dwellings, duplex, garages (including garage/garden suites), projects that involve changes in grades, services or drainage patterns, small industrial, institutional or commercial projects with a minimal engineering component, or other serviced buildings under 200m^2. The Town reserves the right to ask any Developer or Builder to obtain the services of a Consulting Engineer if they feel that the project requires specialized knowledge (e.g., structural retaining walls, complex servicing). Small developments that fall within the criteria outlined in the Stormwater section of the EDCG will require a Consulting Engineer for their stormwater requirements.

Minor on-site engineering review is required when there are changes in lot grading, drainage, stormwater management, or the lot is located in a Low Steep Creek Hazard zone.

In addition to the Town requirements mentioned above, certain small development infrastructure inspections must be witnessed by the Town. Service inspection services are offered by the Town for a fee. The Engineering Department requires a minimum of 24 hours advanced notice for these inspections (contact the Engineering Department at engineering@canmore.ca).

Alternatively, the Developer may submit a stamped letter and inspection report prepared by a Consulting Engineer for the inspection of water and sanitary services. If a Consulting Engineer is engaged they will be required to inspect all aspects of the service installation, inclusive of insulation (where required) and pressure testing.

Infrastructure inspections that must be conducted include the following:

- Verification of adequate slope and depth of water and sanitary lines

- Water (or air) pressure test (water service pipe and low pressure sanitary sewer pipe)
- Materials confirmation
- Insulation specifications and placement (if required)

Contractors must have the bedding and servicing in place but still exposed for inspections.

2.2.4 Intermediate Development

Any development that requires construction of new or replacement of water, sanitary or storm service connections beyond the parameters of Small Development as described above. Typically defined as multi-unit (3 to 10 units) projects, subdivisions creating 3 to 10 lots or less, or buildings with a gross floor area between 200m^2 and 2,000m^2.

These applications require a Consulting Engineer and a notice of engagement letter as outlined in the Submission Requirements (2.4), below. A Landscape Architect is required in cases where municipal landscaping will be provided.

2.2.5 Large Development

Large developments are defined as multi-unit projects greater than 10 units (may be integral to one structure or multiple structures); buildings with a gross floor area more than 2,000 m^2; commercial, industrial or institutional developments that require a Transportation Impact Assessment, and projects of unusual complexity (at the discretion of the Town) where significant variances to Town guidelines and standards are required.

Subdivisions creating more than 10 lots will be considered large developments.

These applications require a Consulting Engineer and a notice of engagement letter as outlined in the Submission Requirements section, below. A Landscape Architect is required in cases where landscaping on municipal lands will be provided.

2.3 Development/Subdivision Application Review Process

Development permits (DP) are required for most developments and must be obtained from the Town of Canmore Planning and Development Department.

The milestones detailed below outline the engineering review process for subdivisions and developments. The engineering review process timeline is based on these milestones and is intended to work alongside the requirements of the Planning and Development Department.

2.3.1 Milestone #1 – Pre-Application Meeting

A pre-application meeting is intended to provide guidance to a Developer or Builder regarding Town of Canmore expectations for a specific project, prior to an Applicant making significant investments of time and resources in a proposal

Pre-application meetings are required for various types of applications and are optional for small scale developments. Additional information is available at www.canmore.ca.

2.3.2 Milestone #2 – Development Permit/Subdivision Approval

The DP/subdivision approval is usually the first milestone of the review process for a development project.

A comprehensive description of the DP review and approval process is outlined in the Land Use Bylaw. The Town's website includes Development Permit Requirements Checklists specific to the various types of DP applications. If a pre-application meeting was held, Town administration will outline application requirements specific to the development based on their interpretation of the information provided by the Applicant. Section 2.5 provides additional information regarding the typical Engineering submittals required.

A Development Permit Approval is subject to conditions outlined in the Schedule A document, while an approval of Tentative Plan of Subdivision is subject to conditions outlined in the unratified extract. The Developer is responsible for understanding the conditions and ensuring they are met.

For small developments, a building permit (BP) may be the first milestone of the review process where a DP is exempted in the Land Use Bylaw.

Significant modifications to approved DP drawings will require submittal and approval of a new DP. Minor modifications may be considered by the Development Officer and Town Engineer, at their discretion.

2.3.3 Milestone #3 – Execution of Development Agreement/Subdivision Servicing Agreement

The Developer is free to start stripping and grading a site and construction of infrastructure after execution of a Development Agreement or Subdivision Servicing Agreement and once the Notice to Proceed (NTP) has been issued. In the case of a Development Permit, once the NTP is issued, infrastructure work can commence prior to issuance of a Building Permit unless otherwise conditioned in the Schedule A. The Developer is required to obtain the necessary Road Permits for work within Municipal Road ROW.

The following is required to execute the Development Agreement or Subdivision Servicing Agreement subsequent to issuance of a Development Permit or approval of Subdivision:

1. Approved detailed design drawings;
2. Approved securities estimate;
3. Certificate of Insurance (COI) with the Town named as additional insured;
4. Notice of Engagement;
5. Construction Management Plan (inclusive of ESC plan where required);
6. Satisfaction of Schedule A 'Prior to Construction' conditions or relevant conditions of subdivision approval.

The Town Engineer will issue the NTP upon execution of the agreement.

The grouping and application sequence of CCCs is detailed and recorded as a schedule that is part of the executed development agreement or subdivision servicing agreement and are used for determining securities. In Development Permit and Subdivision applications, securities are required for Town Municipal Improvements and for onsite private landscaping. CCC categories typically required for Development

Agreements and Subdivision Servicing Agreements and used for securities determinations are outlined below. Alternative classifications may be considered by the Town Engineer upon request by the Developer.

2.3.3.1 Securities Categories - Intermediate/Large Development Permit

- Municipal Improvements – Water and Sanitary
- Municipal Improvements - Stormwater
- Municipal Improvements - Surfaceworks
- Private Infrastructure - Landscaping
- Municipal Improvements - Landscaping

2.3.3.2 Securities Categories - Subdivision

- Underground Improvements
    - Water mains and hydrants
    - Sewer and water service connections
    - Stormwater pond facilities
    - Sanitary sewer system
    - Storm sewer system
- Surface Improvements
    - Surface drainage facilities
    - Sidewalk, curb and gutter, and catch Basins
    - Paved roads, paved lanes and paved walkways
    - Emergency access
    - Signage and pavement markings
    - Final lift of asphalt
- Shallow Utilities
    - Street lighting, walkway lighting, pathway lighting
    - Signalization
    - Power facilities
- Landscaping
    - Reserves (including play equipment, irrigation, furnishings etc)
    - PULs, medians, boulevards
    - Fencing

In order to establish the securities amount, the Developer must submit detailed cost estimates prepared by the Consulting Engineer and Landscape Architect based on the approved plans, and which follow the agreed upon CCC categories. In the event that actual tendered costs become available prior to Commencement of Construction of the Development Area, then the securities amounts will be adjusted to

reflect the actual tendered costs for construction. The securities amount is calculated by adding minimum 15% to the total value in order to account for Engineering, Geotechnical and contingency. A decrease in the required securities amount may be granted based on building performance commitments as described in Section 10 of the Land Use Bylaw.

2.3.4 Milestone #4 - Building Permit

Once a DP has been approved, a building permit (BP) is required. When a BP is released, the Developer can start construction of foundations and buildings.

Any proposed changes from the approved DP in the civil drawings, landscaping or site plan must be dealt with through the DP process as described above. Civil and municipal landscaping plans are not to be submitted with the BP application.

In the case of a single-family home, duplex or triplex for which a DP is not required, the site plan and servicing drawings will be submitted, reviewed and accepted with the BP application.

The requirements of a building itself are governed by the safety codes officer pursuant to the Alberta Building Code.

In a subdivision context, the Developer/Builder must ensure that the infrastructure facilitating water supply to the Lands is installed and functional prior to requesting the release of a Building Permit for any building to be serviced by the same.

2.3.5 Milestone #5 - Construction Completion Certificates

The Construction Completion Certificate (CCC) procedure is the process the Town Engineer uses to sign off on all municipal improvements performed by others. Developers of both subdivisions and developments must adhere to this process for successful project completion and for the return of securities.

2.3.5.1 Construction Completion Certificates - Categories & Classification

Separate CCC applications are required for private and public municipal improvements, including maps showing the extents of the infrastructure covered. Clear delineation of private Infrastructure and public municipal improvements and determination of the CCC categories is to be included in the subdivision servicing agreement or development agreement.

Municipal Improvements CCC

Municipal Improvements are works that the Town will own, operate and maintain when all of the Developer's obligations are met.

The intent of a Municipal Improvements CCC is to ensure that all components of infrastructure construction have been addressed. Drawings showing the extent of works covered must be submitted with all CCC applications. Templates for the Municipal Improvements CCC forms are provided in the appendices.

Typical categories for Municipal Improvements CCCs are described in the Securities section above.

Municipal improvements require a CCC, a two-year warranty period and a FAC. The two-year warranty period begins upon acceptance of the CCC.

Where a utility easement is required through or on private property and the infrastructure will be owned by the Town, the public municipal improvements process applies. Registration of the easement or URW is required prior to issuing CCC.

Private Infrastructure CCC

Private Infrastructure are works that are not maintained or serviced by the Town after the Developer's obligations are met.

Private Infrastructure requires a CCC process only, no warranty period applies. The intent of the private infrastructure CCC process is for the Consulting Engineer to confirm that the private infrastructure has been constructed in alignment with approved plans. The Consulting Engineer may determine the categories used for private CCC process, using the Town CCC categories above as a guide and must incorporate the following Private Infrastructure:

- Surfaceworks and Grading
- Water and Sanitary
- Stormwater
- Landscaping

The Town will use its discretion to determine if a Town inspection is required for portions of private infrastructure, based on the complexity of the infrastructure and the potential for impacts to Municipal Improvements. If the Town inspects portions of private infrastructure using its discretion, the Town will issue a record of the inspection to the Consulting Engineer with a copy to the Developer/Builder within 10 days of the inspection. The Town does not sign off on private CCC certificates for private infrastructure, however these certificates must be submitted to the Town prior to release of a Development Completion Certificate (DCC). Furthermore, CCC for private and public water and sanitary sewer systems are required for occupancy permits to be issued.

2.3.5.2 Construction Completion Certificates – Inspection Procedure

After either a public municipal improvement or private infrastructure is completed, the Consulting Engineer for civil works CCC or Landscape Architect for landscaping CCC must complete the following tasks in the order shown:

1. Inspect the municipal improvement or Private Infrastructure, record any deficiencies and advise the Contractor to repair any deficiencies. Once the Contractor has repaired the deficiencies, carry out further inspection(s) and subsequent repairs as required until satisfied with the corrections.
2. Ensure all related outstanding field orders are resolved.
3. Submit the CCC documents for Municipal Improvements for Town review and acceptance. Submit the CCC documents for Private Infrastructure for Town review for Occupancy or DCC purposes. The Town will advise the Consulting Engineer if an inspection of Private Infrastructure is required.
4. Arrange and conduct an inspection for Municipal Improvements attended by representatives of the Consulting Engineer/Landscape Architect and the Town Engineer. Attendance by the

Contractor and Developer is optional. Representatives of the Town's Engineering Department will be available for the site inspections within a reasonable time from the date of request (typically within two weeks).

5. If deficiencies in Municipal Improvements are noted at the time of inspection, a list of those deficiencies must be prepared by the Consulting Engineer/Landscape Architect and submitted to the Town Engineer for agreement.
6. When the deficiencies in Municipal Improvements have been corrected, the Consulting Engineer will, within a reasonable period of time, request a re-inspection of the deficient items with the Town Engineer. Re-inspection fees will apply in accordance with the Fee Schedule. The Consulting Engineer can request the Town Engineer to defer inspections of the corrected deficiencies to the FAC inspection.

An inspection fee will be charged to the Developer in accordance with the Fee Schedule for repeat and extra inspections beyond those listed above and for additional inspections requested by the Developer or Developer's representative.

2.3.5.3 Construction Completion Certificates – Notes

Acceptance of CCCs by the Town Engineer indicates only acceptance of the certificates that the Consulting Engineer has issued. The Town accepts no responsibility for deficiencies, failures, incomplete work, errors, omissions, faulty materials, design failures or non-performance of the design. Evaluation of the performance of the Municipal Improvements will be at the sole discretion of the Town Engineer.

It is the responsibility of the Developer to ensure that Municipal Improvements are constructed in accordance with the drawings accepted by the Town Engineer. Should failures during the warranty period occur in the Municipal Improvements as a result of deficiencies, failures, incomplete work, errors, omissions, faulty materials, design failures or non-performance of the design, then it is the responsibility of the Developer to direct the Consulting Engineer, Landscape Architect and/or Contractor to correct or redesign the Municipal Improvements to obtain suitable performance and acceptance by the Town Engineer.

When determining which items are essential or non-essential for CCC acceptance, the Town Engineer will utilize the latest edition of the CCC Checklist sheets on the City of Calgary website as referred to in the City's *Consulting Engineer's Field Services Guidelines*.

Note that the Town will only perform Landscaping inspections from May 15 to September 30, in good weather conditions, when deciduous trees and shrubs are in leaf and when the ground is free and clear of snow. CCC and FAC inspections for Municipal Improvements other than landscaping may be performed outside of these dates at the discretion of the Town, provided weather and snow conditions permit a reliable inspection.

A template of the Town CCC form is found in Appendix B.

The Town requires that record drawings for both Municipal Improvements and Private Infrastructure be submitted no later than 90 days after CCC acceptance. For Municipal Improvements, the Town requires that the record drawings be submitted no later than December 15 to allow time for the Town to add the new assets into its records.

2.3.6 Milestone #6 – Securities Release

Prior to release of securities pertaining to record drawings, record drawings must be submitted in both PDF and CAD formats to the Town of Canmore to the satisfaction of the GIS Department and in accordance with the Submission Requirements section. Record drawings are required for both Municipal Improvements and Private Infrastructure, inclusive of servicing, grading, landscaping and surfaceworks. Record drawings not conforming to City of Calgary standards, including syntax and formatting, will not be accepted. Record drawings must be received by the Town within 90 days of CCC acceptance.

The Town Engineer may use reasonable discretion to release a CCC certificate while withholding a portion of the securities to address deficiencies. In this case the Consulting Engineer will produce a cost estimate for the corrective actions, which will be reviewed by the Town. An additional 15% will be added to the cost estimate for the corrective actions for Engineering, Geotechnical and Contingencies and the total will be withheld until the deficiencies have been resolved.

Upon acceptance of a CCC or FAC certificate, the Town Engineer will endeavour to authorize a securities reduction within 10 days. This authorization will trigger the administrative process to return the authorized amount. Typically, securities are reduced as follows:

- 60% - for successful CCC acceptance
- 20% - for successful record drawings acceptance
- 20% - for successful FAC acceptance

For higher value projects such as large developments, the amount of securities retained for record drawing acceptance will be capped at a maximum of $150,000 per major securities category as described below:

- Water, Sanitary Storm
- Surface
- Shallow Utilities
- Landscaping

The Town will retain a minimum $5,000 security until the final outstanding FAC is accepted by the Town Engineer.

2.3.7 Milestone #7 – Occupancy

When Building Permit occupancy is granted, building owners and/or tenants can occupy the premises. A Developer/Builder typically applies for Building Permit occupancy when construction is very near completion.

The Planning and Development and Engineering Departments have requirements that must be satisfied prior to a Builder/Developer being able to book the Safety Codes inspection of the building for occupancy. Please contact the Planning and Development Department for a list of their requirements.

For small developments, in addition to any planning and safety code requirements, Engineering will review the following:

1. Water and Sanitary services passed inspection, or service exemption letter on file;

2. Curb Stop – visible, undamaged, accessible and level with surface;
3. Rough Grading and Overland Drainage completed;
4. Documentation received for Low Pressure Sanitary Service (if applicable);
5. Letter of compliance received for retaining wall(s) exceeding 1.0m in height.

At the discretion of the Town, outstanding items may be noted and resolved subsequent to occupancy but prior to file closure. Item (1) listed above is a strict requirement prior to occupancy.

For intermediate and large developments, in addition to any planning and safety code requirements, Engineering will require the following:

1. Municipal Improvements CCC accepted for water and sanitary servicing (where applicable);
2. Private Infrastructure CCC accepted for water and sanitary servicing.

Occupancy applies to Building Permits and not to subdivision or development permit; however, it should be noted that, in new subdivisions, the subdivision will need to have obtained CCC acceptance of the underground infrastructure for Municipal Improvements and acceptance of CCC for Private Infrastructure (water and sanitary) for occupancy to be granted to the pertinent development lots.

2.3.8 Milestone #8 – Warranty Period and Maintenance Requirements

The acceptance of a CCC for Municipal Improvements by the Town Engineer signals the beginning of the Warranty Period. The Warranty Periods as described below commence on the date of CCC acceptance:

- Water, Sanitary and Storm: two years
- Stormwater Pond Facilities landscaping within High Water Level area: three full growing seasons
- Surface: two years
- Shallow Utilities: two years
- Landscaping: two full growing seasons

A growing season means the time between the dates the Town accepts the CCC to:

a) June 30 of the following year; or
b) The date when, in the sole opinion of the Town, the irrigation system(s) are operating and the vegetation is in full leaf, whichever event occurs last.

Extended warranty periods for deficiency repairs may be required at the discretion of the Town Engineer, acting reasonably, to a maximum of one year after repair completion notification by the Consulting Engineer.

2.3.8.1 Infrastructure

During the Warranty Period the Town assumes the ownership, normal operation and routine maintenance (excluding repairs or matters arising from inadequate or deficient design or construction). During the Warranty Period, the Developer is responsible for the adjustment of valve boxes, manholes, hydrants and other appurtenances where top lift of pavement or other such grades are not yet established.

Prior to FAC application the Developer must submit a CCTV inspection report of Town sanitary and storm sewers. Should flushing and cleaning of sewers and related appurtenances be reasonably required by the Town Engineer this work must be undertaken by the Developer and accepted by the Town prior to acceptance of the FAC.

2.3.8.2 Landscaping

During the applicable Warranty Period for Municipal Improvements - Landscaping, the Developer is responsible for maintaining all landscaped features, including but not limited to, fencing, turf, trees, shrubs, trails, signage, irrigation systems, play equipment and “mutt mitt” dispensers. The Developer is responsible for providing and maintaining adequate and appropriate measures to protect landscaping from damage.

Prior to acceptance of the Landscaping Construction Completion Certificate, the Developer must submit maintenance schedules satisfactory to the Town with respect to grass cutting, watering, “mutt mitt” dispenser refilling, litter control and emptying of pedestrian waste containers; and maintenance programs for fertilizing and weed control, tree care and playground inspections.

During the Warranty Period for Landscaping, the Developer is responsible for advising the Town of any observed private encroachments onto Municipal Reserves or Environmental Reserves.

2.3.9 Milestone #9 – Final Acceptance Certificate

A successful Final Acceptance Certificate (FAC) inspection signifies the end of the Warranty Period and marks that time at which municipal improvements are the full responsibility of the Town for operations, maintenance, and repairs. All deficiencies must be rectified to the satisfaction of the Town Engineer prior to signing of a FAC. Generally, a successful FAC signifies the end of a Developer’s obligations for public municipal improvements.

The Consulting Engineer and/or Landscape Architect must follow the process outlined above for Town CCC inspections when requesting a FAC inspection.

A template FAC form is found in Appendix B.

2.3.10 Milestone #10 – Development Completion Certificate

A Development Completion Certificate (DCC) is issued by the Planning and Development Department when all obligations have been met by the Developer. All CCC certificates for Private Infrastructure and FAC certificates for Municipal Improvements must be issued in order to release DCC.

2.4 Submission Requirements

Development Permit and Subdivision application requirements are outlined in checklists available at www.canmore.ca. The Town will provide clarifications on documents required to form a complete application as part of the pre-application process. This section of the EDCG is intended to provide information on the format and contents of submittals.

All submission forms including drawings, letters, reports and any other documentation must be submitted in PDF digital format and authenticated in accordance with APEGA requirements. Original applications are submitted through the Planning and Development Department. PDF drawing packages should be limited

to a maximum size of 40MB where practical and must be flattened and have all viewports deleted. In cases where this file size cannot be respected, consideration may be given to providing multiple smaller files.

Consulting Engineers and Landscape Architects must submit record drawings in PDF and CAD format, unless permission is granted by the Town to use a different format. As a default, the Town will require that civil construction CAD drawings conform to the layer names, colours and linetypes described in the Civil Layers reference document in the City of Calgary's CAD Standard. See the City of Calgary website for details and downloadable templates. In addition, all submitted CAD drawings must meet the Spatial Reference Standards described in Section 2.5.6.3.

Applications that are incomplete or are not in accordance with the requirements will be rejected.

All revisions to existing applications for subdivisions or developments must include a letter prepared by the Consulting Engineer and/or Landscape Architect which gives a description of the revisions. Any significant variances from the Town's guidelines that are proposed by a Developer or Consulting Engineer must be discussed with the Engineering Department prior to making an application. If proposed variances are minor, they may be noted in the application letter.

2.4.1 Notice of Engagement

The Notice of Engagement letter for Field Inspection Services from the Consulting Engineer/Landscape Architect may optionally be submitted with the application, but is required prior to execution of the Development Agreement or Subdivision Servicing Agreement. A sample letter is provided in Appendix B.

2.4.2 Field Services

Field services will be in accordance with the City of Calgary's Consulting Engineers Field Services Guidelines. Field services shall be carried out by and are the responsibility of the Consulting Engineer/Landscape Architect for private and/or public municipal improvements. The Consulting Engineer/Landscape Architect is responsible for ensuring that all field service staff under his or her supervision are trained as outlined in the Consulting Engineers Field Services Guidelines. In addition to the City of Calgary requirements, field service staff must be familiar with the Town of Canmore's standards, guidelines and procedures.

2.4.3 Level of Service

The Consulting Engineer/Landscape Architect must provide Field Inspection services at a level of service which adheres to the stipulations of the City of Calgary *Consulting Engineer's Field Services Guidelines*. It will also be the responsibility of the Consulting Engineer/Landscape Architect to employ professional, knowledgeable, qualified staff to provide the above services and to adequately submit all required documentation, field submittals and record drawings as stipulated in these guidelines.

The Town Engineer will immediately advise the Developer if, in the Town Engineer's opinion, the Consulting Engineer/Landscape Architect is not providing sufficient inspection and supervision according to generally accepted engineering practices.

2.4.4 Plot Plan

A surveyed plot plan shall be prepared by an Alberta land surveyor and must show all existing/proposed legal components/settings of the property. The plot plan must be submitted as part of the development application. The plot plan is to be submitted digitally; however, it may be accompanied by a hard copy.

2.4.5 Landscaping Plans

Detailed landscape and construction drawings are a requirement of applications where municipal improvements will be built on Town owned land or land operated by the Town. They must be provided digitally and should include the following:

- Detailed layout plan
- Detailed planting plan
- Detailed grading plan
- Detailed irrigation plan (where applicable)
- Details of solid waste facilities including locations
- Construction details of all landscaping improvements
- Specifications for all landscaping improvements

Construction landscape plans and specifications must also identify natural features intended to be retained and detail the intended methods of protecting and maintaining natural features during construction.

Site plans must identify Town owned trees. A Tree Protection Plan may be required, please contact the Parks Department for further information.

2.4.6 Design Brief

Intermediate and Larger development applications require an engineering report prepared by the Consulting Engineer that identifies the proposed water and sanitary sewer servicing design for the proposed development, the impacts on the capacity of the existing infrastructure and possible requirements for public infrastructure upgrades. This design brief must include a declaration that the design respects the Alberta Environment Guidelines and Standards and the relevant Town of Canmore Guidelines and Standards, or must specify where the design does not comply and provide a justification.

The Town's *Utility Master Plan* as published on www.canmore.ca must be used as a reference document in the preparation of this report.

2.4.7 Municipal Improvements Plan

For intermediate and large developments, a plan showing the proposed ownership (hence operation and maintenance obligations) of the public versus private municipal improvements (both offsite and onsite) is required.

2.4.8 Stormwater Management Plan

Intermediate and larger development applications require a complete stormwater management plan. This plan must be submitted in report-style by a Consulting Engineer, however in the case of intermediate developments the Town Engineer may accept that the calculations be provided on the relevant drawing in lieu of a report. In the case of Large Developments, the proposed terms of reference for the report should be submitted to the Town Engineer for review, using these guidelines, following the pre-app meeting for the proposed development and prior to submittal of the application. The Town Engineer will endeavour to provide feedback on the proposed scope within 10 working days of submission.

2.4.9 Transportation Impact Assessment

A Transportation impact Assessment (TIA) may be required for development and subdivision applications. The Town generally requires a TIA according to the criteria outlined in the City of Calgary *Transportation Impact Assessment Guidelines*.

Should the Trip Generation be expected to be below the established thresholds, the Town Engineer may require that the Developer submit a memorandum from a Transportation Engineer confirming the anticipated volumes. On occasions, despite the development not reaching the threshold value abovementioned, a TIA will still be requested due to particular circumstances in the area surrounding the project or due to concerns of the surrounding/adjacent communities, or other circumstances that the Town Engineer deems appropriate to review.

For Developments in areas supported by a subdivision level TIA, a site specific TIA may be required if traffic generation exceeds the values assumed for the site in the subdivision level TIA.

The proposed terms of reference for these reports must be submitted to the Town Engineer for review, using these guidelines, following the pre-app meeting for the proposed development and prior to submittal of the application. The Town Engineer will endeavour to provide feedback on the proposed scope within 10 working days of submission.

2.4.10 Geotechnical Study

For all applications the Consulting Engineer must follow the requirements outlined in the City of Calgary *Geotechnical Report Guidelines for Land Development Applications*.

Development Permit applications typically require the submittal of a site-specific geotechnical study. In areas where stormwater drainage is proposed to be managed that includes infiltration measures, the study should include permeability testing to inform the stormwater design.

In certain cases, it may not be possible to perform infiltration testing prior to development of the stormwater management plan. In these cases, the Consulting Engineer may submit a stormwater management plan with assumed infiltration values for the purpose of the application. In these cases, revised plans incorporating measured infiltration values are required prior to commencement of construction and will be included as a condition of development approval.

2.4.11 Wellhead Protection Area

For projects located in the wellhead protection area, a hydrogeological report may be required, depending on the type of development proposed, in accordance with the Town's *Land Use Bylaw*. For projects in the wellhead protection area conforming to the *Land Use Bylaw*, the Town Engineer may alternatively require a letter from the Consulting Engineer stating that no adverse impacts on the aquifer are anticipated due to construction or the design of the project.

2.4.12 Construction Management Plan

A Construction Management Plan is required for all Intermediate and Large Developments. The Construction Management Plan Guidelines in Appendix G specify the minimum requirements for the plan. These Guidelines are updated from time to time, the Applicant is encouraged to obtain the latest version on the Town's website.

The Construction Management Plan must identify the location and swing radius of any overhead cranes. Crane Swing Limitations (No Fly Zones) are to be clearly marked on the plans. If the crane swing radius occupies airspace above municipal lands or rights of way, then a crane swing agreement will be required prior to erection of the crane.

The Developer/Builder is responsible to submit a CMP and have it accepted by the Town Engineer prior to execution of the Development Agreement or Subdivision Servicing Agreement.

For Subdivisions and Developments with significant Municipal Improvements, the Developer must invite the Town Engineer to attend the construction kick-off and subsequent regular site meetings regarding Municipal Improvements.

2.4.13 Site Grading/Overland Flow Drainage Plan

The site grading/overland storm drainage plan will be used for both planning and engineering purposes. The site grading/overland storm drainage plan must reflect the requirements outlined in the grading and storm water management sections of the EDCG. The site grading/overland storm drainage plan is meant to show three main aspects of design as follows:

- Design elevations of earthworks – specifically those along property boundaries and building faces
- Building floor elevations, storm sewer, invert elevations and locations
- A representation of how overland storm drainage will behave in the design storm event

Details of the site grading/overland storm drainage plan must include the storm design features listed below. See Figure EDCG AP 2.1 Grading Plan Requirements.

2.4.13.1 Small Developments

- Directional flow arrows based on finished grading for minor event
- Directional flow arrows based on finished grading for major event
- Vegetative drainage features including berms and swales
- Location and details of weeping tile assembly and associated infiltration pit

- Finished grading of retaining wall (sufficient points to show slope)

2.4.13.2 Intermediate/Large Developments

In addition to the requirements for detached dwellings and duplexes, larger projects will require more detail including:

- Areas outside the property lines that drain into the development
- Constructed drainage features including catch basins and piped system infrastructure, size, material specifications
- Construction details and locations of all infiltration basins
- Any infiltration values used in the storm calculations
- Storm specific landscaping that is part of stormwater treatment
- Drainage areas and coefficients of run-off
- The boundaries of high-water levels for detention ponds
- Trapped low areas in the subdivision

Design calculations must also be provided indicating the hydraulic design of the system.

2.4.14 Sites with Building Grade Plan and Lowest Top of Footing Requirements

Typically, when a subdivision is created, the Consulting Engineer will create a building grade plan (also known as a grade slip, development grading plan) for each single family and duplex development lot created. Developments in new subdivisions should conform to the site servicing and grading requirements shown on the accepted building grade plan for that subdivision.

If a building is proposed with a footing elevation lower than the lowest top of footing elevation shown on the accepted building grade plan, the proposal must be accompanied by a letter from a qualified Consulting Engineer addressing the proposed change. The statement must indicate that the proposed change will have no adverse impact on the development or the servicing of that site, or alternatively, that all impacts and required mitigation have been addressed in the proposed change. This deviation must be noted on the lot grading plan accompanying the building permit application. See Figure EDCG AP 2.2 Building Grade Plan – Minimum Requirements.

2.5 Additional Documentation Required at Construction Completion Certificate Submission

All testing noted below must be performed by an independent testing firm contracted by the Developer or Consulting Engineer. For small developments, testing results must be submitted prior to release of excavation permit deposits. The following additional documentation is required with CCC submissions:

- Letter from geotechnical engineer if weeping tile is not installed
- Compaction results as per requirements of the excavation permit for work within Municipal right of ways
- For footing elevations lower than that indicated on the building grade plan, a letter from a Consulting Engineer representing the Builder as outlined in the requirements above.

- Where applicable, Utility Rights of Way for Municipal Improvements on private property are to be registered on title prior to accepting CCC.

2.5.1 As-Constructed Grade Certificate

This requirement applies to the construction of a duplex, semi-detached or single-detached dwelling; a multifamily development; and any building on a commercial or industrial site.

The Developer or Builder must submit an as-constructed grade certificate within six months of the date that Occupancy is granted by the Town. In the case of sites with multiple buildings, this applies only if construction has not begun on a subsequent building on that parcel of land within that period of time.

This document reflects both the proposed (original design) and constructed surface grades. The As-Constructed Grade Certificate must indicate that grading was completed within the acceptable tolerances specified in Table 2-1 below, as adapted from City of Calgary bylaw 32M2004. The Certificate must be certified by a Professional Land Surveyor, Consulting Engineer or Registered Architect.

2-1: Acceptable Grading Tolerances

Item	Acceptable Grade Tolerances	Over-Riding Minimum Grades	Other
Top of Footing Verification	±0.15m	Top of footing must not be lower than the recommended lowest top of footing per Building Grade Plan	If house or building constructed with minimum entrance grade below minimum grade (MG) or Registered Minimum Grade (RMG) specified, 0.08m maximum tolerance
As constructed grades for landscape after loaming	±0.15m	Meet intent of Building Code	Maximum grade ratio of 3:1 without a retaining wall
Areas within 1.2m of house or building foundation wall under decks and cantilevers		Meet intent of Building Code	
Concrete driveways, sidewalks and patios		Meet intent of Building Code	Not applicable to driveways in cases where below-grade garages are approved
Intermediate/Large Developments			Trap-low areas must have volume capacity set out in Stormwater Management Plan

2.5.2 Municipal Improvements - Deep Utilities

2.5.2.1 Record Drawings

The layout plan must indicate all deep utilities (i.e., water, sanitary sewer and storm sewer). Direction of flow, alignments, locations in relation to property line or mains as well as the purpose, material type and size of mains is required on the plan. Related infrastructure pertaining to these utilities is also required (catch basins, manholes, hydrants, and appurtenances). A metric chainage, where appropriate, must be shown. Design calculations for water main and service sizing, as well as sanitary design calculations should be referenced on the drawings.

The Consulting Engineer is responsible to show the placement of all shallow utilities as well as associated street furniture inside of municipal rights of way or easements. Pedestals, transformers or other shallow utility appurtenances must be shown with approximate dimensions.

- Water record drawings must include the following information:
    - valves, bends, tees and junctions of all watermains
    - main and service sizes, material type and class
    - curb stop locations
- Sanitary record drawings must include the following information:
    - locations and surveyed inverts of manholes and catch basins (drywells)
    - main and service sizes, material type and class
    - slopes of gravity mains and services
    - service invert elevations at terminus

2.5.2.2 Water System Reports – Private Infrastructure and Municipal Improvements

CCC submissions for watermains and hydrants must include the testing and documentation as detailed in Section 4 of the EDCG. The Private Infrastructure CCC shall also meet the testing and documentation as detailed in Section 4 of the EDCG. By submitting test results with a CCC application the Consulting Engineer certifies that they have reviewed the tests and that the results meet all applicable standards and guidelines. The results below are required for both Private Infrastructure and Municipal Improvements except where otherwise noted:

- Pressure testing
- Bacteriological testing
- Hydrant flow testing
- Compaction test results for public Municipal Improvements

2.5.2.3 Sanitary and Storm System Reports – Municipal Improvements

CCC submissions for Municipal Infrastructure sanitary and underground stormwater works must include the following testing and documentation:

- A leakage test must be completed under the supervision of the Consulting Engineer as per Section 5 of the EDCG. All public mains with inverts below the 1:100-year groundwater elevation must be tested.
- A pressure test shall be completed for low pressure sewer systems as per Section 5 of the EDCG.
- Compaction test results (trench backfill) shall be provided for public Municipal Improvements. Compaction testing must be done so there is adequate representation of the trench backfill area.
- A CCTV inspection shall be completed and must include all newly placed public mains that are 150 mm or larger. The Consulting Engineer must view and sign off on the CCTV inspection results. The CCTV inspection results must be submitted to the Town digitally and must include videos, a summary report and the Consulting Engineer's verification. A subsequent CCTV inspection is required to be completed not more than 30 days prior to FAC application.

2.5.3 Municipal Improvements - Surface Works

2.5.3.1 Record Drawings

The layout plans for surface works must indicate all locations and measurements (widths and radii etc.), and the type of material used for Municipal Improvements – Surface Works, such as but not limited to, roads, lanes, parking areas, sidewalks, walkways, pathways. The plans must indicate the extents and type of curbs and gutters. Plans must include the location of street signage, traffic signage, pavement markings, animal proof waste containers and postal kiosks. Separate details may be required for corner detailing at intersections.

CCC submissions for Municipal Improvements surface works must include the following testing and documentation.

2.5.3.2 Concrete Works

- Concrete Strength Test Results: for concrete on Municipal Improvements for surface works
- Compaction results for base, sub-base and sub-grade on Municipal Improvements beneath concrete surface works

2.5.3.3 Paved Roadways (First Lift) And Pathways

- Marshall Mix Analysis of the asphalt material (where required by City of Calgary)
- Compaction results for base, sub-base and sub-grade – include Municipal pathways
- Gradation tests for base and sub-base granular material
- Compaction tests for first lift asphalt
- Paving (second lift – if required)
- Marshall Mix Analysis of second lift asphalt (where required by City of Calgary)
- Compaction tests for second lift asphalt

2.5.4 Municipal Improvements – Utility Facilities

2.5.4.1 Record Drawings

Record drawings and operation and maintenance (O&M) manuals must be submitted with the CCC submission for all facilities forming part of Municipal Improvements. See Section 2.3 of the EDCG for more information.

Record drawings for Utility Facilities such as lift stations, pump houses, PRV chambers, reservoirs, must include the following details:

- Description and location of the facility
- Architectural record drawings
- Electrical and instrumentation record drawings (schematic and PLC programming)
- Mechanical record drawings (process piping, pumps, schematics, probe settings, HVAC, etc.)
- Equipment manufacturers' information

2.5.4.2 Operations and Maintenance Manuals

Operation and maintenance (O&M) manuals must be submitted to the Town for Municipal Improvements constructed along with record drawings. The O&M manuals must be prepared according to the requirements outlined in this section. Other documents (ex: Construction Contract Documents) with the Town for specific Municipal Improvements or capital projects may include more detailed requirements outside of the requirements of the EDCG.

The O&M manual must be an organized compilation of all operating and maintenance data pertaining to any facility provided by the Developer and must be prepared by the Consulting Engineer in electronic and hardcopy formats. Manuals are to be provided in a three-ring or similar type of binder with hard covers and spine, divider sheets with labeled tabs and envelopes for over-sized inserts. The binder must be of heavy-duty construction, suitable for removing and inserting pages, and of adequate size for the material presented. The O&M manual may include more than one volume. All binders must be clearly labeled with the date, name and location of the facility.

Three complete hard copy sets of the O&M manuals and one digital version are to be submitted to the Town prior to, or together with, the CCC application. The O&M manuals are subject to review by the Town Engineer prior to acceptance by the Town. Operation and maintenance manuals must include, but not be limited to, the following information:

- List of names and contact details of firms involved in the design, construction and supply of equipment or services for the facility
- General description, application and operating conditions of the facility
- Equipment manufacturer's detailed technical information including installation, operation and maintenance instructions, parts lists and component diagrams
- Installation and performance test results
- Service and repair instructions
- Inspection compliance certificates

- Warranties and guarantees

2.5.5 Municipal Improvements - Landscaping

2.5.5.1 Record Drawings

Record drawings must illustrate the Municipal Landscaping Improvements as constructed, including:

- Detailed layout plan
- Detailed planting plan
- Detailed grading plan
- Detailed irrigation plan (where applicable)
- Details of solid waste facilities including locations
- Construction details of all landscaping improvements
- Specifications for all landscaping improvements

For information about irrigation system record drawings, see Section 10 of the EDCG.

2.5.5.2 Tangible Capital Asset Accounting

A document detailing the following parameters must be submitted with the record drawings for Municipal Improvements – Landscaping:

- Total lengths and width of trails (asphalt and gravel/clay)
- Furniture inventories
- Park signage inventories
- Playground inventories
- Fencing quantities
- Irrigation system inventories
- Solid waste bins
- Total area of maintained turf/sports fields/active areas (municipal reserves)
- Unmaintained natural areas (environmental reserves)

The following information is required for each new improvement:

- Installer's name
- Manufacturer
- Supplier
- Cost
- Part number (where applicable)
- CCC date

2.5.6 Electronic Data Submission Requirements

2.5.6.1 Delivery Methods

Data will be provided by email, FTP site, external file sharing, or by an alternate method as approved by the Town.

2.5.6.2 Acceptable File Types

Data must be provided in PDF and CAD format. All files must adhere to the City of Calgary CAD Standard and meet the Spatial Reference standards below. City of Calgary downloadable CAD templates may be used to assist in the preparation of drawing submissions.

2.5.6.3 Spatial Reference Standards

All data must be provided in NAD83 3TM projection with reference meridian being 114° West. as per the City of Calgary CAD standard. The well known ID (WKID) of this horizontal coordinate system is 3776, defined by the European Petroleum Survey Group (EPSG) authority.

Vertical geodetic elevations must be provided in the Canadian Geodetic Vertical Datum of 1928 (CGVD28) as per the City of Calgary CAD standards. The well known ID (WKID) of this vertical coordinate system is 5713, defined by the European Petroleum Survey Group (EPSG) authority.

2.6 Other Engineering Permits

This section of the EDCG is provided to advise Developers, Consulting Engineers and Builders of permits that may be required prior to any construction in the Town of Canmore. The intent is to provide Applicants with the information necessary to undertake construction. Please note that failure to comply with the permit application instructions or permit conditions may result in safety issues, processing delays, rejected permit applications and/or a stop work order.

2.6.1 Utility and Pipeline Locations

Prior to commencing work, the Contractor shall contact the appropriate agencies listed below and other private utility locator as required to locate existing underground utilities and pipelines in or adjacent to the construction work site prior to commencement of work. Any utility companies not covered under Utility Safety Partners as well as EPCOR shall be contacted for locates of water, sanitary and storm utilities.

Town owned underground cables servicing traffic signals and pedestrian lighting are not registered with Utility Safety Partners. It is the Contractor's responsibility to identify if the site is in proximity to these facilities and to engage a private utility locator. Upon request to engineering@canmore.ca, the Town of Canmore will provide drawings that indicate the approximate locations of these facilities to assist the private utility locator. Note that drawings may not be available for all facilities.

- Utility Safety Partners (Click before you dig): utilitysafety.ca
- EPCOR (Water and Sanitary Utilities): canmorelocates@epcor.com
- Town of Canmore: engineering@canmore.ca

2.6.2 Road Right-of-way Usage Permits (Road Use Permits)

Road use permits are required for any work within a Town of Canmore road right-of-way prior to any construction activity or placement of construction equipment or materials, including oversize equipment or structure moves. Please see the Town of Canmore's website at www.canmore.ca for the application form and process. Applications must be submitted a minimum of four full business days in advance. If a partial or full road closure is required, the application must be submitted according to the following timelines:

- Arterials and transit routes – 20 business days prior to work
- Collector roads – 10 business days prior to work
- Local roads – four business days prior to work.

In emergency situations the Town may waive or reduce the minimum advance notice requirement.

Note that provincially owned and operated highways exist inside Canmore municipal boundaries such as Highway 742 (locally partially named Three Sisters Drive, Three Sisters Parkway and Spray Lakes Road), Highway 1, and Highway 1A. Prior to any work on/near these provincial highways, the Applicant/Contractor is to contact Alberta Transportation and Economic Corridors and obtain appropriate permits.

Traffic control person (flag person) accreditation is required by the Town on arterial and collector roads when a directional closure is required. Any individual acting as a traffic control person must be properly trained.

2.6.3 Permission to Work Permits – Outside Regular Hours

A permission to work permit is required when an Applicant or Contractor wishes to work before 7:00 a.m. and after 10:00 p.m., Monday to Saturday, and any time on Sundays or statutory holidays, in accordance with the Town's Community Standards Bylaw. The application and further information about this process is available on the Town of Canmore's website at www.canmore.ca.

2.6.4 Excavation Permit

An excavation permit is required to excavate or break-up the surface of a road, lane/alley, sidewalk or landscaped area within a Town owned road or utility right-of-way or other public land (e.g., parks and municipal reserve). Please see the Town of Canmore's website for the most up-to-date application form and process. Applications must be submitted a minimum of four full business days in advance. If the work is to take place within road right-of-way, a Road Use Permit will be required as described above. If the excavation is approved and secured through a Development Agreement or Subdivision Servicing Agreement with Consulting Engineer involvement, no Excavation Permit is required.

2.6.5 Blasting Permit

A blasting permit is required for all blasting operations within the Town of Canmore and shall conform to Town's *Regulation of Explosives Bylaw* 32-96, the provisions of the *Explosives Act* (Canada) and the regulations made thereunder, and with the provisions of the *Occupational Health and Safety Act - General Safety Regulation*. In the event of conflict between any of these, the more stringent shall take precedence.

As there is inherent danger with blasting activities, these applications shall be handled on a case-by-case basis. The application for a blasting permit can be found on the Town of Canmore's website at www.canmore.ca.

2.6.6 Demolition Permit

A demolition permit is required whenever an existing structure is to be demolished or moved. Demolition permit applications are submitted through the Planning and Development Department. Procedures and requirements for utility disconnects and waste disposal requirements are dealt with by the Engineering Department through this permit process in addition to Building Code requirements.

2.6.7 Cross Reserve Permit

A Cross Reserve Permit, applied for through the Town Parks Department, is required for any work or travel on Town owned or managed public lands, such as Municipal Reserves, Environmental Reserves and Park spaces.

2.6.8 Crane Swing Agreement

When preparing a Construction Management Plan, the Developer or Builder must anticipate the erection of a crane and provide its location and swing radius in the plan. Prior to erecting and operating the crane, the Developer is required to enter into a Crane Swing Agreement with the Town.

2.6.9 Engineering Department Fees

The schedule of fees assessed by the Engineering Department for engineering services is reviewed and updated annually. The current *Master Fee Schedule* is available on the Town of Canmore's website at www.canmore.ca.

SECTION 3 – SITE GRADING AND OVERLAND DRAINAGE

TERMS OF USE

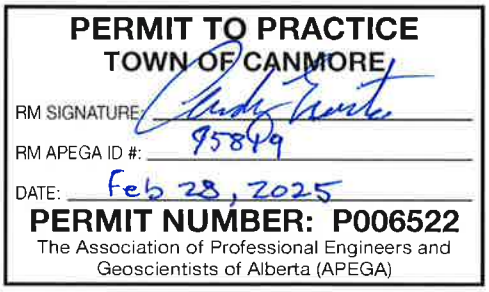
The "2025 Engineering Design and Construction Guidelines, Section 3" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

FEB 28, 2025

Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 3" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

3.0 Site Grading and Overland Drainage

The intent of this section is to ensure the protection of property from flooding, to encourage stormwater infiltration and to provide guidelines for overland drainage.

3.1 Design Considerations

Where developments and subdivisions exist in high groundwater conditions, the Town reserves the right to ask for a geotechnical or hydrogeological investigation to address specific issues related to groundwater.

3.1.1 Grading Considerations

Grading for all developments should be kept to a minimum where practical and feasible considering servicing, road access, emergency access or other factors. Building and site layouts that accommodate and conform to the pre-development landscape as much as reasonably possible should be considered. alterations to the natural topography should be minimized as per the Town's *Guidelines for Subdivision and Development in Mountainous Terrain*.

3.1.2 Lowest Top of Footing

Lots with existing development grading plans generally have a dictated lowest top of footing elevation. In cases where applications do not have a dictated lowest top of footing elevation, a Consulting Engineer should be engaged to confirm if a building can be serviced by gravity for the sanitary sewer system or if a sewage lift pump will be required. Note that gravity services are preferred over sewage pumping due to complexity, energy consumption and maintenance requirements.

3.1.3 Grading Transition Between Properties and Street ROW

Particular attention must be given to transitions with neighboring properties on Small and Intermediate Developments, especially in redevelopment scenarios, to ensure that proposed grades transition smoothly to existing grades on adjacent properties. Designers of Small and Intermediate Developments will be required to show the existing grades as per the plot plan on all submissions.

Large Developments will need to consider overall transitions and surrounding grades in an appropriate context to the application.

When developing in the valley bottom, the Minimum Floor Elevation must respect the elevations in Figure EDCG HLC 9.8, 1:100 Year Design Groundwater Elevations and Figure HLC 9.3, Overland Flow Elevations, as outlined in the *Land Use Bylaw*. Developers should be mindful of nearby grades that are not reflected in these figures.

In some redevelopment cases, using these elevations without being mindful of nearby grades can cause the proposed dwelling to fall in a low spot with respect to the surrounding area grades and eliminate the possibility of an escape route for a major event. See Figure EDCG GRD 3.1 Overland Escape Route, for more information. Developers are required to have their legal plot plan reflect elevations of nearby parcels that will fall higher than their minimum habitable floor elevation.

The Engineering Department reserves the right to dictate a higher minimum habitable floor elevation should they reasonably assess that a proposed habitable space may be adversely affected by stormwater runoff. The Land Use Bylaw allows for an adjustment of Maximum Building Height for the purpose of ensuring positive drainage.

3.1.4 Grading and Stormwater

Grading plans should be mindful of the stormwater management of the application area and Consulting Engineers should be familiar with the information in the Stormwater section of the EDCG (Section 6). Developers are reminded that grading should not direct stormwater runoff exceeding pre-development rates and patterns to neighboring private properties, Town sidewalks or onto a lane or street, except in accordance with an approved grading plan.

Lots should be graded in such a way that quantity and velocity of surface runoff is minimized, and that infiltration and detention is maximized, as reasonably feasible or in accordance with applicable Stormwater Management Plans.

Grading of lots should follow the approved development grading plan where available.

Where there is no existing development grading plan (or in the case of a re-development), two general approaches to grading should be used which are described in the following figures: Figure EDCG GRD 3.2 Lots in Valley Bottom: General Grading, and Figure EDCG GRD 3.3 Lots on Slope: General Grading.

It should be noted that grading is intrinsically related to stormwater and landscaping. Consulting Engineers should consider these three areas concurrently. As a general rule, to distinguish landscaping from grading, Consulting Engineers are asked to consider the shape of the land to be the grading, and the landscaping to be the plantings themselves on top of that shaped land. Should discrepancies arise between grading and landscaping design, the grading plan will always govern over the landscaping plan.

3.1.5 Snow Removal and Storage

Site plans for Intermediate and Large developments are required to show at least one proposed location for snow storage or describe the approach to snow management. Snow storage locations should not impede access to or the function of bicycle racks, sidewalks and active transportation facilities.

Consideration should be given to snow removal and storage during design to minimize the amount of deicing chemicals required. This can be achieved by considering the flow paths created by snow melt, which can create diurnal melting/icing cycles, leading to increased use of deicing chemicals which can negatively impact the quality of soils and receiving waters.

3.1.6 Slope Stability

For all applications the Consulting Engineer should follow the requirements outlined in the City of Calgary *Geotechnical Report Guidelines for Land Development Applications*. This guideline establishes the documents to be submitted with an application and defines the testing and reporting methods.

Slope stability reports are required for all sites where existing or final grades exceed 15% or where, in the opinion of the Town Engineer, slope stability is considered to be a potential concern.

All land proposed for development as defined in the City of Calgary Geotechnical Report Guidelines for Land Development Applications must have a minimum Factor of Safety (FOS) of 1.5 against slope failure. Lands with a FOS less than 1.5 may be taken as Environmental Reserve at subdivision at the discretion of the Town.

Municipal Reserve lands that will accommodate structures such as paved pathways, playgrounds, picnic shelters, etc. are required to achieve an FOS of 1.5. Other areas of Municipal Reserve may be accepted with a minimum FOS of 1.3 at the discretion of the Town.

3.2 Special Features

3.2.1 Retaining Walls

Retaining walls that are higher than 1.0 m or a series of retaining walls where the combined slope is steeper than 3H:1V must be designed and sealed by a Consulting Engineer (typically structural or geotechnical, or both for large structures). The Town may accept retaining walls on slopes steeper than 3H:1V where approved and sealed by a Consulting Engineer. The design submitted to the Town must include a letter of engagement outlining the scope of the Consulting Engineer's assignment, which is to include the Consulting Engineer's responsibility as Engineer of Record, design and specifications for all elements (or combined engineering by multiple professionals that encompass the design as a whole), and inspection for compliance with the design.

Refer to Detail Sheet 74: Dry Pack Rock Retaining Wall from the City of Calgary Parks 2022 Development Guidelines and Standard Specifications: Landscape Construction for further details regarding rock retaining walls.

Plan and elevation drawings submitted to the Town should show general dimensions including:

- Wall foundation and minimum toe embedment
- Wall backfill and drainage
- Wall inclination
- Elevation of top and bottom of wall
- Sizing of all elements
- Material type
- dimensions of offset of wall from property boundaries and structures
- The Engineer(s) of Record shall indicate on the retaining wall design whether or not the wall requires safety railings and shall provide rationale for the decision. Details and dimensions of safety railing (guard) on top of retaining wall to be shown if required.

Upon completion, the Engineer(s) of Record must submit a letter to the Town certifying that the retaining wall has been constructed in accordance with the design or outlining where deviations have occurred along with rationale.

3.2.2 Window Wells and Sunken Entrances

The following are design criteria for window wells and sunken entrances (see Figures EDCG GRD 3.4 Window Well Drain, and EDCG GRD 3.5 Sunken Entrances):

- Window wells and sunken entrances should not be placed in overland drainage paths.
- Grading around sunken entrances and window wells should ensure runoff is directed away from the sunken entrances and wells.
- Sunken entrances must have an exterior step up or curb at any building entry point.
- Window wells and sunken entrances will require a drain that directs runoff trapped in the well to an appropriately sized seepage pit or other discharge facility.

3.2.3 Weeping Drain Tile

As governed by the Alberta Building Code, weeping tile is required for all developments unless otherwise recommended by a geotechnical engineer based on a thorough investigation and analysis of local subsurface soil and groundwater conditions.

All sump pump discharge is to be day-lighted and directed in such a way to avoid the recirculation into the basement foundation, a neighbouring property, or causing adverse effect to Municipal Improvements. Avoid discharge to hard surfaces to prevent slippery conditions, directing discharge towards landscaped areas is encouraged. The invert elevation of a sump pump discharge for properties located in the Valley Bottom Flood Hazard Overlay and High Groundwater Area Overlay shall be positioned above the defined flood elevation.

Discharging to ground is preferred, however if weeping tile discharge to a piped storm system is proposed, the connection should be made exterior to the building and above grade, with an adequate air gap to eliminate the possibility of backflow. Design of weeping tile showing specific invert elevations for weeping tile, sumps and discharge locations will be required if piped storm systems are to be proposed, and their design must take into account the contributions of weeping tile for sizing purposes. All weeping tile connections to a storm system will need to be indicated on the application and be accepted by the Town Engineer.

Weeping tile and sump pumps shall not be connected to the sanitary sewer system.

3.2.4 Garage and Parkade Drains

All garage drains shall meet the requirements of the *Alberta Building Code* and Alberta Environment standards.

Parkade floor drains shall be directed to an oil/grit separator and discharged to the sanitary sewer. Trench drains at the bottom of a parkade ramp shall be directed to an oil/grit separator and discharged to the storm sewer. In the High Groundwater Regulation area, provisions should be made to prevent ingress of groundwater into the sanitary sewer system.

3.2.5 Driveways

Grading of lots must accommodate a smooth transition from the front of the property to the street ROW. This is especially critical with driveways that access a sloped street. Retaining to accommodate access must be done on private property to allow the Town to modify the street within existing street grades.

Driveway and parkade ramp grades should adhere to the latest edition of the *City of Calgary Roads Construction Standard Specifications*.

Driveways sloping towards the building are discouraged. Reverse sloped driveways should meet the freeboard requirements of Section 3.4.2.3 of the 2011 *City of Calgary Stormwater Management & Design Manual* and *DSSP Design Guidelines*.

To review a reverse sloped driveway proposal, the Town may require supplementary information from the Consulting Engineer be provided with the application, including, but not limited to topographic survey and an assessment of adjacent stormwater runoff patterns. A statement in the design narrative is required indicating that the design provides adequate protection from stormwater ingress. The Consulting Engineer should consider the density of topographic elevation points needed on the As-Constructed Grade Certificate to demonstrate and certify that the as-constructed condition respects the approved design.

Proposed reverse sloped driveways must include a gravity connection to the storm sewer system complete with a backflow prevention valve located in a separate manhole on public property. Sump pumps are generally not permitted, however they may be considered for parkades on Large Developments. It is recommended that the driveway slopes away from the garage door at 2% for minimum 600mm.

In certain cases of infill development an existing driveway crossing and/or depressed curb is no longer required due to the proposed access location. In these cases, the Developer is responsible for replacing the sidewalk and curb as required to eliminate the driveway crossing.

Driveway widths must not exceed the limits stated in the Town of Canmore's *Land Use Bylaw*.

Permits and Commencement of Construction

Typically, stripping and grading signal the commencement of construction. It is up to the Developer or Contractor to ensure all necessary permits and approvals from other governing agencies are in place prior to work. No construction, including stripping and grading, may take place without a construction management plan (CMP) that has been approved by the Town if required by the EDCG. See Section 2.4 of the EDCG for further information about submission requirements and applicable development application sizes.

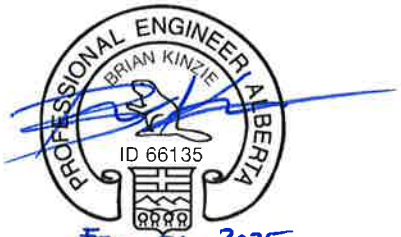
It is the responsibility of the Developer to ensure that erosion and sediment control (ESC) measures are in place prior to construction commencement. It is essential that ESC measures are maintained for the duration of the project including through the placement of landscaping. The removal of vegetation and topsoil during construction or other soil disturbing activities, as well as groundwater disturbing activities can have detrimental impacts on the Town's stormwater management infrastructure, its surface water bodies, and the groundwater aquifer. The Town of Canmore requires Contractors to follow the most recent edition of the City of Calgary Water Resources', *Erosion and Sediment Control Guidelines* with regards to details and specifications. Consulting Engineers may propose alternative inspecting and reporting requirements in consideration of site-specific conditions, including building sites within an area already under construction with ESC measures in place such that the overall intent is maintained.

SECTION 4 – WATER SYSTEM

TERMS OF USE

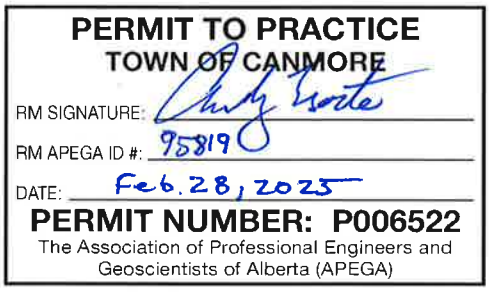
The "2025 Engineering Design and Construction Guidelines, Section 4" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 4" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

4.0 Water System

Water system elements not specifically referenced in this document shall be in accordance with the latest edition of the documents listed in Section 1.

4.1 Design Parameters

The intent of the design parameters provided is for the network to be designed for build out. In areas where system modeling determines the criteria cannot be achieved with existing boundary conditions, these will be considered on a case-by-case basis by the Town of Canmore Engineering Department and the proposed systems consultant.

4.1.1 Demands and Peak Factors

Water demands shall be determined in accordance with the latest edition of the Town's *Utilities Master Plan* published at www.canmore.ca at the time of application based on land use, density and unit consumption rates. Specific design flow rates and peak factors for residential, commercial, industrial and institutional developments or defined land use districts shall follow minimum rates shown in the *Utility Master Plan* or other criteria applicable to specific developments in accordance with good engineering practice, and as approved by the Town Engineer.

Table 4-1 provides a summary of current and future water demands, system pressures and the associated design criteria.

Table 4-1: Water Demand and Pressure Summary

	Units	Design Criteria
		2022 UMP
Average Daily Demand (ADD)		
Water Treatment Plant Production (composite)	L/c/d	360
Consumption (residential only)	L/c/d	250
ICI	m^3/ha/d L/unit/d	30 810
Hotel	L/unit/d	700
Peak Day Water Demands (PDD)	Peak Factor[a]	2 x ADD
Peak Hour Water Demands (PHD)	Peak Factor[a]	4 x ADD
System Pressures		
Minimum Service Pressure at Peak Hour Demand	kPa	350
Minimum System Node Pressure to Calculate Fire Flow	kPa	140
Maximum Service Pressure	kPa	620
Maximum Pressure in Downtown Pressure Zone	kPa	496
Maximum Allowable Velocity in Distribution System	m/s	3.0
Notes:		

a) For large industrial or commercial developments, peak factors specific to the types of developments proposed shall be used.
L/c/d: Litres per capita per day
m^3 /ha/d: cubic metres per hectare per day

4.1.2 Pressure Zones

The distribution system shall be designed with consideration given to various pressure zones within the subdivision. Service pressure shall be maintained within a range of 350–620 kPa (40–90 psi). If the proposed subdivision is to be tied into the existing downtown distribution system, it shall be designed so that the downtown pressure does not exceed 496 kPa (72 psi).

For the Peak Hour Demand minimum pressure specifically, the Town will consider a lower service pressure to a minimum of 280kPa when it is clearly demonstrated that the target minimum service pressure of 350kPa cannot be achieved.

See notes in Section 4.2.10.3 of the *Engineering Design and Construction Guidelines* (EDCG) for pressure requirements of service connections.

4.1.3 Fire Flows

Pipes in the waterworks system and private service connections shall be adequately sized. A sufficient number of hydrants shall be installed to provide the minimum required fire flows at each location.

Available Fire Flow is calculated by maintaining a minimum 140kPa in the system under the Maximum Daily Demand scenario.

4.1.3.1 Greenfield Development

The required Fire flows in greenfield developments are shown in Table 4-2 below.

Table 4-2: Required Fire Flows

Land Use Category or Development Type	Fire Flow (litres per second)	Design Criteria Time Duration (hours)
Detached and Duplex Residential	85 L/s	2 h
Multi-Family, Small to Medium Size Units	120 L/s	2 h
Commercial, Institutional, Industrial – adequately separated, 3 floors or less	200 L/s	2.5 h
Multi-Family, Medium Density (4-plex to 6-plex)	200 L/s	2.5 h
High Density, Multiple Closely Spaced or Contiguous Buildings of 3 or More Floors	300 L/s	3.5 h

4.1.3.2 Infill Development

Water supply for fire protection systems should meet *Fire Underwriters Survey "Water Supply for Public Fire Protection" (2020)* and shall meet Alberta Fire and Building Code requirements.

In redevelopment areas where the Town's water network may not have the available fire flows to meet the requirements of the proposed development, the Consulting Engineer will evaluate the available and required fire flows and address in the Design Brief. Upon request, the Town will provide the modeled available fire flow at the Town's watermain that the development will connect to.

If the Consulting Engineer determines that the available fire flow is less than the required fire flow, the Consulting Engineer may propose water network improvements to achieve the required fire flow. Alternatively, the Consulting Engineer may use the methodology contained in the latest edition of the Fire Underwriters Survey "Water Supply for Public Fire Protection" to adjust the building design such that the required fire flows are equal to or less than the available fire flows.

4.2 Design and Construction of Water System Components

4.2.1 General Notes

Any proposed water distribution system or part of a system shall be designed to serve the area within a subdivision development boundary as well as any known future area that is contiguous with the proposed system. Proposed extensions to the water distribution network shall be modeled by the Consulting Engineer under various demand scenarios to determine the required water main sizes. The impact of all new major developments placing significant water demands on existing water supply, storage, transmission and distribution systems and the need for any resulting off-site improvements shall also be determined by network modeling. Existing network operating conditions at the proposed connection nodes (i.e., boundary conditions) will be provided by the Town upon request.

Development (or redevelopment) of a site currently served by a well will be required to connect to the municipal water supply as per the Town of Canmore *Water Bylaw*. The existing well shall then to be decommissioned as per Provincial regulations.

Distribution mains shall be continuous (looped) whenever possible. Where a closed system (dead end) is accepted, the maximum number of single dwelling units shall not exceed 45 on a permanent basis.

No cross-connections are allowed under any conditions. Backflow prevention devices shall be installed, inspected and tested as required by applicable regulations (e.g. plumbing code).

Water system components shall remain accessible. There shall be no obstruction or impediment to free and direct access to any service, water main, valve, curb stop, fire hydrant, water meter or other appurtenances on the waterworks system.

See the City of Calgary *Standard Specifications Waterworks Construction* for water systems to be installed in areas contaminated or potentially contaminated. with volatile organic compounds.

4.2.2 Easements, Legal Requirements and Implications

Distribution mains shall not be placed on private land without a registered easement. The typical minimum easement or public utility lot (PUL) width for an independent non-encased water main (or any main) is

9.0m, this may be reduced to 6m for an independent encased water main (or any main). All encasement pipes shall extend 1.0m beyond the property line. The typical minimum easement or public utility lot width increases to 12.0m for two utilities in the same easement (sleeved or unsleeved). Services connections to a water main located in an easement or PUL are discouraged. Easement or PUL width reduction may be considered if mains have shallow, insulated bury.

A sufficient number of valves shall be provided to permit isolation of the main in the easement or PUL without disruption of services outside the easement.

Where a reduced easement or PUL is accepted by the Town, and where future maintenance of mains would be difficult due to proximity of foundations or other adjacent improvements, the Town may require the mains to be placed into a casing pipe or the foundations (of adjacent improvements) protected by some other method.

Any landscaping improvements approved by the Town in excess of sod or hard surfacing within a utility right-of-way/easement (URW) that may be disturbed by future maintenance operations will be replaced by sod or the approved hard surfacing to match adjacent areas by the Town.

Development permit (DP) applications shall include an overall plan showing what portions of the water system being constructed will function as a private system. Any on-site portions of distribution water mains to be owned and maintained by the Town of Canmore require a URW survey plan prepared by a legal surveyor (and not by description) to be registered accompanied by the Town's standard Utility Right of Way agreement prior to CCC issuance and return of securities.

4.2.3 Water Mains Design in Town Right-of-Way

4.2.3.1 Size

Water mains must be consistent with those in adjacent subdivisions so that continuity of main size is maintained between subdivisions. The maximum length of mains between ties permissible in residential development are as follows:

- 150mm diameter mains (in cul-de-sac less than 150m in length only)
- 200mm diameter mains: maximum 550m between ties
- 250+mm diameter mains: maximum 760m between ties

Minimum main size shall be 200mm diameter in a residential subdivision and 250mm diameter in an industrial or commercial subdivision. The Town engineer may require that larger mains be installed to service or benefit adjacent or future developments or as required when, in the opinion of the Town, the increase in size is required to hydraulically compensate for dead end mains or high-density developments. *Endeavour to Assist* financial clauses for oversize mains will be considered in development agreements.

Mains in residential cul-de-sacs that are shorter than 150m may be reduced to 150mm diameter, where the conditions on the City of Calgary *Design Guidelines for Subdivision Servicing* can be respected.

Dead-end mains are strongly discouraged and will only be contemplated in circumstances which meet the applicable City of Calgary guidelines.

Flush-outs shall be required at the end of a dead-end watermain if there is no hydrant located at or near the end of the main. The flush-out shall be of sufficient size to provide 0.75m/s of velocity in the main and shall have a minimum diameter of 50mm. See Figure EDCG WAT 4.1 Typical 50mm Watermain Flush-Out for flush-out details. A park service may be accepted in lieu of a separate flush-out subject to acceptance by the Town Engineer.

4.2.3.2 Cover

In streets, lanes, PULs and easements, the minimum cover from the top of the water main to the final surface grade shall be as follows:

- 2.7m in clay soil
- 3.3m in soil that is predominantly gravel

For dead-end mains, the minimum cover from the top of the water main to the final surface grade shall be as follows:

- 3.0m in clay soil
- 3.3m in soil that is predominantly gravel

In areas with high groundwater, water mains may be installed with reduced cover and insulated where accepted by the Town engineer. The minimum depth of bury in such areas should be as close to the above specifications as possible, however not less than 1.8 m below the final surface grade, subject to Town approval.

In areas where pipe insulation is used, insulation shall be as specified in Section 4.2.3.4 of the EDCG.

4.2.3.3 Backfill Requirements

Backfill requirements for deep utility services shall be in accordance with the latest edition of the City of Calgary *Standard Specifications Waterworks Construction*.

Much of the Town of Canmore sits on an aquifer and has fluctuating groundwater levels. As a result, specific attention should be given to the need for clay plugs. The spacing (frequency) of clay plugs shall be as follows or as otherwise approved by the Town:

- On slopes of 4-7%: not more than 100m apart;
- On slopes greater than 7%: not more than 50m apart.

At all intersecting pipes in steep slope areas

4.2.3.4 Insulation

Insulation used for in-ground construction shall be extruded polystyrene to CAN/ULC S701, Type 4 classification. Approved products are DuPont HI-40 or HI-60 and Owens Corning Foamular 400 or 600, or as otherwise accepted by the Town.

Where required by the Town, pre-insulated piping systems incorporating a core pipe, polyurethane foam, closed-cell insulation and outer jacket shall be used in place of sheet or granular insulation materials in the pipe zone. Pre-insulated piping systems shall be designed for each specific application in accordance with the manufacturers' recommendations.

See Figures EDCG Water WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller and City of Calgary Standard Specifications Waterworks Construction, file Number 453.1044.001 and 453.1045.001 for further information. The Town of Canmore EDCG Figure takes precedence except in situations not covered by this Figure.

4.2.3.5 Material

Approval of pipe material, and any other materials used in the distribution system shall be as per the latest version of the City of Calgary *Standard Specifications Waterworks Construction*.

4.2.4 Isolation Valves

Valves on distribution mains shall be located to minimize the number of valves required to be closed in order to isolate a section of main. The maximum number of isolating valves for a section of main shall be four. No more than one hydrant shall be isolated (out of service) when a single section of main is isolated.

All valves in the distribution system shall be equipped with a 50mm x 50mm operating nut and shall turn counter-clockwise (left) to open.

Isolation valves required at intersections shall be located on the projection of property lines or dimensioned to property lines.

The following criteria should be considered in the placement of isolation valves:

- Preferred at intersections; Mid-block locations are subject to the approval of the Town Engineer
- Three valves at cross intersections
- Two valves at tee intersections
- Not more than three valves required to isolate line (four if cross intersection involved)
- Not more than one hydrant is taken out of service during shutdown
- Not more than 45 single family units, one multi-family site, or one commercial site are taken out of service during shutdown

Private water systems shall have an isolation valve on the Town side of the entrance to the private system.

4.2.5 Booster Pump Stations

Design guidelines will be provided by the Town to streamline booster pump station designs. Each installation, however, will be reviewed by the Town on a site-specific basis.

Sizing calculations and detailed drawings shall be submitted for review and acceptance by the Town. Equipment and programmable logic controller (PLC)/supervisory control and data acquisition (SCADA) systems shall be designed in accordance with the requirements of the Town. These standards change as

new technologies emerge and as existing facilities in Canmore are upgraded. Contact the Engineering Department for current requirements at the planning stage of new projects.

The equipment shown in Table 4-3 are approved manufacturers for public installations, unless otherwise reviewed and accepted by the Town.

Table 4-3: Booster Pump Station Equipment and Manufacturer

Equipment	Approved Manufacturer
Pumps (potable water supply)	Peerless, Gould, Myers or Weir
Master Control Cabinets	Allen-Bradley
Level Controls	Milltronics
Programable Logic Controllers	Modicon, Allen-Bradley, ITT Flygt
Electrical Relays/Transfer Switches	Allen-Bradley
Variable Frequency Drives	Allen-Bradley

4.2.6 Pressure Reducing Valves

Pressure reducing valves (PRVs) and PRV stations shall maintain a constant downstream pressure regardless of varying inlet pressure. The City of Calgary *Standard Specification Waterworks Construction* shall be followed, except as noted below.

Town of Canmore PRVs and PRV stations shall be complete with and conform to the following minimum requirements:

- Valves shall have a tight monolithic structure. Where construction joints occur, water stops shall be incorporated. Valves shall turn counter-clockwise (left) to open
- Each structure shall be insulated with spray-on urethane foam on all interior walls and ceiling (reinforced mesh required).
- A floor drain and sump shall be used wherever practical and outside the groundwater protection zone.
- All steel piping shall be painted blue (to Alberta Environment standards).

Piping and fittings within a PRV station shall comply with the following requirements.

Piping and fittings within a PRV station shall be a prefabricated steel module including pipe, fitting and flanges, with a fusion-bonded epoxy internal lining and external coating that meets the City of Calgary's Standard Specifications Waterworks Construction, section 505.01.02 Type A. The external coating for all piping shall also comply with the City of Calgary's standard detail sheet #45, note #9. The external coating should be blue in colour, either as pigmentation in the fusion-bonded epoxy (if available) or as an additional overcoat of compatible material.

The external coating of the pipe cast within the wall of the PRV chamber shall form a watertight seal with the concrete to protect against groundwater infiltration. The coating in this area may be roughened or otherwise treated as recommended by the manufacturer. Alternatively, a waterstop flange can be welded around the outside of the pipe in the centre of the embedded section of pipe. This flange can be left

uncoated to form a better bond with the concrete. The exterior coating of the pipe outside of the wall of the PRV chamber shall be wrapped with an approved Polyethylene tape or Denso Mastic tape or Yellow Jacket shrink sleeve.

All PRVs and PRV stations shall have a surge relief valve tied to the storm sewer or other suitable option to provide physical protection of downstream pressure settings. If a surge relief valve is not possible or practical, the PRV station shall include a downstream surge-arrester that will automatically close the valve if the downstream set pressure is exceeded.

If required, PRV stations shall have a pressure sustaining pilot control to protect upstream pressures. An analysis of flow requirements for each pressure zone will be required to determine the need for this option. If a pressure sustaining pilot control is required, the design shall include the following:

- "Y" screens to capture grit and debris on the pilot line
- Position indicators
- Liquid-filled pressure gauges for both upstream and downstream
- Adequate pipe support.
- Pilot control isolating cocks for valves 75 mm or larger
- Isolating gate block valves to allow bypass and valve servicing
- Speed controls as determined by the valve supplier
- Domestic water supply valve bypass
- Epoxy-coated valves
- Valves and piping that meet all pressure requirements
- Inlet and outlet ventilation piping

Detailed drawings of the proposed pressure sustaining pilot control installation shall be sent to the Town for review and acceptance prior to tendering or fabrication as applicable. Once constructed, all operating pressures shall be clearly marked in the PRV station and in the operating/maintenance manuals supplied to the Town. This shall include an operating description of each installation, including location.

4.2.7 Hydrants

4.2.7.1 Hydrant Type

Hydrants shall be free draining. If hydrants are installed in areas with high groundwater, the hydrant drains shall be plugged. Non-draining hydrants shall have the top and caps painted red and shall be clearly marked with a disk labelled Fire Service Only installed on the hose port; the disk shall be installed when the hydrant is installed.

All hydrants shall be Mueller (Modern and Super Centurion), McAvity (Clow Brigadier McAvity), or AVK (model 2700 and 2780) unless otherwise approved by the Town engineer.

All hydrants shall be 150mm dry barrel type with one 100mm diameter "Storz" pumper connection and two 65mm threaded hose connections. Threaded hose connections shall be 4 threads per inch (TPI) conforming to the Alberta Mutual Aid (AMA) thread standard.

The exterior of the hydrant above and 300mm below the grade-line flange shall be painted in accordance with City of Calgary Standard Specifications Waterworks Construction, Section 505.01.00 (Type C) in the following colours:

- Red body, equal to C.I.L. #22370, Riley PM2506 or approved equal
- Black caps (for free-draining hydrants) Cloverdale #11107 or approved equal
- Red top

Hydrant details can be found in Figures EDCG WAT 4.4 Hydrant Details, EDCG WAT 4.5 Hydrant Valve Tie-Back and EDCG WAT 4.6 Hydrant Valve Tie-Back Flanged Valve to Flanged Tee.

4.2.7.2 Hydrant Coverage

Hydrants shall be located such that proper hydrant coverage is provided for the entire subdivision, development or as required by Emergency Services.

To provide complete coverage of any structure, hydrants shall be spaced so that the maximum distance from the hydrant shall not exceed 90m radius in low-density residential areas or 60m radius for institutional, commercial, industrial and high-density developments (measured along the street).

4.2.7.3 Hydrant Placement

Hydrants shall be placed to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians. Where possible, hydrants should be placed at intersections. Mid-block hydrants should be avoided unless required for specified coverage. Hydrants in cul-de-sacs shall be located at the entrance of the cul-de-sac.

The minimum distance from a hydrant to any driving surface or any structure shall be 2.0m or 1.0m from back of curb where provided. If a suitable location is unavailable, bollards shall be placed around the hydrant between the driving surface and the hydrant. Bollards shall be placed such that they do not block access to the pumper or hose ports. Trees or above-grade hard landscaping in the vicinity of hydrants shall be located to maintain adequate clearance from the hydrant.

The minimum distance of a hydrant from a power pole, light standard or transformer shall be 3.0m unless a greater separation is the Alberta Electrical Utility Code.

4.2.7.4 Hydrant Construction Requirements and Sign-off

Newly-installed hydrants on private and public property shall be functional and shall be put into service before construction of new buildings on the property proceeds beyond the foundation stage where such stages are constructed primarily of combustible materials.

Newly-installed and non-functioning hydrants shall be clearly marked with a cover bag labeled *Out of Service* or other marking as accepted by the Town. Bags shall be a commercially-available product manufactured from polyethylene or canvas for this specific purpose (E.g. – RS Steel “Fire Hydrant Out of Service Covers” bag). Bags shall be installed when the hydrant is installed and shall not be removed until the requirements of Sections 4.2.8 and 4.2.9 have been met.

A hydrant flow test shall be performed on all newly-installed hydrants according to AWWA Manual M-17. A copy of the results shall be forwarded to the Engineering Department prior to putting the hydrants into service and prior to the acceptance of the Construction Completion Certificate.

All hydrant installations, whether new construction or the repair of existing, shall be reviewed by the Consulting Engineer and/or Town prior to backfilling. The Consulting Engineer is responsible for final sign-off of the hydrant installation for CCC submission purposes.

4.2.7.5 Permission to use Hydrants for Construction

Prior to hydrant usage, the user shall apply to the Utility Operator and/or the Town.

A meter shall be obtained from the Utility Operator prior to the use of the hydrant. The user shall follow the rules of use as established by the Utility Operator and the Town *Water Bylaw*, including payment of deposits and water usage charges.

The hydrant user shall only use the hydrant designated by the Utility Operator. The user accepts responsibility for any and all damages caused by improper use of the designated hydrant during use of that hydrant.

If it is determined by the Utility Operator that the meter or hydrant has been tampered with for the purpose of fraudulent misrepresentation of usage during the use of the hydrant, then the deposit paid by the user shall be forfeited and the user shall be suspended from further hydrant use in addition to any fines or penalties levied pursuant to the non-permitted use.

4.2.8 Private Water Mains and Hydrants

All hydrants and water mains supplying water for firefighting that are located on private property outside of a public utility right-of-way are the responsibility of the private development to maintain in accordance with the applicable codes. Some legacy developments are equipped with a public hydrant where there is a registered utility right-of-way (URW) plan and agreement executed jointly with the Town.

4.2.9 Tie-ins, Disinfection, Bacteria Test and Final Flushing of Water Mains

The order of testing and disinfection shall be in accordance with the latest editions of ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride Pipe (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings, Section 10 - Preparation for Use, and the City of Calgary Standard Specifications Waterworks Construction. Where discrepancies between these documents occur, ANSI/AWWA C605 shall govern.

The contractor shall notify the Utility Operator and Town a minimum of three full business days in advance of any proposed water main tie-in or service disruption. This is to ensure that there are no conflicts with system operation or maintenance and to allow for time to comply with any special procedures required by the Utility Operator or the Town. See the Watermain Tie-in Checklist included in Section 0 of the EDCG.

New watermains and hydrants shall be flushed, hydrostatically (pressure) tested, disinfected, tested for bacteria and flushed as outlined below. The Consulting Engineer shall provide advance notice to the Town Engineer of the pressure test such that the Town Engineer may also witness the test if desired. The

developer is responsible for ensuring that the construction drawings at the subdivision approval or development permit (DP) stage include the information described in the following sections.

4.2.9.1 Operation of Isolation Valves

Isolation valves shall be opened by the Utility Operator to put a watermain into service only after the watermain pressure and bacteriological testing has been completed and accepted by the Town.

All operation of isolating valves shall be by the Utility Operator except in the case of an emergency or other unforeseen shutdown requirement, and then only by qualified operators with immediate notification, or under the direction and permission of the Utility Operator.

4.2.10 Service Connections

Developers shall install service connections to all single family, semi-detached or duplex lots created through subdivision. These services shall extend either 2.5m (no shallow utility easement) or 5m (with shallow utility easement) into the lot.

Each lot requires one service of suitable size with a curb stop/isolation valve located 0.3 m on the Municipal side away from the property line. More than one service for any lot may be authorized by the Town under appropriate terms and conditions and in conformance with the National Plumbing Code.

Where existing lots are not serviced, but subject of subdivision application, the provision of services may be deferred to the Development Permit stage at the discretion of the Town. The Town will require registration of a Deferred Servicing Agreement on the title of the lots without municipal services.

Servicing drawings for Development Permit applications for properties that are not pre-serviced must indicate whether the connection to the existing main is proposed as a hot tap or cut-in tee. When evaluating the approaches, the Consulting Engineer should consider the impacts of depressurizing the main and providing temporary water to impacted properties. When a cut-in tee is accepted, costs incurred by the Town of Canmore to support the depressurization, temporary water and recommissioning of the main will be borne by the Developer.

Services for separately-titled properties may not cross under another property, unless within an easement between the separately titled properties, and shall connect to main services located on municipal property. Proposals for alternative servicing configurations for multi-unit properties such as condos must respect the National Plumbing Code

In circumstances where an application for subdivision requires that services for a single parcel must cross an adjacent parcel to connect to the municipal mains, an easement between the two parcels must be registered on title for these private utilities. Both parcels require a separate connection to the public mains. This scenario is illustrated in Figure 4-1.

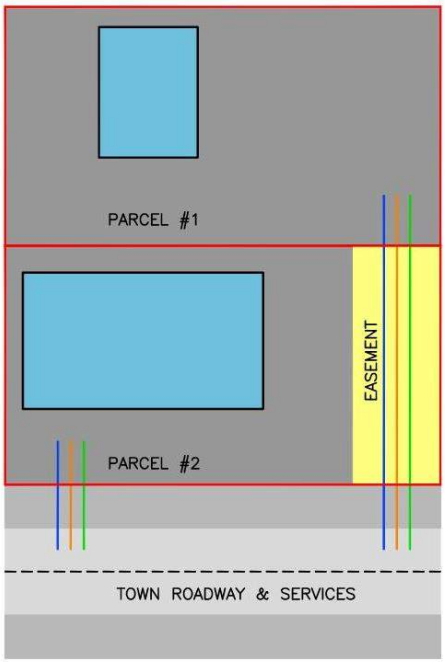


Figure 4-1: Utilities Easement

In the case where an application for subdivision requires that services for multiple parcels must cross an adjacent parcel, the services must be built to EDCG standards, are subject to the CCC/FAC process and are to be placed in a PUL. Alternatively, a URW naming the Town as Grantee must be registered on the affected parcel. In this scenario the services will be dedicated as public. This latter scenario, as illustrated in Figure 4-2 is strongly discouraged and will only be considered in unusual circumstances.

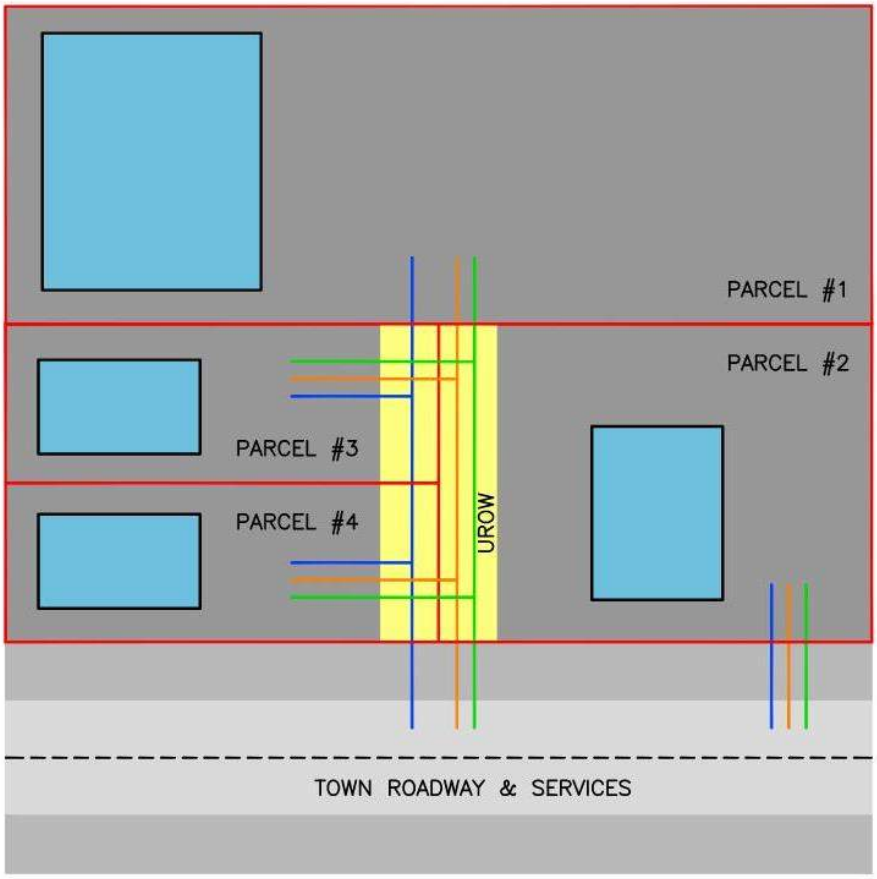


Figure 4-2: Utility ROW

Placement and Separation

Horizontal separation requirements for services shall be as indicated in the table below, taken from the City of Calgary Design Guidelines for Development Site Servicing Plans.

Table 4-4: Horizontal Separation Requirements

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

Note that shallow utility companies may require different separation. Separation requirements must be verified by the Consulting Engineers responsible for civil and shallow utility design.

Services installed to existing buildings should be on an alignment that will best suit the interior plumbing, or as required by the Town engineer. A water service expansion loop (gooseneck) shall be laid in the horizontal position.

Service pipe 100mm and larger that passes through building floor slabs or exterior foundation walls shall comply with the City of Calgary *Standard Specifications for Waterworks Construction*.

All water services shall be installed complete with isolation valve, rod and stem, an approved means of protection during construction and marker posts. The water service pipe shall be plugged in a manner compatible with the service pipe to prevent ingress of foreign material and contamination of the service pipe and to prevent discharge in case the service valve is opened.

4.2.10.1 Materials

All water service materials shall comply with NSF/ANSI 61.

For detached dwellings and duplexes the following materials will be accepted for new water services:

- Service pipe shall be cross-linked polyethylene (PEX), sizes 20-40mm, minimum SDR-9, conforming to AWWA C-904, ASTM F876/877, CSA B137.5; as manufactured by Rehau (Municipex), Plasco, or approved alternative.
- Should PEX not be available, service pipe up to and including 40mm shall be Type K soft copper conforming to ANSI/AWWA C800-89 Standard and ASTM B88. All copper pipe shall be third-party certified (TPC).
- For 50mm services, the Town of Canmore allows only polyethylene pipe, minimum SDR-9 or PC160, conforming to ANSI/AWWA C901, PE3408 or 3608 or 4710 and SCA B137.1. Compression-type fittings with stainless steel inserts or electro-fusion joints shall be used. The Town of Canmore does not allow 50 mm copper service pipe of any type.

For multi-unit residential, commercial and institutional construction, the Town will accept polyvinyl chloride (PVC) pipe - ANSI/AWWA C900 Standard and ASTM B88, minimum class 150, DR-18 pipe for new water service 100mm diameter and larger. The Town will also consider HDPE material for pipe 100mm or larger.

4.2.10.2 Insulation

All services shall be protected against freezing. Where the specified cover cannot be maintained, insulation of the service is required as shown on Figure EDCG Water WAT 4.2.

4.2.10.3 Pressure Guidelines for Services

The minimum water service size for detached residential lots is 20mm. Where the static water pressure measured at the main is less than 350kPa (approx. 50psi), a 25mm (minimum) service connection is required. Note that the requirements of the National Plumbing Code apply and additional criteria are outlined in the City of Calgary *Design Guidelines for Subdivision Servicing*.

Service connections with static water pressures that may exceed 550kPa (80psi) shall have a pressure reducing valve installed in the residence and notation shall be made on the servicing plan. Existing pressure zones in the Town are described in the *Utility Master Plan*. Pressure zone boundaries may be adjusted to incorporate new developments or to respond to operational issues. Contact the Engineering Department for current requirements at the planning stage of a new development.

4.2.10.4 Inspections

Detached Dwellings and Duplexes

For sites which are not pre-serviced, service connections, both construction from the main to the curb stop and construction from the curb stop to the building, shall be inspected by the Town of Canmore's Engineering Department prior to backfilling. Service installation from the curb stop shall precede construction of the footings on new developments.

For water services up to 25mm, all on-site servicing up to the water meter shall be inspected by the Town of Canmore. The contractor shall arrange an inspection a minimum of one full business day in advance with the Town of Canmore.

Contractors are reminded that water service lines 50mm and smaller must be one piece from the curb stop valve to the inside of the building up to the future building meter.

The contractor is responsible to pressurize the water line from the curb stop to the end of pipe. All residential connections up to and including 50mm shall be hydro-static (water) tested to 1050kPa (150psi), or 1.5 x line operating pressure, whichever is greater for 1 hour. Services installed under freezing conditions or subject to freezing prior to a building being heated may be tested with air to 450kPa (65psi) for one hour. The test pressure shall not exceed the manufacturer's recommended maximum test pressure.

Following satisfactory testing, and prior to the water meter being installed, the builder shall install a reduced flow meter-spacer. This spacer may be obtained from the Town's building inspector or the Utility Operator. The spacer is installed in the water line at the point where the water meter will be installed and allows for testing of the system. The builder shall install a wire for an external reading device as per drawing WAT-01. As the final requirement of obtaining an Occupancy Certificate, submit a Water Meter Installation Request Form at canmore.ca. Upon receipt of the request, the Utility Operator will schedule a time to remove the spacer, install a water meter and open the curb stop. Refer to the Town of Canmore Water Bylaw for details governing connections and operation of curb stops. See Figure EDCG WAT 4.10 Residential Water Meter Installation (20mm Example).

Multi-unit Residential and Commercial, Institutional and Industrial

The Consulting Engineer engaged by the builder/property owner is responsible for inspections of the installation of all public/private servicing. This includes the pressure test of the water service from the curb stop to the end of the pipe (length of pipe must be long enough to reach and will eventually be hooked up to the water meter) and for submission of test results to the Town of Canmore prior to application for a water meter.

The Consulting Engineer is responsible to ensure that all pipe work is reviewed prior to backfilling. The Construction Completion Certificate, Final Acceptance Certificate or Development Completion Certificate may not be accepted if review of new construction and/or maintenance work is not signed off by the consulting engineer.

All commercial/industrial service connections and multi-family (R3) sites with services greater than 50mm shall be hydrostatic (water) tested to 1050kPa (150psi), or 1.5 x line operating pressure, whichever is greater. The test pressure shall not exceed the manufacturer's recommended maximum test pressure. The contractor is responsible for providing manufacturer's documentation on the product being installed if requested by the Town engineer.

Commercial/industrial or multi-unit developments with service size 50mm or smaller shall be as per detached dwellings and duplexes above.

4.2.10.5 Service Connections to Existing Water Mains

Detached Dwellings and Duplexes

A saddle connection is required, as per the City of Calgary's *Water Resources*, *Standard Specification*, *Water Works Construction*, for services to detached dwellings and duplexes. All water service pipe shall be continuous from main to curb stop and from the curb stop into the building with no couplings joining short

lengths of pipe. Copper water pipe may not be suitable if the required length exceeds the maximum length available for copper pipe. In such a case, PEX or polyethylene (PE) pipe should be used.

Multi-unit Residential, Commercial and Institutional

A cut in connection is required for extensions to the distribution system or connections to a private system for on-site development. These connections are usually done at 90° to the existing main. The contractor is responsible for effective disinfection, including methodology of chlorination, for the existing line that is affected by the cut in connection. The method of disinfection may need to be approved by the Town unless it directly follows methodologies outlined in relevant AWWA or City of Calgary standards. The Town Engineer may require a hot tap connection in situations where the main line is considered critical, and not suitable for a cut in connection. The Consulting Engineer is responsible for reviews and final sign off of all connections.

On pre-serviced sites to the property line, isolation valves/curb stops shall only be operated by an authorized party in accordance with the *Water Bylaw*. Plumbers and other contractors may not operate isolation valves/curb stops exceeding 25mm (as per Town of Canmore *Water Bylaw*). Contact the Utility Operator for more information on authorized isolation valve/curb stop operation.

On unserviced sites, the contractor shall first install the services from the Town's mains to the property line. The Consulting Engineer engaged by the developer/property owner is responsible for reviews of the installation of all off-site servicing and submission of all required testing requirements. Following satisfactory installation of the public portion of the service, the line shall be flushed, pressure tested, and, if necessary, disinfected and tested, after which time the isolation valve/curb stop shall be closed. The isolation valve/curb stop shall not be opened until acceptance of the installation by the Town of Canmore after which an authorized party may open the curb stop upon request by the developer/property owner.

4.2.10.6 Placement of Subdivision Pre-service

All services shall be identified with a marker post. Posts shall be 50 x 100mm, blue painted wood stakes extending from the invert of the terminated service connection to a minimum of 0.6m above the ground level.

Flexible Pre-services

The water service pipe shall be extended 5.0m into the property with a coil of pipe of sufficient length that there are no joints or couplings between the curb stop and water meter. The coil(s) of service pipe are to be left in a wooden box capable of withstanding earth pressures and protected from freezing. See Figure EDCG WAT 4.8 Pre-Service Connection Detail: Flexible Pipe.

Non-Flexible Pre-services

For services of non-flexible material (e.g. 150 mm PVC DR18D) the Contractor shall install the pre-servicing as shown in Figure EDCG WAT 4.9 Pre-Service Connection Detail: Non-Flexible Pipe.

4.2.11 Service Connections – Existing Systems

Where the existing structure is demolished and replaced, the water service must be replaced to the main at the expense of the developer if it is greater than 30 years old or if required due to sizing. The same conditions apply where additional serviced buildings or an addition to an existing building is proposed.

The property owner may submit a request to reuse the water service and is encouraged to submit this request with the Building Permit or Development Permit application to avoid delays during construction. The request must include the following:

- Age of water service (if known)
- Depth, diameter and insulation
- Presence of bleeder (if known)
- Location of curb stop relative to property line
- Confirmation that the existing service meets the NPC sizing requirements

Should the Town deem the reuse of the water service an acceptable consideration, the property owner will be required to expose the service pipe for inspection by the Town Engineer. The Town will assess the proposal based on the inspection and the information provided. In some cases existing water services include a bleeder to prevent freezing. Services with bleeders must be replaced regardless of age or condition. In the case where the Town approves the reuse of an existing service, the property owner shall execute a *Service Replacement Exemption Letter*, a copy of which can be obtained from the Town Engineering Department.

Where the service is found to be unacceptable for re-use, complete replacement of the existing service, including disconnection at the main, is required at the property owner's expense. The new service must meet the current City of Calgary Water and Sewer Standard Specifications and the sizing requirements of the National Plumbing Code (current edition).

All 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.

4.2.11.1 Abandonment of Existing Services

All Demolition Permits require abandonment of existing services unless otherwise approved under a *Service Replacement Exemption Letter* or as part of a Development Permit or Building Permit. A Road Use and Excavation Permit may be required and the abandonment shall be witnessed by either the Town, the Utility Operator, an authorized professional acting on behalf of the Town, or the property owner's Consulting Engineer. Water service lines shall be abandoned outside the private side of the property line, at the curb stop or at the main as directed by the Town Engineer. Abandonment of existing water services shall be required if an existing building is demolished and nothing is constructed on site, if a replacement service is constructed in an alternate location, if an existing building is demolished and a new building requiring different service sizes is erected or if the Town engineer determines the existing service cannot be used due to condition.

If lots are being consolidated, the unneeded water service(s) shall be abandoned as follows:

1) The service line shall be excavated back to the curb stop.
2) The service to be terminated shall be shut off at the curb stop.

The service line is to be cut between 300mm outside of the private side of the property line and 300mm from the curb stop (where feasible, otherwise 300mm from the curb stop) and crimped if copper pipe or plugged with a manufactured plug approved by the Town if material other than copper.

The main stop or saddle shall be repaired or replaced by the property owner if it is deemed unacceptable by the Town Engineer.

4.2.12 Metering

The Town of Canmore requires a water meter to be installed on all residential, commercial, institutional and industrial services. A request for water meter installation must be submitted prior to issuance of an Occupancy Certificate. Once the meter is installed, the water shall be turned on by the Utility Operator. For installation or more information, contact the Utility Operator. The stipulations for metering are as follows:

- For each legal property title, installation of one water meter is required.
- Refer to City of Calgary *Standard Specifications, Waterworks Construction* for meter installation details.
- For water meters 75mm in size and larger, the Builder shall install a 120V outlet within 1.5m of the water meter for the purpose of providing power to the meter.
- Water meter nut couplers must be used on either side of the water meter to allow for safe installation and replacement.
- No branch line or tap is permitted between a water meter and the curb stop.
- For multi-unit developments a multi service header pipe may be permitted, as per City of Calgary, Standard Specification, Waterworks Construction. A header splitter on the property side, after the curb stop may be considered, as long as each unit has an isolation valve and meter on the service to each unit.
- A subsidiary water meter may be provided on the downstream side of the Town's meter by a customer for their own purposes. Any subsidiary water meters shall have tags to identifying them as private water meters.
- The Developer shall submit a water meter installation request and propose the size, type and number of water meters to be supplied and installed for each customer, for review by the Town. Subsequent to Building Permit approval, the Developer is advised to submit water meter requests for intermediate and large developments 4-6 months in advance of the required installation date due to supply chain considerations.

Detached Dwellings and Duplexes

For detached dwellings, a single service and a single meter is required. For up-and-down, back-to-front duplexes, there is one service to the building and one water meter for each unit. For side-by-side or semi-detached duplexes, one service and one water meter is required for each side.

Garden Suites

For garden suites that do not have a separate title from the main dwelling, it is expected water (and sanitary sewer) services will generally be connected to the existing dwelling's service downstream of the water meter. A subsidiary meter may be provided on the downstream side of the Town's meter by a customer for their own purposes. A subsidiary water meter shall have a tag to identify it as a private water meter.

Multi-Family Residential

For multiple housing units consisting of three or more attached units, one service feeds the building with one water meter per unit.

For multi-unit dwellings, each dwelling unit shall be metered individually. All water meters shall be installed at the header, where the service line enters the building and shall be located in one common area.

In residential multiplexes with four or more units, a minimum one common hose bib is required and shall be metered. Placement of the hose bib should accommodate contractors as well as residents.

Commercial, Institutional and Industrial

Single-unit commercial buildings require a single service and single water meter. For multiple side-by-side units in industrial and commercial buildings, one water meter per legal property title is required.

Each site will be unique with respect to flow requirements and water meter sizing. The sizing of the meter will affect the water and wastewater rates.

4.2.13 Park/Irrigation Service

See Section 11 of the EDCG.

4.3 Water Main Tie-in Checklist

(Example only. List to be specific to the development.)

Water System Tie-In / Scheduled Disruption Checklist			
Task	**Responsibility**		
	Consulting Engineer	**EPCOR**	**Contractor**
Obtain all required permits from Town (www.canmore.ca)			
Prepare Service Interruption Notice to residents			
Review Service Interruption Notice			
Notify residents of service interruption (minimum 48 hours prior)			
Notify Town of Canmore Engineering, EPCOR & EMS of service interruption and out of service hydrants			
Provision of all hoses, gauges, etc. to facilitate work			

Shut off existing service valves affected by service interruption			
Boundary valve operation for service interruption			
Bag out of service hydrants			
Installation of new cut in tees and valves at tie-in points			
Swabbing new pipe, valves & fittings with superchlorinated water (to AWWA C651)			
Inspection of installation of new cut tees and valves at tie-in points			
Flushing (operation of boundary valves)			
Operation of existing hydrants for flushing			
Operation of new valves and hydrant for flushing			
Choose water discharge location (and de-chlorination method if required)			
Dechlorination			
Turbidity measurements of flushing water			
Bacteriological sample collection after service interruption			
Approval to re-activate mains and services after service interruption			
Re-activation of boundary valves and mains			
Infrastructure installation past tie-in valve			
Bag out of service hydrants			
Onsite infrastructure installation inspection past tie-in valve			
Preliminary flushing (operation of boundary valves)			
Preliminary flushing (operation of onsite valves and hydrants)			
Hydrostatic test			
Pressure gauge readings			
Operation of existing hydrants for water injection during superchlorination			
Superchlorination (to AWWA C651) (commencement measurements)			
Superchlorination concentration measurements (after 24 hours)			
Choose water discharge location (and de-chlorination method if required)			

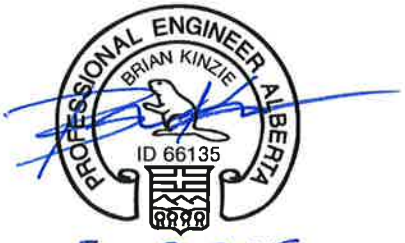
Flushing (operation of boundary valves)			
Flushing (operation onsite valves and hydrants)			
Dechlorination			
Chlorine concentration measurements			
Turbidity measurements			
Bacteriological sample collection			
Record and distribute water testing results			
Compilation of test results and CCC applications			
Notification that Town has accepted onsite water testing results			
Activation of new waterworks infrastructure and services			

SECTION 5 – SANITARY SEWER

TERMS OF USE

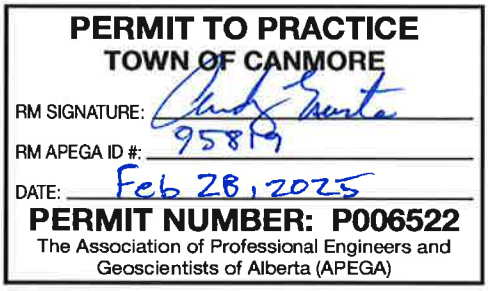
The "2025 Engineering Design and Construction Guidelines, Section 5" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



FEB. 28, 2025
Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 5" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

5.0 Sanitary Sewer

Sanitary sewer system elements not specifically referenced in this document shall be in accordance with the latest edition of the documents listed below in Section 1.

5.1 Design Parameters

Any sanitary system or part of a system should be designed to serve not only the area within the subdivision development boundary, but, in the opinion of the Town Engineer, any reasonably known future development which is tributary to the system in accordance with the *Utilities Master Plan* and/or other relevant servicing studies.

5.1.1 Sewage Flow Generation and Peak Factor

Specific sewage design rates for residential, commercial, industrial or institutional developments or defined land use districts should follow minimum rates shown in the latest edition of the *Utilities Master Plan.* Sewage design rates for uncommon developments must be considered on an individual basis in accordance with good engineering practice. Flow demand calculations shall be referenced on the drawings. Direction of flow shall also be shown on the drawings.

Table 5-1 shows the minimum sewage design rates given in the 2022 edition of the *Utilities Master Plan*.

Table 5-1: Sewage Design Rates

Development Type	Minimum Sewage Design Rate
Wastewater Treatment Plant (Composite Rate)	360 L/c/d
Residential	250 L/c/d (40 persons/developable ha min. for detached residential)
ICI	30 m^3/ha/d gross hectares
Hotels	700 L/unit/d
Residential Peaking Factor	1+14 / (4+P ½) (Harmon's Formula)
ICI Peaking Factor	3.5
Hotel Peaking Factor	4

Peaking Factors (Multiplied by dry Weather Flow except as noted.)

The peak (population generated) flow for a residential population shall be determined by the following formula:

$$Q_{ppw} = \frac{GxPxPf}{86.4}$$

Where:

Q_{ppw}	=	peak dry weather flow (L/s)
G	=	the per capita average daily design flow (L/c/d)
P	=	the design contributing population in thousands
Pf	=	"a peaking factor"

The peaking factor (Pf) to the larger of 2.5 or Harmon's Peaking Factor where:

Harmon's Peaking Factor	=	1+14 / (4+P ½)
Where P	=	The design contributing population in thousands

Residential	Harmon Formula determination (2.5 minimum)
Commercial, Industrial, Institutional	3.5
Hotel	4.0
Composite	Peak wet weather flow (WWF) = 3.8 x ADWF at WWTP

Extraneous Flow Allowance

The minimum inflow/infiltration outside high groundwater regulated areas shall be 0.284 L/s/ha. The minimum inflow/infiltration within high groundwater regulated areas shall be 0.66 L/s/ha.

Hydraulic Capacity

The capacity of any section of a sanitary line shall be determined based on the portion of the line which has the least slope. The Manning formula shall be used to calculate gravity flow in pipes.

Use Manning's n=0.018 for pipes older than 1980 and n=0.013 for pipes from 1980 and newer.

5.2 Design and Construction of Sanitary Sewer Components

5.2.1 Gravity and Force Main

5.2.1.1 Type

Gravity mains shall be polyvinyl chloride (PVC) with a minimum standard dimension ratio (SDR) 35 unless otherwise accepted by the Town Engineer. In areas of high groundwater, fused PVC or high-density

polyethylene (HDPE) pipe may be considered for reducing extraneous flow. Clay tile, cast iron or concrete sewer pipes are not permitted.

5.2.1.2 Size

Minimum sizes of public sanitary mains are as follows:

- Residential Subdivision: 200mm diameter minimum
- Commercial, Multi-family, Mixed Use, Industrial Subdivision: 250mm diameter minimum; unless the Consulting Engineer can demonstrate flows and grades justify a smaller diameter

5.2.1.3 Slopes

Minimum permissible slope for sanitary sewer pipes shall be as per City of Calgary *Design Guidelines for Subdivision Servicing*.

5.2.1.4 Cover

For gravity mains the minimum cover from crown to finished grade shall be 2.50m. If the required cover cannot be maintained, insulation, as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller is required. Alternative insulation configurations that meet manufacturer's recommendations and that are authenticated by a Professional Engineer may be considered.

Cover for force mains shall be designed as for water mains. In streets, lanes, easements and public utility lots (PULs) the minimum cover from crown to the final grade shall be 2.7m in clay or silty soils and 3.3m where the soil is predominantly gravel. If the required cover cannot be maintained, insulation shall be required as per water mains.

5.2.1.5 Placement and Alignment

Sewer mains should be laid as straight as possible. If a simple horizontal curve is required to conform to curved streets, curved sewers are permitted provided they meet the manufacturers recommendations and the City of Calgary's Design Guidelines for Subdivision Servicing and Calgary's Standard Specifications for Sewer Construction.

For all commercial and multi-unit residential sites where deep utility services are to be installed within predominantly clay or other relatively impermeable material such as bedrock, a clay plug shall be installed within the trench backfill adjacent to the site boundary. The clay plug shall be as described in the latest edition of the City of Calgary's *Standard Specifications Sewer Construction*.

5.2.1.6 Extraneous Flow

Where the invert of a sanitary main falls below the 100-year groundwater elevation, or where required by the Town Engineer, an inspection for infiltration/exfiltration shall be undertaken prior to a Construction Completion Certificate (CCC) being issued. Refer to ASTM D3212 and the City of Calgary's *Standard for Sewer Construction*.

5.2.1.7 Video Inspection

A closed-circuit television (CCTV) video inspection of all sanitary mains shall be undertaken in accordance with the City of Calgary's *Standard Specifications Sewer Construction*. Observations shall be coded in accordance with the NASSCO (National Association of Sewer Service Companies), *Manual of Sewer Condition Classification* or Town approved equivalent.

The CCTV video inspection must be received and accepted by the Town prior to CCC. A confirmatory CCTV re-inspection must be submitted with the FAC application. The inspection must have been performed no more than four weeks prior to the submittal of the request.

5.2.2 Manholes

All manholes and appurtenances shall conform to the City of Calgary, *Standard Specifications Sewer Construction* and City of Calgary, *Design Guidelines for Subdivision Servicing* except as noted below.

- Standard, precast, pre-benched manholes should be used where possible.
- Sewer inverts through manholes shall be benched to provide directional flow.
- The maximum distance between manholes should be 120m for sewers 375mm or less, or 150m for sewers 450mm to 750mm. In all cases, a manhole is required at the upper most end of a sewer, and at all changes in grade, size or alignment.
- The invert of services entering manholes shall be less than 760mm above the outgoing pipe centreline. If the drop is greater, a drop structure shall be provided.
- Services greater than 150mm shall require a manhole where tying to the main.

A continuous mortar bed shall be placed between the top slab, collars and frame as shown on City of Calgary Detail Sheet 38. Mortar shall not be placed solely on the inside face of the collars.

5.2.3 Frames and Covers

Manhole frames and covers shall be manufactured in accordance with the City of Calgary *Standard Specifications – Sewer Construction* and the Calgary memo from March 21, 2024, titled *Water and Sewer Utility Castings Specifications*.

If requested, the manufacturer shall submit to the Town stamped and signed shop drawings with full dimensions and with markings specified.

Shallow (150mm) manhole frames and *Town of Canmore – Sanitary* solid covers or other covers as approved by the Town shall be installed on all sanitary manholes for Municipal Improvements. Covers labeled *Town of Canmore* are not to be used on private infrastructure.

5.2.4 Low Pressure Sanitary System Mains

Development areas in the Town which cannot be adequately or economically serviced by gravity sewer systems may be serviced by low pressure sanitary (LPS) systems where approved by the Town. All LPS systems shall be engineered in accordance with applicable regulations, generally accepted design principles and approved equipment manufacturer's recommendations. Low pressure sewer mains shall be sized to suit the area and type of development to be serviced by the LPS system.

Terms and conditions of the Town of Canmore, *Sewerage Use Bylaw 2015-018* apply to LPS systems. See Section 5 of the EDCG for information about LPS system service connections.

5.2.5 Lift Stations

Lift stations are generally located along mains where needed to overcome gravity. The use of lift stations in subdivision design should be minimized whenever possible. Where unavoidable, rationale should be provided describing why no alternative design was viable.

The intent of the guidelines in this section of the EDCG is to streamline sanitary lift station design. Each lift station installation will be reviewed by the Town on a site-specific basis. Lift stations shall be located, designed and constructed in accordance with the City of Calgary, *Wastewater Lift Station Design Guidelines.* EPCOR design guidelines for controls, automation and equipment standards are updated annually and will be provided to the Consulting Engineer early in the design process.

Detailed design briefs and engineered drawings with completed calculations shall be submitted for review and acceptance by the Town. The design brief must address how environmental concerns such as noise, odour and light trespass will be mitigated. A Lift Station Control Philosophy is required early in the design process to outline the following:

- Alarming strategy
- Operator interfaces
- PLC communication failure
- Control modes
- Equipment
- Building and process alarms
- PLC system
- Trend and historian data
- LOI security

A building must be provided to house the following equipment at a minimum, in separate ‘wet’ and ‘dry’ sides:

- Generator
- Wet well
- Controls
- Electrics

The Town will provide guidance on the architecture of the building, a building permit application is required. Doors to the ‘dry’ side of the facility must be sized to allow extraction of the generator.

The following equipment is required, at a minimum:

- Water service, with hose bibs and sink
- Electrical hoist
- Heating/ventilation as per Alberta Environment standards

- Intermediate floor and clear access
- Sub-structure concrete or steel with cathodic protection
- Interior lighting
- Minimum of two pumps with automatic alternating operation
- 100mm camlock connection on discharge piping for emergency bypass
- Separate check and isolation valves for each pump (ball type check valve, full ported eccentric isolation valve)
- Valve operators outside chamber so no access required
- Amp meters on all motors over 5 HP
- Emergency power, fueled by diesel
- Odour control system
- Inlet flow metering (continuous) and pump hour meters
- Photocell controlled exterior lighting
- Outlet flow metering
- Pressure gauges and pressure transmitters on the discharge piping
- Electrical air-source heat pump and electrical hot water heating should be considered (no natural gas connection required).

Table 5-2, below, shows lift station equipment along with approved manufacturers that should be installed as a minimum, unless otherwise reviewed and accepted by the Town.

Table 5-2: Lift Station Equipment and Manufacturer

Equipment	Approved Manufacturer
Motor Control Centre Cabinets	Allen-Bradley
General Control Cabinets	Hoffman, Rittle, Hammond
Level Controls	Endress & Hauser, Pulsar
Programmable Logic Controllers	Modicon
Electrical Relay	Allen-Bradley
Transfer Switches	Eaton, Cummins or approved alternative
Variable Speed Drives	Toshiba
Pumps (submersible, sewage)	ITT Flygt, KSB, Vaughan

Programmable logic controller (PLC)/supervisory control and data acquisition (SCADA) systems shall be designed in accordance with the requirements of the Town. These standards may change as new technologies emerge and as existing facilities in Canmore are upgraded. Contact the Engineering Department for current requirements at the planning stage of new projects The developer is responsible

for initial SCADA programming and radio studies (if required). The Developer is responsible for programming of PLC and HMI equipment, the Town will provide sample programs.

5.2.6 Service Connections – Gravity Services

5.2.6.1 Size

The pipe diameter and class of pipe used for gravity service connections shall conform to the City of Calgary, *Standard Specifications Sewer Construction*.

5.2.6.2 Cover

Minimum cover for gravity service connections, from crown of pipe to finished grade, shall be 2.50m. If the required cover cannot be maintained, insulation shall be required as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller, or as per manufacturer's recommendations as designed by a professional engineer and accepted by the Town.

5.2.6.3 Placement and Alignment

A separation of 0.6m shall be maintained between individual services along mains. Sanitary services should be placed a minimum of 2m off neighboring property lines. Where practical, sanitary services should be placed below a foundation wall as opposed to boring through the wall.

Bends in gravity services are discouraged. Consulting Engineers are encouraged to provide straight gravity servicing wherever practical. Gravity servicing with bends will require a variance. A maximum of two 22.5° bends will be allowed only where it can be shown that a practical methodology for emergency cleanout is possible, and where compliant with the relevant sections of the plumbing code. Alternatives will require approval of the Town Engineer.

Developers shall install service connections to all single family, semi-detached or duplex lots created through subdivision. These services shall extend minimum 2.5m (no shallow utility easement) or minimum 5m (with shallow utility easement) into the lot.

For all multi-family or commercial sites where a sanitary service is to be installed within predominantly clay or other relatively impermeable material such as bedrock, a clay plug shall be installed within the trench backfill adjacent to the property line. The clay plug shall be as described in the City of Calgary, *Standard Specifications Sewer Construction*.

5.2.7 Test Manholes

Test manholes are required on sanitary sewer services from all new Industrial, Commercial and Institutional (ICI) developments and in certain Change of Use applications. Refer to section 6.11 of the City of Calgary *Design Guidelines for Development Site Servicing Plans* and the City of Calgary Industry Bulletin released June 2019 titled *Test Manhole Update* for details.

Test manholes shall comply with Drawing number 452.1001.015 of the City of Calgary *Standard Specifications – Sewer Construction*.

5.2.8 Service Connections – Low Pressure Sanitary System Services

Service connections to an existing low pressure sanitary (LPS) system shall comply with the design criteria developed for that system. The design criteria may be obtained upon written request from the Engineering Department. Terms and conditions of the Town of Canmore, *Sewerage Use Bylaw 2015-18* apply.

Applications for connection shall be made using the forms appended to this section. All conditions for the LPS system shall be completed as stated in the schedule appended.

Private system owners shall be responsible for all operation and maintenance of private grinder pump systems including, and not limited to, all replacement costs.

5.2.8.1 Size

Low pressure sanitary system service connections shall be a minimum of 38mm copper tube sizing (CTS) HDPE with a minimum pressure rating of 1,100kPa (160psi) from the LPS main to the building connection.

5.2.8.2 Cover

Minimum cover from crown of pipe to finished grade shall be 2.7m in clay, 3.3m in granular soils. If the required cover cannot be maintained, insulation shall be required as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & smaller, or as per manufacturer's recommendations as designed by a professional engineer and accepted by the Town. Refer to Section 4 of the EDCG for further information.

5.2.8.3 Placement and Alignment

A horizontal separation of 0.6m shall be maintained between individual services along mains. Sanitary services should be placed a minimum of 2m off neighboring property lines.

5.2.8.4 Curb Stop Component

The curb stop shall have an adjustable cast iron service box with stem as per City of Calgary, *Standard Specifications Sewer Construction*.

The curb stop shall conform to Town of Canmore specifications for water service connections except that it will have *Sanitary* printed on the curb stop.

5.2.8.5 Grinder Pumps

Connections to LPS systems shall be with a grinder pump system capable of solids grinding and appropriate dynamic head to deliver contents under a wide range of pressure conditions.

The pumping chamber (sump) shall be manufactured from HDPE, fiberglass reinforced pipe (FRP), sulfate-resisting concrete or other approved corrosion-resistant material. The sump shall be protected from freezing, be leak-proof and prevent the infiltration of groundwater. The sump shall be sealed and vented in accordance with the Plumbing Code. For a typical detached dwelling unit, the net pump-out capacity of the collection sump (tank) should not exceed 500L. The total pump-out capacity of the sump shall be

larger and include reserve storage capacity for power outages, etc. For homes with above-average water consumption (due to installations of hot tubs, swimming pools, etc.), or for multi-unit residential developments, a professional designer should be consulted for proper sump sizing.

Grinder pumps designed for a LPS system application shall be manufactured by Environment One, Hydromatic, Meyers or equal approved by the Town Engineer with a design capacity of 41L/min at 27m (11 US gpm at 90ft.) total dynamic head. The pump shall be capable of intermittent operation at pressures at least 25% above and 50% below the design rating.

The pump shall be complete with controls to automatically start and stop the pump at pre-selected liquid levels in the sump.

The discharge piping shall include unions or couplings that allow the pump to be disconnected for servicing or repair. The discharge piping shall also include a double check valve, shutoff valve and pressure gauge within the building or access chamber.

5.2.9 Service Connections – Existing Systems

Where the existing structure is demolished and replaced, the sanitary service must be replaced to the main at the expense of the Builder or Developer if it is not PVC (gravity) or 38mm copper tube sizing HDPE with a minimum pressure rating of 1,100kPa (160psi) (LPSS) and/or if it is greater than 30 years old. The same conditions apply where additional serviced buildings or an addition to an existing building is proposed.

The new service should be on the same alignment as the existing service and, may utilize the existing service tie-in at the main if the existing connection is of acceptable material and in good condition. Existing pre-formed junctions on the main shall be utilized with a suitable transition fitting. Existing strap-on saddles shall be removed and replaced to suit the new PVC service pipe for gravity systems.

If not replacing the existing service along the original alignment, the old service shall be terminated at the main at the expense of the Builder or Developer.

In the case of a PVC gravity service greater than thirty years of age, the property owner may submit a request to reuse the sanitary service and is encouraged to submit this request with the Building Permit or Development Permit application to avoid delays during construction. The request must include the following:

- Age of sanitary service (if known)
- Depth, diameter and insulation
- Confirmation that the existing service meets the NPC sizing requirements
- CCTV-video and report prepared by a qualified contractor
- Processing fee as outlined in Fee Schedule

A Low Pressure Sanitary Service (LPSS) must be replaced if it does not meet the size and material specifications outlined above, or is greater than 30 years of age. In the case of a Low Pressure Sanitary Service greater than thirty years of age, the following information is required to support a service replacement exemption request from the Builder or Developer:

- Age of sanitary service (if known)
- Depth, material, diameter and insulation

- Location of curb stop relative to property line
- Confirmation that the existing service meets the NPC sizing requirements
- Processing fee as outlined in Fee Schedule

If, following review of the submittal, the Town deems that the existing service is in good condition, is adequately sized and is insulated or at adequate depth below frost, the service does not have to be replaced. However, the Builder or Developer shall execute a *Service Replacement Exemption Letter*, a copy of which can be obtained from the Town Engineering Department.

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.

5.2.10 Abandonment of Existing Services

All Demolition Permits require abandonment of existing services, unless otherwise approved under a *Service Replacement Exemption Letter* or as part of a Development Permit or Building Permit. A Road Use and Excavation Permit may be required and the abandonment shall be witnessed by the Town, the Utility Operator, an authorized professional acting on behalf of the Town, or the Consulting Engineer.

Sanitary sewer services shall be abandoned as follows:

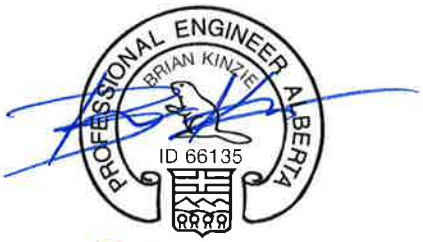
1) The service line shall be excavated and removed from the main to the property line.
2) If the service line is not completely removed within the property, the service line shall be cut at property line and the private service sealed with a watertight cap or plug if the service material is PVC. If the service line is composed of a material other than PVC, the service pipe shall be plugged with a non-shrink grout.
3) If the service material at the main is PVC, the terminated service shall be capped. If the service material is vitrified clay pipe (VCP) or other material, the stub shall be covered with a plastic cap. Capping of sanitary lines is preferred; grouting of pipe will be considered on a case-by-case basis by the Town Engineer.
4) If the service is a LPSS, the main stop shall be closed and a 300mm length of service pipe beyond the main stop shall be left in place and sealed with a watertight cap. If the service pipe is not removed on the private property, the curb stop shall be removed and the service pipe plugged with a plug with the same pressure rating as the pipe at least 300mm inside the private side of the property line.

SECTION 6 – STORMWATER

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 6" is made available for use in the Town of Canmore effective as of the date below:

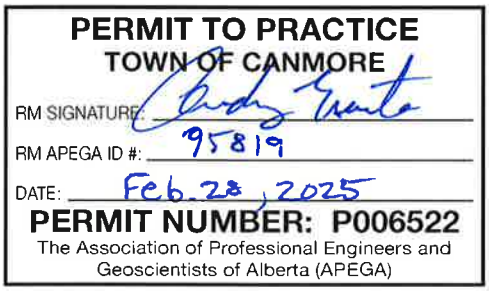
February 28, 2025



FEB. 28, 2025

Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

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6.0 Stormwater

It is important that Consulting Engineers and others treat these guidelines as a tool to assist them and not as a rulebook for stormwater management solutions. There are many site-specific issues that affect development and stormwater management planning. Although these guidelines provide practical and specific guidance, there must be flexibility to account for site-specific conditions. Stormwater management solutions are location dependent, and this must be recognized when applying the guidance provided in this document.

Stormwater should be treated as a resource. As opposed to the traditional capture, detain and release approach, Consulting Engineers are encouraged to harvest, reuse, and re-infiltrate stormwater as much as is practical to the site. Specific attention should be paid to the suitability of infiltration-based approaches in undermined lands.

Low impact development storm management and techniques should be used whenever practical, particularly reducing the imperviousness of the site. Please visit the following website for information about low impact development techniques: www.alidp.org. The Town encourages the use of distributed, low embodied carbon stormwater solutions such as bioretention facilities, raingardens and permeable pavements. While carbon intensive, traditional grey stormwater systems continue to play an important role in stormwater management, the multiple co-benefits offered by Low Impact Development solutions can be superior in terms of cost and performance.

Developers are encouraged to use stormwater systems that reduce the amount of manufactured infrastructure required. Developers are encouraged to harness the slope of the land. Where practical, natural materials and organics should be used as filtering media.

6.1 Reference Documents

A complete list of reference documents is provided in Section 1.

Consulting Engineers should refer to Stormwater management reports specific to respective developments (as part of area structure and area redevelopment plans, subdivision applications) as available from the Town or respective developer.

6.2 Conceptual Planning

6.2.1 Hierarchical Approach

Stormwater management planning for subdivisions and developments shall be based on a hierarchical approach. This entails working from the watershed to the sub-watershed to the subdivision and finally down to the site level. The hierarchical approach acknowledges the linkage and interdependence of community planning to stormwater management planning at all levels. This is particularly important when designing legal boundaries of new subdivisions. When subdividing large tracts of land, development teams are encouraged to seek out boundaries that complement the existing hydrology and existing stormwater aspect of the site. Parcel selection should complement the existing or planned infrastructure.

The following four key aspects of stormwater systems need to be addressed.

1) Quantity

In addition to reducing erosion implications, stormwater designs shall minimize the potential for downstream flooding and ponding. A wide spectrum of rainfall events shall be accounted for and it must be shown that smaller storms are kept on site as stipulated in this section.

2) Quality

Stormwater designs shall reduce contaminant loading from urban storm drainage to meet current removal requirements of City of Calgary.

3) Erosion and Sediment Control

All stormwater designs shall incorporate erosion and sediment control (ESC) measures as the City of Calgary standards.

Stormwater management shall be designed and constructed such that downstream erosion is prevented.

4) Hydrologic Cycle

Stormwater management in accordance with the principles of the hydrologic cycle is encouraged. Stormwater designs should try to mimic the original characteristics of the site hydrology. Please note that in some literature, this aspect of stormwater management is also known as base flow maintenance.

6.2.2 Design

Any stormwater system design shall meet the following standards, goals and plans:

- Comply with current editions of Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage, the City of Calgary's Stormwater Management Design Manual and relevant City of Calgary Industry Bulletins such as the 2023 Stormwater Management Facilities (SWMF) and Miscellaneous Items.
- Identify trapped low areas and place caveats on affected lots
- Mitigate potential for downstream flooding and erosion as much as possible
- Conform to the relevant accepted stormwater management master plan for the area

In addition, Consulting Engineers are encouraged to:

- consider principles of sustainability discussed in this section.
- minimize the potential risks arising from stormwater system designs to persons and property within the development boundaries.
- minimize inconvenience caused by surface ponding and flooding
- reduce contaminant loading from urban storm drainage and industrial runoff discharges by the use of best management practices.
- design pretreatment and infiltration facilities to operate under cold climate conditions and to be protected from damage due to frost.
- not pump stormwater unless it forms part of a progressive system for rainwater harvesting or as otherwise deemed acceptable to the Town Engineer.
- grade lots in such a way that quantity and velocity of surface runoff is minimized, and infiltration and detention is maximized throughout the site (as is practical).

- include acceptable stormwater management techniques that direct runoff to an acceptable drainage system for lots that are lower than adjacent roadways.
- direct runoff from an event that cannot be feasibly infiltrated to an appropriate stormwater system.
- minimize runoff flowing onto / across pedestrian walkways or multi-use pathways as is practical.
- sustain a sites' pre-development hydrologic regime by using techniques that infiltrate, filter, store, and evaporate stormwater runoff close to its source, where feasible.
- utilize plants to support phytoremediation by helping to contain, degrade, or eliminate pollutants and mitigate contamination of soil, water, and air.

6.2.3 Stormwater Management in High Groundwater Conditions

In instances (developments and subdivisions) where high groundwater exists, the Town reserves the right to ask for a geotechnical investigation to address specific issues of groundwater including highest anticipated groundwater level and lowest footing elevation for each lot.

6.2.4 Stormwater, Grading and Landscaping Relationship

Developers and Consulting Engineers must be aware of the relationship between stormwater, grading and landscaping. These disciplines will need to work together. Stormwater management will dictate the grading, and landscaping will be dictated by both of these factors. Development teams are encouraged to bring these three disciplines together at the early stages of the project in accordance with the integrated planning and design approach to work towards a cohesive design. It is recognized that compromises may be required to maintain a balance with existing policies and guidelines.

6.3 Design and Construction of Stormwater Management Components

6.3.1 Runoff Coefficients

The average runoff coefficient shall be weighed according to the amount of each type of area tributary to a given inlet. Values of coefficients should be in accordance with standard values from the City of Calgary's *Stormwater Management Design Manual*.

6.3.2 Dual Drainage Concept

For all sites, storm drainage shall be designed on the basis of minor and major systems.

Minor systems include components such as roof leaders, gutters, lot drainage, catchbasins, underground pipe systems, and on-site infiltration. Minor systems provide a basic level of service by conveying flows during minor storm events. In Canmore, the 1:5-year, one-hour event shall be used for design of minor systems.

Major systems include components such as lot drainage, roads, gutters, and storage facilities. Major systems convey runoff from the extreme events in excess of the minor system capacity. In Canmore, the City of Calgary stormwater criteria shall be used for design of major systems. Extended-period modeling may be required for larger developments, as directed by the Town.

Provisions shall be made for overland drainage during frozen ground conditions or over-saturation of the infiltration zone where applicable.

6.3.3 Design of Small Sites in the Valley Bottom

Small (detached dwellings and duplexes) and intermediate developments located on the valley bottom shall generally follow a "treatment, then infiltrate" approach to deal with stormwater runoff. Stormwater details shown in Figures EDCG STM 6.2 Rain Garden: Full Infiltration (Typical Section) and EDCG STM 6.3 Typical Drainage Well should be used for infiltration of the site stormwater runoff.

6.3.4 Design of Large Sites

For sites 2.0ha and larger (or where required by the Town Engineer), an overland flow analysis shall be provided for all new subdivisions and for all redevelopment sites in Canmore. The Town will require detailed computer modeling to be carried out to define the complete system, including depth of flow and velocity along the conveyance route, as well as the behavior of trap-lows and their interaction with storm sewers. Stormwater runoff determination for all new areas shall be made using a unit area release rate approach unless otherwise specified in a Stormwater Management Master plan accepted by the Town.

6.3.5 Surcharged Pipe Storage

Surcharged pipe storage is discouraged in the Town of Canmore. However, with approval from the Town Engineer, storage tanks can be used. For example, Cultec Stormwater Chambers and Brentwood Industries StormTank Modules are acceptable for use on private property. For stormwater management on Municipal Improvements the Town prefers alternatives to storage tanks, such as a distributed approach to managing stormwater with LID facilities. If a storage tank is unavoidable, an adequately sized oil/grit separator shall be installed upstream and the storage tank shall be equipped with access points for inspections and sediment removal.

6.3.6 Infiltration Systems

Infiltration systems shall address and show the 100-year groundwater elevation, lowest parkade elevation, lowest floor elevation, lowest footing elevation and geotechnical infiltration rates as applicable. Infiltration systems shall be placed with a minimum of 0.6m clearance (from the lowest horizontal plane of the system) from the 100-year groundwater elevation, as is practical.

In redevelopments, the design should re-infiltrate the first 19mm/day of runoff in the 1:5-year event.

6.3.7 Infiltration Facilities

An infiltration rate of $8x10^{-4}$ m/s has typically been used in the lower valley area of Canmore, unless the site-specific geotechnical testing shows otherwise. An infiltration rate based on 24-hour sustained saturated condition, may be used to calculate infiltration area requirements. The rate shall be based on in-situ tests performed at the proposed infiltration site, or on conservative values based on similar soils and laboratory testing. A suitable reduction factor dependent on finished site conditions shall be applied to the infiltration rate to account for possible future sediment build up and clogging. Where the peak runoff rate is greater than the adjusted infiltration rate, buffer storage shall be provided.

Detention storage volume, where required for infiltration purposes, shall include only the drywell volume and effective porosity of the drain rock around the drywell that is located above the 1:100-year groundwater elevation. For infiltration tanks, the basin bottom and side area shall be used to calculate the required area. For drywells, the drain rock circumference times height shall be used to calculate the required area.

Pretreatment best management practices (BMP) shall be used to reduce solids input to an infiltration system and to capture hydrocarbons. In order to ensure adequate water quality treatment, the Consulting Engineer should select an appropriate Impervious to Pervious (I/P) ratio as described in the City of Calgary *Low Impact Development Guidelines Module 2 – Bioretention and Bioswales*.

In the wellhead protection zone, additional treatment to remove pollutants may be required by the Town. These treatment processes may include vegetative filters, sumps, detention storage, oil-grit-separators (OGS) etc.

Capability for inspection and maintenance (access ports and entrances) shall be provided for all infiltration facilities.

6.3.8 Stormwater Ponds

Detailed information on stormwater ponds shall be submitted to the Town with an application. See Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System* for further information. Design and construction of stormwater ponds shall follow the latest edition of the City of Calgary *Stormwater Management & Design Manual* and the relevant sections of the Calgary Parks *Development Guidelines and Standard Specifications: Landscape Construction*.

The Consulting Engineer is encouraged to consider the role of source controls at the lot level which can achieve volume and peak flow reductions which may justify a smaller storm pond than would be required using traditional stormwater management techniques. The Consulting Engineer is also encouraged to contemplate integrating existing wetlands into the stormwater management facility.

Consulting Engineers are encouraged to utilize an Integrated System Approach to selection and design of stormwater ponds that balances stormwater management, habitat and biodiversity, and amenity and placemaking. Due to superior water quality treatment and potential for recreational, habitat and aesthetic value, wet ponds and engineered wetlands are preferred over dry ponds. Dry ponds may be contemplated under extenuating circumstances or where they are proposed to provide a recreational amenity and are designed to minimize nuisance ponding.

All stormwater ponds require the appropriate authorization from the Town and Alberta Environment prior to construction. Pursuant to Alberta's *Environmental Protection and Enhancement Act (EPEA)*, a registration is required for the construction of all stormwater ponds. The Consulting Engineer is responsible for preparing and submitting the required information to Alberta Environment subsequent to an authorization from the Town.

6.3.9 Outfalls

All stormwater runoff from subdivision and site development areas shall be managed prior to discharge for both water quality and quantity control to minimize the adverse impact on the environment.

Manufactured oil/grit separators are required to meet the performance specifications in the City of Calgary Stormwater Management & Design Manual, supplemented with specifications in the 2023 Industry Bulletin Stormwater Management Facilities (SWMFs) and Miscellaneous Items

Design of outfalls into any watercourse shall be submitted for review and acceptance by the Town, Fisheries and Oceans Canada (where required), and by Alberta Environment.

6.3.10 Culvert End Details

Culvert inlet and outlet details shall typically be constructed per the latest edition of the Alberta Transportation Highway Geometric Design Guide, as detailed in figure C-4.7, Hand Laid Rock Riprap. Also refer to Alberta Transportation's Highway Geometric Design Guide, Section C-4 for culvert installation guidelines.

The Consulting Engineer may request to exclude the installation of a clay seepage seal if they believe it would provide negligible benefit due to coarse granular native soils and intermittent flow. Such requests are subject to the approval of the Town Engineer.

Rock supplied for riprap shall be hard, durable, angular in shape, resistant to weathering and water action, clean and shall meet the following Class 1 gradation:

- 0% larger than 450mm
- 20–50% larger than 350mm
- 50–80% larger than 300mm
- 100% larger than 200mm

Small outfalls (300mm and smaller) with low outlet velocities may be proposed with smaller gradations.

Rip rap shall be placed on a geotextile.

6.3.11 Piped Systems

Storm sewers shall be designed as a separate sewer system. Effluent from sanitary sewers or any potentially contaminated drainage from industrial, agricultural or commercial operations shall not be discharged to storm sewers. Contaminated drainage means the introduction of any foreign or undesirable physical, chemical or biological substance into the environment which results in or is likely to result in deleterious effects.

Storm sewers shall be designed and constructed in accordance with the City of Calgary's *Stormwater Management and Design Manual* and the City of Calgary's *Standard Specifications Sewer Construction*.

The minimum size for a public storm sewer is 300mm diameter in low-density residential subdivisions and 375mm diameter in multi-family, commercial and industrial subdivisions. There is an exception to these minimum sizes for weeping tile roadway drains, which typically vary from 100mm to 250mm diameter.

Catchbasins shall be equipped with a 600mm-deep sump.

Town of Canmore – Storm solid covers or other covers as approved by the Town shall be installed on all storm manholes for municipal improvements on public property. Covers on oil-grit separators shall provide

some means of identifying the device. Covers labeled *Town of Canmore* are not to be used on private infrastructure.

6.3.12 Downspouts

Downspouts are to be constructed such that they:

1. Are directed away from neighbouring properties, structures, driveways and sidewalks;
2. Are directed towards absorbent landscape features;
3. Are a minimum of 2m away from any public infrastructure such as sidewalks, streets, lanes and alleys to reduce potential for icing.

6.4 Best Management Practices

Stormwater best management practices (BMPs) are methods of managing stormwater drainage for adequate conveyance and flood control that are economically acceptable to the community. Stormwater BMPs are management methods that retain as much of the natural runoff characteristics and infiltration components of the undeveloped system as possible and reduce or prevent water quality degradation.

Stormwater BMPs are normally looked at as five levels of control. All stormwater systems should address these five levels of control, as noted below. It is generally accepted that the cost of control measures increases as they get farther from the source. As such, the order in which these BMP control measures should be addressed is the same order in which they are listed below (starting closest to the source). In addition to the Town of Canmore *Stormwater Master Plan*, Consulting Engineers are encouraged to review the documents referenced in Section 1 of the EDCG for more details regarding these controls. All stormwater BMPs require acceptance by the Town.

6.4.1 Five Levels of Best Management Practices

To assist Consulting Engineers during their consideration of stormwater system designs, the Town notes that there are generally five levels of BMPs that are recognized:

1) Pollution Prevention

Pollution prevention involves public education, awareness and participation, in addition to regulations, enforcement, and application of bylaws. Developers should provide literature where applicable summarizing the private stormwater management system made available to the bodies that represent a conglomerate of units such as a condominium board. The literature should outline a recommended maintenance schedule along with a description of what type of inspections may be required.

2) Source Controls

Source controls are measures designed to minimize the generation and entry of pollutants into stormwater runoff. Emphasis is on non-structural and semi-structural measures applied at or near the source. Examples of source controls include:

- minimizing the sediment that is used in the winter for ice control.
- minimizing pollutant content for salt/sediment used on ice.
- catch basin cleaning.

- use of environmentally friendly de-icing agents.
- runoff separation: runoff that has not travelled across a vehicle carriageway may not require pretreatment and can be infiltrated directly into the ground.

3) Lot Level Best Management Practices

Lot level BMPs are practices that reduce runoff volumes and/or treat stormwater before it reaches a municipal conveyance system. These controls can be either structural or non-structural in nature and applied at the individual lot level or on multiple lots that drain a small area. Typically, these techniques would be implemented on individual dwelling lots or for small commercial/industrial lots.

4) Conveyance Best Management Practices

Conveyance BMPs are measures that mitigate the impacts of urbanization when conveying runoff such as promoting soil moisture replenishment, groundwater recharge and infiltration, where practical. Conveyance systems for both the minor and major systems shall be low energy overland flow where practical. Consulting Engineers are reminded that runoff needs to be of a quality so that it does not negatively affect the groundwater. Stormwater conveyance systems transport drainage from developed areas through sewer or grassed swale systems.

5) End of Pipe Best Management Practices

End of pipe BMPs provide flow attenuation, major flow conveyance, and water quality enhancement of stormwater before discharge into a receiving water body. A number of end-of-pipe alternatives are available for application depending on the characteristics of the upstream catchment, and the regulations and requirements for water quality in the receiving waters. End of pipe practices that provide extended detention reduce the rate of stormwater discharge by storing the stormwater runoff temporarily and releasing it at a controlled rate. Water quality treatment is provided through enhanced settling and biological processes.

6.5 Maintenance

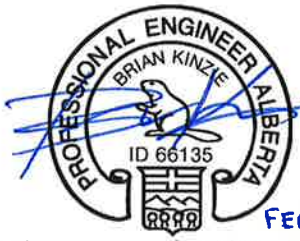
The Consulting Engineer is responsible for providing the Town with a suggested maintenance schedule for all treatment facilities on private lands as well as those on right-of-ways (ROWs). The maintenance schedule should suggest the frequency for replacement of filters for all components that are meant to filter runoff and for all filter mediums. There should also be a suggested schedule for the removal of sediment and any other maintenance requirements to ensure the treatment facilities are functioning properly with maximum efficiency.

SECTION 7 – TRANSPORTATION SYSTEMS

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 7" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

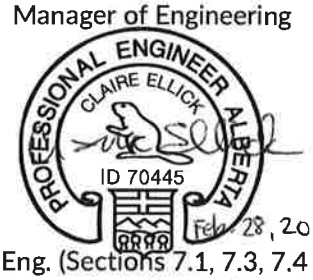


FEB. 28, 2025

Brian Kinzie, P.Eng. (Sections 7.5 and 7.6)
Municipal Engineer

Feb 28, 2025
ID 95819

Andy Esarte, P.Eng. (Section 7.2)
Manager of Engineering



Feb 28, 2025

Claire Ellick, P.Eng. (Sections 7.1, 7.3, 7.4 and 7.7-7.11)
Transportation Engineer

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Andy Esarte, P.Eng.
Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 7" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

7.0 Transportation Systems

The Town of Canmore's 2018 Integrated Transportation Plan (ITP) provides strategic direction for how to accommodate current and future transportation needs in a manner consistent with the Municipal Development Plan (MDP). The Municipal Development Plan envisions a transportation network that accommodates multiple modes of travel through a Complete Streets approach (defined in section 4.5 of the ITP), and a trail network that prioritizes and encourages walking, cycling and transit use while accommodating private vehicles within a reasonable capacity. The MDP states the design of public systems, including roads, sidewalks, parks, pathways, lighting, landscaping and street furniture, should support and encourage walking and cycling modes of transportation for accessing the Town Centre and other commercial areas.

As directed by the MDP and ITP, Complete Streets and the active transportation network should address accessibility and connectivity for all ages and skill levels for each season of the year. This is referred to by the City of Calgary, and throughout this document as a 5A Network, or Always Available for All Ages & Abilities.

The transportation network envisioned in the MDP places added emphasis on streetscaping and the design of both private and public realm to nurture Canmore's unique sense of place. The MDP indicates the transportation network is intended to provide both movement but also be livable, providing places to be and gather. This is reflected in the ITP in section 4.5.2 Balance Place and Link and 5.2.3 A Unique Network of Connections & Places.

The ITP provides vision and guiding principles for the street network, active transportation network, traffic calming, transit service, and commercial goods movement. The ITP assesses network capacity in the Town Centre and has established a 2030 goal of 40% non-vehicular trip share to maintain a functional roadway network while accommodating growth. The ITP provides guidance for new development and roadway retrofits in support of this target.

The direction of the MDP, and recommendations of the ITP have informed development of the guidelines in this section for construction of roadways, pathways and developments. The Town has endeavored to align these guidelines with existing standards and legislation including Alberta's Traffic Safety Act, Transportation Association of Canada guidelines, and the Manual of Uniform Traffic Control Devices for Canada (MUTCDC), current editions. Where these guidelines and the EDCG fall short of providing sufficient detail to accomplish the principles of the ITP, design may be inspired by standards and designs of other jurisdictions, and best practice guidelines such as the BC Active Transportation Design Guide, with appropriate consideration for professional practice requirements in Alberta.

The information in this guide does not absolve private and public sector planners, architects or engineers from their duty to carry out due diligence when designing private and public infrastructure. This includes checking relevant standards, regulation, and legislation. The Engineer of Record is responsible for applying these guidelines to site specific context and to accept professional responsibility for any professional work product in accordance with the Engineering and Geoscience Professions Act.

7.1 Layout and Connectivity

7.1.1 General

The layout, street classification, and connectivity of a newly planned subdivision should result in outcomes broadly consistent with the vision and policy of the MDP and recommendations of the ITP.

Road and pathway networks should coincide with the layout shown under the applicable statutory document, for example Area Structure Plans, to ensure logical ties to adjacent subdivision areas.

Where a proposed subdivision or development site is not connected to the existing or planned active transportation and transit network, the developer is responsible for providing off-site connectivity to connect the development in accordance with MGA 650(1), and any relevant statutory documents.

7.1.2 Network Planning

The MDP states that the transportation network will provide capacity for the movement of people through seamlessly connected active transportation links, as well as 'Complete Streets', defined as streets prioritizing sustainable modes including walking, cycling and transit. Where additional travel capacity is required for the existing network, new walk, cycle and transit connections will be favoured over adding vehicle lanes.

The MDP under 13.1.3 Subdivision Design provides guidance for submissions to include the following, along with other considerations:

- limited direct driveway access onto arterial roads and major traffic routes;
- separation of pedestrian and cycle travel from vehicle traffic;
- pedestrian connections linking with the Town pathway and trail system, schools; recreation areas, and commercial activity centres;
- transit stops or planned locations for future transit stops.

The conceptual design of an area, whether at statutory/non-statutory plan preparation, or at the subdivision planning stage, is expected to consider the preservation of natural vegetation, natural grades and landscape features, in addition to transportation considerations. The conceptual design should demonstrate how natural features, natural grades and landscape features are preserved and integrate with transportation design elements. The conceptual design should allow for subdivision level design of roadways, pathways, and developments that provide direct connections to the local and community network for walking and cycling, safe and accessible grades, and consider requirements of maintenance and operation.

Per MDP 14.3.5, Transportation Impact Assessments (TIA) may be required to be submitted for development proposals, including area structure plans, land use bylaw amendments, and subdivision and large development permit applications. Walking, cycling and transit should be key considerations in all traffic impact assessments. Transportation Impact Assessments should be based on the City of Calgary's Transportation Impact Assessment Guidelines. Inputs into assessments should be supported by local statutory documents to establish trip generation and mode-share targets and incorporate Town approved data or data collected for the purpose of the assessment as may be required. Section 2.4.9 provides additional detail on TIA submission process and requirements.

Section 7.7 includes guidelines for off-street connectivity to the network.

7.1.3 Mixed-use Commercial Areas

Area plans may consider mixed-use commercial areas with a street-oriented pattern of development and may include higher quality pedestrian realms. This development pattern is typically characterized by buildings that are built to minimum setbacks with building entrances directly on the street. Per MDP 10.1.3, mixed-use commercial areas will have a strong pedestrian-oriented design with good connections to pathways and sidewalks. The EDCG includes design elements in support of MDP 10.3.2, which states that developments should include a high-quality design such as landscaping treatments, gathering places, and street furniture. Planning policy objectives of the MDP can be accomplished by emphasizing walking, cycling and transit facilities in these areas.

7.1.4 Residential Areas

Per 6.1.2 of the MDP, residential neighbourhood design should include the following key characteristics: provision of a safe pedestrian and cycling environment; neighbourhood nodes or activity centres to encourage community interaction and engagement and facilitate future local transit.

Per MDP 6.1.3, all residential areas should be integrated with the municipal commuter pathway system and connected to the trail system. Public trails or pathways should be provided on public property in general. Trails or pathways on private property that are intended for public use shall be protected by rights-of-way or easements that grant public access.

Low density residential developments should be laid out in a way that vehicle access to individual parcels is provided by way of local road, lanes, or private mews.

7.1.5 Pathway Network

Pathways network layout should conform to the latest edition of the Town of Canmore's Open Space and Trails Plan, Integrated Transportation Plan, relevant area plans and other statutory documents. The Town will endeavor to maintain alignment between these plans over time, particularly where they overlap, however each plan may have unique requirements. Where the plans are conflicting, the most recent plan should take precedence.

7.1.6 Walking and Cycling

The MDP 14.3.2 states that the movement of pedestrians and cycling should be integral in the design and reconstruction of the transportation network.

The MDP and ITP reference the use of both Complete Streets and a pathway network to separate people walking, using mobility devices, and cycling from vehicular traffic and to connect between origins and destinations including the transit network.

The design of facilities for walking and cycling should consider the following principles of an 5A Network as identified in section 5.2.1 of the ITP:

- Directness: provide direct access to and between various destinations for commuting, visiting, shopping, and other everyday activities.
- Safety: be both statistically safe and perceived as safe.

- Comfort: Ensure an enjoyable experience through features such as smooth surfaces, wide bicycle lanes, and spaces that promote social interaction and easy passing.
- Continuity: a seamless experience through intersections, with no breaks or dead ends.
- Attractiveness: streets that are quiet, clean, and aesthetic are more appealing than congested, noisy, and polluted ones.

Designs may achieve the above principles through a variety of approaches. The EDCG provides design details that address common situations such as typical cross sections and intersection designs. Where the EDCG does not address a location specific requirement, the MDP 14.1.1 states that designs shall meet, and are encouraged to exceed leading industry guidelines and standards and encourages designers to think creatively and harness local or site-specific advantages.

While vehicle trips may be accommodated through indirect travel routes, the network should be designed to be highly permeable for walking and cycling trips, and provide direct connections for walking and cycling and direct access to transit infrastructure. Where long unbroken blocks, crescents, and cul-de-sacs create barriers for travel, connections should be provided every 100m–150m, or where desire lines are best served. While it is preferred that connections are on public land, some circumstances may require access to be provided across private land. In such cases a public access easement should be provided.

Pathways outside of the road right-of-way may be planned to serve transportation or recreation requirements for an area or both. The provision of separate pathways will not replace the need to provide walk and cycle infrastructure within the road right-of-way.

End of trip facilities for cycling play an important role in connectivity and are addressed in Section 7.8.

7.1.6.1 Cul-de-sac, Crescents

A crescent or cul-de-sac should provide one or more 5.0m PUL or MR to provide walking and cycling connectivity, except where it can be demonstrated that there are no desire lines, and there will be no future connections within (or beyond) the area, for example where restricted by a wildlife corridor.

7.1.7 Public Transit

The MDP 13.1.3 Subdivision Design states that transit stops, or planned locations for future transit stops, should be incorporated into subdivision proposals to support good urban design.

The MDP 14.3.8 states that facilities to accommodate expansion of the public transit system should be considered in new development proposals.

New developments should incorporate a road network that supports transit operations by utilizing collector and arterial streets for transit routes. To maintain efficient service delivery and safety, transit routes are not to be planned for local roads, except when necessary to provide turnaround capability during interim phases of development. Where bus routes are planned on collector roadways, parking should be minimized to provide space for bus stops and allow efficient flow of bus traffic.

All collector and arterial roadways within new developments should provide adequate connectivity and designated turnaround points to support public transit bus movements and route continuity without the requirement to access on private property. This includes ensuring that buses have sufficient space for turning at the ends of collector and arterial roadways at all phases of development.

In areas where immediate bus service is not planned, developments should include the placement of signage at all planned bus stop locations on collector and arterial roadways to indicate that the area has been designed for potential future transit service. This will inform residents and visitors of future service plans, fostering awareness and readiness for transit integration. The signage may be integrated with other parking signage to minimize clutter.

To align with the requirements of the MDP, convenient 5A network walk and cycle connections should be provided between planned transit infrastructure and adjacent developments. Stops should be in located in pairs on the opposite sides of the road, in close proximity to road crossings. Rights-of-way should be designed to include the space required for future transit stops.

7.1.8 Emergency Access

Emergency access requirements will be reviewed as part of the development approval process. The City of Calgary's Fire Department Access Standard (2018) should be used as guidance for emergency access, in addition to other applicable guidelines (including the National Fire Protection Association 1140 Standard for Wildland Fire Protection), or as determined by the Canmore Fire Chief to appropriately meet standards of safety and the best interests of the community. Where a Wildfire Risk Assessment is required as part of an application, this document should provide recommendations for emergency access locations for the purposes of efficient evacuation and access by emergency services.

Maximum cul-de-sac and crescent lengths shall account for emergency access requirements, as outlined in NFPA 1140 and the Calgary Fire Department Access Standard.

7.2 Street Design

7.2.1 General

Designers may achieve the principles of the ITP through a variety of approaches. The EDCG provides specific details of design that address common situations such as typical cross sections and intersection designs. Designs should be adapted to site specific conditions, and existing network conditions, to align with principles of the ITP.

Where the EDCG does not address a location specific requirement, MDP 14.1.1 guidance states that designs shall meet, and are encouraged to exceed leading industry guidelines and standards and encourages designers to think creatively and harness local or site-specific advantages.

Road rights-of-way should be flat across the full cross section, notwithstanding minimum crossfall for drainage. In support of accessibility, active transport modes, transit operations and maintenance, grades of 6% or less in profile should be targeted. Maximum grades of 8% are permitted for local and collector roads, and 7% permitted on arterial roads where 6% or lower grades cannot practically be achieved.

The following guidelines are to be addressed in the design of streets, in addition to criteria outlined in Figure EDCG STR 7.1 Design Elements for Urban Thoroughfares.

Details related to signage can be found in Figure EDCG STR 7.11 Typical Street Sign Installation.

7.2.1.1 Public Realm

The space adjacent to vehicle lanes and any adjacent mountable elements is termed the public realm. This is the public space along a street where people can walk, cycle, sit, wait for transit and interact with each other. The public realm is comprised of:

- The boulevard (or furnishing zone) where infrastructure such as streetlights, benches, bike racks, and landscaping are located adjacent to the curb. The furnishing zone may be primarily hardscaped in busy commercial environments. Intermittent parking bays (Figure EDCG STR 7.7 Parking Bay) may also be accommodated within this space along local and collector roadways.
- The active transportation zone is located adjacent to the boulevard (or furnishing zone). This is the space where people can walk or cycle along a corridor, free of obstructions. The size of the active transportation zone that is required to accommodate pedestrians depends on the roadway classification and adjacent land uses, as outlined in the following sections. Active transportation zones should be clear of all obstructions, including space on each side of the hard surfaces that is clear of vertical hazards for travel and maintenance equipment.
- The frontage (or buffer) zone is located between the active transportation zone and building faces. It provides pedestrians with an offset from adjacent buildings, and provides clearance from doors opening outwards, ramps, stairs, enclaves, and other elements that aid in interfacing between the active transportation zone and the building and building access.

MDP 10.1.9 states the design of public systems, including roads, sidewalks, parks, pathways, lighting, landscaping and street furniture, should support and encourage pedestrian and bicycle modes of transportation for accessing the Town Centre and other commercial areas.

Details on how to accommodate these elements into various roadway classifications are outlined in Sections 7.3.2, 7.3.3 and 7.3.4, and Figures EDCG STR 7.2 Road Classification, STR 7.3 Local (ULU 50) Parking Both Sides Cross-Section, EDCG STR 7.4 Local Rural Parking Both Sides Cross-Section, EDCG STR 7.5 Collector (UCU 50) Parking Both Sides Cross-Section and EDCG STR 7.6 Arterial (UAD 50) No Parking Cross-Section.

Figure EDCG STR 7.23 On-street Bicycle Parking provides detail on the positioning of bike racks within public spaces. Bicycle racks positioned within road right-of-way should ensure that parked bicycles can be accommodated within the furnishing zone, and do not encroach on the active transportation zone. Racks placed adjacent to motor vehicle parking should be placed between parking stalls to avoid conflict with opening doors.

7.2.1.2 Walking

Where specific pedestrian design requirements are not addressed in the EDCG, universal design principles of the Accessibility Design Guide, GoA, should be adhered to for all elements of the pedestrian realm, to facilitate year-round access to public infrastructure and spaces.

Sidewalks should be continuous across all access points and intersections and maintained at a grade elevated from the roadway. Exceptions may be made to accommodate flow of emergency services and transit vehicles, or where local conditions may preclude maintaining a continuous facility.

Next to parking bays, sidewalks should be constructed monolithically with the curb and gutter adjacent to the parking bay. When a midblock pedestrian crossing is required, it should be placed where there are no

parking bays, such that sightlines are maintained and the maximum distance crossed by a pedestrian is the width of the travel lanes.

Planning and design of the pedestrian realm is related to anticipated levels of pedestrian activity within different contexts and based on adjacent building orientation and location, and land uses. See specific road design by classification for guidance on widths.

Details particular to the design of sidewalks and pathways can be referenced in Figure EDCG STR 7.13C Patterned Concrete Buffer Detail, Figure EDCG STR 7.16 Tactile Warning Plates (at Curb Ramps), Figure EDCG STR 7.17 Expansion Joint Layout, and Figure EDCG STR 7.18 Crosswalk and Elephants Feet Pavement Markings.

7.2.1.3 Cycling

Cycle paths should be unidirectional. There may be certain contexts under which a section of bidirectional cycle path may be considered to accommodate connectivity and desire lines, however this should be established early in the planning process to minimize or eliminate conflicts with intersections, driveways and accesses.

Cycle paths should be separated from the driving surface with space to accommodate buffering, parking, snow storage, lighting, landscaping and transit stops. Where parking bays are constructed adjacent to separated cycling infrastructure, a minimum hard-surfaced buffer of 0.6m should be provided from the back of curb to the edge of the cycling facility.

Cycle paths should be maintained at a grade elevated from the roadway and should be continuous across all access points and intersections. Cycle paths at intersections may be at street level, crossing roadway asphalt, and delineated by pavement markings, where vehicle traffic is given priority, for example where it is desired to accommodate flow of emergency services and transit vehicles.

Cycle paths should be broom-finished, pigmented red colour saw-cut concrete, or red pigmented asphalt. A buffer should be provided between cycle paths and sidewalks along collector and arterial roadways. See Figure EDCG STR 7.13C Patterned Concrete Buffer Detail for specifications.

Where a separated cycling facility intersects with another separated cycling facility or pathway, a minimum corner radius of 2.5m should be provided.

Utility appurtenances should be located outside of bikeways and paved shoulders accessible to cyclists. Appurtenances within these areas should be “cycle-safe” models with top elevations set flush with the surrounding pavement surface.

7.2.1.4 Public Transit

New transit stops should be designed in accordance with Figure EDCG STR 7.8 Bus Stop Layout.

Transit infrastructure should meet universal design principles of the Accessibility Design Guide, GoA, including connections to adjacent walking and cycling infrastructure.

New transit stops should include an accessible concrete pad, and lighting. For stops that are to be put into use at the time of development, the stop should also include a shelter, garbage and recycling bin, bench, "next bus" signage and bicycle parking. Widened road right-of-way, public utility lots or municipal reserve

may be required for the accommodation of a transit stop, and as such should be considered at each stage of the approvals process.

Where transit operations will interact with cycling infrastructure, best practices in cycling design should be applied. Physically separated cycling facilities should be accommodated by means of a bend-out design, where they are not already separated from the curb by a boulevard, to ensure continuity of cycling movement and the avoidance of conflict with passengers boarding and alighting the bus. The bend out design requires the cycling facility to be behind the entire bus stop pad (including passenger waiting area, bike racks and shelter). Tactile walking surface indicators (specifically tactile direction indicators) should be provided for pedestrians to be able to locate the transit stop from the sidewalk. Detectable warning surfaces should be provided on both sides of the cycling facility where people accessing transit are required to cross the cycling facility.

7.2.1.5 Parking

Parking should be provided on local and collector roads only and should not be included in the design of arterial roadways.

Where barrier-free stalls are provided on-street, access to the sidewalk is to be provided in accordance with the Accessibility Design Guide, GoA, so as not to require any travel in a vehicle lane by a person using a mobility device. This may require adjustments to the standard cross section to accommodate additional sidewalk width.

The provision of on-street parking should be limited to parking bays. Parking bays may be interspersed with access points, street trees, landscaping and street lighting and should typically accommodate a maximum of five vehicles. Each bay should be separated from travel lanes by a concrete invert crossing. Standard or rolled curb with reverse gutter should be used between the edge of a parking bay and any adjacent sidewalk. Design details for parking are outline within respective road designs based on classification.

Signage design for on-street parking is to be developed as part of roadway design, with Town input for regulations (permitted use, time restrictions, and pricing), and included in development submissions.

7.2.1.6 Intersections and Mid-block Crossings

Intersecting roads should be as near to 90 degrees as possible to allow for safer turn movements, shorter crossings, and to maximize sightlines. Intersections on the inside of curves are undesirable as they can reduce visibility, make turning more difficult, and can reduce safety, and should be avoided wherever possible. Access is to be considered at time of network planning as outlined in Section 7.4 Access Management and Design.

Intersection corner radii should be designed to the minimum value as demonstrated to operate acceptably by a transportation engineer. Design vehicles must be able to turn from inside lane to inside lane without encroaching on adjacent lane configurations. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons. Encroachment into adjacent lanes may be permitted in areas of low traffic, for example on local roads.

Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width. In addition to the design and control vehicles below,

intersection geometry should include accommodation for walking and cycling and should adhere to universal design principles.

Intersection right-of-way should accommodate infrastructure and geometry for walking and cycling facilities appropriate for the road classifications and street design.

Separate signals for walking and cycling should be included at all signalized intersections where walking and cycling facilities are present.

When a midblock pedestrian crossing is required, it should be placed where there are no parking bays to limit crossing distance to the width of the travel lanes. In retrofit situations, as an interim measure, precast concrete can be utilized to create safe mid-block crossings and for other traffic calming measures. Details for precast concrete medians are provided in Figure EDCG STR 7.20A Precast Concrete Median 600mm - 1500mm, Figure EDCG STR 7.20B Precast Concrete Median 2000mm – 3000mm, and Figure EDCG STR 7.20C Precast Concrete Median Anchoring Details.

7.2.1.7 Utility Rights-of-way

A 3.5m-wide utility right-of-way should be provided on both sides of road rights-of-way to accommodate utility requirements except where it can be demonstrated that utility requirements can otherwise be accommodated through laneways. Other street and utility designs may be approved by the Town provided utility requirements are adequately accommodated.

7.2.2 Local Roads

Local roads provide direct access to abutting residential properties. They collect and distribute trips from residential properties to collector roads and the pathway network (see Figure EDCG STR 7.3 Local (ULU 30) Parking Both Sides Cross Section).

Use of the EDCG local road cross sections, raised crossings, raised intersections, and continuous sidewalks is expected to result in a typical driver speed at or below the 30km/h posted maximum. Provided the details of the EDCG are applied, additional engineering consideration with respect to design speed is not required.

Where local roads serve local traffic only, with low density housing and a limited number of units, the Town may direct the use of a rural cross-section, as shown in Figure EDCG STR 7.4 Local Rural Road Parking Both Sides Cross-Section, and other changes to the standard local road cross-section as may be appropriate for the context.

Table 7-1 provides a summary of design values for local roads. More context regarding the application of these values can be found in the sections following.

Table 7-1: Local Road Quick Reference Table

Design Element	Value
Right-of-Way Width	15.3m
Target Road Capacity	2000 vehicles per day
Design Speed	30km/h

Posted Speed	30km/h
Driving Surface Width*	6.0m
Sidewalk Width	1.8m
Boulevard Width	2.2m
Median separation/painted centre line	No
Parking Bay Width**	1.95m

*Measured from face-of-curb
**Measured from back of concrete invert crossing to face-of-curb (see Figure EDCG STR 7.3 Local (ULU 50) Parking Both Sides Cross-Section)

7.2.2.1 Walking

Local roads should have a minimum 1.8m wide broom-finished, trowelled, natural colour concrete sidewalks on both sides. Next to parking bays, sidewalks should be constructed monolithically with the curb and gutter adjacent to the parking bay with a minimum width of 2.3m to incorporate a door swing zone.

Sidewalks should be separated from driving surfaces by a curb and gutter and by a minimum 2.2m wide boulevard.

7.2.2.2 Cycling

Cycling on local roads will be accommodated in shared-use lanes. Where volumes are at or below 1000 vehicles per day, local roads may be used as connections to the cycling network. For network continuity, unless physical separation of the cycling facility from the vehicle lanes is provided, local roads should not be relied on beyond local connectivity.

7.2.2.3 Parking

On-street parking is encouraged on both sides of local roads within parking bays.

7.2.2.4 Access and Intersections

Where safe to do so, local road access to local and collector roads should be controlled through appropriate regulatory signage, as determined by a transportation engineer.

Traffic calming measures, such as raised crossings and raised intersections, EDCG Figure SRT7.14 Typical Raised Intersection, should be considered for use at all intersections and crossings. Additional design attention may be required in areas with higher volumes of pedestrian activity, and areas where speed compliance may be a concern.

Table 7-2 outlines design and control vehicles for local roadways. For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-2: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Local Road	Passenger Car	Waste Collection Truck, School Bus, Fire (Ladder) Truck, Medium Single Unit Truck	Maneuver within hard surfaced areas. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum 0.3m clearance from body overhang to vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.3 Collector Roads

Collector roads collect and distribute trips from residential, commercial and industrial areas. They distribute travel from neighbourhood to neighbourhood within the community and serve secondary trip generators, such as schools, community business centers, parks, sports fields, etc. Public transit may operate along collector roads within the community (see Figure EDCG STR 7.5 Collector Parking Both Sides Cross-Section).

Travel lane widths for collector roads should be 3.55m to the face-of-curb where two opposing travel lanes are adjacent. Where there is separation between opposing travel lanes, minimum lane widths of 3.25m (face of curb to face of curb) are acceptable provided there will be no mirror overhang into adjacent walking/cycling refuge space by design or control vehicles.

There may be cases where right-of-way adjustments are necessary on collector roadways that include horizontal curvature, to allow for rollover zones at the back of curb to accommodate control vehicles, while ensuring no encroachment into, or reduction of, the public realm.

Depending on context, the Town may direct the use of a rural cross-section for collector roadways per Figure EDCG STR 7.5 Collector Parking Both Sides Cross-Section, modified as may be required for context.

Table 7-3 provides a summary of design values for collector roads. More context regarding the application of these values can be found in the sections following.

Table 7-3: Collector Road Quick Reference Table

Design Element	Value
Right-of-way Width	22.0m

Target Road Capacity	2,000 to 10,000 vehicles per day
Design Speed	30km/h
Posted Speed	30km/h
Travel Lane Width*	3.25-3.55m
Sidewalk Width**	
Residential areas	1.8m
Adjacent to schools, loading zones, and commercial development	2.5m
Boulevard Width	2.8m
Unidirectional Cycle path Width	2.3m Typical Cross Section
Median Separation/Painted Centre Line	No
Parking Bay Width***	1.95m

*Measured from face-of-curb
**Except where adjacent to on-street parking, or fronting onto mixed-use commercial development (see Walking section)
***Measured from back of concrete invert crossing to face-of-curb

7.2.3.1 Walking

Collector roads should have a minimum 1.8m, broom-finished, natural-colour concrete sidewalk on both sides. 2.5m or wider sidewalks should be considered adjacent to mixed-use or commercial areas, loading areas, and school zones.

Where sidewalk width varies from the standard cross section, the boulevard width may be adjusted to suit.

Crosswalks should be placed where there are no parking bays, such that the maximum distance crossed by a pedestrian is the width of two travel lanes (7.1m face-of-curb to face-of-curb).

7.2.3.2 Cycling

On collector roadways, unidirectional cycle paths have an ideal width of 2.5m where space allows to accommodate side-by-side cycling. Otherwise, unidirectional cycle paths should be a minimum width of 2.3m. Where the cross-section is constrained, typically in retrofit situations, a minimum width of 2.0m should be provided.

Bi-directional cycle paths should be avoided where conflicts with access and intersections exist. Bi-directional facilities have an ideal minimum width of 3.0m where space permits and a minimum width of 2.5m. Wider facilities may be required based on local context or area planning.

7.2.3.3 Public Transit

Transit stops may be accommodated within travel lanes along collector roads. On collector roads, a layby should be provided for within the right of way at stops with higher ridership, and every three to four stops to facilitate traffic flow.

7.2.3.4 Parking

On collector roads, parking bays may be placed on one or both sides of the street depending on right-of-way availability and expected use.

7.2.3.5 Access and Intersections

Table 7-4 outlines design and control vehicles for collector roadways. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons Control vehicles should not cross the centreline of the intersection approach. Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width. For additional information on access, refer to Section 7.4 of the EDCG.

For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-4: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Collector Road	Single-unit Bus, Passenger Car	School Bus, Fire (Ladder) Truck, WB-21	Maneuver within clear width driving surface without encroachment into oncoming traffic. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum body overhang clearance of 0.3m to approach centreline, and vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.4 Arterial Roads

Arterial roads facilitate mobility and longer distance travel, and provide connectivity throughout the community, and the Provincial highway network. Arterial roads serve the major trips between principal areas of trip generation generally with relatively few controlled access points. Transit is expected to operate along arterial roads within the community (see Figure EDCG STR 7.6 Arterial [UAD 50] No Parking Cross-Section).

Table 7-5 provides a summary of various design values for arterial roads. More context regarding the application of these values can be found in the sections following.

Table 7-5: Arterial Road Quick Reference Table

Design Element	Value
Right-of-way Width	30.0m
Target Road Capacity	10,000 - 15,000 vehicles per day
Design Speed	50km/h
Posted Speed	50km/h
Travel Lane Width*	3.25-3.55m
Sidewalk Width:	
Commercial or high-activity areas	3.0m
Pedestrian-oriented** roadways	2.5m
Non-pedestrian-oriented roadways	1.8m
Boulevard/Furniture Zone Width	3.0m
Unidirectional Cycle path Width	2.5m ideal, 2.0m constrained
Median Separation/Painted Centre line	Yes
Parking Bay Width***	-

*Measured from face-of-curb
**Pedestrian-oriented roadways feature buildings that front onto or have pedestrian access within 4.0 m of road rights-of-way
***Measured from back of concrete invert crossing to face-of-curb

7.2.4.1 General

Travel lane widths for arterial roads should be 3.55m to the face-of-curb. Where there is separation between opposing travel lanes, and under constrained conditions, minimum lane widths of 3.25m between curb faces may be considered, providing that it can be demonstrated that there will be no mirror overhang into adjacent walking/cycling refuge space by design or control vehicles.

Median separation should be provided intermittently along arterial corridors including to provide refuge at all pedestrian crossing locations and to accommodate turn bays at intersections. Emergency access must be considered in the layout and frequency of medians, to allow emergency vehicles opportunities to pass queued traffic.

There may be cases where right-of-way adjustments are necessary on arterial roadways with horizontal curvature to allow for rollover zones at the back of curb to accommodate control vehicles, while ensuring no encroachment or reduction of the public realm.

Depending on context, the Town may direct the application of a rural cross-section for arterial roadways, modified as may be required for context. See Figure EDCG STR 7.6 Arterial (UAD 50) No Parking Cross-Section.

7.2.4.2 Walking

Arterial roads should have a 2.5m broom-finished, natural-colour concrete sidewalk on both sides. 3.0m or wider sidewalks should be considered adjacent to commercial areas or high-activity areas, and 1.8m sidewalks may be considered in areas of low pedestrian activity.

Sidewalks should be separated from curb and gutter by a minimum 3.0m wide boulevard or furniture zone. Where sidewalk width varies from the standard cross section, the boulevard width may be adjusted to suit. In a commercial or high-activity street the furnishing zone may be predominantly hardscaped.

Marked pedestrian crossings should include median refuge islands (EDCG drawing *STR 7.15 - At Grade Crossing with Median Refuge*) that allow pedestrians to cross one direction of travel at a time.

Crosswalks should be placed where there are no parking bays, such that the maximum distance crossed by a pedestrian is the width of two travel lanes (7.1m face-of-curb to face-of-curb).

7.2.4.3 Cycling

Cycling should be accommodated on unidirectional and continuous cycle paths. Unidirectional cycle paths should be an ideal minimum width of 2.5m to accommodate side-by-side cycling. Where the cross-section is constrained, typically in retrofit situations, a minimum width of 2.0m should be provided. Bi-directional cycle paths should be avoided where conflicts with access and intersections exist. Bi-directional facilities should have an ideal minimum width of 3.0m and a minimum width of 2.5m. Wider facilities may be required based on local context or area planning.

7.2.4.4 Public Transit

Transit is expected to operate along all arterial roads within the community. Transit stops may be accommodated within travel lanes along arterial roads, however a layby should be provided for within the right of way at all major destinations, and at a minimum each two to three stops to facilitate traffic flow.

7.2.4.5 Parking

On-street parking will not be provided along arterial roads.

7.2.4.6 Access and Intersections

Table 7-6 outlines design and control vehicles for arterial roadways.

Design vehicles should be able to turn from inside lane to inside lane without encroaching on adjacent lane configurations. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons or space from adjacent lanes where deemed appropriate by a transportation engineer, and to the satisfaction of the Town. Control vehicles should not cross the centreline of the intersection approach.

Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width.

For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-6: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Arterial Road	Single-unit Bus and Passenger Car	School Bus, WB-21, Fire (Ladder) Truck	Maneuver within clear width driving surface without encroachment into oncoming traffic. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum body overhang clearance of 0.3m to approach centreline, and any other vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.5 Lanes

Lanes provide the following functions in the Town's transportation system:

- Access between residential, commercial or mixed-use properties and the adjacent roadway network
- Emergency access

Lanes are to meet the following design parameters:

- Lanes shall have a minimum 6m clear space for travel lanes and should be for emergency response where abutting development.
- The entire lane width shall have a load bearing capacity of 38,556kg (85,000lbs.) or greater.
- All newly constructed lanes should be paved.
- Lanes in existing areas that provide access to commercial land, parkade entrances or development fronting onto the lane should be paved.

Parking is not allowed within the travel lanes of a lane.

The layout of lanes should be designed to prevent possible shortcutting, which could result in requirements for gates.

Maximum lengths of lanes between exits to streets should not exceed 175m, unless pedestrian connectivity to adjacent roads and pedestrian facilities is provided per Section 7.1.6, in which case the maximum permitted length of lane is 350m.

7.2.6 Private Mews

Private mews are privately owned roadways that provide an alternative to lanes or local roads. They are recommended for new developments where access is required for rear-facing units or other unique circumstances where a lane would be inadequate, but a full local road cross-section is already provided to the front of the property or is otherwise undesired.

Private Mews should meet the following design parameters:

- 9m corridor or larger
- 20km/hr travel speeds
- Shared space with cycling
- Shared space or separate 1.8m sidewalk
- Pedestrian level lighting
- Hard surface travel areas, with a minimum of 6m of clear space for travel lanes
- Where designed as emergency access, have a load bearing capacity of 38,556kg (85,000lbs) or greater and provide appropriate emergency vehicle egress

Public utilities for serving adjacent properties must not be constructed in a private mews.

7.2.7 Emergency Access Roads

Emergency access roads provide secondary access and are typically utilized during an emergency. They are otherwise closed to all public traffic but should allow for pedestrian and cycling connectivity. Vehicle access from properties abutting an emergency access road is not permitted.

Typically, lanes and roads are favoured over emergency access roads in order to reduce assets requiring maintenance and to eliminate the need for gates and bollards. A multi-use pathway or other pedestrian facilities of sufficient width may serve as an emergency access if the area served is limited, and traffic volumes and potential conflicts during an emergency are expected to be low.

Emergency access roads are to meet the following design parameters:

- The road shall have a paved width of 6m with a load bearing capacity of 38,556kg (85,000lbs) or greater, unless otherwise approved by the Fire Chief.
- Curves in emergency access roads should be designed to provide sufficient width to accommodate the largest piece of fire apparatus available, a Bronto Fire Truck, with an overall length of 13.93m, overall width of 2.6m and curb to curb turning radius of 11.36m. The swept path for this design vehicle shall be demonstrated to be maintained within the proposed road surface (utilizing the full road width as needed).
- Lands for emergency access roads should be dedicated as municipal road right-of-way.
- The full width of the of the emergency access roadway surface should be set at or above the 1:200 year flood elevation when located in overland flood areas.

See Figure EDCG STR 7.21 Swinging Emergency Gate Access, and Figure EDCG STR 7.19 RLP Bronto 230WB Turn Radius Diagram for details related to the design of infrastructure for emergency services.

Parking is not allowed within the right-of-way of an emergency access road.

7.3 Vehicle Access Management and Design

7.3.1 General

Vehicle accesses should be located and designed to minimize conflicts with pedestrians, cyclists, transit and between motor vehicles. Vehicle access widths should be minimized to reduce the conflict area where motor vehicles drive across active transportation facilities. Emphasis should be placed on preserving or enhancing the character of the street and the pedestrian realm through the design of access.

Separation distances between accesses and intersections should be maximized, and should align with opposing access points to the street. Where possible, it is encouraged to consolidate access between sites to minimize the number of intersections along the fronting road. Beyond requirements for emergency access, multiple access points to an individual site should be avoided.

In areas expected to generate higher traffic volumes, including mixed-use development and medium to high density residential uses, including any rear-fronting developments, vehicle access should be provided via lanes or private mews and by way of consolidated access, rather than fronting driveways to individual units.

In areas expected to generate lower traffic volumes including low density residential areas, front driveway accesses to the adjacent local roadway may be considered if permitted in the LUB.

In residential areas that feature rear-fronting developments, access for walking, cycling and driving should be provided via lanes, or private mews.

For development sites that front onto collector roads and flank lanes, private mews, or local roads, access should be provided from those facilities, rather than the collector road.

Direct access to an arterial road shall not be permitted, except where no other access is available. Where access to an arterial road is permitted, adequate space must be provided on site to ensure that all motor vehicles (including waste, loading, and passenger vehicles) are able to exit the property facing forward.

Vehicle access design should not impede continuous, uninterrupted sidewalks and pathways at any point of travel. Typical details of how access across continuous sidewalks and pathways may be achieved are provided in Figure EDCG STR 7.12 Ramp Layout, Figure EDCG SRT 7.12A “Bend Out” Driveway Crossing Plan View, Figure EDCG STR 7.12B “Bend Out” Driveway Crossing Section View, Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View, and Figure EDCG STR 7.13B “Bend In” Driveway Crossing Section View.

Offset intersections are generally discouraged but may be considered on a case-by-case basis along residential streets if the offset is 60m or greater between centrelines, subject to review and approval the Town.

7.3.2 Waste Collection and Loading

Where loading is required to support a commercial use, accommodation of loading activities should occur either on site or within a lane and must not require blocking of sidewalks, cycling facilities, vehicle lanes, on-street parking, or any other element within the road right-of-way.

Development sites that require on-site waste collection should demonstrate that waste collection vehicles can turn around on-site to avoid reversing into the adjacent street.

7.3.3 Active Transportation Facilities

The following considerations should be made when designing access across active transportation facilities:

- The sidewalk and cycle path surface should maintain their longitudinal grade (no ramping) as they intersect with the driveway surface.
- The cross-slope of the sidewalk and cycle path should be designed to a maximum of 2% where the driveway crosses them, and a maximum of 1% where a longitudinal grade of 1.5% or greater exists.
- The sidewalk and cycle path should be maintained in the same surface material through the driveway.
- Where a cycle path, or multi-use pathway exists, aprons of minimum 0.6m and up to 2.0m width should be provided on roadway side of the driveway, and a minimum of 2.0m on the development side of the driveway, in a contrasting material on both sides of the sidewalk and cycle path to emphasize the crossing location.
- At high volume driveways and minor intersections, the cycle path will be set back between 5.5m and 6.0m per Figure EDCG STR 7.12A “Bend Out” Driveway Crossing Plan View.
- Where road elevation and site grading permit, the driveway surface should ramp up to cross the sidewalk and path, and ramp down on the far side of the sidewalk and path. Designers should consider ramp slope and length to effectively reduce vehicle speeds without resulting in vehicles bottoming out.
- Tactile warning indicator plates are required on the sidewalk at both edges of the driveway crossing, as illustrated in Figure EDCG STR 7.12A “Bend Out” Driveway Crossing Plan View and Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View.

7.3.4 Public Transit Considerations

A space of 10m should be provided between a transit stop and the nearest perpendicular edge of drive lane of an access. Access design should not impact existing or planned transit stop locations unless a change to that location is addressed through the development approval process.

7.3.5 Grades and sightlines

Accesses should not exceed maximum slopes as identified in the “Driveway Grades” detail in the City of Calgary’s Roads Construction Standard Specifications.

Sightlines for any access are to meet the requirements of the latest version of the Transportation Association of Canada’s Geometric Design Guide for Canadian Roads. Sightline evaluations should be provided where an access is proposed along a vertical or horizontal curve, where a roadway includes existing or future dedicated cycling facilities as identified in the ITP, and/or where existing street furnishings (including bus stop, trees, advertising signage, fences, retaining walls or buildings) may restrict clear sightlines at the proposed access location.

7.4 Pathway Design

7.4.1 Multi-use Pathway Sizing and Separation of Walking and Cycling

Threshold levels for determining pathway widths and when walking and cycling volumes warrant separation are provided in Table 7-7 below. Estimated volumes are to be provided through a Transportation Impact Assessment, based on the expected corridor volumes and area plan requirements.

Table 7-7: Guidance on Pathway Separation

User Ratio for Separation	Typical peak daily volumes for various pathway widths (people)*		
	3.5m	4.0m	4.5m or greater or separation
>20% of people using the path are walking	Up to 1200	Up to 1400	1400+
<20% of people using the path are walking	Up to 1750	Up to 2000	2000+

*Typical peak daily volumes should be calculated using the average of peak day of the week use during peak season (typically June–August, though may vary depending on location).

7.4.2 Multi-use Pathway Design

Multi-use pathways are typically gravel/clay or asphalt surface paths for combined walking and cycling. Widths and surfacing of multi-use pathways will typically be defined in the OSTP, ITP and statutory planning documents.

Where part of the 5A Network, pathways should be a minimum 3.5m asphalt surface in accordance with EDCG STR 7.9 Typical Multi-Use Path Cross-Section - Asphalt Surface.

Where a pathway is part of an unmaintained pathway network, a clay-gravel mix may be used in accordance with EDCG STR 7.10 Typical Multi-Use Path Cross-Section - Gravel/Clay Surface.

Pathways should be protected from root intrusion and associated damage as illustrated in the figures listed above. In designing root protection, consideration should be given to site specific conditions. In cases where the Town determines that root damage is not expected to occur, root protection may be excluded.

Pathways should be separated from the road by a minimum of 2m and should be above or equal to the road elevation at centreline, particularly at crossings, driveways and accesses. See Section 7.4 of the EDCG and Figure EDCG STR 7.12 Ramp Layout, Figure EDCG SRT 7.12A “Bend Out” Driveway Crossing Plan View, Figure EDCG STR 7.12B “Bend Out” Driveway Crossing Section View, Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View, and Figure EDCG STR 7.13B “Bend In” Driveway Crossing Section View for more details.

7.4.2.1 Drainage

Where practical, pathways are preferred to be oriented and cross sloped in a way that takes advantage of sun exposure to promote melt of ice and snow. In sloped areas, particular care in design of drainage will be required to avoid sheet flow across pathways, ice build-up and erosion. Point drainage and outfall

locations should avoid draining immediately upslope of pathways unless drainage measures are provided to carry flows away from or under the path surface.

7.4.2.2 Pathway Intersection Design

Pathways should intersect at as close to 90 degrees as possible, with a clear hierarchy between the through pathway and the connecting pathway, along with appropriate yield signage or pathway markings or both as required.

At intersections, a minimum corner chamfer of 2.5m, is required for maintenance equipment. A larger chamfer may be required as determined through geometric design for pathway users. A radius may be used in lieu of a chamfer where it will not result in a narrow point. A mixing circle should be used when transitioning between multi-use and separated facilities.

Sightlines approaching intersections and crossing points should meet the recommended guidelines for stopping sight distance and sight triangles within the *Transportation Association of Canada Geometric Design Guide for Canadian Roads*. Minimum stopping sight distance for a person cycling is a factor of the speed being travelled, the surface material and condition (friction between tires and surface), a person cycling's perception-reaction time, and the grade of the facility. Stopping sight distance can be greater for people cycling than for people driving a motor vehicle and should be considered in the design of cycling facilities.

Placement of landscaping, signage, fencing and other elements should be reviewed at the time of pathway design.

7.4.2.3 Transit

Where pathways interact with transit, pathway facilities should be accommodated by means of a bend-out design, to ensure continuity of walking and cycling movement and the avoidance of conflict with passengers boarding and alighting the bus. The bend out design requires the bicycle facility to be behind the entire bus stop pad (including passenger waiting area, bike racks and shelter). Tactile walking surface indicators (specifically tactile direction indicators) should be provided for pedestrians to be able to locate the transit stop from the sidewalk.

Pathway surfacing should be consistent with the Town's *Open Space and Trails Plan*.

7.5 Roadway Lighting

7.5.1 Scope and Applicability

The intent of the lighting section is to provide guidance for Roadway and Active Modes Facility lighting which aligns with the goals of the geometric design section. Illumination design should follow IES standards, while the EDCG provides guidance on materials selection, level of service and streetscaping. *The City of Calgary Design Guidelines for Street Lighting* may be used as a reference for aspects of the design that are not addressed by the EDCG or IES. The Consulting Engineer is encouraged to contact the Town Engineer for clarifications where necessary.

Specifications for lighting of private buildings and parking facilities are provided in the Land Use Bylaw and are not addressed in this document.

7.5.2 Roadway Classification

Roadway lighting requirements are set by the Illuminating Engineering Society of North America (IES) in the Recommended Practices for Design and Maintenance of Roadway and Parking Facility Lighting ANSI/IES RP-8-18 based on the classification of the roadway. To determine the appropriate classification which should be applied to roads in Canmore, the Town's road classifications have been compared against City of Calgary classifications and those in the Transportation Association of Canada's Geometric Design Guide for Canadian Roads (TAC GDG) below in Table 7-8.

Table 7-8: Roadway Classification Comparison

Roadway Classification		Town of Canmore	The City of Calgary	TAC GDG	IES
Arterial	Classification Name	Arterial	Arterial	Minor Arterial	Major
	Lanes	2	4 - 6	-	-
	Capacity (veh/day)	</=15,000	20,000 - 35,000	5,000 - 20,000	-
	Design Speed (km/h)	50	50 - 60	50 - 70	-
	Basic ROW Width (m)	30.0	36.0 - 46.0	20.0 - 45.0	-
Collector	Classification Name	Collector	Collector	Residential Collector	Collector
	Lanes	2	2	-	-
	Capacity (veh/day)	</=10,000	2,000 - 8,000	<8,000	-
	Design Speed (km/h)	30	50	50 - 80	-
	Basic ROW Width (m)	22.0	22.5	20.0 – 24.0	-
Local	Classification Name	Local	Residential	Local	Local
	Lanes	2	2	-	-
	Capacity (veh/day)	1,000 (bike route) 2,000 (non-bike route)	2,000 (non-bike route maximum)	≤2,000	-
	Design Speed (km/h)	30	40	30 - 50	-
	Basic ROW Width (m)	15.3	16.0 / 18.4 / 22.5	15.0 - 22.0	-
Activity Street	Classification Name	Activity Street	Activity Centre	-	-
	Lanes	2	2	-	-
	Capacity (veh/day)	3,000	3,000 – 15,000	-	-

Roadway Classification		Town of Canmore	The City of Calgary	TAC GDG	IES
	Design Speed (km/h)	20	50	-	-
	Basic ROW Width (m)	-	26.0	-	-

Based on the comparison presented above, arterial roadways within the Town accommodate a lower vehicle capacity and have a lower number of lanes than is typical for other jurisdictions. The Town's arterial roads are similar to collector roads in other jurisdictions. Based on this, the application of IES lighting requirements for a collector road is recommended on the Town's arterial roads. The Town's collector and local roads are similar to the respective classification in other jurisdictions and should receive collector and local classified IES lighting. The activity street classification is intended as a pedestrian oriented main street, and therefore should receive collector level lighting. Lanes, access lanes and emergency lanes do not require lighting. Recommendations for the application of IES lighting to the Town's roadway classification are summarized below in Table 7-9.

Table 7-9: Recommended IES Lighting Classification

Town of Canmore Road Classification	Roadway Lighting Classification (ANSI/IES RP-9)
Arterial	Collector
Collector	Collector
Local	Local
Activity Street	Collector
Lane, Access Lane, Emergency Lane	Not Typically Lit

7.5.3 Lighting Design Criteria

7.5.3.1 Lighting Levels

The Town requires that design criteria follow the recommendation of IES RP-8. These guidelines, outlined in Table 7-10, are to be used at the Engineer's discretion and can be adjusted on a case-by-case basis. An illumination study is required when new walking or cycling infrastructure crosses an existing roadway, to assess potential lighting upgrades.

Table 7-10: Roadway Lighting Design Criteria

ToC Class (IES Class)	Pedestrian Activity	Avg. Luminance (L_{avg}cd/m^2)	Avg. Uniformity Ratio (L_{avg}/L_{min})	Maximum Uniformity Ratio (L_{max}/L_{min})	Maximum Veiling Luminance	Illuminance (Lux)	Avg/Min Uniformity

					Ratio ($L_{v,max}/L_{avg}$)	R2, R3 pavement	
Arterial & Collector (Collector)	High*	0.8	3	5	0.4	12	3
	Medium	0.6	3.5	6	0.4	9	3.5
	Low	0.4	4	8	0.4	6	4
Local (Local)	High*	0.6	6	10	0.4	9	6
	Medium	0.5	6	10	0.4	7.5	6
	Low	0.3	6	10	0.4	4.5	6

*To be used in limited scenarios only, with ToC Engineer's approval.

Luminance should be the primary design method. The illuminance method is to be used only where luminance method is not possible or not appropriate, such as intersections, cul-de-sacs, short blocks, or surround areas.

7.5.3.2 Surround Ratio

The new release of RP-8-21, approved by ANSI/IES in December 2021 defines a new parameter for roadway lighting, the surround ratio SR, which sets the required illumination levels adjacent to the roadway. The surround, for the purpose of calculating the SR design parameter, is defined as the area with a width of 3.6m outside the travel lane. Its purpose is to improve visibility of shoulders, cycle paths and other areas adjacent to the roadway. The SR is the ratio of surround illumination to the adjacent travel lane illumination. The SR should be 0.8 or greater.

Meeting the SR parameter in certain scenarios may not be desirable (e.g., environmentally sensitive areas, or where additional lighting equipment creates additional roadside hazards), or may not be critical (e.g., low speeds residential local roads). The balance and need for visibility improvements should be considered along with any potential negative impacts.

7.5.3.3 Color Temperature and Rendering

A color temperature of 3000K should be adopted for fixtures across all road classifications, as it generally represents the industry standard for street lighting. Color rendering affects the ability of a light source to reveal colors of objects in contrast to a natural light source and is measured by the color rendering index (CRI). Most streetlighting products have a minimum of 70CRI and this value is adopted as the minimum allowable CRI.

7.5.3.4 Maximum and Minimum Lighting Levels

Lighting levels should be designed to minimize excess illumination. Any lighting levels which are designed more than 15% above the required lighting criteria should be reviewed by the Town and specific justification should be provided by the lighting designer.

Lighting levels should be designed to provide adequate illumination. Any proposed lighting levels which are designed below the required lighting criteria require justification provided by the lighting designer and written acceptance by the Town in the form of a Fortis lighting waiver.

7.5.3.5 Light Trespass

The Consulting Engineer should consider IES recommended levels for light trespass values as based on Lighting Zones defined in the IES/IDA (International Dark-Sky Associations) Model Lighting Ordinance (MLO). These values should be considered maximum allowable levels at property line or the face of the building, whichever is greater. Deviation from these levels will be reviewed by the Town and specific justification should be provided by the lighting designer.

Lighting zones vary from Zone 0 (e.g., wilderness areas, parks and preserves) to Zone 4 (e.g., high density entertainment districts, heavy industrial uses). The typical lighting zones for the Town of Canmore are Lighting Zone 0 (e.g. wilderness areas, parks and preserves and undeveloped areas), Lighting Zone 1 (e.g., single- and two-family communities, business parks), Lighting Zone 2 (e.g., multifamily residential, schools, recreational facilities, neighborhood business districts).

Light trespass should be addressed in lighting design in accordance with the recommended values in the MLO, and should be considered maximum allowable levels at property line or the face of the building, whichever is greater.

Light trespass and glare can be controlled with light distribution, shielding, location and lumen output. Many complaints are triggered not by the light trespass itself, which can be insignificant, but rather by the glare and glow of a light source against the dark sky. As long as there is a direct line of sight to the fixture, lighting can generate complaints even if the light trespass is zero. Consideration should be given to shielding opportunities in this scenario.

7.5.4 Material

Fortis Alberta maintains roadway streetlighting for the Town. Roadway streetlighting should be standardized in accordance with Fortis practices where possible, including using the Fortis standard streetlighting product catalogue.

7.5.4.1 Streetlight Products

Town standard streetlighting products are shown below in Table 7-11. All products listed below are available through Fortis Alberta's standard catalogue. The widespread use of the GLEON Galleon on all roads except Activity Streets is intended to consolidate the type of lighting installations, provide a uniform aesthetic and simplify maintenance operations. Galleon fixtures are an environmentally friendly fixture (Dark-Sky IDA approved) while the Candela Pendant used on Activity Streets is not Dark-Sky IDA approved. Lighting designers should contact the Town for additional specifications when designing activity street lighting.

Table 7-11: Streetlight Styles

Road Classification	Streetlight Product
Arterial	GLEON Galleon with davit (Cooper Lighting) or Cobra Head in BLACK
Collector	GLEON Galleon (Cooper Lighting)
Local	GLEON Galleon (Cooper Lighting)
Activity Street	Candela CAND3 Pendant (Signify Lumec)

Figure 7-1: Cobra Head

Figure 7-2: GLEON Galleon

Figure 7-3: Candela Pendant

Luminaire wattages are a function of the illumination design and the wattages required to achieve the required lumens have been decreasing with advances in luminaire technology.

A tapered or davit pole, as appropriate, should be used for Cobra Head and Gleon Galleon style lighting on arterials. A square pole should be used for Gleon Galleon style lights on Collector and Local Streets. A round pole should be used for Candela Pendant style lights on Activity Streets.

7.5.4.2 Pole Height

Streetlight pole height is an important factor affecting streetlight design and user experience. Larger pole heights enable a single streetlight to cover a larger area and offer lower capital and maintenance costs. Lower pole heights are pedestrian-scale and create a more inviting space for walking and cycling street users. The maximum recommended spacing between poles based on the Town's typical cross sections is shown below in the table below.

Table 7-12: Maximum Light Spacing based on Pole Height

Pole Height	Arterial	Collector	Local	Activity
9.0m (30ft)	46m	-	-	-
7.6m (25ft)	-	47m	-	-
6.0m (20ft)	-	-	34m	-
5.0m (16ft)	-	-	-	24m

Notes:

- These maximum spacings are achieved in ideal conditions, where no conflicts exist with driveways, trees, utilities, intersections. Actual spacing may be less and should be confirmed by the lighting designer.
- Arterial road – lighting is assumed to be on both sides of the roadway.
- Collector and local road – lighting is assumed to be on one side of the roadway.

Recommended pole heights are shown in the table below. Lower pole heights are recommended for Activity Streets as they support the pedestrian oriented nature of these streets.

Table 7-13: Pole Height

Road Classification	Pole Height
Arterial	9.0m (30ft)
Collector	7.6m (25ft)
Local	6.0m (20ft)
Activity Street	5.0m (16.4ft)*

*Pole height at luminaire.

All precast concrete bases used should comply with City of Calgary standard types.

7.5.4.3 Summary

Recommended roadway lighting products are summarized below in Table 7-14.

Table 7-14: Recommended Roadway Lighting Products

Road Classification	Streetlight Style	Pole Height	Pole Style
Arterial	Gleon Galleon (Cooper Lighting) or Cobra Head in black	9.0m (30ft)	Square, galvanized with black powder coat; Davit as required
Collector	Gleon Galleon (Cooper Lighting)	7.6m (25ft)	Square, galvanized with black powder coat

Local	Gleon Galleon (Cooper Lighting)	6.0m (20ft)	Square, galvanized with black powder coat
Activity Street	Candela CAND3 Pendant (Lumec/Signify)	6.0m (20ft)	Round with shroud, galvanized with black powder coat, Lumec PC-1A luminaire support bracket; NOVA Pole custom aluminum tenon adaptor required (DWG# 22-MC-000-03816-F, November 18, 2022)
Lane, Access Lane, Emergency Lane	Not typically lit	N/A	N/A

7.6 Active Modes Lighting

7.6.1 Lighting Decision Tool

7.6.1.1 Design Objectives

The IES recommends evaluating the need for continuous lighting of pathways but does not provide specific guidance on how to complete an evaluation. This section was developed based on a review of standards from other jurisdictions and incorporates the following general principles:

- Provide lighting and eliminate glare sources at locations that demand multiple information gathering processes, such as intersections, conflict points and facilities where both pedestrians and cyclists are present.
- Lighting should particularly be considered where night use is expected such as routes serving commuters.
- Areas where nighttime security is an issue such as underpasses and tunnels should be lit.

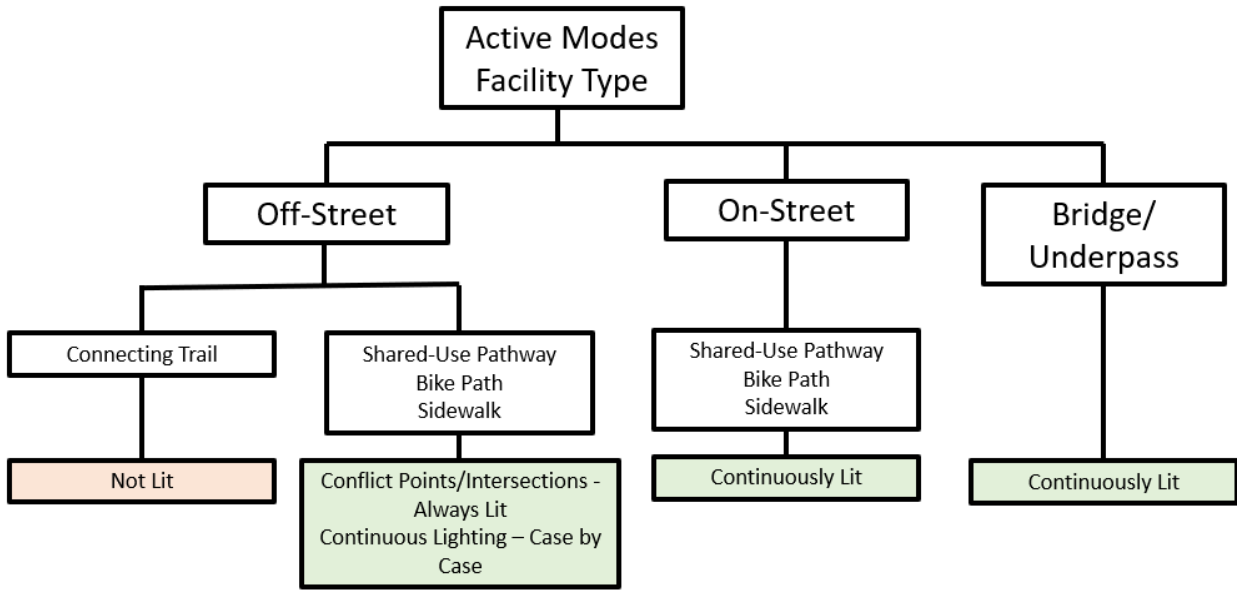
Medium and light use pathways should ensure wayfinding as a minimum lighting requirement alongside hazard points or areas of interest, such as bridges, obstacles, stairs, curves, termination, or resting points.

7.6.1.2 Decision Tree

Figure 7-4: Active Modes Facility Lighting Decision Tree provides recommendations about which active modes routes should be prioritized for lighting of new and retrofit projects. Active modes facilities such as sidewalks on local roads may not be required to meet a specific lighting level as spillover lighting generally provides sufficient light. Definitions for on-street and off-street facilities are provided:

- On-Street: facility is within the road right-of-way and classified as arterial, collector or activity street; the alignment is parallel to the road and may or may not be separated from vehicle traffic
- Off-Street: active modes facilities which are not directly parallel to the roadway, or follow an alignment separated from vehicle traffic

Figure 7-4: Active Modes Facility Lighting Decision Tree



Notes:

- Off-street shared-use pathways that form part of a designated commuter network should be continuously lit. Shared-use pathways that are primarily recreational will be reviewed on a case-by-case basis.
- Wayfinding lighting and lighting for safety and comfort should be considered for all active modes.

7.6.2 Lighting Design Criteria

7.6.2.1 On-Street and Bridge/Underpass Facilities

The current IES standard RP-8-21 recommends the following illumination levels for cycle paths and sidewalks. These lighting requirements should be applied to On-Street and Bridge/Underpass facilities. The Town may require increased lighting at underpass facilities dependent on geometry and sightlines.

Table 7-15: Recommended IES Lighting Levels for On-Street Facilities

Condition	Eavg (lux)-Horizontal*	Ev,avg (lux)-Vertical**	Eavg/Emin-Horizontal
High pedestrian activity	10	5	5
Medium pedestrian activity	5	2	5
Low pedestrian activity	2	1	10

*Calculated at pavement level

**Calculated at 1.5m above grade, in both directions parallel to main pedestrian flow

7.6.2.2 Off-Street

The Active Modes Facility Lighting Decision Tree is used to determine whether lighting is required based on facility type. The ANSI/IES RP-43-22, Recommended Practice: Lighting Exterior Applications provides recommendations for illumination levels for active transportation facilities outside the road right-of-way when lighting is required.

Lighting levels to be used within the Town of Canmore are shown in Table 7-16 and are intended to act as a guideline for lighting designers rather than a specific requirement.

Table 7-16: Proposed Lighting Levels for Off-Street Facilities

Mixed Cycling and Pedestrian Paths	Eavg (lux) - Horizontal	Eavg/Emin - Horizontal
LZ2		
Lower limit	8	5
Upper limit	15	5
LZ1		
Lower limit	4	5
Upper limit	8	5
LZ0	No lighting prescribed	

Note: For Cycle paths, the same illumination values are recommended, but with a relaxed uniformity ratio of 10:1.

According to the Active Modes Facility Lighting Decision Tree, lighting at conflict points and intersections should be applied in all cases except LZ0. Proposed lighting levels for conflict points should meet the minimum proposed lighting levels for off-street facilities and should exceed the minimum standards outlined in Table 7-17.

Table 7-17: Proposed Lighting Levels for Conflict Points for Off-Street Facilities

Condition	Eavg (lux) - Horizontal	Eavg/Emin - Horizontal
Illuminated pathways	≥ Pathway Eavg ≥ 8	5
Unlit pathways	8	5

7.6.3 Materials

7.6.3.1 On-Street

Active modes facilities within the road right-of-way may receive adequate illumination from the roadway lighting luminaires, depending on their photometric distribution, amount of backlight, pole spacing and pole layout (single sided, staggered or opposite). Human scale lighting is preferable and may be required at the discretion of the Town. Pedestrian level luminaires mounted on roadway poles at a height of 4.5m (15ft) or specific 4.5m (15ft) pedestrian level pole and luminaires should be used when human scale lighting is implemented.

On-street active modes lighting should use the same product line and style that was used for roadway lighting.

Arterial and Collector: GPC Galleon Pedestrian Companion (Cooper lighting) on pedestrian level pole and/or at 4.5m on roadway light pole

Activity Street: Candela Pendant by Lumec (Signify)

7.6.3.2 Off-Street

Off-street lighting may be accomplished by either bollards or pole mounted lights powered through a wired connection or solar. A product for each of these applications is provided in Table 7-18 below.

Table 7-18: Off-Street Active Modes Lighting Products

Lighting Style	Product	Additional Details
Wired Pole Mounted	GPC Galleon Pedestrian Companion (Cooper Lighting)	4.5m (15ft) pole height Square pole, galvanized with black powder coating
Wired Bollard	BRT6 (Cooper Lighting) BRM836 Gardco (Philips)	1.1m (42”) high with beveled top
Solar Pole Mounted	LX95 or TX300 (Solar Vision)	4.5m (15ft) pole height Square pole, galvanized with black powder coating
Solar Bollard	SB40 (Solar Vision) PLB Series (First Light) WLB Series (First Light)	Black finish Black finish Black finish

Bollards versus Pole Mounted Lighting

Off-street pathways can be illuminated by either pole mounted luminaries or bollards. A maximum recommended spacing between bollards and pole mounted pathway lighting has been calculated for a 3.5m wide pathway and is shown in Table 7-19. This is provided for illustrative purposes, the Consulting Engineer is required to perform an illumination design.

Table 7-19: Maximum Light Spacing for 3.5 m Wide Pathway

Height and Lighting Style	Spacing
1.0m (3.3ft) – Bollard	10m
4.5m (15ft) – pole and luminaire	44m

Notes:

- The above analysis is applicable to both medium activity situations and dark-adapted situations. The limiting factor in all cases is the E_{avg}/E_{min} ratio, which is affected by pole height.
- Wired bollards and pole mounted luminaire systems have been assumed. The bollard used for spacing calculations and pricing is a McGraw-Edison BRT6 Bollard. The pole and luminaire used is the GPC Galleon Pedestrian Companion. Lighting was assumed to be single sided.
- Where a 5:1 uniformity is required (medium activity situations) and the pathway is wider than 3.5m, bollards should be installed on both sides of the pathway at a reduced spacing.
- There is no significant difference when using 4.5m poles on 5.5m pathways; the spacing remains consistent with those for the 3.5m pathways.

Bollard lighting does not provide adequate vertical illumination and should only be used where obtrusive lighting is a concern or where the primary intent is wayfinding. In cases where illumination design criteria must be met, pole mounted lighting is necessary to achieve the vertical illumination objectives. When lighting a large active modes intersection or areas where safety is an issue, pole mounted luminaires should be used.

Wired versus Solar Active Modes Lighting

When a power source is readily available, wired lighting should be utilized as it is the most cost-effective and reliable solution. Solar lighting generally has a lower lumen output, can be un-reliable during periods without sunlight and will require replacement of batteries. Solar lighting should not be utilized except in areas where providing power is not feasible or cost prohibitive.

7.7 Off-street Connectivity

The importance of ensuring that pedestrian and cycling facilities connect effectively with private infrastructure and development is highlighted in the MDP and ITP. MDP 10.1.3 states buildings will front toward and address the public street and provide quality spaces that contribute to the public realm. The design of commercial developments should support and encourage pedestrian use of the area.

MDP 13.1 Urban design speaks to high quality site and building design in support of walkable and bikeable neighbourhoods and a comfortable pedestrian environment.

In determining the design of private infrastructure, consideration should be given to requirements for mode-share for walking, cycling and transit use for the area. Mode-share targets are established in the ITP, and statutory documents and supporting technical assessments. The following provides consideration for best practice to meet typical requirements of statutory plans.

Off-street connectivity should be direct, safe, comfortable, and continuous and provide a consistent experience for travel with requirements for on-street facilities. Per the MDP 10.3.2, uses requiring large surface parking areas and vehicle access may be allowed, however multi-use commercial areas shall have a

strong pedestrian-oriented design with good connections to pathways and sidewalks. Connections through vehicle parking areas should be designed to be separate from driving areas, and at a continuous elevation.

Pedestrian connections should be designed to best practice as outlined in the Accessibility Design Guide, GoA. For example, on-site sidewalks should be a minimum of 1.8m in width and be free of vertical obstructions.

Connections for cycling should be a minimum of 2.5m wide, uninterrupted and at a continuous grade, and with no obstructions between on-street facilities and secure bicycle parking. Cycle access may be shared with pedestrian access. Where volumes are expected to be high, consideration should be given to wider facilities, or separate accesses for walking and cycling. Cycle access may be provided through shared access with vehicles where that provides a solution consistent with ITP principles.

In existing neighbourhoods, where a unit fronts onto a lane, a hard-surfaced walking connection with pedestrian level lighting should be provided from the fronting street to the rear development fronting onto the lane (though the development site).

In cases where a site is subdivided, and access is provided via an easement on the site, access for walking and cycling should be provided in a manner consistent with public facilities including sidewalks (1.8m minimum width) or multi-use paths (minimum 2.5m width) between public roadways and subservient parcel building entrances and associated bicycle parking. These facilities are to be included in an instrument on title to ensure pedestrian and cycle access in perpetuity.

7.8 Off-Street Parking

Off-street motor vehicle and bicycle parking shall be provided as per the requirements of the Town of Canmore's *Land Use Bylaw*. Any parking studies required by the Land Use Bylaw or other statutory documents should give consideration to the strategies of the Integrated Parking Management Plan, 2018 and be based upon a Terms of Reference approved by the Town.

The Accessibility Design Guide, GoA provides guidelines and best practice for accessibility of off-street parking and provides the basis for off-street parking accessible design.

7.8.1 Bicycle Parking Design Standards

The layout and design of all bicycle parking should meet or exceed the dimensions identified within this document.

Short-term bicycle parking is defined as parking that meets the needs of people spending two hours or less at a site. They may not be regular visitors to the site, and therefore it is important that short-term bicycle parking be conveniently located and visible, ideally within 15m of the principal entrance of the building. Weather protection for short-term bicycle parking is encouraged to facilitate access for people cycling in all weather and seasons.

Long-term bicycle parking is intended to meet the needs of people spending several hours or longer at a site (e.g. residents, employees, people using transit, etc.) and should provide security and weather protection. Where residents and employees can be expected to store bicycles for a longer duration, access should be limited by means of a locked bike room or other secure enclosure with access control. Options for facilitating secure access include keys, fobs, smart cards or other technologies. Long term bicycle

parking should either be provided at grade or on P1 of a parkade structure, with convenient and barrier-free access provided between the offsite roadways and paths, and the bicycle parking stall.

Long-term bicycle parking should be comprised of no less than 70% floor-mounted racks that do not require a person to lift a bicycle. Floor-mounted racks should be provided as "inverted-U" style racks with spacing as outlined in Figure EDCG STR 7.22 Bicycle Parking Area. While the figure provides a design domain range for aisles and adjacent to walls, minimums should only be used in constrained situations. Alternative rack types may be used where the intent of this guideline is met. Any alternatives to the "inverted-U" style should support the frame of a bicycle in at least two places, to prevent it from falling over, and allow for the locking of the frame and one or both wheels to the rack with a U-lock. Racks should be no less than 0.85 m in height. The cross-slope of areas with bicycle parking should not exceed 2%.

7.8.1.1 High-Density Bicycle Parking

In some constrained situations, higher density of bicycle racks may be considered for securely enclosed, long-term bicycle parking. Higher rack density is not appropriate for short-term bicycle parking applications. The proportion of high-density racks on a site should not exceed 30% of the required supply. While high density bicycle parking can maximize the use of space to store bicycles, it does not accommodate all people or all bicycle types, and as such should be limited in its application. Two-tier bike racks may be considered for high-density parking applications only if they include lift-assisted access to the upper tier, and if they provide for the secure locking of both the wheel and frame of the bicycle to the rack with a U-lock. Access to and design of high-density bicycle parking is required to meet all the dimensional requirements shown in Figure EDCG STR 7.22 Bicycle Parking Area. Other forms of high-density bicycle parking will be accepted in the place of regular "inverted U" if it can be demonstrated that it provides the same level of security, accessibility, and convenience as a standard "inverted U" style rack.

7.8.1.2 Rack Access and Placement

All racks should be secure and well-anchored to concrete (either by means of an in-ground mount, or tamper-proof mounting techniques if surface-mounted). Bicycle parking areas should be located where racks and storage rooms receive active surveillance by passers-by, when located near main entrances, and where they are visible from surrounding building windows.

All changes in grade between a site's property line and short or long-term bicycle parking areas should be accommodated by ramps or sloped paths to facilitate barrier-free access. Long-term bicycle parking areas located on P1 of a parkade should be made accessible through both the building elevator and via the parkade ramp. All doors that must be navigated between a site's property line and areas for short or long-term bicycle parking should be barrier-free with power assist, including to and from elevator vestibules. If elevator use is required or expected to access bicycle parking areas, it should be demonstrated that the interior dimensions of the elevator can accommodate a variety of bicycle types.

While the dimensions in this guide reflect parking requirements for a standard bicycle, design should consider the presence and accommodation of a variety of bicycle types and accessories. These may include bicycle trailers, cargo bicycles, and recumbent bicycles among others. To accommodate these types of cycles, an additional 0.9m of in-line clearance should be considered for some stalls, without encroaching into the aisles required for maneuvering bicycles into and out of a bicycle parking area as shown in Figure EDCG STR 7.22 Bicycle Parking Area. Signage to indicate that access to these stalls is prioritized for longer bicycles may help to avoid their being occupied with the same frequency as other

standard stalls. The provision of these spaces should be given extra consideration in destinations where one might expect a higher proportion of trips that may require bicycle trailers or cargo bikes (e.g. outside of a daycare or grocery store).

Designated areas for snow storage should not encroach into outdoor bicycle parking areas at any time of year.

7.8.2 Passenger Vehicle Parking Design Standards

Minimum dimensions for the design of parking areas should be as shown in Table 7-20.

An on-site loading space should be designed and located so that all vehicles using that space can be parked and maneuvered entirely within the bounds of the site before moving onto adjacent streets. A loading space should be:

- A minimum width of 3.1m.
- A minimum depth of 10.0m.
- Maintain a minimum overhead clearance of 4.3m.

Parking stall dimensions should be clear of all obstructions, other than wheel stops. Wheel stops should be provided in any stalls that front onto an adjacent pedestrian facility, to ensure there is no vehicle encroachment over the sidewalk.

Parking stalls abutting a wall or other physical vertical barrier to door access should be a minimum width of 3.1m.

Driveways, loading spaces and bus parking stalls should be designed for the appropriate design vehicles to allow for adequate turning radii and movement within the site. Where required by the Town, modelling for vehicle swept paths to be provided. Large vehicles may be accommodated through use of the full drive and aisle widths within a site.

Table 7-20: Design Standards for Parking Areas

Stall Width	Parking Angle	Aisle Width* (A)	Stall Depth Perpendicular to Aisle (D)	Stall Width Parallel to Aisle	Half Parking Module (D+A)	Parking Module (2D+A)
Dwelling Units						
2.50m	90 degrees	7.20m	5.40m	2.50m	12.60m	18.00m
2.50m	75 degrees	6.12m	5.64m	2.59m	11.76m	17.40m
2.50m	60 degrees	4.82m	5.49m	2.89m	10.31m	15.80m
2.50m	45 degrees	4.00m	5.00m	3.54m	9.00m	14.00m
Other Developments						
2.60m	90 degrees	7.20m	5.40m	2.60m	12.60m	18.00m
2.60m	75 degrees	6.12m	5.64m	2.69m	11.76m	17.40m

2.60m	60 degrees	4.82m	5.49m	3.00m	10.31m	15.80m
2.60m	45 degrees	4.00m	5.00m	3.68m	9.00m	14.00m

*This value is both a minimum and a maximum unless otherwise demonstrated to be a requirement for vehicle swept paths on the site.

Parking stalls that are accessed directly from a lane shall be a minimum of 6m in length. Parallel parking stalls should be a minimum length of 7m.

The maximum grade of a parking stall should not exceed 8% in any direction. Parking dimensions for parking angles between 75 degrees and 45 degrees should be calculated using a straight-line interpolation between dimensions shown in Table 7-20.

7.9 Pavement Markings

Longitudinal Lines to use water-based paint with Low VOC. This includes:

- Pavement long lines
- Barrier-free stalls
- Parking lot lines
- Pathway markings (yield signs, cycle marking, pedestrian marking, pathway text)

Symbols and Lateral makings to use surface thermoplastic or surface MMA. This includes:

- Arrows
- Stop lines and stop box lines
- Barrier-free stalls
- Crosswalks including zebra markings
- Sharrows
- Elephant's feet
- Electric vehicle parking stall symbols

7.10 Street Name Blades

Street Name Blades should be green background with uppercase white lettering, utilizing 3M High Intensity sheeting or approved equivalent. Street name blades mounted at ground level should be 150mm high with 100mm text in Highway Gothic Series C 2000. Signage mounted on traffic signals should be evaluated by the Consulting Engineer in accordance with the MUTCDC.

7.11 Wayfinding

Vehicle and pedestrian scale wayfinding is used to direct network users to popular destinations. The document *Canmore Wayfinding Program – Design Intent* provides guidance on the graphic design, materials and physical design of wayfinding elements.

SECTION 8 – SHALLOW UTILITIES

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 8" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The "2025 Engineering Design and Construction Guidelines – Section 8" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

8.0 Shallow Utilities

The design and installation of shallow utilities in the Town of Canmore is guided by the Alberta Electrical Utility Code, the City of Calgary's Design Guidelines for Subdivision Servicing, and the design guidelines and standards produced by service providers.

Guidelines for the design and installation of street lighting are provided in Section 7.

The following information is supplementary to the above-mentioned documents.

8.1 Application Process

When submitting a subdivision detailed design or a development permit application for Intermediate or Large developments, the developer is required to provide a detailed shallow utility plan for each phase of development for review by the Town Engineer. The shallow utility Facility Map must show the location of all underground and aboveground facilities relative to existing and proposed deep utilities, surface works and landscaping.

The developer shall engage the shallow utility providers or a specialized consultant for preparation of the shallow utility Facility Map which addresses conflicts and service needs for all shallow utility providers. This Facility Map is submitted with the Development Permit or Subdivision application for review and approval by the Town. Subsequent to this approval, the shallow utility providers are required to submit utility line assignment (ULA) requests to the Town Engineer for review and acceptance. Line assignment applications associated with an approved Facility Map shall be accompanied by a letter that includes:

1. The Town's subdivision or Development Permit file number;
2. Date of the Town's approval of the shallow utility Facility Map;
3. A statement confirming that the line assignment application complies with the approved Facility Map;
4. The total number of metres of trench proposed.

The ULA application drawings shall include the following:

1. Surfaceworks features such as curb and sidewalk (existing or design);
2. Property lines, URW and easement boundaries;
3. Deep utilities;
4. Municipal trees (in accordance with Tree Protection Plan requirements).

The developer is responsible for providing rights-of-way, easements registered in the name of the Town of Canmore or public utility lots to accommodate the servicing. The tentative legal plan and utility right-of-way plan, together with the utility right-of-way agreements are to be submitted to the Town for acceptance prior to submittal to Land Titles for registration and are required prior to, or concurrent with, subdivision endorsement. In the case of a bareland condominium, the developer must register a URW in the name of the shallow utility providers prior to, or concurrent with, subdivision endorsement where applicable.

The developer and shallow utility providers are responsible for identifying the requirements for federal and provincial permitting. The developer and shallow utility providers shall prepare, submit and pay all

costs associated with these applications. In areas of infill development and redevelopment where aerial facilities exist, builders or homeowners may wish to relocate existing poles, anchors, transformers, etc. In these cases, the applicant must request a preliminary design from the appropriate service provider which is forwarded to the Town for review. Should the Town agree to the work in principle, the applicant will be required to provide the design details to affected property owners and register their consent. The Town will identify the scope of property consents required and will approve the ULA request only if 100% of owners surveyed consent to the work.

The Streetlight Investment will be directed to the municipality for the construction of new public streetlights.

8.2 Design

All new cable and conduit installations shall be underground. For rural applications where the installation of buried services is not practical, aerial infrastructure may be accepted by the Town Engineer. Adequate ducts shall be installed under roads prior to construction to accommodate the installation of shallow utilities. The use of municipal reserve lands for shallow utilities is discouraged to minimize constraints to future development. Above ground infrastructure shall be placed within a URW on private property or on a PUL lot. The use of MR lands for above ground equipment will not be permitted by the Town except under extenuating circumstances or where it is required to service Municipal Infrastructure or schools within the MR parcel.

Separations between trees and shallow utilities shall conform to the specifications in the City of Calgary *Development Guidelines and Standard Specifications: Landscape Construction* (current edition).

Shallow utilities shall be installed in a four-party trench wherever practical. Four-party trenches must be located in continuous dedicated 3.5m wide easements located adjacent and parallel to roads in the front of lots abutting roads, however the Town of Canmore may support reduced URW widths in extenuating circumstances and if agreed to by the shallow utility providers.

Shallow utilities shall be separated laterally from water and sewer mains by not less than 3.0m and shall be located a minimum distance of 3.0m from any valve or hydrant, however decreased lateral separation may be considered by the Town where water and sewer mains are installed at shallow depths and where the shallow utility providers are in agreement. Horizontal separation from shallow utilities to water services is defined in Section 4 of the EDCG.

When properties with existing aerial services drops are undergoing redevelopment the Town does not permit additional poles on Municipal Right of Way. If the service can be maintained as an aerial drop without an additional pole on public land it is acceptable, otherwise the drop must be buried.

8.3 Construction

Trenchless methods should be used whenever possible for proposed services crossing existing roads to avoid compromising the integrity of the road surface. The developer, shallow utility provider and contractor should familiarize themselves with local soil conditions to ensure that an appropriate methodology is selected.

The following must be obtained from the Town for any work on Municipal Rights of Way. Refer to Section 2 for details on permit types and application requirements.

- Road Use Permits

- Excavation Permits
- Cross Reserve permits

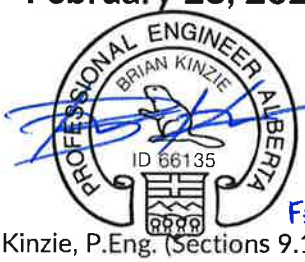
These permits must reference the ULA reviewed and accepted by the Town during the approval process. The utility provider must notify the Town of completion of work on an approved ULA within 10 calendar days. The utility provider must submit as-built drawings within 60 calendar days following completion of the work.

SECTION 9 – HAZARDS AND LOCAL CONDITIONS

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 9" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



FEB. 28, 2025

Brian Kinzie, P.Eng. (Sections 9.1, 9.4, 9.5)

Municipal Engineer

Feb 28, 2025

Felix Camire, P.Eng. (Sections 9.2, 9.3, 9.6)

Project Engineer

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 9" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

9.0 Hazards and Local Conditions

In addition to hazards that municipalities in Western Canada are typically exposed to such as high surface water levels, wildfire and transportation related events, the town of Canmore is also vulnerable to steep creek hazards, undermining from former coal mining activities and high groundwater levels.

This section of the EDCG provides a description of the hazards and location conditions associated with undermining, valley bottom flood hazard, steep creeks, high groundwater, and railway risk in the town of Canmore. It provides information about the constraints when working in these areas and possible mitigation measures that Developers and Consulting Engineers need to consider when presenting development applications and undertaking capital projects in the town.

9.1 Undermining

Surface and underground coal mines were developed on the south side of the Bow River valley, between Pigeon Mountain and the Town of Canmore, from the 1880s to the 1970s. Coal was primarily extracted by underground mining, however some surface exploration and mining also occurred. Subsidence, surface features of past mining activity and the presence of coal seam outcrops all present potential concerns. When developing land where these hazards may be present, an undermining assessment is required, and remedial action may be necessary.

9.1.1 Alberta Regulation AR 34-2020

The Natural Resources Conservation Board (Decision report #9103, issued in 1992) approved a variety of urban land uses on lands where mining hazards may be present. The Provincial regulation and guidelines have been produced to regulate and assist in the evaluation of these lands. This regulation states that Part 17 of the Act and the *Subdivision and Development Regulation (AR 43/2002)* does not apply with respect to undermining in the designated lands.

This regulation designates the applicable lands and sets out the requirements for an undermining review that a Developer must undertake.

When the undermining review has been completed satisfactorily, a compliance certificate will be issued, and acknowledgment of receipt forwarded by the Province of Alberta to the Town of Canmore. The Town of Canmore is required to retain copies of certificates and reports and make them available to the general public. This regulation also requires the Developer to file with the Register of Land Titles a caveat against any title to land for which an undermining report is prepared and a compliance review certificate is completed.

Within the Regulation Area, a compliance certificate is required:

1. Before the adoption of or an amendment to an Area Structure Plan;
2. Before a subdivision application is submitted;
3. Before Canmore issues a development permit.

9.1.2 Guidelines to Evaluate Proposed Development over Designated Undermined Lands

The Province of Alberta approved *Guidelines to Evaluate Proposed Development Over Undermined Lands in the Town of Canmore*, Alberta April 1, 2020, through Ministerial Order MSD: 004/20. The purpose of the guidelines is to establish a staged process which provides for progressively increasing levels of confidence and confirmation as to whether a surface development may be undertaken without jeopardy to public safety and without incurring an unacceptable risk of damage.

The guideline addresses three stages of development:

1. Area Structure Plan Stage
2. Land Use & Subdivision Stage;
3. Development & Building Permit Stage.

9.1.3 Indemnification and Liability

Alberta Regulation 113/1997 exempts the Town of Canmore from liability for losses and damage that arise during development or use of the designated lands. Alberta Regulation 112/1997, in combination with the 1999 Indemnity Agreement, indemnifies the Town of Canmore and its agents in respect of loss and damage associated with the development or use of the designated lands.

Regulation AR34/2020 also specifies the insurance amounts that must be held by the Developer and the undermining professional engineer with respect to undermined lands.

9.1.4 Site Developments outside of Designated Lands

The undermining regulation area covers lands that were the subject of the 1992 NRCB decision, however undermined lands exist outside the current regulation area. Should an application for an Area Structure Plan, land use amendment, subdivision or development permit be submitted for such lands, an amendment to include them in the undermining regulation area will be required prior to Municipal approvals.

9.2 Valley Bottom Flood Hazard

Certain areas of the valley bottom of the Town of Canmore are located in the floodway, flood fringe and overland flood zones of the Bow River, as designated by Alberta Environment. These areas are described in the Town's *Valley Bottom Flood Hazard Overlay* section of the *Land Use Bylaw*. These regulations establish permitted and discretionary uses, minimum first-floor elevations, and locations of mechanical and electrical equipment. Refer to Figure EDCG HLC 9.3 Overland Flow Elevations for specific details.

9.3 Steep Creeks

After the flood event in 2013, the Town of Canmore established the Mountain Creek Hazard Mitigation Program with the goals of re-establishing damaged infrastructure, learning about hazards from steep creeks in the community, assessing the consequences and mitigating accordingly. The Town has adopted a risk-based approach for evaluating options for mitigation. This means that mitigation is not solely based on

a return period but on the consequences of a hazard occurring, including but not limited to the overall community impact, the safety risk to individuals and potential economic losses.

Steep creeks have been addressed in the Town of Canmore *Municipal Development Plan* (MDP) and *Land Use Bylaw* (LUB). Development in steep creek hazard zones may be permitted according to these regulations.

For development in moderate hazard zones, flood protection measures shall be designed to mitigate flood, debris flood or debris flow hazards. The level of protection required is determined on a case-by-case basis with the goal of meeting tolerable risk criteria as adopted by the Town in the MDP.

The Steep Creeks section of the EDCG provides direction and guidance to support resilient development in hazard areas where development is permissible. It provides guidance for small-scale on-site mitigation up to established thresholds defined within this document. Off-site mitigation, and mitigation work that exceeds these thresholds, shall be designed by a qualified professional. The EDCG are also applicable for existing developments in identified hazard zones to reduce vulnerability.

The Town may use in-house personnel or retain an independent qualified professional to provide advice during the review and approval process for any proposed work in hazard areas.

9.3.1 Policies, Regulations, and Emergency Plan

9.3.1.1 Government

The adoption by the Town of Canmore of guidelines on steep creek hazard and risk, and changes in land use regulations are all aiming at reducing the risks due to steep creek hazards. The 2023 edition of the *Alberta Building Code* does not have any specific codes related to buildings in flood or steep creek hazard zones.

9.3.1.2 Developer

Evacuation routes for proposed developments, including main and alternate routes, shall be designed and analyzed carefully to ensure that building occupants and rescuers can successfully evacuate the property when required.

9.3.2 Design – General

Hazards in mountain creeks strongly depend on geological conditions and morphology of the catchment. Steep creek hazards considered herein are, in order of increasing sediment concentration: clear water flood, debris flood, and debris flow. There is a continuum between these hazard types: floods transition to debris floods, and eventually to debris flows. Conversely, dilution of a debris flow through partial sediment deposition and tributary injection of water can lead to a transition of debris flows to debris floods, and eventually floods. The damage potential usually increases with increased sediment concentration. These three hazard types are considered in the present guidelines, as they can all occur during a single event. Each hazard type has different implications for mitigation design; therefore, Consulting Engineer of steep creek mitigation need to identify which hazard type or types could affect each area of development.

Steep creek hazard zones are areas identified as potentially dangerous for development. The MDP defines the different hazard zones under the Section *Steep Creek Hazard Zone*. The zones are identified in the Steep Creek Hazard Overlay in the LUB.

9.3.2.1 Level of Protection

Due to the risk-based approach for assessing steep creek hazards adopted by the Town, the level of protection required can change on a case-by-case basis and depends on the type and number of elements that are exposed to the hazard.

The Town's requirements for assessment studies, and policy for development in steep creek hazard zones, can be found in the MDP and the LUB.

In high/extreme hazard zones, only the developments listed in Section 7.8.2 of the LUB are allowable. Measures outlined in these guidelines might be applicable.

In moderate hazard zones, a site-specific steep creek risk assessment (SCRA) is required. The risk assessment will determine if the development is allowed and what level of protection is required. SCRAs shall be undertaken by a qualified professional. Site-Specific SCRA guidelines are found in Appendix C of the EDCG, with supplemental information regarding risk analysis, vulnerability and loss estimation in Appendix D Quality Assurance Statement for Site-Specific SCRAs is found in Appendix E

In low and residual hazard zones, the risk can be mitigated by adopting some of the measures outlined in these guidelines. A risk assessment is usually not required for developments in low and residual hazard zones. However, where a development proposal may result in significant economic losses or damage to buildings in the case of an event, a site-specific steep creek risk assessment, specifically related to economic risk, may be required to evaluate the development and proposed on-site mitigations.

9.3.3 On-Site Mitigation Measures

In general, any mitigation measures proposed or constructed should not cause any material adverse impact on other properties. Ideally, it should also reduce the overall flood risk.

Flood avoidance ensures that the water will not come into contact with the building. Flood resistance, or dry-proofing, stops water entering a building. Flood resilience, or wet-proofing, accepts that water will enter the building, but through careful design will minimize damage and allow the re-occupancy of the building quickly.

9.3.3.1 Minimum Floor Elevation

Minimum floor elevations are established to ensure that the habitable space of a development is higher than modeled flood levels. This ensures adequate flood protection.

9.3.3.2 Minimum Building Opening Elevation

The minimum building opening elevation concept is similar to the minimum floor elevation. However, it is used for below-grade basement in low and residual hazard zones, or in moderate hazard zones if deemed

acceptable (once a site specific steep creek risk assessment has been completed). Building openings refer to window wells, garage doors, door entrances, and the top of foundation walls.

9.3.3.3 Low and Residual Hazard Zones

In low and residual hazard zones, the minimum floor elevation and the minimum building opening elevation shall be a minimum of 300 mm above proposed finished grades (see

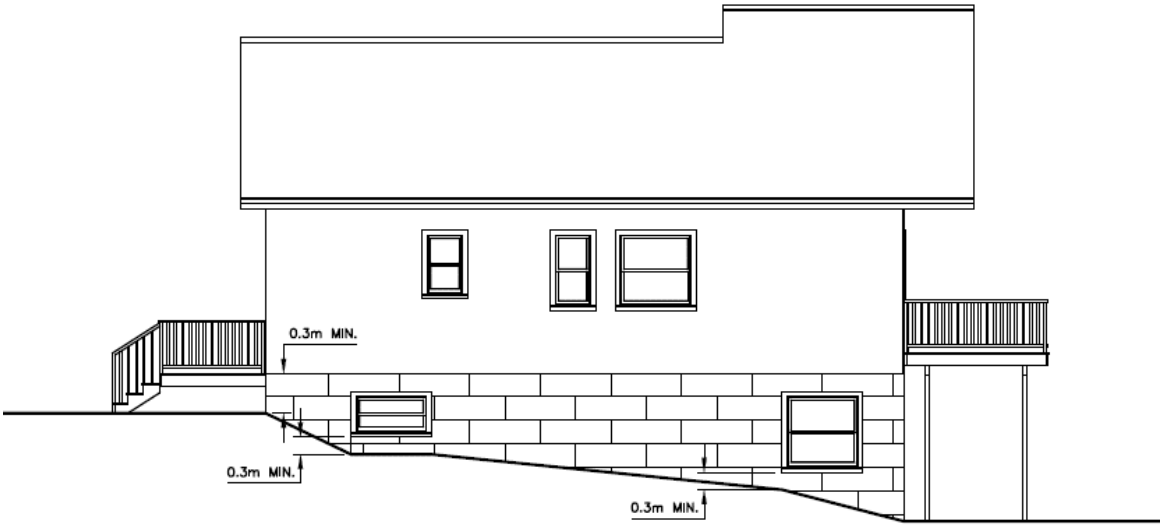


Figure 9-1). The design shall also consider Section 6 of the EDCG regarding stormwater management. A higher minimum floor elevation or minimum building opening elevation might be required to account for stormwater management.

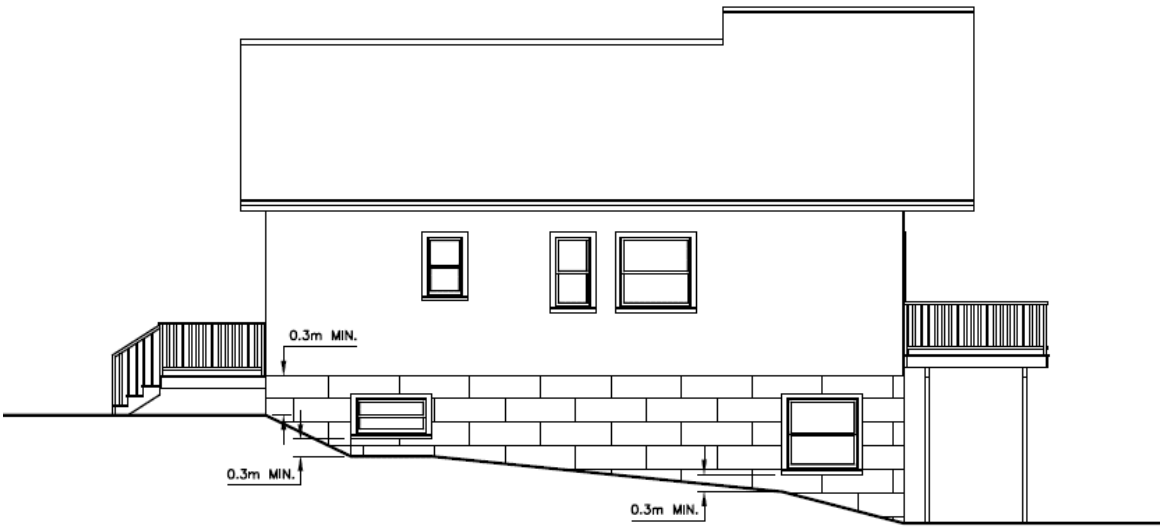


Figure 9-1: 300 mm above proposed finished grades

9.3.3.4 Moderate Hazard Zones

In moderate hazard zones, the modelled flood levels, plus 100mm of freeboard, is used to define the minimum floor elevation and the minimum building opening elevation. The modelled flood levels are based on model results from the applicable hazard assessment and provided by the Town of Canmore for the site-specific steep creek risk assessment.

9.3.3.5 Flood Avoidance

Avoidance measures are aimed at preventing water coming into contact with a building. The most basic principle of flood avoidance is to not build in identified flood hazard areas.

Avoidance can be accomplished by raising the development above the modeled flood level, or by using the topography to divert flood waters away from the development.

Driveways

Driveways sloping towards the building are discouraged. However, they are acceptable in low and residual hazard zones when the minimum building opening elevation requirement of 300 mm is met, and may be permitted in moderate hazard zones where an SCRA addresses the potential hazard, and the minimum building opening elevation requirement is met. This requirement can be met through grading or other passive measures. Requirements of Section 3.3.5 (Driveways) of the EDCG shall also be met.

Elevation: Raising the Development Above the Design Flood Level

The development is not exposed to the hazard when raised above modeled flood level. Development can be built on higher ground by raising the property lot, or by raising the development itself on foundations that can withstand the impact of the flow. Minimum floor elevation shall be used.

Raising the Lot

Raising the lot can be considered for infill development sites that are low compared to neighboring lots, where raising the lot would reduce its risk without significantly increasing flood risk elsewhere. If raising of a lot is required, it might have to be offset by the provision of additional flood storage areas or improved flood routes elsewhere.

Creating an island effect with surrounding areas inundated by floodwater is not acceptable as there must be safe access for emergency vehicles and evacuation. Essential and emergency access routes should be designed above design flood level.

Raising the elevation of a lot shall be designed by a qualified professional and shall consider the following:

- Topsoil stripping, storage and reinstatement
- Existing ground conditions and type of material
- Compaction and settlement of structural fill material
- Possibility of mobilizing contaminants
- Possible changes to flow behavior of debris floods

Slope and embankment fill is required to be stable under conditions of flooding, including rapid rise, rapid drawdown and prolonged inundation. Fill side slopes shall be no steeper than 2(H):1(V). Moreover, a minimum Factor of Safety of 1.3 should be used for the design of those slopes.

Erosion protection of side slopes shall be designed according to Table 9-1 below.

Table 9-1: Design Standard for Side Slope Protection

Hazard Zone	Flow Conditions (depth & velocity)	Design Standard
Low	Less than 1m & 1m/s	Grassed side slopes, as per Design of Deflection Measures section, below.
Moderate	As per site specific flow data	Shall be designed by a qualified professional.

Retaining Walls

Elevation of a building or a lot may also be done with wood (only in low and residual hazard zones), stone, concrete, or stone-pitched retaining walls. An example of a stone wall is shown in Figure EDCG HLC 9.4 Stone Retaining Wall on Silvertip Road, Canmore AB. Retaining walls over 1 m in height or in moderate hazard zones, shall be designed in accordance with Section 3.3.1 of the EDCG and minimum requirements described in

. Stone-pitched walls and concrete walls shall be designed by a qualified professional. An example of stone-pitched wall is shown in Figure 9-3.

Table 9-2: Retaining Walls

Hazard Zone / Flow Velocities	Foundation Depth	Wall Type
Low/Less than 1 m/s	Only EDCG Section 3.3.1 applies	Wood, stone retaining wall, concrete wall or stone-pitched wall.
Moderate/1 m/s to 2 m/s	Minimum 1 m 0.5 m acceptable if wall is directly adjacent to a paved road or has adequate scour protection	Either: a) Stone retaining wall b) Stone-pitched wall c) Concrete walls (covered by rock or abrasion resistant material for walls exposed to debris flood / debris flow impacts)
Moderate / Greater than 2 m/s	Minimum 1.5 m 0.5 m acceptable if wall is directly adjacent to a paved road or has adequate scour protection	Either: a) Stone-pitched wall b) Concrete walls (covered by rock or abrasion resistant material for walls exposed to debris flood / debris flow impacts)

Figure 9-2: Stone Retaining Wall on Silvertip Road, Canmore AB

Figure 9-3: Example of Raised Lot Grading with Stone-Pitched Retaining Wall

Reinforced Foundations

Elevation may also be accomplished with reinforced foundations, providing space for flood waters below the main floor. This solution is also outside the scope of these guidelines and shall be designed by a qualified professional.

9.3.3.6 Fuel Storage and Other External Installations

Fuel storage containers, private pumping stations and any other external service installations with mechanical or electrical parts should be raised and secured at or above the minimum floor elevation.

9.3.3.7 Flood Resistance

Resistance measures are aimed at preventing floodwater ingress into a building; they are designed to minimize the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. They are only effective for short duration flooding of low flow depth. They include the use of low permeability materials that reduce the rate of water ingress into a property. However, total prevention of water ingress, or dry proofing of a building, is very difficult to achieve. Structural reinforcement can also be used to reduce the impacts of debris flood or debris flow.

Temporary Measures

Temporary measures may be adequate only for existing development in low and moderate hazard zones of steep creeks. The application of temporary measures shall be assessed on a case-by-case basis by a qualified professional.

Examples of temporary measures for flood protection include:

- Flood shields, panels, doors and gates
- Temporary covers for openings in the foundation walls
- Sandbags
- Deployable flood barriers

However, the following issues with temporary measures have been identified:

- Homeowners have the responsibility to store, maintain and install the flood protection products.
- Future homeowners must be made aware of the use of temporary products as the chosen flood mitigation measure.
- The durability and sustainability of some products has not been proven.

Temporary measures are therefore not appropriate for new developments and shall not be pursued. Consequently, only permanent flood resistance measures are permissible for new development.

Permanent Measures

Lot Grading and Drainage

Landscaping of a development site or property boundary to direct or divert floodwater away from buildings can be effective, particularly in low or residual hazard zones, where the predicted duration of flooding is short (i.e., hours rather than days) and/or velocity is low (less than 1 m/s).

Grades adjacent to new buildings should be sufficient to allow for settlement of fill and maintenance of positive drainage away from the building. A minimum slope of 2% should be established on all lots to provide positive drainage away from the buildings. The minimum grade should be exceeded if topography allows. Grades shall be designed by a qualified professional.

Basement and Below Grade Spaces

Because of potential harm to building occupants, flood-proofing of spaces below the top of foundation wall is only permitted in low and residual hazard zones, or for non-residential occupancies in moderate hazard zones (non-habitable structures, crawl spaces, building access, garages, and additional storage area for residential buildings), unless a site-specific risk assessment demonstrates that the risk associated with a habitable basement is within acceptable threshold. In such cases, walk-out basements are permitted, if they are on a non-flow exposed side of the property. Walk-out basements are usually built into a hill or into a lot with strong grades between the front and rear yard.

Walk-up basements, containing sunken entrance, or dug-in stairs that go from the ground level down to the basement as an entry/exit to the building should be avoided. However, they are permitted in low and residual hazard zones, and maybe permitted in moderate hazard zones where an SCRA allows it.

Foundation Design

Table 9-3 below, describes the recommended design consideration for foundation walls.

In moderate hazard zones, the qualified professional undertaking the foundation design shall consider the anticipated flood loads (lateral hydrostatic forces and the vertical buoyant), potential debris impact loads (impact forces based on velocities), and scouring of foundation walls, in combination with other regular anticipated loads, as per Part 4 of the Building Code. The design flood elevation should also be considered to determine bearing capacity requirements of footings.

Table 9-3: Foundation Design Considerations

Hazard Zone	Design Requirements	Scouring Consideration
Low and residual hazard	Waterproofing measures apply and steel-reinforced concrete walls recommended on all sides,	None
Moderate hazard	Steel-reinforced concrete walls recommended on all sides, designed to withstand expected debris impact forces.	Building should have either: a) deep foundations able to resist anticipated scouring, b) scour protection to protect the foundations.

Openings in Foundation Walls

Openings (doors, windows, dryer outlet, etc.) in foundation walls may be allowed in accordance with

Table 9-4, below.

Table 9-4: Allowable Openings in Foundation Walls

Hazard Zone	Openings on Flow Exposed Foundation Walls	Openings on Non-flow Exposed Foundation Walls
Low and residual hazard	Windows allowed. Consider non-opening and sealed windows. The bottom of window, or top of window well, shall be above the Minimum Building Opening Elevation Other openings: not allowed	Windows allowed. The bottom of window, or top of window well, shall be above the Minimum Building Opening Elevation Walk-out basement entrances allowed: door sills shall be above the Minimum Building Opening Elevation. Walk-up basement entrances: top of retaining walls and landing (step-up) shall be above the Minimum Building Opening Elevation. Other openings allowed: shall be above the Minimum Building Opening Elevation
Moderate hazard	SCRA determines if openings are allowed.	Openings allowed: shall be above modelled flood level, plus 100 mm freeboard.

Window Wells

All window wells in a steep creek hazard zone shall follow the requirements set-out below, and as detailed in Figure EDCG GRD 3.4 Window Well Drain.

- Window well drainage system shall be designed by a qualified professional and shall minimize the likelihood of water accumulation in the well.
- The contact between the window well and the foundation wall shall be sealed.
- The bottom of the well shall be at a minimum of 150mm below the underside of the window.
- The top of the window well shall extend at least to the Minimum Building Opening Elevation.
- Grades around the window well must slope away at 2% minimum.

Waterproofing Measures

Waterproofing of foundation walls significantly increase the flooding resistance of a building and could be adopted for building in steep creek hazard zones.

The Foundation Walls section of the National Institute of Building Science's *Whole Building Design Guide* provides descriptions of waterproofing membranes, drainage materials, and systems common in foundation walls and below-grade building enclosure systems that could be adopted. The information is found at: www.wbdg.org/guides-specifications/building-envelope-design-guide/below-grade-systems/foundation-walls.

9.3.3.8 Flood Resiliency

Flood-resilient buildings, or wet-proofing of buildings, are designed and constructed to reduce the impact of flood water entering the building so that minimal permanent damage is caused, structural integrity is maintained, and drying and cleaning is easier. Such measures could be adopted for building in steep creek hazard zones.

Internal Space Layout

Careful layout of internal space is an effective measure to minimize the impact of floods. Living accommodation, mechanical room and electrical panel, storage space for key provisions and equipment, should be located at or above the design flood level. Further consideration should be given to locate the mechanical room and the more-frequented rooms in the sheltered area of the building opposite to the flow-exposed side(s) of the building.

An access to the building shall be located on a side that is not reasonably expected to be directly exposed to flood. This will help guarantee safer egress in case of an event.

For developments with underground parking below the modeled flood level, flood-proofing may not be necessary to prevent damage from floodwater as vehicles can be moved to higher ground. However, mechanical and electrical services should not be located below the modeled flood level. An unobstructed means of pedestrian ingress and egress should be provided above the modeled flood level.

Suggested Strategies to Minimize Flood Impacts

Suggested strategies to minimize flood impact to buildings and their occupants, flood resiliency measures, are described in **Error! Reference source not found.**, below.

Table 9-5: Suggested Strategies to Minimize Flood Impact to Buildings

Building Components	Strategies to Minimize Flood Impact
Walls and Insulation	Consider solid walls with external insulation instead of cavity construction to avoid problems of contamination entering the cavity. If cavity insulation is selected, consider using rigid closed-cell materials instead of other common insulation material such as wool batts to minimize moisture retention.
Foundation Openings for Services	Where possible, all service entries/openings should be sealed.
Water, Electricity and Gas Meters	Consider locating these services a minimum of 1m above finished grades.
Electrical Services	Consider locating electrical panel a minimum of 1.5m above slab elevation, and outlets 1 m above slab elevation to minimize damage to electrical services.

HVAC Systems and Hot Water Tanks	Consider installing air conditioning compressors, heat pumps, furnaces, hot water tanks, tankless water heaters, ductwork and ancillary devices 1 m above slab elevation and preferably above ground. Consider hanging units from the ceiling. Consider not installing baseboard heaters and underfloor heating in below grade basements. Hydronic baseboards should be considered.

9.3.4 Deflection Measures

This section covers the design of simple deflection measures, including basic principles of bioengineering. Deflection measures minimize the building exposure to the hazard by deflecting flow away from the development. Deflection measures will typically be off-site.

The retention of water and/or sediment to reduce peak discharges and sediment volumes, extensive soil bioengineering, as well as forest management measures, are out of scope for these guidelines. Any such measures shall be designed by a qualified professional.

9.3.4.1 Deflection Measure Requirements

The deflection measures shall be designed by a qualified professional and shall take into consideration the following requirements:

- Deflection measures shall be designed and constructed in a way that the risk to people inside buildings are reduced in case of a modeled flood event.
- Measures shall be designed according to the flow impacts / impact intensities determined in hazard assessment studies or site-specific steep creek risk assessments.
- Consideration shall be given to access and egress from a property in case of an event.
- Deflection measures can also function as a retaining wall to elevate a building.

9.3.4.2 Design of Deflection Measures

Deflection of flow can be achieved with berms, walls or wedges. These deflection measures may be applied for floods, debris floods and debris flow of different flow depths and velocities. However, these guidelines apply only for the design of an earth berm in a low or residual hazard zone, with maximum flow velocities of 1 m/s and maximum flow depth of 1m.

Deflection measures in a moderate hazard zone shall be designed by a qualified professional. Impact pressure and geotechnical conditions are critical design consideration for such designs. The design of deflection walls shall include structural analysis of the proposed structure according to the impacts as provided by a hazard assessment. Minimum berm height shall be the modeled flood level plus 300 mm of freeboard.

9.3.4.3 Design of Seeded Earth Berm

In low and residual hazard zones, a grassed earth berm without additional erosion protection may be sufficient. The berm shall be constructed according to the specifications below. Alternate protection measures shall be designed by a qualified professional.

Berm specifications:

- Maximum slope steepness of 2(H):1(V)
- Berm height shall be 1.3m, which includes the required 150mm of topsoil and 300mm of freeboard.
- The foundation of the berm shall be stripped of all vegetation, organic and otherwise objectionable materials, to a minimum depth of 300mm. After stripping, the earth foundation should be moistened if dry and should be compacted to 95% Standard Proctor Max Dry Density before placement of the first layer of fill material. Fill shall not be placed on frozen soils, ponding or standing water, or on deleterious materials.
- Fill material should be locally sourced, if readily available. Table Table 9-5, below, shows suitable materials for berm construction, as per the Unified Soil Classification System (USCS), ASTM D-2487. Inclusion of vegetation, organic material or frozen soil in the berm is not permitted.
- The fill shall be layered along the full length of the berm in depths appropriate to the equipment used. Maximum lift thickness of 100mm is appropriate for small equipment use, such as vibratory plate compactor. Maximum lift thickness of 200-300mm is permitted for heavy equipment use, such as sheepsfoot rollers, vibratory and smooth-wheeled rollers, depending on material type.
- Compaction shall meet 95% Standard Proctor Max Dry Density.

Table 9-5: Materials Suitable for Berms, in Preferential Order

Material Classification (USCS)	Description
GC	Clayey gravel
SC	Clayey sand
GM	Silty gravel
CL	Lean clay (low plasticity)
CI	Intermediate clay (moderate plasticity)

9.3.4.4 Topsoil, Seeding, and Plant Material

Topsoil and plant material used for flood protection, as well as the maintenance requirements, shall adhere to the landscaping guidelines in Section 10.0 of the EDCG. Additional specifications are provided below.

On an earth berm, on side slope of a raised lot, or within the banks and channel of a creek, only grass and small shrubs shall be planted. The following shrub species, with a maximum trunk diameter of 40mm, are appropriate:

- Green Alder (*Alnus crispa*)
- Pussy Willow (Salix discolor)
- Smooth Willow/Gray-leaved Willow (Salix glauca)
- Meadowsweet/Birch Leaved Spiraea / White Spiraea (Spiraea betulifolia)

Only the Willow species can grow from the stump and can be used for brush layers or willow staking. Plant material should ideally be harvested within the Bow Valley, from a location with similar growing conditions. Approvals for harvesting from private and public lands shall be obtained if sourced offsite.

Strong rooted grass species, of the seed mix shown in Table Table 9-6, below, shall be used. An alternate seed mixes could be considered if the required seed mix is not readily available. A seeding rate of 25 kg/ha shall be used. Erosion protection, such as coconut mat, geofabric and hydromulch, should be considered, especially when grass has not been established prior to autumn and winter months.

Table 9-6: Seed Mix for Flood Protection

Scientific Name	Common Name	Target Cover	% of Seed Mix (PLS)	Kg Required (PLS)
Deschampsia ceaspitosa	Tufted Hairgrass	20%	6.6%	1.65
Koeleria macrantha	Junegrass	20%	5.2%	1.30
Bromus carinatus	Mountain Brome	10%	28.4%	7.10
Agropyron smithii	Western Wheatgrass	10%	23.3%	5.83
Poa alpina	Alpine Bluegrass	20%	10.2%	2.55
Agropyron dasystachyum	Northern Wheatgrass	10%	16.6%	4.15
Elymus canadensis	Canada Wildrye	5%	9.3%	2.33
Agrostis scabra	Rough Hairgrass	5%	0.4%	0.1

9.3.4.5 Maintenance of Grass and Plant Material

The following maintenance is required on berms and raised lot side slopes:

- The grass shall be cut once, only after a year of growth, to promote early root growth.
- Re-seeding shall be undertaken every spring until the grass is well established.
- Weeds shall be removed as per Alberta's Weed Control Act.
- Trees, plants or shrubs shall be cut when trunk diameter of 40mm is reached.

9.3.4.6 Design of Other Deflection Measures

The design of other deflection measures, such as timber plank wall and earth berms with stone-pitching, is out of scope for these guidelines. Other deflection measures shall be designed by a qualified professional.

9.3.5 Steep Creek Mitigation of Medium to Large Developments

Mitigation of debris-flood and debris-flow hazards for medium to large developments (i.e., on subdivision level, area structure plan) must be designed by a qualified professional who is experienced in steep creek hazard mitigation design. The mitigation design must adequately address the nature of debris floods and debris flows, which are substantially different from clear water or river flooding.

9.3.5.1 Hazard Type Characteristics and Design Scenarios

The qualified professional designing mitigation measures must identify the specific hazard type (i.e., clear water flood, debris flood, debris flow) that could impact the development and the designed mitigation measures. On many fans, multiple hazard types can impact the same location. The design basis for mitigation measures shall be based on multiple design scenarios that together represent the range of possible hazard impacts (e.g., hazard type, flow depth, flow velocity, peak discharge, volume). Hazard type(s) should be derived from the existing steep creek hazard and risk assessment reports that are available on the Town of Canmore online Property Viewer. If the appropriate assessment reports are not available for a new development area, then the Developer shall retain a qualified professional experienced in steep creek hazard assessment.

Designs may have different performance objectives for each design scenario, as needed to meet the risk reduction target. For example, a structure may be designed to fully contain a smaller, more frequent flow, but allow overtopping without erosion or collapse for larger, less frequent flows.

Debris-flood and debris-flow mitigation designs that are located on a fan need to simultaneously manage several overlapping and equally important aspects of these hazards:

a) Water and debris-flow discharge: The discharge includes the mixture of water, sediment, and debris.
b) Watershed sediment: This is the volume of sediment that enters the fan from the watershed.
c) Fan sediment: This is the volume of sediment that is redistributed on the fan through erosion, entrainment, and re-deposition.
d) Woody debris: This includes small branches to large logs that are carried on top of (debris floods) or mixed into (debris flows) the flow.
e) Bank erosion: This is the removal of sediment, soil, and rocks from the bank of the creek channel causing the channel to widen and the bank to move laterally away from the channel.
f) Flow avulsion: This is the potential for flows to exit the existing dominant channel due to discharge exceeding the channel capacity, channel blockage, or bank erosion.
g) Dynamic impacts: This is the force of the flowing mixture against structures.

9.3.5.2 Mitigation Measures

A functional chain of multiple mitigation measures is typically needed to address these various hazard aspects and meet the performance objectives of all design scenarios. The following mitigation measures may be applicable:

a) Land use planning: Use steep creek hazard zones to inform the development layout, with high occupancy land uses (e.g., housing) and critical infrastructure in the lowest hazard zones. Highest

hazard zones should be used for low risk uses like parking lots and green spaces, consistent with the LUB and MDP.

b) Local building and infrastructure protection: Protect individual buildings and infrastructure with site specific measures that deflect flows, resist erosion, resist dynamic impact, and resist ingress of flood water and debris. These measures are described in Section 9.3.4.2 of the EDCG.

c) Site grading: Place infrastructure and buildings above modeled flood levels. Protect fills and building foundations from erosion and undermining. Incorporate floodways into the site grading plans that convey flood waters through designated, low occupancy areas (e.g., parking areas, green spaces). Raising the development elevation is described in Section 9.3.3.5 of the EDCG.

d) Conveyance channels: Design conveyance channels to carry floods and debris floods from a steep creek to a safe outlet point. The conveyance channel design must accommodate or incorporate elements (e.g., sediment basin, erosion protection) that manage: the sediment volume arriving from the watershed; the peak discharge of the flow; woody debris; and the potential for erosion and redistribution of sediment along the channel. Conveyance structures can transfer hazard and risk. Risk transfer must be assessed against the risk tolerance criteria adopted in Section 3.5 of the MDP,. Where possible, wide and shallow channels, or floodways defined by berms set far back from the channel, should be considered instead of narrow and deep channels. A wide and shallow channel mimics natural debris-flood channels, reduces forces on erosion protection, reduces redistribution of sediment on the fan, reduces lateral bank migration, and can accommodate larger volumes of woody debris without channel blockage. Narrow and deep channels could be inappropriate for debris-flood conveyance in new development since they could be prone to unexpected lateral bank migration and flow avulsion.

e) Sediment and debris-flow retention: Capture debris-flood sediment or debris-flows using a suitably sized basin and/or barrier. A retention structure located near the fan apex would be sized for the sediment or debris-flow volume arriving from the watershed. A retention structure located part way down the fan needs to also account for the volume of sediment eroded from the fan, as well as potential for avulsion upstream. A suitably sized wide and shallow conveyance channel may also act as a sediment and debris flow retention structure. Other types of retention structures generally include one or more outlets or spillways that allow flows to safely pass the structure. Channels downstream of retention structures must be designed to accommodate the high erosive power of flows that have been stripped of sediment by the retention structure.

f) Diversion structures: Diversion structures are erosion protected channels and/or berms that intercept and carry flows around critical infrastructure, buildings, or discrete areas. Diversion structures can transfer hazard and risk. Risk transfer must be assessed against the risk tolerance criteria adopted in Section 3.5 of the MDP s. Risk transfer can be managed by discharging floods safely into downstream water body or into existing, appropriately sized, flood conveyance structures located downstream of the development.

g) Water or debris attenuation: Debris-flows and debris-floods contain surges of relatively higher peak discharge. The peak discharge of water and/or sediment can be reduced by temporarily capturing and storing the water and/or sediment with a barrier and/or basin. The reduced peak

discharge allows for relatively smaller conveyance structures downstream of the attenuation structure.

h) Erosion protection: Erosion protection in steep creek mitigation structures could include stone pitching, grouted stone pitching, suitably sized riprap, or concrete structures that protect against bank migration, scour, and entrainment of sediment from the channel bed and banks. Erosion protection can be a revetment placed on top of erodible soil or can include channel stabilization, grade control structures, or ground sills that resist knickpoint migration, downcutting, outflanking of structures, and bank migration.

i) Woody debris retention: Capture woody debris in an area that allows water to be conveyed past the woody debris and is protected from flow avulsions from the channel. The volume of woody debris that can be captured is a function of the woody debris deposition area. Basins, ponds, and wide conveyance channels can retain a much larger volume of woody debris than deep narrow channels.

9.3.5.3 Design Guidance

Mitigation measures should be designed using criteria, parameters, and methods that are suitable for steep creek hazard mitigation. The following provides specific design guidance:

a) Sizing of channels and openings: The peak discharge of debris floods and debris flows can be many times larger than the peak discharge of a clearwater flood. Identify the hazard type and size channels and openings for the specific hazard that may occur. Identify where multiple hazard types may occur. Allow for sediment and woody debris conveyance and deposition, as appropriate, given the functional chain of mitigation measures.

b) Freeboard: Freeboard is the vertical distance from the design water surface (i.e., given the design discharge) to the top of the confining channel wall. Freeboard is similar to a factor of safety that compensates for many factors that could contribute to the top of flow elevation being greater than the design water surface. These factors could include: waves; uncertainties or changes in channel roughness; uncertainties in peak discharge; return period of the design discharge (and likelihood of exceedance); superelevation (or runup) of flow at bends; changes in the bed level (e.g., sediment deposition); or woody debris that is carried on top of the water surface. Freeboard would typically be in the range of 0.3 m to 2 m, and selection of the freeboard should be justified by the qualified professional based on the design return period of the flow and how the factors listed above were addressed in the design. If a design directly accounts for uncertainty in other ways (e.g., using risk concepts), the term and concept of freeboard may be omitted.

c) Debris-flow and debris-flood loads: Load cases need to account for static, dynamic and drag loads as relevant for the specific structure. Dynamic loads occur when debris flows, debris floods, or woody debris initially impact structures. Static loads occur when structures are retaining sediment and debris, and drag forces occur where flows pass over a structure, for example over a spillway. Load should be assessed as a function of flow depth, deposit depth, flow velocity, and flow density.

d) Woody debris management: Design woody debris retention structures to resist the relevant impact forces and identify how the volume of woody debris retained relates to the capacity of other design elements and the expected total volume of woody debris.

e) Sediment management: Identify the volume of sediment that can be contained by the sediment retention structure, allowing for an appropriate sediment deposition slope (typically between 0.5

and 1.0 times the natural gradient of the fan surface). Justify selection of the sediment deposition slope. Describe how the sediment storage capacity relates to the expected volume of sediment from the watershed and volume that may be entrained from the fan upstream of the sediment retention structure.

f) Erosion protection: Alberta Class 3 riprap is the minimum size of riprap acceptable for erosion protection in debris-flood and debris-flow mitigation structures including channels and berms, except in areas not subjected to direct impact of debris-flood or debris-flow, such as in areas of ponding with low flow velocity. Justification to use smaller than Class 3 must be provided. Stone pitching, grouted stone pitching, and/or concrete structures are required in areas that are exposed to high intensity flows, defined as an intensity of 5 m^3/s^2 or greater (flow depth times flow speed squared).

g) Berms: Berms should be designed with appropriate consideration for the unique characteristics of debris-flow and debris-flood processes described in Section 9.3.6.1. Seek to use locally available materials as borrow, if the aggregate characteristics are appropriate. Consider material availability and consequences of seepage on berm stability and flooding due to seepage. Given the relatively short duration of debris flows and debris floods (i.e., minutes to days), it may be acceptable to omit a low permeability liner or low permeability fill if the berm stability objectives are met and there is an adequate method for managing water that seeps through the berms. Protect berms from erosion.

h) Super-elevation: Due to high velocities, flows may super-elevate around channel bends. Channel and berm sizing should account for the potential for super-elevation.

9.4 Groundwater

The central portion of the Town of Canmore (situated in the valley bottom) is underlain by coarse and pervious river gravels to a considerable depth. These gravels together with the nearby presence of the Bow River result in high groundwater levels that impact trench and foundation excavations as well as completed building foundations and underground utilities. A number of piezometers and staff gauges are located throughout the central area of Canmore. Groundwater levels are recorded regularly and analyzed for historic trends. This information is available to the Town and Developers to improve the design, construction, operation and maintenance of municipal infrastructure, stormwater management systems and buildings with respect to the impact of high groundwater levels.

Monitoring locations are shown on Figure EDCG HLC 9.6 Piezometer and Staff Gauge Location and sample level fluctuations on Figure EDCG HLC 9.7 Typical Water Level Fluctuation.

9.4.1 Building Floor Elevations

Town's *Land Use Bylaw*, *High Groundwater Area Regulations*, prohibits the building of habitable floor space below the maximum 1:100-year design groundwater elevation. These elevations, which include a freeboard allowance between 0.2m to 0.6m, are based on a groundwater model and are shown on Figure HLC 9.8, 1:100 Year Design Groundwater Elevations. Local conditions such as soil types and topography may influence groundwater elevations and a site specific geotechnical or hydrogeological study is recommended to assess groundwater levels at seasonal highs and compare to statistical data.

In the case of data discrepancies that may exist between information on Figure EDCG HLC 9.6, Figure EDCG HLC 9.8 and more recent piezometer data, the engineer should propose whether the highest

anticipated groundwater elevation will be determined using the highest of elevations from Figure EDCG HLC 9.6, data from Town historical records or by recent data from test wells or piezometers on site.

Certain areas within the High Groundwater Regulation Area are marked as 'To be determined'. In these areas a qualified professional is required to assess existing data and perform a site specific evaluation to determine the appropriate elevation.

All sanitary sewer and water service piping located in a subsurface mechanical room shall be sealed against infiltration of any groundwater and water meters shall be situated above the 1:100-year ground water level unless the mechanical room is designed and constructed to withstand the infiltration of groundwater. All sanitary sewer and manholes located below the 1:100-year groundwater elevation should be tested for infiltration/exfiltration as outlined in Section 5 of the EDCG. The Developer is responsible for all costs associated with the testing.

9.4.2 Underground Parkade and Lowest Parking Slab Elevation

Parkade floor levels may be lower than the 1:100-year groundwater level but not lower than the 1:20-year groundwater level to avoid frequent nuisance flooding. However, the Town has the authority to make the final decision on the appropriate elevation to be used on a site. The impact of periodic flooding shall be determined and evaluated by the Consulting Engineer. In all cases, the structure should be designed to address all hydrostatic and hydrodynamic forces due to high groundwater conditions at the site.

9.4.3 Mechanical and Electrical Installation Elevation

The Province of Alberta and Town of Canmore require that all mechanical and electrical installations be installed above the maximum 1:100-year design and groundwater elevations noted above.

9.4.4 Utility Installations and Foundation Excavations

The installation of deep utilities and excavation for buildings in the central area of Canmore should be scheduled for times when groundwater levels are at their lowest. This occurs between the late fall and early spring. When excavation into the water table cannot be avoided, disposal of groundwater from an excavation may be necessary. The Consulting Engineer shall prepare and submit plans for such disposals to the Town engineer as part of the construction management plan. Provided there is no detrimental impact to the aquifer, vegetation, adjacent properties or structures, groundwater may be discharged as follows:

- Water may be discharged to a temporary, on-site infiltration basin specifically designed for that purpose based on the maximum discharge pumping rate and the soil infiltration rate. If the discharged water contains a high sediment load, a separate sedimentation basin or an additional allowance for the infiltration basin shall be provided.
- Water may be discharged to a naturally vegetated area of adequate size and with suitable soils. If the discharged water contains a high sediment load, a geotextile filter shall be installed at the discharge point to collect and contain the sediment; this shall be removed upon completion and any disturbed areas restored to an acceptable condition.
- Water may be discharged to a natural watercourse or surface water body provided the discharge has first been treated and the quality of the discharged water is equal to or better than that of the receiving body, especially with respect to sediment and turbidity. While possible in theory, this option has seldom been utilized due to the relatively high infiltration rates which favor the use of

on-site infiltration basins. The Consulting Engineer (and in smaller cases the Builder) is responsible to obtain additional approvals that may also be required from the Province of Alberta.

In all cases, the point of discharge shall be protected against erosion. If sediment-laden or turbid discharge water finds its way into any surface water course, discharge shall cease immediately, sediment shall be removed, and the area shall be restored to its pre-existing condition. All groundwater disposal methods proposed on municipal lands or within the Town's wellhead capture zone must be accepted by the Town Engineer prior to construction. The Consulting Engineer (and in smaller cases the Builder) is responsible to obtain additional approvals that are required from the Province of Alberta.

Trench or excavation groundwater may not be discharged to the sanitary sewer system.

Discharge to a contained stormwater sewer system (system with a detention pond that does not discharge directly to a surface water body) or to a stormwater drywell may be considered where the water is of acceptable quality and such discharge has been authorized in writing by the Town Engineer.

9.5 Protection of Aquifer for Municipal Water Supply

The Town obtains a significant portion of its' total municipal water supply from groundwater in the Bow River valley aquifer beneath the Town. Existing production wells are located adjacent to Policeman's Creek near the intersection of Railway Avenue and Old Canmore Road. The Town has adopted a wellhead protection strategy made up of three control mechanisms to protect this water supply source. Development in the area upstream of and near to the production wells is controlled by the Town and restricted to uses or activities that will not adversely affect the quality of the groundwater. Refer to the *Land Use Bylaw*, *Section 7.4 Groundwater Protection Overlay* for additional details.

9.5.1 Control Mechanisms

9.5.1.1 Control Mechanism #1 - Construction Activity Control

Construction of municipal improvements on municipal lands or other activities not regulated by the *Land Use Bylaw* and located within the wellhead capture protection zone (see Figure EDCG HLC 9.9 Wellhead Capture Protection Zone) as defined by hydro-geological parameters, shall comply with these guidelines and any other specific requirements deemed necessary by the Consulting Engineer for the protection of the Town's water supply source.

9.5.1.2 Control Mechanism #2 - Land Use Control

The Town's *Land Use Bylaw* establishes the wellhead protection area, which is used to regulate land use for all development sites wholly or partly within the boundary of the area. The limits of the wellhead protection area (land use) are shown in Section 7.4 of the *Land Use Bylaw*. Certain types of land uses are prohibited from the wellhead protection area. Permitted or discretionary uses must conform to the performance criteria listed in the *Land Use Bylaw* and the Town may require a risk assessment report as part of a site development permit application. Refer to the *Land Use Bylaw* for additional details.

9.5.1.3 Control Mechanism #3 – Stormwater Disposal Control

Stormwater treatment and disposal for all outfalls (including drywells and other infiltration devices) shall be in accordance with the Town of Canmore's EDCG or Alberta Environment standards, whichever is the more stringent. Refer to Section 6.0 of the EDCG for additional details.

9.5.2 Technical Requirements and Performance Regulations

A wellhead protection area is considered to be the extent of the areas covered by the three control mechanisms described in the previous section (construction activity control, land use control, and stormwater disposal control). The technical requirements for development in wellhead protection areas are described in Table Table 9-7, below.

Table 9-7: Technical Requirements for Development in Wellhead Protection Areas

Development Description	Technical Requirements
All Proposed Developments	A stormwater drainage plan shall be prepared for all proposed developments to the satisfaction of the development authority. The plan shall show how surface water can be effectively managed, including the identification, containment and appropriate disposal of contaminants found in surface water should they occur.
All New Developments Where On-Site Collection and Treatment are Proposed	Stormwater systems shall be constructed in conformance with the guidelines provided in the Town of Canmore's EDCG.
Development in Residential Areas of the Wellhead Protection Area	It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer.
Development that Uses Pilings	It shall be demonstrated, to the satisfaction of the development authority, that the pilings shall not degrade the aquifer including the development of pathways without stormwater disposal control between the ground surface and the aquifer.
Development in Commercial and Industrial Areas of the Wellhead Protection Area	• All new petroleum storage tanks and all petroleum storage tank replacements shall be placed above ground. Tanks shall have secondary containment with dikes, impervious liners or equivalent, a leak detection and/or monthly statistical inventory reconciliation analysis system and shall have an overfill or spill prevention system. • All containers of material that could contaminate the aquifer shall have secondary containment and continuous monitoring. • It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods

	of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer. • All holes created by the removal of piles, foundations, drilling or any other similar activity shall be properly sealed in a manner to minimize seepage into the underlying aquifer. • If required, monitoring programs that detect contamination of the aquifer shall be prepared and implemented to the satisfaction of Alberta Environment. • A materials handling management plan shall be prepared for hazardous and dangerous materials that are brought on site. The plan shall be in compliance with the Canadian Transportation of Dangerous Goods Act, WHMIS and Alberta Environmental Protection and Enhancement Act.
Development that Involves Compressed Gas Pipelines	• All pipeline plans shall meet the conservation and reclamation requirements of the Alberta Environmental Protection and Enhancement Act. • It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer.
Development that Involves Liquid Petroleum and Oil Pipelines	The same requirements as those listed for compressed gas pipelines shall apply.
Development that Involves Pasture, Dry Land Farming and Passive and Active Recreational Activities	• A pesticide and/or fertilizer management plan that complies with the Alberta *Environmental Protection and Enhancement Act*, Section 5 and the *Public Health Act*, *Nuisance and General Sanitation Regulation* AR 242/85 shall be prepared and implemented. • Pesticides shall only be stored in facilities that comply with Alberta's *Safety Codes Act* and environmental *Enhancement and Protection Act Regulations*. • The application of pesticides shall be done only by individuals holding a valid and applicable pesticide applicators certificate or by uncertified individuals working under the direct supervision of a provincially certified applicator. • All new petroleum storage tanks and all petroleum storage tank replacements shall be placed above ground. All tanks shall incorporate secondary containment with dikes, impervious liners or equivalent, leak detection and/or monthly statistical inventory reconciliation inventory system and each tank shall have an overfill or spill prevention system.

All Current Uses Which Involve the Handling of Biomedical Wastes	All such business or operations shall register their existing management plans with the Town of Canmore and shall ensure that the Town is notified of any plan modifications.
All Commercial Kennels and Veterinary Clinics	All such businesses shall develop animal waste management plans and register these plans with the Town of Canmore and shall ensure the Town is notified of any plan modifications.

9.6 Development Adjacent to the Railway

Development adjacent to the railway shall be in accordance with this guideline to ensure risks to life and property are within generally accepted risk tolerances.

9.6.1 Baseline Risk Assessment

A baseline risk assessment was undertaken in 2019 on all parcels adjacent to the railway corridor in Canmore (Canmore Railway Risk Assessment, 2019). Provided that the development meets the railway proximity and envelope requirements below for the specific land use classification, no further assessment is required. Where a variance from guidelines is proposed, the Applicant will be required to complete further assessment in accordance with the City of Calgary Development Next to Freight Rail Corridors Policy Implementation Guide.

9.6.2 Rail Proximity Envelope

These guidelines utilize the concept of Rail Proximity Envelope (RPE), which determines the area of potential exposure of developments along the railway corridor. The RPE has three dimensions:

- Width – measured parallel to the rail track
- Depth – measured perpendicular to the rail track
- Height – measured vertically to the rail track

The Height of the RPE is 7m for all scenarios. For new developments, the Depth of the RPE is 30m from the property line, which is necessary to take into consideration possible future expansion of train traffic along the corridor (see Figure 9-4) However, for existing buildings, the Depth is measured from the middle of the rail track since it is not feasible to relocate them outside of the RPE and further from the rail track (see Figure 9-5 below). The Width is defined below.

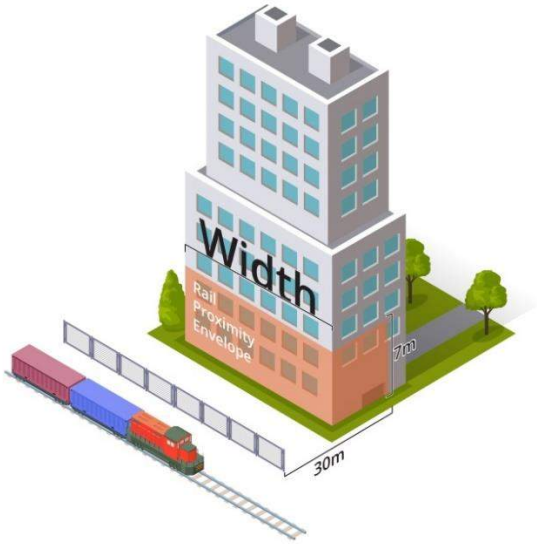


Figure 9-4: Illustration of the Rail Proximity Envelope for New Developments

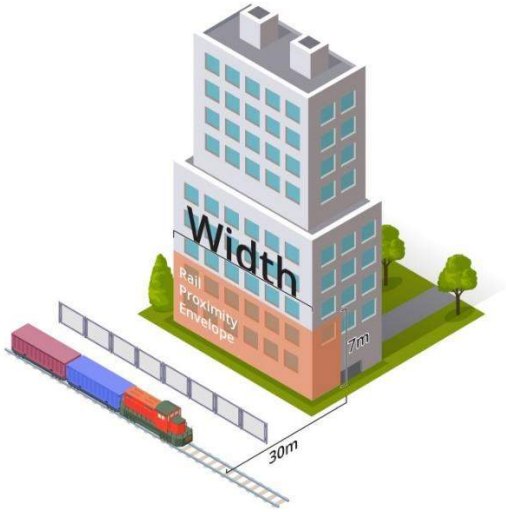


Figure 9-5: Illustration of the Rail Proximity Envelope for Existing Buildings

9.6.3 Maximum Widths

The maximum building or use width, for allowable uses, is outlined in Table 9-8 below.

Table 9-8: Maximum Building or Use Width

Allowable Uses	Maximum Building Width or Maximum Use Width* (meters)
Sensitive Use	25
High Density Use	84
Low Density Use	837
Manufacturing (and open space) Use	unlimited

*Only applies to Use(s) within the Rail Proximity Envelope

9.6.4 Use Classification

Reference Table Table 9-9 or use classification for the purpose of development adjacent to railway.

Table 9-9: Allowable Uses Classification

High Density Uses	Low Density Uses	Sensitive Uses
Visitor Accommodation*	Live/Work Studio*	Medical Clinic*
Apartment Building*	Duplex*	Care Facility*
Hostel*	Manufactured Dwelling*	Daycare*
Townhouse*	Detached Dwelling*	Education Institution*
Townhouse, Stacked*	Accessory Dwelling Unit*	Hospital*
Bed & Breakfast*	Retail	Library*
Arts and Crafts Studio	Financial Institution	Bulk Fuel Station
Eating and Drinking Establishment	Automotive and Equipment Repair	Gas Bar and Service Station
Office	Personal Service Business	Laboratory
Common Amenity Housing	Automotive Part Sales	
Automotive Sales and Rentals	Industrial Equipment Sales and Rentals	
Kennel	Contractor Services and Repair	
Museum	Car Wash	

Pet Care Facility	Laundry Facility	
Private Club	Light Manufacturing	
Veterinary Clinic	Printing Establishment	
Athletic and Recreational Facility, Indoor	Rapid Drive-Through Vehicle Service	
Convention Centre	Storage Facility and Warehouse	
Entertainment Establishment	Brewery/Distillery	
Public Building	Wholesale Store	
Retail Sales with 500 m2 or greater of GFA	Athletic and Recreational Facility, Outdoor	
	Funeral Home	
	Religious Assembly	
	Recycling Depot	

*Considered Noise Susceptible Uses

9.6.5 Sensitive Uses

For any development where a building is within the RPE and includes a Sensitive Use, further assessment is required in accordance with the City of Calgary Development Next to Freight Rail Corridors Policy Implementation Guide.

9.6.6 Noise Study

A noise study might be required for Noise Susceptible Uses listed Table 9-9 that are located within the RPE. See the City of Calgary Development next to Freight Rail Corridors Policy Implementation Guide for noise study requirements.

9.6.7 Development adjacent to the Trans-Canada Highway

A Noise Impact Assessment is required when development is proposed adjacent to the Trans-Canada Highway, as specified in Section 2.18 of the Land Use Bylaw. The study shall be prepared by a qualified professional and shall adhere to the criteria described in the latest edition of the *Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction within Cities and Urban Areas* prepared by Alberta Transportation.

Developers are required to submit a Roadside Development Permit application to the Province for any development within the development control zone as defined by Alberta Transportation and Economic Corridors.

SECTION 10 – Landscape Design Guidelines

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 10" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The "2025 Engineering Design and Construction Guidelines – Section 10 is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

10.0 Landscape Design Guidelines

The following sections of the EDCG are intended as design guidelines for Town owned land and land operated by the Town. They are not specifications to be used for construction. The developer is responsible for the development of specifications for construction specific to each project. The guidelines are not intended to stifle innovative design, the Town encourages new ideas and methods.

The preparation of landscape drawings by the developer should be done in consultation with the Town Planning and Development and Engineering Departments.

10.1 Required Reading

All plans and specifications shall conform to the following documents:

- *Guidelines for Subdivision and Development in Mountainous Terrain*, Adopted June 13, 2006 by Council, Resolution 282-2006
- Town of Canmore. *Open Space Development Guidelines*. 2005.

10.2 Landscaping Application Requirements

The developer shall engage a registered landscape architect to undertake conceptual design, detailed design and construction drawings, construction inspection and record drawings for all Town owned land or land operated by the Town, in accordance with these guidelines. Landscaping applications requirements can be found in Section 2.5.5

10.3 Landscaping Inspections

Landscaping inspections, CCC and FAC, follow the process for municipal improvements inspections describe in Section 2.4.

10.4 Site Preparation, Grading, Topsoil, Seeding and Sodding

10.4.1 General

In areas where cut and fill is necessary, earthworks shall be done in a manner compatible with the natural landform. Unnatural, continuous slopes of the same gradient shall be avoided. Contours shall modulate and blend with the existing natural slopes wherever appropriate.

The developer shall contact all required utility companies prior to commencing work to determine the location of buried utilities. In the case of pipelines, a crossing agreement is required from the utility company. Restoration of any disturbed land is the developer's responsibility.

The developer shall ensure that care is taken to protect the following against damage:

- Existing plant material
- Existing natural undisturbed soil conditions
- Lawns
- Buildings

- Sidewalks
- Curbs
- Fences
- Paved areas
- Other natural and built features

The developer shall maintain adequate barriers and construction signs to ensure public safety at all stages of work. The developer shall provide and maintain temporary roadways and walkways for vehicular and pedestrian traffic as directed by the Town of Canmore's Engineering Department.

Prior to any type of planned traffic disruption within the Town's road right-of-way (ROW), which includes roadways, back lanes, utility right-of-ways (URWs) and sidewalks, the developer shall contact the Engineering Department to arrange permitting and formal authorization.

Prior to any type of planned closures within the Town's existing municipal reserves (MR), environmental reserves (ER) or parcels including trails and public green space, a cross reserve permit is required. Contact the Parks Department to arrange for permitting and formal authorization.

10.4.2 Clean-Up

Upon completion of work, all work material, stones, roots, oilcans, equipment and excess excavated material shall be removed from the site.

Any plant material deemed invasive or noxious (that falls under the Alberta Weed Control Act) shall be removed and disposed of in an appropriate manner. Invasive or noxious plant material shall not be mixed with the removed grubbing material to be disposed of in a landfill site without discussing disposal methods with the Parks Department. The invasive or noxious plant material may be required to be handled and disposed of separately to avoid cross-contamination at the landfill site.

Any soil and debris spilled onto pavement, concrete, natural areas and waterways shall be cleaned immediately.

Refuse or foreign material of any kind shall not be buried on site. All soil contaminated by oil, gasoline and diesel fuels or any other substance harmful to the natural environment shall be immediately excavated and remove from the site all and dispose of at an appropriate landfill site.

All litter and debris resulting from construction that may be on adjacent properties and natural areas shall be removed.

In general, the site shall be left in in a neat and clean condition that is equal to or better than the site conditions before work started.

10.4.3 Grading

10.4.3.1 Sub-Grade Preparation

Sub-grade elevation shall be the final grade minus surfacing material depth as shown in the following list:

- Seeded areas: 150 mm below final design grade

- Sodded areas: 100 mm below final design grade
- Shrub beds: 450 mm below final design grade
- Playground sites: 300 mm below final design grade
- Graveled areas: 225 mm below final design grade
- Paved areas: 225 mm below final design grade
- Concrete sidewalks: 150 mm below final design grade.

Slopes along property lines or perimeters of construction areas where design contours must match existing elevations shall not exceed 3:1. Slopes in areas to be mowed shall not exceed 3:1. Changes in grade shall be made to appear natural and to blend slopes into adjacent areas.

The Engineering Department representative may check specified compactions. The developer's representative shall arrange for an independent testing company to perform tests. Compaction shall be measured in accordance with ASTM (American Society for Testing Materials) Standards. All materials, including fill, topsoil and topsoil amendments shall be approved prior to installation. Upon request by the Engineering Department, a representative sample of all materials will be subject to laboratory analysis.

10.4.3.2 Final Grade Preparation

The Engineering Department shall approve the sub-grade before placing any base or surface material, including topsoil. The grade shall ensure positive drainage of sports fields, with an optimum 2% grade in all directions for the playing surface. Wherever possible, new work shall enhance the overall drainage of the area.

Existing drainage courses shall be maintained and incorporated into the development wherever possible. Grading shall insure positive drainage away from buildings and sidewalks. Design drainage so that the retention and infiltration of water is not on public walkways and trails. Drainage patterns that direct surface runoff onto roads and ditches shall be approved by the Engineering Department. Grading may allow water to pond within eight hours of a rainfall in areas where natural infiltration exists, to allow a natural area to retain more ground moisture. The Engineering Department prior to work commencing shall approve this work.

When necessary manhole frames and covers, valve boxes, hydrants or any other appurtenance shall be adjusted to design grade.

The Engineering Department shall approve the final grade preparation prior to fertilizing, seeding, and/or sodding.

10.4.4 Topsoil and Finishing Grade Quality

10.4.4.1 Source Quality Control

The Town of Canmore requires inspection and testing of imported topsoil prior to placement on site. A testing laboratory designated by the Town of Canmore's Engineering Department shall carry out inspection and testing of topsoil. The developer shall pay all costs of testing, as specified. Topsoil will be tested for texture (clay, sand and silt content), nutrient content, soluble salt content, pH value, organic matter, weed seed content, growth inhibitors and soil sterility.

Samples submitted to the testing laboratory shall be 0.5 kg in size and shall include the following information:

- present use of topsoil, location of stockpile or source
- intended use of topsoil
- type of sub-soil
- quality of site drainage.

Samples shall be prepared and shipped in accordance with provincial regulations and testing laboratory requirements.

Submit two copies of the soil analysis and the recommendations for corrections to the Engineering Department for acceptance.

10.4.4.2 Topsoil Placement

Schedule the placement of topsoil and finish grading to permit sodding, hydro/spray seeding or seeding operations under optimum conditions. If native plant communities are to be established, replacement of topsoil with enough time to allow for proper weed control to occur before seeding and planting. This involves allowing seed in the seed-bank of the soil to germinate over several weeks, then tilling or spraying as necessary to control the weeds.

10.4.4.3 Topsoil Materials

Topsoil supplied by the developer/supplier shall be a fine, friable, medium loam, neither of heavy clay nor of a very light sandy nature and shall be capable of sustaining good agricultural growth. The target use and long-term maintenance goals should be reflected in the selection and application of all soil materials used within the Canmore area. For passive open spaces or active open spaces, follow the guidelines below, unless otherwise specified by the Engineering Department.

Passive Open Spaces: Berms, Ditches and Boulevards

Topsoil is required in all passive open spaces. In specific situations where native plant materials are being used, xeriscaping with minimal topsoil or no topsoil at all is possible. To ensure this is done properly, all xeriscaping shall require specific approval from the Engineering Department. Table 10-1 provides a summary of topsoil characteristics required for use in various passive open spaces.

Table 10-1: Topsoil in Passive Open Spaces

Type of Passive Open Space	Soil Mix Characteristics
Mowed and Un-Mowed Turf Areas	• acidity range pH of 5.5 to 7.0 • free from subsoil, roots, vegetation, weed seeds, stones larger than 40 mm in the greatest dimension, or any other extraneous materials • topsoil containing prohibited invasive or noxious weeds is not acceptable
Planting of Trees, Shrubs and Ground Covers	• mix 3 parts topsoil to 1 part peat moss and 1 part sharp sand • incorporate bone meal into planting soil at a rate of 0.6 kg/m3 of soil mixture

Type of Passive Open Space	Soil Mix Characteristics
	• peat moss: derived from partially decomposed fibrous or cellular stems and leaves of species of sphagnum mosses • elastic and homogeneous, brown in colour • free of wood and deleterious material, which could prohibit growth • shredded particle minimum size: 5 mm
Xeriscape Area Without Grass Cover (Rock gardens or shrubs planted in rocks)	• containing minimum 4% organic matter for clay loams • acidity range pH of 5.5 to 7.0 • free from subsoil, roots, vegetation or weed seeds • topsoil containing prohibited invasive or noxious weeds is not acceptable • large rocks may be acceptable depending on the construction design (contact the Engineering Department for design-specific approval)

Active Open Spaces: Sports Fields, Baseball Diamond Outfields & Parks

Topsoil is required for development of all Active Open Spaces as described in Table 10-2, below.

Table 10-2: Topsoil in Active Open Spaces

Soil and Amendments for Active Open Spaces	Soil and Additive Characteristics
Soil Mix for Mowed Active Open Space Turf Areas	• containing minimum 4% organic matter for clay loams • acidity range pH of 5.5 to 7.0 • free from subsoil, roots, vegetation, weed seeds, stones larger than 20 mm or any other extraneous materials • topsoil containing prohibited invasive or noxious weeds is not acceptable
Fertilizer	Furnish and incorporate amending materials as determined by laboratory analysis to eliminate deficiencies. Submit application schedule and rates for approval by the Engineering Department.
Sand	• clean sharp sand passing a 2 mm sieve • free of chemical or organic impurities

10.4.4.4 Subgrade Preparation

Soil contaminated with toxic materials shall be removed and disposed of at an appropriate landfill site. Surface debris, roots, vegetation branches and stones in excess of 50 mm diameter shall be removed.

The entire area to receive topsoil shall be cultivated to a depth of 100 mm. Cultivation shall be repeated in those areas where equipment used for hauling and spreading has compacted the soil.

10.4.4.5 Spreading of Topsoil

Topsoil shall be spread with adequate moisture in uniform layers over approved, dry and unfrozen sub-grade during dry weather. Table 10-3, below, provides topsoil spreading details.

Table 10-3: Spreading of Topsoil

Type of Space	Topsoil Spreading Details
Passive Open Spaces: Boulevards, Berms and Ditches	Spread topsoil evenly over the entire area to obtain a minimum depth of 150mm after settlement.
Active Open Space: Sports Fields, Baseball Diamond Outfields, Parks	Evenly spread mixed topsoil (1:2 peat moss and medium loam) over the entire area to obtain a minimum topsoil mixture depth of 150 mm after settlement.
Shrub Bed Areas	Spread planting soil mix to a depth of 450 mm for shrub planting.
Rock Gardens and Xeriscape Areas	If groundcover species are to creep throughout the rocks, topsoil shall be spread 50 mm thick over the area. Cover rocks should be placed on the soil as desired, with groundcover species planted among the rocks. Where grass and flowers are to be planted, the shrub soil mix shall be placed 300 mm deep. Where shrubs and trees are to be planted, topsoil shall be placed 450 mm deep. If no groundcover species are to spread among the rocks, no topsoil should be spread. Landscaping fabric or geotextile fabric allowing water to pass through shall be placed to prevent weed establishment but allow water to infiltrate. Where grass and flowers are to be planted, the shrub soil mix shall be placed 300 mm deep. Where shrubs and trees are to be planted, topsoil shall be placed 450 mm deep. In gravel soils and areas of fast-draining soils of 150 mm depth, a silt/clay mix over sub-grade is required to improve moisture retention. Manually spread topsoil around trees, shrubs and obstacles.

10.4.4.6 Soil Amendments

Soil amendments shall be added at a rate determined by the laboratory analysis of the soil sample. A soil amendment application schedule and rates of application shall be submitted for approval by the Engineering Department. Soil amendments shall be mixed to the full depth of topsoil prior to application of sod, seed or fertilizer.

10.4.4.7 Finish Grading

Finish grade shall be completed to the following specifications:

- Do not mix topsoil and subsoil during loading, hauling, and spreading.

- Topsoil shall be finely graded and loosened. Eliminate rough spots and low areas to ensure positive drainage. A loose, friable bed shall be prepared by means of cultivation and subsequent raking.
- Finely grade surface to ensure positive drainage away from buildings and sidewalks.
- Smooth fall cut to catch basin rims and finished flush.
- Do not cover catch basins, valve covers and inspection vaults.
- Roll topsoil to consolidate it in areas to be sodded, leaving the surface smooth, uniform and firm against deep foot printing. Achieve a fine, loose texture, which meets the approval of the Engineering Department.
- Leave the finished surface smooth, uniform and sufficiently firm to prevent sink pockets when irrigated.
- For active open spaces, accurate grade surveys may be required for both sub-grade and finish-grade.
- For sports fields, accurate grade surveys are required for both sub-grade and finish-grade.
- Remove materials not required for construction from the site.

10.4.5 Seeding

The establishment of new plant communities can easily fail due to the presence of invasive species. For this reason, proper weed control shall occur prior to any attempts to establish the new plant community. Pre-seeding chemical weed control is recommended wherever possible. The use of weed-free soil is essential to ensure the success of any project.

10.4.5.1 Description and Quality Assurance

Seeding shall be packaged in original containers. The label shall indicate net mass, analysis of seed mixture, percentage of pure seed, year of production, date tagged and location. Seed packaging label and 500 g samples shall be approved by the Engineering Department prior to seeding operation. All seed mixtures must not contain any weed, such as prohibited noxious or noxious weeds identified under Alberta's Weed Control Act.

Additionally, weed certificates need approval for each species to ensure no other problem species are present in the seed.

The Engineering Department may test grass seed to verify seed conformance to specified requirements.

10.4.5.2 Seed Mixes and Calculations

Seed mixes shall be made using pure live seed (PLS) to calculate the percentages of each species in the mix. For native species, the Tz results (live seed) may be used in place of germination within the PLS calculations for some species due to the long dormancy of many native species. Calculate PLS using the following formula:

SR (PLS)	=	This seed is required by the project (kg).
SR	=	Seed required (kg) - final kg's of seed required after PLS is accounted for in the mix.
SP1 (PLS)	=	% (PLS) of species "1" required in the mix.

SP (PLS) = % (PLS) of a species required in the mix.
SP1 = % (PLS) of species "1" required in the mix.
Gr1 = % germination of species "1" (Tz or germination may be used).
Gr = % germination of each species.

$$SR = (\Sigma SP\ (PLS)\ (1/Gr) * SR\ (PLS) \qquad SP1\ (kg) = SP1 * SR$$

$$SP1 = \frac{SP1(PLS)\ (1/Gr1))}{\Sigma SP(PLS)\ (1/Gr)}$$

See Table 10-4 and Table 10-5, below, for examples of these calculations.

Table 10-4: Seed Required

(PLS) Seed Required (kg)	Seed Required (kg)
25	34.47

Table 10-5: Calculation of PLS Required

% PLS in mix	Species	% Germination	% of actual mix	kg needed
35%	Idaho Fescue/*Festuca idahoensis*	100%	25%	8.75
15%	Blue Grama Grass / *Bouteloua gracilis*	50%	22%	7.5
10%	Western Wheatgrass / *Pascopyron (Agropyron) smithii*	85%	9%	2.94
10%	June Grass / *Koelaria macrantha*	90%	8%	2.78
20%	Alpine Bluegrass / *Poa alpina*	50%	29%	10.00
10%	Perennial Ryegrass / *Lolium perenne*	100%	7%	2.5

The following approved seed mixes shall be used when possible; the Town prior to purchase and placement shall approve substitutions:

Non-Native Seed Mixes

Only use certified Canada # I seed varieties, in accordance with the Canadian Seeds Act for lawn grass mixtures. Mixes shall have minimum purity of 97% and germination of 75% mixed by weight to the following specifications:

Mix 1) Grass seed mixture for sports fields and maintained turf areas:

- 25% Able I Kentucky Bluegrass / *Poa pratensis*
- 25% Shadow Chewing Fescue / *Festuca rubra ssp fallax*

- 15% Award Kentucky Bluegrass / *Poa pratensis*
- 15% Nu-destiny Kentucky Bluegrass / *Poa pratensis*
- 10% Creeping Red Fescue / *Festuca rubra*
- 10% Player Pier Perennial Ryegrass / *Labium perenne*

Mix 2) Grass seed mixture, non-native mix for slopes, natural areas and non-maintained areas:

- 25% Canada Blue Grass/ *Poa compressa*
- 25% Hard Fescue / *Festuca ovina var duriuscula*
- 20% Sheep's Fescue / *Festuca ovina*
- 20% Alpine Blue Grass/ *Poa alpina*
- 10% Manhattan III Perennial Ryegrass (nurse crop) / *Lolium perenne*

Native Seed Mixes

The use of any native seed shall only be conducted using seed that is free of all prohibited noxious and noxious weeds. A seed purity and weed certificate shall be included for all species in the mix for inspection. Reject any seed lot with too many weeds of concern All weed analysis and germination certificates shall be included. Both germination and Tz analysis shall be submitted if the Tz formula is to be used in the PLS calculations. Native seed mixes, mix by weight to the following specifications:

Mix 3) Mowing-tolerant native grass seed mixture for slopes, natural areas and non-maintained areas:

- 35% Idaho Fescue / Festuca idahoensis
- 15% Blue Grama Grass / Bouteloua gracilis
- 10% Western Wheatgrass / Pascopyron (Agropyron) smithii and/or Northern Wheatgrass / Elymus lanceolatus (Agropyron dasystachyum)
- 10% June Grass / Koelaria macrantha
- 20% Alpine Blue Grass / Poa alpine
- 10% Manhattan III Perennial Ryegrass (nurse crop) / Loium perenne

Mix 4) Non-mowed native grass seed mixture for slopes, natural areas and non-maintained areas:

- 25% Idaho Fescue / *Festuca idahoensis*
- 15% Festuca campestris / *Festuca campestris*
- 10% Western Wheatgrass / *Pascopyron (Agropyron) smithii* and/or Northern Wheatgrass / *Elymus lanceolatus (Agropyron dasystachyum*)
- 15% June Grass / *Koelaria macrantha*
- 15% Alpine Blue Grass / *Poa alpine*
- 10% Manhattan III Perennial Ryegrass (nurse crop) / *Lolium perenne*
- 10% Optional species use one or a number of the following species depending on site characteristics: Alkali Bluegrass / *Poa ampla*, Parry's Oat Grass / *Danthonia parryii*, Western Porcupine Grass / *Stipa curtiseta*. Mountain Brome / *Bromus carinatus*, Alpine Timothy / *Pheleum alpinum*, Tufted Hair Grass / *Deschampsia caespitosa*

Mix 5) Wildflower mix for slopes, natural areas and non-maintained areas:

- 25% Yarrow / Achillea millefolium
- 25% Blue flax / Linum perenne
- 25% Brown Eyed Susan / Gaillardia aristata
- 25% Canada Milk Vetch / Astragalus canadensis

Substitutions

The Engineering Department shall approve any substitutions made to the above seed mixes. Do not use the following species as substitutions into native seed mixes because they are either non-native or there is a high risk of them being non-native even if a registered variety:

- Rocky Mountain Fescue / *Festuca saximontana* (DNA-proven native varieties not available)
- Sheep's Fescue / *Festuca ovina* (Not native)
- Creeping Fescue / *Festuca rubra* (Not native)
- Hard Fescue / *Festuca ovina*

10.4.5.3 General

Upon request, prior to any application of seeding, the developer shall provide to the Engineering Department all identification labels, including grass seed, fertilizer and other materials used. Labels shall be clearly marked with the content breakdown, weight, analysis results, name of supplier and manufacturer. Quantities of each seed species within seed mixtures must be clearly marked on the labels.

The Engineering Department reserves, the right to reject any proposed turf seed mix or materials that does not conform to the manufacturer' specifications. The developer/contractor will remove all rejected seed/materials from the site immediately.

Due to the wide range of microclimate conditions in the valley, Developers can provide a native turf seed mix developed for a specific site. Submit the proposed native seed mixture details and breakdown (certificate of analysis) to the Town for approval by the Engineering Department prior to the purchase and application of the mixture.

In naturalized areas, the addition of native wildflowers may be applicable if the Engineering Department approves the proposed species. The proposed species may only be native wildflowers of the Canadian Rockies, specifically the Canmore/Bow Valley area. The proposed wildflower seed mixture shall not contain any weeds, such as prohibited noxious or noxious weeds, as identified under the Alberta Weed Control Act. Submit a certificate of analysis with a complete detailed breakdown of the quantity of ingredients to the Engineering Department for approval prior to purchasing.

10.4.5.4 Preparation and Installation

Surface preparation prior to seeding, seeding and watering shall be as follows:

- Loosen seeded areas to a cultivated surface 150 mm deep. On un-compacted topsoil, scarify the surface to a depth of 20 mm.
- On compacted topsoil, surface shall be aerated and top-dressed with no less than 50 mm of soil.

- The surface shall be finely graded to be free of humps, hollows, and deleterious and refuse material.
- Seed the surface using a Brillion or similar mechanical seeder, or hydro-seed, as required. Seed half the amount of the prescribed seed mixture in one direction, with the other half of the seed mixture seeded in a perpendicular direction.
- Seeding rates shall be applied at no less than the seed mix labeled recommendation per/lb. per/1000 sq. ft. for over-seeding and/or newly seeded areas.
- Do not seed Native seed at a rate lower than 25 kg/ha.
- Drill seeding is not suitable for native seed because it buries the seed too deep for the small native seeds to establish successfully. Recommend Brillion seed drills, broadcast and harrow, and hydro-seed techniques, depending on the project needs.
- In small areas or areas around existing vegetation, hand seeding may be required. In such cases, seed shall be hand raked into the topsoil.
- Native seed mixes shall be seeded before June 1 or after September 15. Other seed mixes shall be seeded during early spring before June 15, or after August 15 or as recommended by the Engineering Department. Seed when the wind is less than 8 km/hr. Work shall not be performed under adverse conditions such as frozen ground, heavy rain or snow.
- Float and roll seeded areas to firm the seedbed.
- Water the entire area with a fine spray immediately after each area been sown. Apply enough water to ensure penetration of at least 50 mm. Care shall be taken to avoid washing out seeds.
- A watering schedule shall be submitted to the Engineering Department for approval. Watering shall be done when necessary and with sufficient amount to ensure germination and to prevent grass and underlying soil from drying out. Care shall be taken to prevent overwatering as this will cause a shallow root system and prevent seed from knitting tightly.
- Immediately after seeding, barricades and warning signs shall be erected to protect the seeded areas from traffic until the grass is established.

Application of Fertilizer

Preparation for fertilizer application and fertilizer application shall be as follows:

- The final grade shall be approved by the Engineering Department prior to fertilizing, seeding or sodding.
- A fertilizer application schedule and rates shall be submitted to the Engineering Department for approval.
- Starter fertilizer (with high Phosphorus content for root initiation) shall be applied immediately after seeding.
- Fertilizer shall be spread uniformly (two directions at half rate) over the entire area of topsoil at a rate determined on the basis of the laboratory analysis of the soil sample.
- A watering schedule shall be submitted to the Engineering Department for approval. Watering shall be done when necessary and with sufficient amount to ensure germination and to prevent grass and underlying soil from drying out. Care shall be taken to prevent overwatering as this will cause a shallow root system and prevent seed from knitting.

Hydroseeding

All seeding shall be done when weather conditions, soil temperature and moisture conditions are suitable.

Upon request and prior to any application of seeding, the developer shall provide to the Engineering Department all identification labels, which include descriptions of grass seed, fertilizer, mulch and other materials used. Labels shall be clearly marked with the content breakdown, weight, analysis results, name of supplier and manufacturer. Quantities of each seed species within the mixtures shall be clearly marked on the labels.

The Engineering Department reserves the right to reject any proposed seed or materials if either does not conform to the manufacturer' specifications. The developer may also be ordered to remove all rejected seed/materials from the site immediately.

Seeding with hydro-seeding emulsion slurry shall be done at the following quantities per hectare:

- 1600 kg of wood fiber mulch
- 300 kg of the approved seed
- 450 kg of fertilizer
- 50 kg of tackifier

Water shall be used in the quantity required to form slurry in accordance with the manufacturer's recommendations.

All seeded areas shall be mulched on the same day, immediately following the seeding. An approved mulch blower shall be used. Only those areas that can be mulched in the same day shall be seeded. Mulch shall be applied at a rate sufficient to form an even, uniform net over the entire area, to a depth of not less than 20 mm and not exceeding 50 mm.

Seed and mulch mixtures shall not be sprayed onto trees, shrubs, trail surfaces, roads, parking lots, sidewalks, bridges, houses, fences, park amenities (benches, picnic tables, playground equipment, garbage receptacles, etc.) or other surfaces not meant for seeding. All traces of over-spraying shall be removed.

Seed Protection on Slopes

On slopes 2:1 or greater, a Curlex erosion-control blanket or approved equal shall be installed over the seeded area. For grades exceeding 2:1, the seeded slope shall be covered with jute, straw, coconut or other approved matting.

Matting shall be rolled down over slopes without stretching or pulling and should lay smoothly on the soil surface. The top end of each section of matting shall be buried in a narrow 150 mm deep trench, leaving a 300 mm overlap from the top roll over the bottom roll and a 100 mm overlap over adjacent section. The outside edges of the matting shall be stapled and overlapped at 1.0 m intervals.

When seeding in ditches with side slopes that exceed 2:1, matting shall be unrolled in the direction of flow and strip ends overlapped 150 mm with the upstream section on top. Methods shall be at the discretion of the Engineering Department and upon approval.

Slopes shall be top-dressed with a light layer of topsoil to ensure close contact between matting and the soil before seeding.

10.4.6 Sodding

10.4.6.1 Description and Quality Assurance

Nursery Sod

Freshly cut and healthy with a strong, fibrous root system, cultivated in nursery field as turf grass crop containing a maximum of 2% of other grass species and maximum of two broad leaf weeds and ten other weeds per 40 m^2 area. Thickness of sod soil portion shall be a maximum of 40 mm and minimum of 25 mm. Sod shall be cut in accordance with recommendations of Nursery Sod Growers Association of Alberta.

Bluegrass/Fescue Grass Sod

Sod grown from minimum 65% Kentucky Bluegrass and a 35% Creeping Red Fescue blend or sod specifically developed for the Bow-Canmore valley, if available.

Sod Quality

Sod shall be healthy and vigorous with a strong, fibrous root system, free of stones, burned or bare spots, disease, insect infestation, netting, and shall contain no more than 1% weeds and other grasses.

10.4.6.2 Product Delivery, Storage and Handling

Nursery sod shall be delivered rolled or flat to prevent tearing or breaking. Broken or irregular pieces are unacceptable. Sod shall be delivered to site within 24 hours of being lifted. Sod shall be stored pallets and shall be protected from drying out.

A certificate of weed content found in the sod may be requested by the Engineering Department. The developer shall ensure that this certificate is available when requested.

Sod and all other material shall be protected before, during and after installation. This includes providing adequate protection to materials that may deteriorate if exposed to weather.

Sod shall be laid within 24 hours of its arrival on site. Installation shall be during the growing season, not during times of freezing temperatures or over frozen soil. During wet weather, sod should be allowed time to dry sufficiently to prevent tearing during lifting and handling. During dry weather, sod shall be protected from drying by watering as necessary. Dry sod will be rejected. Care shall be taken to prevent dropping of soil in handling.

Loosen areas to be sodded to a cultivated surface 100 mm deep. Fine-grade the surface so it is free of humps, hollows, and deleterious or refuse material.

10.4.6.3 Preparation and Installation

The following steps shall be followed in preparation for and installation of sod:

- The surface shall be floated to achieve design elevations with a tolerance of 25 mm in 3 m when measured in any direction.

- Starter fertilizer (with high Phosphorous content for root initiation) shall be applied as per the manufacturer's recommended spread rate ratio prior to laying the sod.
- Sod shall be laid in rows, smooth, even and flush with adjoining surfaces and with joints staggered. Care shall be taken to butt sections closely, without overlapping or leaving gaps.
- Immediately after sod installation, the areas shall be watered in sufficient quantities to obtain moisture penetration through the sod and into the upper 100 mm of topsoil.
- To prevent damage, when sod and soil are sufficiently dry, sod shall be rolled to ensure good contact with the topsoil and to remove minor depressions and irregularities.
- All sodded areas that show open joints and/or cuts and that are not butted flush with the adjoining surfaces shall be re-sodded or top–dressed, as directed by the Engineering Department representative.
- Deficient areas shall be top-dressed by spreading and raking topsoil into the open joints between sod pieces and adjoining surfaces.
- Grass seed shall be hand-broadcast on all top-dressed areas with Mix 1 (grass seed mixture for sports fields and maintained turf areas) as per the manufacturer's recommended seed rates. Seeding rates shall be applied at no less that the seed mix label's recommendation per/lb. per/1000 sq. ft. for over-seeding or newly-seeded areas.

The contractor shall provide the Engineering Department with a sod watering schedule to ensure proper root establishment and to maintain the turf areas in a healthy, vigorous growing condition during the warranty/maintenance period.

Application of Fertilizer

Fertilizer shall be spread uniformly in two directions over the entire area of topsoil at half-rate, determined on the basis of laboratory analysis of a site soil sample.

A fertilizer application schedule and rates shall be submitted to the Engineering Department for approval.

Laying of Sod on Slopes

When laying sod on slopes with grades exceeding 2:1, the following steps shall be taken:

1. biodegradable mesh shall be placed on topsoil prior to placing sod
2. mesh shall be secured with wood pegs at 1 m on-center
3. mesh shall be lightly covered with topsoil
4. sod sections shall be laid at right angles to the slope
5. sod shall be secured with five pegs per square metre to prevent shifting
6. pegs shall be driven flush with the sod surface.

10.4.6.4 Turf Maintenance and Acceptance

All turf areas shall be maintained in a healthy, vigorous, growing condition until accepted by the Town on the date of the FAC or DCC.

Grass shall be mowed regularly to maintain a constant height between 50 mm and 65 mm. The first cutting for seeded areas shall occur when the grass is 75 mm high over 75% of the area. No more than 33% of the grass blade shall be cut at any one mowing. Excess clippings shall be removed after mowing. Mowing

direction shall be changed each time an area is mowed (i.e., end zone to end zone, sideline to sideline and corner to corner) to avoid compaction and wear.

A watering schedule shall be submitted to the Engineering Department for approval. New turf areas shall be watered when necessary and with sufficient amount to ensure germination and to prevent grass and underlying soil from drying out. Care shall be taken to prevent overwatering as this will cause a shallow root system and prevent seed from knitting

A fertilizer application schedule and rates shall be submitted to the Engineering Department for approval. Areas shall be fertilized regularly to establish healthy grass. Frequency shall be determined on the basis of the laboratory analysis of the soil sample and/or as per the manufacturer's recommendation.

Invasive plant/weed, insect and fungus control shall be completed when required. Chemicals shall be used in strict accordance with manufacturer's recommendations, jurisdictional laws and shall be applied by a licensed applicator. Care shall be taken to ensure safe application during wind and weather conditions. Pesticides and herbicides shall be applied at times when application will not cause damage to new grass or other plants. Precautions shall be taken to avoid spraying existing natural ground covering vegetation, bushes and trees.

Upon completion of a pesticide or herbicide application, signs shall be erected within the area sprayed, which identify that the area has been sprayed, the date of application, contact name and phone number of the licensed applicator, and the type of pesticide/herbicide applied. Signs shall remain in place for 48 hours and shall be removed by the applicator within 72 hours of the application time.

All areas showing deterioration, bare-spots, burns, or areas that are thin or washed out shall be top-dressed and re-seeded or re-sodded. Turf edges shall be trimmed neatly, and all clippings shall be removed from planting beds, tree saucers and pavement. Sod shall be rolled to remove depressions and irregularities when necessary. Areas where subsidence has occurred shall be repaired. Maintenance shall be monitored by the Engineering Department representative throughout the warranty period.

Work under this section shall be accepted when:

- growth of seeded or sodded areas has been properly established
- turf is free of bare and dead spots
- turf is invasive plant-free (free from prohibited noxious, noxious, invasive grasses and annual weeds).

Areas seeded in the fall shall be accepted the following spring, one month after the start of the growing season, provided conditions specified above are fulfilled.

10.5 Plant Material

Developers shall be responsible for site planning and design that respects the following key considerations when choosing plant material for developments in the Bow Valley area:

- Existing vegetation and site features shall be preserved. In natural areas where existing vegetation has been disturbed or destroyed, replanting shall be done with native tree, shrub and grass species. Rehabilitation shall be undertaken in a manner that promotes natural succession.
- Nursery stock that has been propagated from plant stock collected and grown in Chinook regions of Alberta, south of Red Deer, and grown within Hardiness Zones 1-3 shall be selected.

- Plant materials that reduce/eliminate wildlife and fire hazards shall be chosen.
- With the exception of straight-line boulevards, tree planting or formal planting areas in park areas, planting methods that are sensitive to the ecological patterns in the Bow Valley and that blend in with the existing vegetation shall be used.

Methods of establishment, maintenance and irrigation of the proposed landscape design shall be outlined in the development proposal. The quality and extent of the proposed landscape established on the site, and the areas of natural vegetation preserved shall be the minimum standard to be maintained on the site for the life of the development.

Tree planting plans for road rights-of-way shall be approved by the Engineering Department to ensure proper sight clearances from roads and intersections and clearance from utilities.

Developers shall not plant over utility lines or proposed utility line locations. The Engineering Department can be contacted to verify locations. Where overhead utility lines exist, planting guidelines available from Trans-Alta Utilities shall be used.

Proposed tree and planting bed locations shall be staked by the developer's representative and approved by the Engineering Department prior to installation.

10.5.1 Quality Control and Assurance

All plant material shall meet horticultural standards of the Canadian Nursery Landscape Association (CNLA) regarding grading, quality and nomenclature.

All transplant plant material shall be made available for inspection by a representative of the Engineering Department prior to removal at the source. Nursery-grown plants shall be true to type, structurally sound, well-balanced, healthy, vigorous, of normal growth habits, densely foliated when in leaf, and with healthy well-developed root systems. Supplied plants shall be free of disease, insect infestation, insect eggs, rodent damage, sun scald, frost cracks, girdling (deep band/impression made around the trunk of a tree in the bark and cambium layers, generally from the guying collars of tree staking supports, which disrupt the flow of nutrients), and other abrasions or scars to the bark.

Approval of nursery-grown plant material at the source of supply does not preclude the right of the Town to inspect plants upon arrival to the site or during planting, and to reject damaged plants or those not conforming to the specification. Removal of transplant material shall be done with a tree spade. The extent of root ball removed shall be sized in accordance to the age, type, size and height of the tree.

10.5.2 Allowable Plant Materials

At minimum, all plant material other than native material shall be nursery-grown and shall meet the specifications for size, height, spread, grading, quality and method of cultivation set out in the latest *Guide Specifications for Nursery Stock* prepared by the Canadian Nursery Landscape Association (CNLA) and the International Society of Arboriculture (ISA).

Any plant material not conforming to Section 10.5.7, Plant Species List, shall be designated as non-acceptable and will be rejected. Wild-crafted native plant material may only be used when approved in writing by the Engineering Department. All native plant material shall be, at minimum, second-generation propagule, unless express permission is given by the Engineering Department. Exceptions may be permitted to salvage native material from an area that is to have all vegetation removed or destroyed.

All plant material shall conform to the sizes shown on the approved/accepted plant lists in Section 10.5.6.3, Tree Size and Species Mix and Section 10.5.6.4, Shrub Size and Species Mix. Larger plant material may be used when approved by the Engineering Department. Use of larger plants shall not decrease the number of trees or plant material that the developer is required to install as per the accepted plant schedule detailed on the approved landscape plan.

10.5.3 Delivery, Handling and Storage

All plants shall be handled with care to prevent injuries to the trunk, branches and roots. Plants shall be protected during shipment with a tarpaulin or another suitable covering to prevent excessive drying from the sun and wind, or breakage from wind or equipment.

When plants cannot be installed immediately upon delivery to site, they shall be protected adequately and watered to prevent deterioration. Trees with soil balls shall only be moved when the soil ball is wrapped tightly in burlap. Plants shall not be used if burlap staves and ropes required in connection with their transplanting have been removed. Plants with cracked or broken soil balls shall not be used. Care shall be taken to protect the root zone of bare root plants with wet straw (ensure straw is seed-free), peat moss, mulch or other suitable material.

10.5.4 Tree Planting Quantities

10.5.4.1 Boulevards Less Than 6.0 m Wide

On boulevards less than 6.0 m wide, a minimum of one tree is to be planted on each side of the road for each 10 m length of road. The following guidelines shall be followed for trees planted on boulevards less than 6.0 m wide:

- Only deciduous trees shall be used.
- Trees of one species shall be used on individual boulevards to give continuity, unless approved otherwise by the Engineering Department.
- The street tree size shall be a minimum of 75 mm caliper.

Islands in cul-de-sacs or medians shall be landscaped with low or no maintenance materials approved by the Engineering Department.

10.5.4.2 Parkland and Boulevards Greater Than 6.0 m Wide

In park areas less than 0.5 ha or on boulevards greater than 6.0 m wide, one tree (coniferous or deciduous) per 100 m^2 shall be provided. In park areas larger than 0.5 ha, one tree per 150 m^2 shall be provided.

The majority of plant material shall be planted in clusters or natural groupings. Spacing of individual trees within clusters shall vary depending on the mature spread; a maximum overlap of 30% of the mature spread is desirable. Spacing of clusters shall vary from a minimum 9.0m to a maximum of 30m.

A variety of plant material, both coniferous and deciduous as appropriate to the site, shall be used. Plant groupings shall be designed to appear as natural as possible.

Coniferous trees shall be planted a minimum of 8.0 m from a collector or arterial road, due to potential damage from salt spray. Deciduous trees may be planted up to 2.0 m from the edge of any roadway.

10.5.4.3 Residential Lots

One tree shall be planted in the front yard of each residential lot or one tree per unit for higher density housing developments (where possible) in areas where no mature trees occur naturally.

Where residential lot trees cannot be planted because of utilities, narrow frontages or other restrictions, the equivalent tree quantity shall be added to other open space areas upon approval by the Engineering Department.

Only deciduous trees, minimum of 75 mm caliper size, shall be used. Deciduous trees exceeding 75 mm caliper and conifers trees taller than 3.0 m high will require an extended warranty and maintenance period of five years.

If enhanced planting is desired, developers may seek approval under the super-standard amenities policy. See the Town of Canmore's *Open Space Development Guidelines*, Section 5.4, Policy on Super–Standard Amenities, for further information.

10.5.5 Treatment of Existing Plant Material

Preservation of existing mature trees may fulfill all or a portion of the tree planting requirements, depending on the quality and quantity of the existing trees when reviewed on site by the Engineering Department. Existing plant material to be retained shall be identified on design plans by species, size and exact location. Transplanting of existing vegetation is subject to the same conditions as that of planting nursery stock.

Plans and specifications shall detail the intended methods of protecting and maintaining existing plant material during construction. Existing plant material that is damaged or destroyed during construction shall be replaced to the satisfaction of the Engineering Department.

10.5.6 Plant Species Selection

The Canmore area is characterized by a short growing season, severe temperature fluctuations and freeze/thaw. These factors limit the species of plants that will survive in the region. Proper plant maintenance and seasonal protection are critical to ensure survival, even of plants that are hardy to this region. Zone 0-3 plants shall be selected, depending on the location, from nursery stock that has been propagated from plant stock grown and collected in Chinook regions of Alberta.

Native plants are part of the natural local ecosystem and support the integrity of the natural areas within the Bow Valley. They are already adapted to the soils and climate of the Bow Valley region and require little care (xeriscape maintenance) once established. Native plant material is more tolerant to wildlife browsing and may be beneficial in attracting or deterring different wildlife species. Once established, native plants may also prevent the invasion of non-native plants to disturbed sites.

10.5.6.1 Canmore Region Native Plants Selection Principles

Landscaping in public areas in the Bow Valley region should be dominated by native plants to demonstrate a landscaping aesthetic that celebrates and promotes, rather than replaces, the native diversity of this part of Canada. Long-term landscaping goals should always consider using preferred and recommended native plant species.

Low-maintenance landscaping is considered environmentally responsible and should be promoted over landscaping that requires regular watering, mowing, trimming or chemical inputs. Domestic turf areas should be minimized as these areas require a high level of maintenance, which results in ongoing environmental impacts and pressures to use chemical herbicides to maintain a monoculture of non-native grasses.

Town of Canmore projects and reclamation associated with any landscape-disturbing activities of public areas within the Town's corporate limits are required to use only the plants on the list of native plant species provided in Appendix F.

A weed is a plant growing where it should not. For this reason, some native plants may be weeds. Additionally, some native plants may have weedy growth habits that are not appropriate for all planting purposes. Plants with the appropriate growth type shall be selected based on landscaping needs.

Establishment of native species requires careful planning. While native plants are adapted to our climate, they have not been altered through selection to make them easy to handle. Proper weed control before establishing native plants is usually required, especially when seeding.

Herbicides may be approved by the Town of Canmore during the development process, subject to all applicable guidelines and regulations, only when their primary purpose is to protect the environment by eliminating invasive, non-native plants and when other effective alternatives are not available.

It is not recommended within the Bow Valley to collect native plants in the wild. As an alternative on developable private property, native plants can be salvaged in areas of scheduled construction disturbances, with the landowner's permission. Native plants can also be sourced from the approved native plant growers list.

10.5.6.2 Controlling Non-Native Plants

Non-native plants pose a significant ecological threat to native plant and wildlife communities. Natural insect predators and diseases are absent from areas that non-native plants invade. Non-native plants displace native plant species that stabilize soils and provide forage and cover for wildlife. Lacking natural controls, non-native species can spread rapidly, degrading wildlife habitat.

Other project proponents requiring Town approvals who wish to use non-preferred plant species must prove that the preferred native plant species are unsuitable for the intended purpose.

Since native plants may not always thrive in specific urban-type environments, in exceptional cases, the limited use of non-native plants may be acceptable where suitable native plants for specific purposes or settings do not exist. Approved non-native plants are included in the tables found in Appendix F but may only be used if permission is obtained for a specific project.

Wherever possible, native plants should be derived from local stocks to reduce the risk of introducing non-native varieties. All the native species listed in Appendix F are now or soon to be available from Alberta native plant sources as seed or plants. The plants included on this list are considered non-invasive and are not normally prone to diseases.

10.5.6.3 Tree Size and Species Mix

Section 10.5.7 provides a list of trees that are native to the Province of Alberta. These species are acceptable for the microclimate areas of landscape planting in the Town of Canmore. Tree selection from this list shall be 50% coniferous and 50% deciduous unless the consultant or developer can demonstrate that the species mix should be different to successfully integrate the project with adjacent natural vegetation patterns.

Coniferous trees must be a minimum of 7 m from any structure and must be separated from other planted or natural coniferous trees by a minimum of 9m between stems.

Coniferous tree sizes at time of planting shall be as follows:

- 25% - 2.0 m height
- 50% - 2.5 m height
- 25% - 3.0 m height

Deciduous tree sizes at time of planting shall be as follows:

- 50% - 50 mm caliper
- 50% - 75 mm caliper

Deciduous trees adjacent to walkways or in boulevards shall have a minimum lower branch height of 1.8 m. Smaller deciduous trees may be used as part of a successional forestry plan.

10.5.6.4 Shrub Size and Species Mix

Section 10.5.7 provides a list of shrubs that are native to the Province of Alberta. These species are acceptable for the microclimate areas of landscape planting in the Town of Canmore. Shrub selection from this list shall be 50% coniferous and 50% deciduous unless the consultant or developer can demonstrate that the species mix should be different to successfully integrate the project with adjacent natural vegetation patterns.

Coniferous shrubs must be a minimum of 3 m from any structure and must be separated from other planted or natural coniferous shrubs by a minimum of 5 m between stems.

Coniferous shrub sizes at time of planting shall be as follows:

- 50% - 2 gallon potted
- 50% - 5 gallon potted or larger

Note that *Arctostaphylos uva-ursi* (Kinnickinnick) and some other ground cover plants are only available in 10 cm containers. In these cases, four individual containers are considered equal to one 2-gallon pot.

Deciduous shrub sizes at time of planting shall be as follows:

- 50% - 2 gallon potted
- 50% - 5 gallon potted or larger.

10.5.6.5 Xeriscape

Xeriscape is the term used for a landscaping method that employs drought-resistant plants in an effort to conserve resources, especially water. Plants identified under this category are recommended for low-maintenance, green design landscaping applications.

Native grasses are, in general, not suited for high-maintenance, regularly-mowed turf areas. Some native grasses can handle mowing and are used as lawn replacements (e.g., blue gamma grass and Idaho fescue). These species are mowed taller than a regular lawn but will handle regular mowing.

Native grasses can be difficult to manage once they have established. It is therefore important to select the appropriate species for a project's needs. Some native grasses grow in bunches and will stay where planted, while others will creep. Some species set seed regularly while others do not. Like non-native species, proper maintenance is required to manage native grass species. It is generally recommended to use long-lived bunch grasses as these are the least likely to grow out of control. Most ornamental non-native grasses are of this variety.

In appropriate moisture regimes, sedges and semi-aquatic species can be beautiful ground cover and ornamental species. These species are less likely to dry out than grasses but require more water throughout the season.

Other groundcovers that are appropriate for xeriscaping include woody species, such as Dryas, Kinnickinnick, Pussytoes and Juniper, which live in dry areas. These species anchor soil in place, but do not dry out so much as to become a fire hazard.

10.5.6.6 Bow Valley WildSmart Program, Prohibited Plant Species, and Plant Species to Avoid

The Bow Valley WildSmart program is a proactive conservation strategy that encourages efforts by communities to reduce negative human – wildlife interactions.

The goal of the WildSmart program is to develop a coordinated approach to education and outreach programs and to help support direct management activities that will aid in increasing public safety and enjoyment, as well contribute towards sustainable wildlife populations.

Bears are attracted to ripened berries, whether naturally occurring or planted, because of their sweet taste and high caloric value. These attractants can be reduced by not planting fruit bearing shrubs or trees in the first place, by picking berries as they ripen, or by removing berry bushes or trees.

The following species are not permitted as they are attractants for bears and other wildlife.

Table 10-6: Prohibited Plant List

Common Name	Scientific Name	Flammability	Palatability (Wildlife)	Comments
Apple	*Malus spp.*	Low	High	Wildlife Attractant – Bears
Crabapple	*Malus spp.*	Low	High	Wildlife Attractant – Bears
Western Chokecherry	*Prunus virginiana melancarpa*	Low	High	Wildlife Attractant – Bears
Plum	*Prunus spp.*	Low	High	Wildlife Attractant – Bears
Western Mountain Ash	*Sorbus scopulinia*	Low	High	Wildlife Attractant – Bears & Birds
Canadian Buffalo Berry aka: Soap Berry & Russet Buffalo Berry	*Shepherdia canadenis*	Low	High	Primary Food Source for Bears Wildlife Attractant: Bears
Pincherry	*Prunus pensylvanic a*	Low	High	Wildlife Attractant – Bears
Saskatoon	*Amelanchier alnifolia*	Low	High	Wildlife Attractant - Bears

WildSmart Plant Selection Recommendations

WildSmart recommends that certain berry and fruit plants not be planted in developed areas. Table 10-7, below, lists plant material (bushes, shrubs and flowers), mostly Bow Valley native, that produce berries or fruit that may attract bears and are, therefore, not recommended by WildSmart. Even though these native plants are abundant throughout the Bow Valley, they should only be used in locations outside developed areas. It is recommended that these plant species not be used in proximity to wildlife corridors or in recognized bears frequented areas.

Table 10-7: Berry and Fruit Plants to Avoid

Common Name	Scientific Name	Flammability	Palatability (Wildlife)	Comments
Red Osier Dogwood	*Cornus stolonifera*	Low	High	**Wildlife Attractant – Bears & Ungulates
Wolf Willow	*Elaeagnus commutata*	Low	Medium	**Wildlife Attractant – Bears
Silver Buffalo Berry	*Sheperdia argentea*	Low	Medium	Primary Food Source for Bears **Wildlife Attractant – Bears

Common Name	Scientific Name	Flammability	Palatability (Wildlife)	Comments
Common Wild Rose aka: Western Wild Rose	*Rosa woodsii*	Low	Medium	**Wildlife Attractant – Bears

10.5.7 Plant Species List

A comprehensive plant species list is included in Appendix F of this document.

10.5.8 Mulch

Mulch shall be composed of the following materials:

- Wood chips obtained from hardwood trees that is free of bark, small branches, and leaves, varying in size from 35 to 75 mm, and with a thickness of 5 to 20 mm.
- Bark chips from coniferous trees, varying in size from 25 to 50 mm diameter.
- Cedar chips with bark varying in size from 35 to 75 mm, and with a thickness of 5 to 35 mm.
- Peat moss that is composed of decomposed plant material; is fairly elastic and homogeneous; is free of decomposed colloidal residue, wood, sulphur and iron. It shall have a minimum of 60% organic matter by mass, and a pH value of 5.5 - 7.0.

Wood chips, bark chips, and cedar chips must be a minimum of 3 m from any structure.

10.5.9 Substitutions

Plants shall only be substituted with prior approval of the Engineering Department. Substitution shall be of the nearest similar approved species and size specified.

If sufficient quantities of nursery stock of the specified size(s) are not available, substitutions shall be with the largest specimen available. An additional 10% shall be added to the total amount of trees to be planted to offset the lack of available specified size(s). Revised sizes shall be indicated on the submitted plans of approval. The developer shall provide proof of the lack of available sizes prior to the Engineering Department approval of the change.

Substitution of plants larger than specified may be permitted if accepted by the Engineering Department. If the use of larger plants is approved, the root balls are to be increased in proportion to the size of plants in accordance with CNLA guidelines. Bare root plants in sizes greater than specified shall be balled in burlap.

10.5.10 Plant Replacements

During the warranty period, plants found dead or not in a healthy, satisfactory growing condition or which do not meet specified requirements in a timely manner shall be replaced. Replacement plant material shall be supplied and planted in accordance with drawings and specifications, and in accordance with Section 10.5.7, Plant Species List.

10.5.11 Plant Characteristics

All plants shall be true to form with growth habit typical to their species. Trees shall be straight, according to their natural habit of growth. Double leaders are not acceptable. Clump or multi-stem trees shall have three or more main stems originating from a common base at the ground line. Shrubs shall have a natural form with a minimum of four canes, typical of genus, species and variety. Groundcovers shall have healthy tops and their size shall be proportionate to root requirements typical of the species and variety. Plants that have been injected with growth hormones are not acceptable.

10.5.12 Plant Measurement

Plants shall be measured in units of caliber, height, or spread called for on the drawings.

Caliber is measured on deciduous trees only and shall mean trunk diameter measured 350 mm above the grade at which the tree originally stood at its' source.

Height shall be measured from the grade at which the plant originally stood at its' source to the top of the main body of the plant (not to the top of the long leader).

Spread is the lateral diameter of the main body of the plant at its' widest natural dimension, not from branch tip to branch tip.

10.5.13 Container-Grown Plants

Plants shall be grown in containers for a minimum of three months and shall have established root system, which will "hold" soil when removed from the container. All plants shall be hardened off, dormant and have sound buds set intact prior to planting. Container size shall be in proportion to plant size. Root-bound plants are not acceptable.

10.5.14 Balled and Burlap-Wrapped

Balled and burlap-wrapped plants shall be supplied from nursery-grown plants with minimum size root balls as follows:

Deciduous:	**Caliper (mm)**	**Ball diameter (cm)**
	50	70
	75	80
Coniferous:	**Height (mm)**	**Ball diameter (cm)**
	2000	80
	2500	90
	3000	122

Root ball size shall be adjusted according to the plant's growth habits. The ball size shall be sufficiently large to contain at least 75% of the fibrous root system, with a ball depth not less than 50% of ball diameter. Soil balls shall be secured with burlap, heavy twine and rope, or burlap, wire baskets and rope. Single burlap shall be supplied on root balls less than 50 cm diameter; double burlap shall be supplied on root balls 50 to 60 cm diameter; double burlap and drum-lace with 6 mm rope at 200 mm spacing shall be

supplied on root balls with a diameter of 60 cm and larger. Plant material shall not be used if the root ball has been cracked or broken prior to or during the planting process.

10.5.15 Excavation

The location of trees and plant beds shall be staked out, and approval from the developer's representative and/or the Engineering Department shall be obtained prior to excavation and planting.

An Alberta One-Call and private utility locates shall be completed to confirm that no shallow utilities are located within the excavation site. A copy of the completed and signed-off One-Call inspection report for each utility inspected shall be supplied for the Engineering Department development file. Any necessary adjustments to excavation location shall be approved by the developer's representative and/or the Engineering Department.

Shrub beds shall be excavated to a minimum depth of 450 mm. Topsoil or soil mix shall not be placed until the sub-grade has been approved. No foreign material shall be buried beneath any planting area.

Plant pits shall be excavated to be the same size as the tree root ball. Where soil is required to fill the plant pit, not more than 50% imported material shall be used and use of at least 50% of on-site material is required. Plant pits for trees and specimen shrubs shall be centred at the location of the stake. Pits shall be excavated in a cylindrical shape with vertical sides with a forked, saucer-shaped bottom to a depth of 50 mm. Tree holes shall be backfilled with 150 mm of suitable topsoil or soil mix and tamped firmly.

Prior to planting, all non-porous and non-biodegradable containers shall be removed from plant root balls. The minimum depth of the plant pit from the downward side of the slope shall be measured when planting on an incline. Excess excavated soil and turf stripped from plant beds and plant pits shall be removed and disposed off-site, or as directed by the developer's representative and/or the Engineering Department.

10.5.16 Plant Installation

Plants shall only be installed when the ground is frost-free. Tree holes and shrub beds shall be dug out by tree spade, excavator or hand shovel and excess soil shall be removed off-site. Imported topsoil and soil mixes shall be approved by the Engineering Department before planting in shrub beds and plant pits.

The following drawings provide information about specific plant installations:

- deciduous tree planting (machine-dug): see Figure EDCG LSC 10.1 for details
- shrub planting (coniferous/deciduous): see Figure EDCG LSC 10.2 for details
- coniferous tree planting (hand-dug): see Figure EDCG LSC 10.3 for details
- deciduous multi stem tree planting (hand-dug): see Figure EDCG LSC 10.4 for details
- deciduous/coniferous tree planting in sod: see Figure EDCG LSC 10.5 for details
- coniferous tree planting (machine dug): see Figure EDCG LSC 10.6 for details.

The width of all planting excavations shall be 300 mm greater on all sides than the width of the root ball. Sub-grade material shall be scarified to a depth of 75 mm under all tree pits and shrub beds.

Plants shall be placed plumb in the center of the planting pit and at the same depth as they were previously grown at the source, with a firm base under the root ball. The plant shall be placed in the

bottom of the plant pit on a minimum bed of 150 mm firmly- tamped topsoil or soil mix. Soil shall be formed in a concave manner in the center of the excavation for balled or burlap-wrapped plants and container-grown plants, and in a convex manner in the center of the excavation for bare root plants. The roots of bare-root plants shall be spread to their approximated natural position and broken or damaged roots pruned. The plant shall be rotated to give the best appearance or relationship to adjacent structures.

Container-grown plants shall be removed from containers prior to planting, ensuring the soil ball remains intact. Biodegradable containers may be planted only if approved by the Engineering Department.

Plant pits shall be back-filled with topsoil or soil mix and hand tamped firmly in layers, not to exceed 150 mm, to ensure no settling. Firm tamping ensures the plant retains its' orientation. No air pockets shall remain around the roots. Before placing the final layer of soil, the twine shall be cut and burlap folded back. The pit shall be filled with water, allowing the soil to settle around the roots or soil ball. After the water has been absorbed, soil shall be filled to grade, formed in a concave manner, and water shall be added again until absorbed.

An earth saucer shall be constructed around the base of each tree, as large in diameter as the excavated area. The saucer shall be dug to a minimum depth of 100 mm, which will accommodate 75 mm of mulch wood chip cover and a 25 mm lip around the complete saucer for water retention. Trees shall be thoroughly watered within 24 hours of planting. Water probing is not acceptable.

Shrub beds shall have a minimum depth of 450 mm of soil mix below final design grade. Trees shall remain at 75 mm to 100 mm below the surrounding grade after planting and watering, unless otherwise approved by the Engineering Department. The grade in planting beds shall be sloped to ensure positive drainage from building foundations before planting.

Play Structure Plant Installation

Shrub beds shall be set back from areas designed for play structures. Beds shall be 3.5 m from the outside edge of the play area or the width of a local pathway where the pathway abuts a play area. The type and spacing of plantings shall ensure clear sight-lines into the play structure area.

10.5.16.1 Tree Supports

All trees shall be braced in a vertical position immediately after planting by guying or staking as described in the following drawings:

- deciduous tree (machine-dug) - support: specifications, details, and procedures; refer to Figure EDCG LSC 10.1
- coniferous tree (hand-dug) - support: specifications, details, and procedures; refer to Figure EDCG LSC 10.3
- multi-stem tree planting - support: specifications, details, procedures; refer to Figure EDCG LSC 10.4
- tree planting in sod (coniferous/deciduous) - support: specifications, details and procedures; refer to Figure EDCG LSC 10.5
- coniferous tree (machine-dug) - support: specifications, details and procedures; refer to Figure EDCG LSC 10.6

Stakes and posts shall be spaced equally around the tree, just outside root ball. Posts shall be driven 450 to 500 mm into the ground.

Guy-wires shall be encased in a hose (guying collar) to prevent contact with the trunk, with a 65-degree maximum angle between the guy-wire and the ground. All guy-wires shall be installed at the same angle. Warning flags shall be fastened to all the guy wires halfway up, or as necessary to insure sufficient visibility.

After tree supports have been installed, broken branches shall be removed with clean, sharp tools in accordance with good horticultural practice.

Support accessories shall be maintained in proper condition. Turnbuckles shall be adjusted to keep tree guys taut and ties and stakes shall be replaced when missing or damaged and as directed by the Engineering Department. Plants that lean or sag shall be adjusted. Guy wires shall be adjusted throughout the warranty/maintenance period to prevent girdling.

The guying and metal-bar posts and or the T-bar stakes shall remain for two growing seasons. The developer is responsible for ensuring that all the tree staking has been removed after two growing seasons and that all damages incurred due to the staking have been repaired prior to the FAC.

10.5.16.2 Tree Support Accessories

Tree support accessories are defined in Table 10-8, below.

Table 10-8: Tree Support Accessory Definitions

Tree Support Accessory	Definition
Guying Collars	• Collars for use with 2,450 mm T-rail post shall be fabricated from 3 to 4 mm galvanized wire and encased in two-ply, reinforced 12 mm diameter rubber garden hose or equivalent. • Collars for use with 600 mm T-rail stakes shall be fabricated from 3 to 4 mm galvanized wire and encased in two-ply, reinforced 6.35 mm diameter rubber garden hose or equivalent.
T-Rail Steel Posts	Posts shall be 2,450 mm long and primed with one brush coat of black zinc-rich paint to CGSB 1-GP-18lb.
Steel Stakes	These shall be T-rail stakes, 600 mm long and primed with one coat of black zinc-rich paint to CGSB-GP-18lb.
Ground Anchors	Anchors shall be a 100 mm diameter steel disc, underground screw-in type, or Duckbill Model 68 DTS tree support kits.
Warning Flagging	Flagging shall be 25 mm wide florescent orange, plastic survey tape, and or orange florescent Galvanized warning tags placed at the1/3 height of tree. Place warning flagging/tags on each guying wire.
Tree Wrapping	Wrapping shall be new, clean, plain burlap strips of minimum 2.5 kg/m^2 mass and 150 mm wide or an approved equivalent.
Guy Wire	Wire shall be 3 to 4 mm malleable galvanized steel.

Tree Support Accessory	Definition
Polyethylene Rope	Rope shall be 12 mm in diameter.
Turnbuckles	Turnbuckles shall be factory galvanized, have 150 mm eyes and a 10 mm diameter threaded opening for tightening.

10.5.16.3 Mechanical Tree Transplanting

All transplant plant material shall be made available for inspection by the Engineering Department prior to removal at the source. Plants shall be excavated with a mechanical tree spade of sufficient size to excavate the required soil ball size (see Figures EDCG LSC 10.1 Deciduous Planting Machine Dug and EDCG LSC 10.6 Coniferous Planting Machine Dug) for details).

Soil balls shall be secured with burlap, heavy twine and rope or with burlap, wire baskets and rope. Tree pits shall be excavated to a size not less than 300 mm greater on all sides than the width of the root ball (see Figures EDCG LSC 10.1 and 10.6 for details). The bottom and sides (75 mm) of the tree pit shall be scarified to ensure root penetration after planting. Warning markers and barricades shall be provided around excavated pits. Excavated plugs shall be placed in former tree locations when possible. Excess plugs shall be removed from the site.

Trees shall be planted immediately upon delivery on site, plumb in the center of the plant pit and at the same depth as previously grown. Trees shall be faced to give the best appearance. After planting, the pit shall be saturated with water to allow the soil ball to settle in the pit. The pit shall be filled to grade with fertile topsoil or soil mix as specified. A 100 mm high lip shall be constructed around the outer edge of the pit.

Guy wires shall be installed immediately after planting, with three double guy lines spaced equally around the plant (see Figures EDCG LSC 10.1 and 10.6 for details). Guy wires shall be attached at 60% of tree height and at a 65-degree angle. Guy wire around the trunk shall be encased in a guy collar to protect the bark. Guy wires shall be flush at finished grade and turnbuckles shall be provided to keep guy wires taut and trees plumb. Warning flagging shall be attached to guy wires as a safety precaution.

10.5.17 Shrub Planting Beds

Figures EDCG LSC 10.7 Shrub Planting Ground Bed, EDCG LSC 10.8 Mulch Bed Bordered by Rock Scaping, EDCG LSC 10.9 Mulch Bed Within a Concrete Sidewalk – Bed Next to Roadway, EDCG LSC 10.10 Plaza Raised Rock Feature Bed, and EDCG LSC 10.11 Sidewalk Raised Rock Feature Bed shall be followed when installing shrub planting beds.

10.5.18 Tree and Shrub Pruning

10.5.18.1 General Tree/Shrub Pruning and Removal

Trees and shrubs on Town owned land and land under the control of the Town shall only be pruned or entirely removed with permission from the Town of Canmore. The Town will determine the serviceable

life of any tree or shrub and will generally remove trees deemed hazardous from public lands due to liability concerns.

When pruning public-owned trees and shrubs, good pruning practices, standards and guidelines shall be followed.

The best time of the year to prune trees and shrubs depends on the plant species, its' condition, and the purpose of pruning. In most cases, corrective pruning of dead or weakened branches can be done at any time of the year, as it will have little effect on the tree's growth. Removal of one or two small branches can be done at any time of the year for the same reason. However, heading, limbing or thinning should be done in the late fall or early winter when leaves have dropped.

Corrective pruning is often done to improve the health and appearance of trees and shrubs damaged by wind, snow, insects and diseases. Branches that are not growing in an upright manner are susceptible to snow or wind damage. Corrective pruning can reduce damage caused by these stresses. Trees and shrubs damaged by wind or snow can be pruned to grow into a more symmetrical shape, thus alleviating future problems.

Pruning for line-of-sight or safety shall be done at any time, at the discretion of the Town.

The following pruning method shall be used when pruning trees or shrubs:

Make three cuts when pruning, especially on large branches:

- The first cut is made a short distance from where the final cut is to be made on the underside of the branch.
- The second cut removes the branch.
- The third cut removes the branch stub just above the branch collar.

All dead branches shall be removed. If there is a double leader, one leader shall be shortened approximately 1.27 cm (0.5 in.) back to a live branch that points away from the tree, at approximately 1/3 the diameter of the leader cut. Broken portions of branches shall be cut back to a live lateral.

The removal of lateral branches, or thinning, shall be done to reduce crown density.

Mature trees that receive extensive pruning of large branches from one side shall have structural pruning to maintain a proper aesthetic tree balance.

In the past, pruning paint and other wound dressings were used to prevent decay at pruning wounds; however, their use is no longer recommended. Pruning paint and other dressings do not quicken the growth of callous tissue (tissue produced by trees and shrubs to cover and seal off wounds), nor do they prevent decay organisms and insects from entering the wounds.

Root pruning is the cutting of roots, and it is used when trees/shrubs are transplanted, or when root density needs to be increased for future transplanting.

10.5.18.2 Branch Pruning

Branch pruning is done for a number of reasons. Most importantly, it is critical to the long-term health and vigour of a tree. Periodic pruning can cut away dead or diseased wood that limits growth. It can also contribute to enhancing views and limiting potentially hazardous conditions.

Branch pruning shall be undertaken during the dormant or less active periods of the year, during winter or summer, depending on the tree species (type). If possible, pruning shall be avoided during spring due to the presence of new growth and fall due to the potential to introduce disease.

Branches shall be cut cleanly with a proper saw or shears, depending on the size of the branch. The cut shall be located adjacent to a node (swelling) in the branch. Along the tree trunk, branches shall be cut just above the branch bark collar at the base of the branch, not flush to the tree trunk, to avoid unnecessary tissue damage.

All coniferous trees greater than 6 m in height are to be pruned to a minimum of 2 m above ground level at the lowest point of the branch.

Pruning shall provide for attractive tree form and not create unnecessary stress on the trunk. Branches shall be adequately spaced along and around the tree trunk. With large trees, one tree trunk shall normally be used as the major support for the tree to avoid potentially hazardous situations. Tree paints on cut branches are no longer considered necessary but the application of tree pruning hormones, in certain instances, can prevent excess growth of new stems.

10.5.18.3 Power Line and Aerial Infrastructure Tree Pruning

Trans Alta, Fortis or Alta Link shall be contacted if pruning is required near power lines.

Tree pruning around power lines and aerial infrastructure is to ensure good clearances and to maintain the health and aesthetic qualities of trees within the Town of Canmore.

Historically, tree pruning within power line clearances within the Town of Canmore has included pollarding and indiscriminate cutting and pruning of trees beside, under and over power lines.

Pollarding (cutting at any point into a tree's trunk or branches) is used to keep woody plants small and to a manageable size. This process is often used on shrubs and hedges to maintain form and shape within a landscape. Trees do not react well to pollarding. Pollarding can create large amounts of dieback and deadwood. This can become hazardous in the future both to the public and tree workers.

10.6 Irrigation Systems

10.6.1 General

Automated irrigation systems may be required where turf areas are to be used for recreational purposes, sports fields and aesthetic features.

This section of the EDCG specifies the supply and installation of irrigation systems. Installers shall have experience at this type and scale of work and be willing to provide proof of experience.

The developer is responsible for verifying all conditions on the site and shall immediately report all discrepancies and variations from the drawings to the Engineering Department.

10.6.2 Record Drawings

Record drawings showing the irrigation system shall be submitted electronically as stated in Section 2.5.5. Drawings shall be drafted in a professional manner and shall be drawn to scale on a legal base plan. Drawings shall show the location of the irrigation system relative to the property line, the power source/tie-in (AC) for the main controller, the main controller location, the electrical providers' consumption meter location. Drawings shall include the locations of all lines, sprinkler heads, valves (drain and zone control), boxes, the water meter location and type of housing, spool to replace the water meter when it is removed during the winter months, double-check valve, park water service (stop and drain type), curb stops, underground pipe fittings not adjacent to surface fixtures (tee, elbows, etc.), saddles for poly-pigtails and other irrigation materials.

Acceptable record drawings shall include but not be limited to the following details:

- A1 sheet size shall be used, showing the Town of Canmore title block.
- The drawing(s) shall be labeled "Irrigation System Record Drawing".
- The drawing(s) shall include a key plan showing the site location.
- Labeling shall be a minimum of 12 pt. font.
- Drawing(s) shall include a plan of the site showing property lines, bearings, surrounding site uses, north location, on-site structures, utilities, fences, buildings, walkways, etc., all to a suitable metric scale.
- The municipal address and legal description of the property, including a registered plan number shall be included on the drawing(s).
- The largest scale shall be 1:250.
- Detail sheets shall not be included in the record drawings. Instead, refer to the year of the specification and the detail sheet name and number (i.e., 1996, Drain Pit for PVC Pipe, Detail sheet #66).
- The type of irrigation system (gravity drain, a blow out or a main line gravity drain with a lateral line that has to be blown out) shall be indicated on the drawings.
- All irrigation zones shall be numbered.
- The drawings shall include the name, address and 24-hour phone number of the irrigation system installer, as well as the developer and consultant, where applicable.
- The drawing shall include the serial number, installation date and confirmation of up-to-date inspection by the Town of the double check valve.

Where deviation from the design drawing is anticipated, all required shop drawings shall be submitted to the Engineering Department for approval. Where deviation from the design drawing conflicts with standard specifications, conflicts shall be identified and an explanation provided (e.g., "This design overrides specification item 7.4 of the 'Layout' for the following reasons:…").

All work shall conform to the approved shop drawings and/or design drawing.

Upon completion of the work, the contractor shall provide the Engineering Department with a complete set of record drawings, showing the sprinkler system as installed. This is the responsibility of the contractor and shall not be construed to be the responsibility of any other party.

10.6.3 Product Delivery, Handling and Storage

All materials shall be stored off the ground and under protection until they are used. Materials shall be supported as required to prevent excessive strain on the piping.

All material that is damaged or rejected shall be removed from the site. No material that has been damaged shall be installed. The Engineering Department reserves the right to reject any material that does not meet the specifications.

10.6.4 Job Conditions

Irrigation installation shall be done in suitable weather conditions. Any conditions or defects encountered on the site upon which work of this section may depend and which may adversely affect the performance of the work shall be reported to the Engineering Department prior to commencing work. Work shall not be started until such conditions or defects have been investigated and corrected.

The irrigation system shall be protected from contamination during construction by blocking all open pipe ends.

10.6.5 Inspection and Testing

The contractor shall have an approved set of drawings and specifications available prior to requesting the Engineering Department for an inspection.

Installations require an inspection from the Engineering Department and/or the Parks Department prior to backfilling.

10.6.6 Open Trench Inspections and Testing

The Engineering Department and/or the Parks Department shall be given a minimum of two full business day notice when an open trench inspection is required.

The following items shall be in place and complete for the open trench inspection:

- proper trench depth and alignment
- bedding material
- pipe alignment joints and expansion couplers and valves
- drains with gravel sumps
- swing joints and head locations
- thrust blocking and conduit under paving
- pressure test with heads (static water pressure)
- pressure test backflow prevention device, in accordance with the Parks Department's specifications. A copy of the Testing and Inspection Report for the double check valve assemblies

shall be submitted to the Parks Department. The municipal address of the site shall be indicated on the Testing and Inspection Report.

- electrical wiring
- meter spacer (spool) and meter supplied by the Town of Canmore through EPCOR Water Services.

The above items shall be inspected in the event that the system is plowed-in.

The contractor shall receive an inspection sheet from the Engineering Department and/or the Parks Department verifying acceptance and approval of the irrigation system as viewed during the open trench inspection, prior to backfilling.

10.6.7 Irrigation System Check

The Engineering Department shall be given a minimum two full business days' notice when a pressure test is required. A pressure test shall not be done unless written proof of the open trench inspection is available, i.e., copy of the Engineering Department inspection sheet.

The following items shall be in place and complete for the pressure test:

- backfilling
- drain valves boxes in place and clear of debris
- water pressure on and flowing freely through the system
- irrigation head adjustment and all heads activated and throwing water to provide adequate coverage, as per the manufacturer's recommendations and the submitted irrigation plan.

At the Engineering Department's discretion, a pressure gauge shall be placed at any point on the system and a reading shall be taken to confirm expected pressure loss in the system. Pressure gauges shall be a minimum 50 mm sized face, 0 – 1000 kPa, Peacock or equal, complete with petcock.

The contractor shall receive written acceptance and approval of the irrigation system from the Engineering Department before proceeding with landscape development.

No claims for payment shall be accepted until written acceptance of the pressure test is issued by the Engineering Department.

10.6.8 Materials and Workmanship

Any materials specified by name and/or model number in the specifications, irrigation drawings or detail drawings shall be used to identifying the materials and to ensure the specific use of that material in the construction of the system. No substitutions shall be permitted without prior written approval from the Engineering Department.

All materials used in the system shall be new and without flaws or defects of any type and shall be the best of their class and kind. All materials shall have a minimum two-year guarantee against material defects or defective workmanship. All irrigation items shall meet current specifications and shall go through a maintenance period of duration and under conditions determined by the type of product, but not less than two years.

If a substitution of materials is desired by the contractor, sufficient descriptive literature and material samples shall be provided to establish the material as an equal substitute at least three weeks before the commencement of the work. In addition, the contractor shall state the reasons for desiring substitute materials. Any substitutions shall meet or exceed specifications and performance standards of the proposed system, without any additional cost to the Town of Canmore.

All materials and equipment shall be installed in a neat and professional manner, following manufacturer's recommendations.

The Engineering Department and/or the Parks Department retain the right to order removal or replacement of any items, which do not present a reasonably neat and professional appearance.

10.6.9 Maintenance of Existing System

The contractor shall maintain the existing irrigation system, or such portions as may be planned for retention, in satisfactory working order during the time of the contract work. If cut-ins or tap-ins to an existing system are required, shutdown time of the existing system shall be minimized as much as is practical.

If the irrigation system being installed is replacing an existing system, the existing system shall be maintained in a satisfactory working order until the new system is available for use in any given area. The reason for this provision is to prevent possible damage to or loss of existing turf due to the loss of an existing irrigation facility. If such capabilities are lost, the contractor shall be held responsible for maintaining the existing turf or for the cost of replacing the turf. If damage to the existing system does not impair the capabilities of irrigating the turf, such damage may be left not repaired on written approval from the Engineering Department and/or the Parks Department.

10.6.10 Equipment, Tools and Labour

Any piece of equipment deemed by the developer's/contractor's representative to be of insufficient or extraordinary size to complete the project shall be replaced by the representative with a piece of equipment that meets the requirements of the task.

10.6.11 Piping and Fittings

10.6.11.1 Park Water Service

One 50 mm irrigation service is required for sub-neighbourhood tot-lots and community regional park sites, subject to the Town's water services agent's approval. A 100 mm service may be required for larger school/community regional park sites.

A back-flow prevention device (i.e., double-check valve) shall be installed on each irrigation service line to Town's water services agent's specifications.

Water meters are provided by the Town of Canmore through Town's water services agent and are to be sized and installed by Town's water services agent. The developer/contractor shall make all water meter supply and installation arrangements with Town's water services agent.

10.6.11.2 Irrigation Systems

A fully-automatic underground irrigation system shall be the minimum requirement for sub-neighbourhood tot-lot park sites and landscaping beds. Irrigation controllers shall conform to the Parks Department's existing systems (e.g., Eklof Park, Town Entrance Features).

A fully centralized (from a main AC controller) automatic underground irrigation system shall be required for community regional park sites and sport facilities. (e.g., Riverside Park or Lions Park). Centralized irrigation systems shall be approved by the Engineering Department and the Parks Department.

10.6.11.3 System Maintenance

The developer shall be required to warranty and maintain the irrigation system for a two-year period, including fall shutdown and spring start-up procedures. Start-up of the irrigation system shall require arrangements to be made with EPCOR to install the water meter and start the water consumption tracking process. At the same time, arrangements shall be made to have the backflow prevention device inspected, tested and sealed by a certified backflow device inspector. This shall be completed prior to activating the system. All records of the backflow prevention device inspection process shall be submitted at FAC for the Town's files.

Winterization of the irrigation system shall require shutting down and blowing out the system. This shall include the removal of the water meter and proper draining of the backflow prevention device to avoid potential freeze-up damages. Arrangements shall be made with EPCOR to remove and store the water meter, install the spool, and record water consumption amounts for the season. The developer is responsible for water consumption during the development process and the warranty/maintenance period and will be billed by EPCOR for water consumption.

Following inspection by the Engineering or Parks Department representative, the developer shall be responsible for any required repairs at the end of the two-year warranty/maintenance period to make the irrigation system fully operational. If the system has been approved and accepted and all other deficiencies have been resolved, the FAC will be approved.

For Town irrigation projects, the contractor shall be required to warranty and maintain the irrigation system for a one-year period, including fall shut-down and spring start-up procedures.

10.6.12 Water Delivery Components

10.6.12.1 Piping and Fittings

All piping downstream of parks water service shall be certified series PVC (SDR26 160 psi) with schedule 40 fittings and schedule 80 nipples, or 75 psi CSA polyethylene pipe for lower capacity systems.

10.6.12.2 Swing Joints and Risers

Swing joints shall be three elbows, using PVC elbows and nipples and brass saddles.

All risers for shrub beds shall be galvanized or schedule 80 PVC and bushed down after the final elbow. A double-clamped tee bar stake shall be used.

10.6.12.3 Sprinkler/Spray Heads

The type of sprinkler/spray heads to be used for irrigation in active open spaces (community regional parks) shall be as follows:

- Sports Fields: Rain Bird Eagle, Hunter I-40 or Rain Bird Falcon
- Baseball Diamonds: Rain Bird Eagle, Hunter I-40 or Rain Bird Falcon
- Parks: Hunter I-40, I-25 or Rain Bird Falcon
- Playgrounds: Hunter I-40, I-25 or Rain Bird Falcon
- Passive Open Space (Sub-Neighbourhood Tot-Lot Parks & Landscaping Beds): Hunter I-40, I-25 or Rain Bird Falcon (depending on the area).

Sprinklers shall meet the following general requirements:

- The sprinkler shall be described on the drawings and shall conform to the manufacturer's performance standards for durability and operation.
- The sprinkler shall have a heavy-duty stainless riser.
- The sprinkler shall have ratcheting riser features on all bodies for easy adjustment.
- The sprinkler shall have two-year, over-the-counter warranty.
- The sprinkler shall have a minimum 4 in. pop up, 6 in pop up preferred. If used on a sports field or ball diamond, the sprinkler shall have a rubber cover to ensure user safety.
- The sprinkler shall be equipped with a drain check valve to prevent low head drainage and shall be capable of checking up to 8 ft. in elevation changes.
- To assist in water conservation, adjustable heads may be used in place of full circle heads for perimeter applications.

10.6.12.4 Controllers

Sub-neighbourhood tot-lot parks and landscaping beds shall have underground automated irrigation systems that include controllers that are compatible with the Town's centralized irrigation system. To be compatible, a Rain Bird Unik or approved equivalent controller shall be installed.

Community regional parks, park/school sites and sports facilities shall have one centralized above ground AC controller with multiple irrigation stations and schedule options.

Wiring to and from the controller and valves shall conform to the Canadian Electric Code and any other regulatory conditions which govern this type of installation. All wiring shall follow irrigation lines where appropriate. Where wiring leaves pipe alignment, it shall be placed in a conduit. Below-ground, PVC conduit is acceptable; above-ground, galvanized conduit shall be used. Splices shall be made waterproof with the use of an acceptable outdoor waterproof wire connector.

10.6.12.5 Electric Valves

Electrical valves shall meet the following specifications:

- Valves shall be Rain Bird P.E.B. with a latching solenoid or approved equal.

- Valves shall be without screens and filters that require replacement.
- Valves shall have a flow control stem.
- Valves shall have a manual open/close valve.
- Valves shall close slowly without a hammer or chatter.
- Valves shall work under extremely low flow and low pressure.

10.6.12.6 Irrigation Boxes

Irrigation boxes shall be constructed of heavy-duty weight polyethylene and be capable of being extended, withstanding the weight of a heavy tractor, and being locked. The gravel beds in boxes shall consist of clean, washed 19 mm gravel with an area marginally larger than the box opening. Irrigation boxes shall be recessed into the ground so the top cover sits flush with the existing turf's finished grade. Care shall be taken to ensure that there are no protrusions above the finish grade and or any tripping hazards.

10.6.12.7 Backfill Material

Backfill material for pipe trenches within 150 mm of the pipe shall be clean, approved sand fill or gravel less than 10 mm in diameter. Backfill material shall be free of organic material, stones and sharp objects capable of damaging pipe.

10.6.12.8 Substitutions

For substitutions, descriptive literature and material samples shall be provided at least three weeks before commencement of work. Any substitutions shall meet or exceed specifications and performance standards of the proposed system without any additional cost to the Town.

10.7 Amenities

10.7.1 Public Space Furniture

Public open space site furnishings shall be indicated on final landscape construction plans and be provided by the developer, in accordance with the direction and approval of the Engineering Department and the *Open Space Development Guidelines*.

Site furnishings shall complement and enhance the natural mountain valley setting and/or the Town of Canmore's mining history. Details consistent with local materials, colour and style shall be used.

Site furnishings shall be vandal–proof where possible.

Plans and details of site furniture, such as benches, picnic tables, bike racks, etc., shall be approved by the Engineering Department.

Table 10-9, below, provides a list of approved site furnishings and details.

Table 10-9: Public Space Furniture

Site Furnishing	Approved Models and Furnishing Details
Park Benches Figure EDCG LSC 10.12	Series "B" Park Bench by Custom Park & Leisure or approved equivalent Details: • free-standing • #1 grade clear cedar • Steel Finish • in-ground or bolted down (depending on application) • used for Memorial Bench Applications (routered for bronze plaque installation)
Public Benches	Wishbone Ltd.: Mountain Classic Straight – Model# MCSB-5 or approved equivalent Details: • free-standing • ## ft. long with arm rests • bolted down only, with concrete spreader inserts and tamper-proof hardware • recycled plastic slats, seat colour in "Sand" • powder-coated aluminum frame, colour in "Textured Black" • stainless steel hardware
Picnic Tables Figure EDCG LSC 10.13	Custom Park & Leisure Ltd: Model# Series B – PBS2 or approved equivalent Details: • free-standing • knotty cedar style, finished in sikkens stain • frame colour: brown, TGIC polyester outdoor finish • wheelchair accessible • surface-mounted onto in-ground concrete foundations • 4 in. x 4 in. treated wood border and trail mix infill pad
Bike Racks	Custom Park & Leisure Ltd: Model# Series B or approved equivalent Details: • in-ground or bolted down (depending on application) • individual loop fits any area • black powdered-coated metal frame, TGIC polyester outdoor finish • For multiple applications, install additional individual units in succession to meet the targeted number of bikes.
Trail Head Large Information Kiosk	H.R. Construction (a division of Rief Industries); 4477 Dick, Rd., Quesnel, British Columbia, V2J 6W9 Details: • same style and design as the Alberta Government's kiosk • constructed out of wood with recycled rubber roof shakes • in-ground installation
Parks Amenity Small Information Kiosks	Information Kiosks solely sourced from Inline Landscaping Ltd.; #3, 107 Boulder Crescent, Canmore, Alberta, T1W 1K9 Details: • constructed of wood

Site Furnishing	Approved Models and Furnishing Details
	• in-ground installation
Bollards with Lights	Gardco (Philips): LED School Bollard Lights or approved equivalent Model # BRM836, 42 in. high with beveled top Details: • LED control - DR • LED natural Light - LNW • light coverage optional at 360o to 180o • voltage 120-240 • finished in black TGIC polyester outdoor finish - BLP • complete with high strength galvanized steel tenon
Large Decorative Bollard	Reliance Foundry Co. Ltd.: Decorative Steel Bollard Model# R-7736 Details: • polyester powder-coated finish; use an epoxy prime coat and a polyester topcoat • can be utilized for decorative or security applications • decorative - height: 36 in. / 91.4 cm • decorative - base diameter: 11-¾ in. / 29.8 cm • decorative – finished in textured semi-gloss black • security - height: 31 in. / 78.7cm • security - base diameter 10-¾ in / 27.3 cm • security - optional steel or galvanized steel pipe • security - Anti-Ram protection fill pipe with concrete • security - finished in Safety Yellow • installation mounting options depend on application (decorative or security); hardware sold separately
Removable Bollard	TrafficGuard Direct: round post, removable top lock or approved equivalent Model #: TL-1004R Details: • heavy-duty construction • 36 in./914 mm tall, 4.5 in./114 mm od • flush-mounted when post is removed • galvanized ground sleeve and filler piece • all surfaces are primed with rust & corrosion resistant, zinc-rich primer w/5,000-hour salt spray performance • standard finish, TGIC polyester outdoor finish RAL1028 in Safety Yellow or custom black, depending on application • optional reflector tape, as required
Permanent Small Bollard	Custom Park & Leisure Ltd.: Permanent Bollard Series or approved equivalent Details: • optional surface mount or in–ground, depending on application • available in three sizes, depending on application • must withstand vehicle impact

Site Furnishing	Approved Models and Furnishing Details
	• standard powder-coated finishes, Safety Yellow for security applications and Matte Black for architectural applications • optional reflector tape, as required

10.7.1.1 Signage

Signage for residential developments or parks shall be complementary to the mountain valley context of Canmore and in scale with the pedestrian environment. Signage shall blend into the landscape and site development, rather than dominating it with larger signs and taller poles.

Only the specified park-related signage and/or park regulatory type signage shall be placed on or at any public green space with Town approval. All other types of signage are regulated by the Town of Canmore's *Land Use Bylaw*. Prior to ordering any type of special signage intended for private or public lands, plans shall be reviewed and approved by the Planning Department.

All signage shall be vandal and graffiti–proof and shall have a protective, cleanable, anti-graffiti, clear surface coating that is durable and long-lasting.

Park-related regulatory signage placed within the road-right-of-way (ROW) shall be approved by the Engineering Department and the Streets & Roads Department and shall follow ROW signage specifications and requirements.

Park-related signage drawings are as follows:

Landscaping - Park Signage:

- Figure EDCG LSC 10.14 Playground Sign Age 2 – 5 Years
- Figure EDCG LSC 10.15 Playground Sign Age 5 – 12 Years
- Figure EDCG LSC 10.16 Type “A” Trail Signage (Trail-Backwoods Informal)
- Figure EDCG LSC 10.17 Type “B” Trail Signage (Trail-Multi Use)
- Figure EDCG LSC 10.18 This Park is Closed to the Public (23:00 to 06:00) (NEW)

Landscaping – Regulatory Signage:

- Figure EDCG LSC 10.19 No Pets (NEW) (replaces “No Dog” sign)
- Figure EDCG LSC 10.20 No Pets Within 20 Meters of Play Apparatus (NEW)
- Figure EDCG LSC 10.21 Pet on Leash (NEW) (replaces “Dog on Leash” sign)
- Figure EDCG LSC 10.22 No Bicycles (NEW)
- Figure EDCG LSC 10.23 Day Use Only Parking Lot Signage
- Figure EDCG LSC 10.24 No Camping/No Bicycling/No Campfires

Custom Signage

Signage for special applications or one-off type applications shall be reviewed and approved by the Town. Some custom signage examples are as follows:

Interpretive Signage Examples:

- Water Shed Loop
- Quarry Lake Community/History/Heritage
- Larch Islands Interpretive Loop Trail
- Amenity protocol signage (small amenity kiosks)
- Kiosk Map Panel (large trail head kiosks)
- Quarry Lake; Pets on leash zone/No pets zone/Pets off leash zone
- Quarry Lake; No Lifeguard on Duty/Deep Water Notification
- Quarry Lake; Keep Off Ice

Park Entry Signage Example:

- "Welcome to Centennial Park"

10.7.1.2 Lighting

Park lighting may be required at select public open spaces or parklands abutting a storm water pond, to provide suitable illumination for night safety.

Lighting standards and fixtures shall be of a pedestrian scale and match street lighting in colour, style and quality.

An excessive amount of illumination detracts from the mountain valley setting. Lighting shall be functional and safe, and at the same time protect the night sky with top and side shielding, where possible. The intensity, direction and type of illumination shall be appropriate to the setting of the Bow Valley/Canmore area. Lighting shall be of commercial quality and vandal-proof.

Walkways and trail bollards with lights shall meet the following standards:

- Gardco (Philips): LED School Bollard Lights or approved equivalent (model # BRM836, 42 in. high with beveled top)
- LED control – DRLED natural light – LNW
- light coverage optional at 360 to 180 degrees
- voltage of 120–240
- finished in black TGIC polyester outdoor finish – BLP
- complete with high strength galvanized steel tenon.

10.7.1.3 Fencing

Perimeter fencing may be required around all sports fields, school sites and park sites. Gate systems shall be installed at controlled access points to the road frontage or trail network. Road frontage fencing is required at all sports fields, school sites and park sites. Fencing proposals shall be reviewed and approved by the Engineering Department prior to construction.

Chain link fencing heights and specifications are as follows:

- Fencing shall be 1.5 m high where private property abuts park space.
- Within 15 m of a ball diamond backstop or adjacent to a soccer goal, fencing shall be 1.8 m high.
- Fencing shall be 1.2 m high where park space is adjacent to a roadway.
- Chain link fencing shall be constructed of galvanized, nine-gauge fence materials, with appropriate service and pedestrian access points.
- All posts shall be anchored in concrete and be installed at 3 m centres.

Where parkland abuts a storm water retention pond or an inlet or outlet structure for the pond, the parkland shall be fenced as described above, consistent with Town policies.

Fencing proposals on arterial and collector roadways shall be reviewed and approved by the Engineering Department prior to construction, and shall adhere to the following specifications:

- Fencing shall be of a close-boarded type and shall extend to within 50 mm of ground level.
- All wood fencing shall be finished with two coats of approved stain. Chain link fencing is permitted when desired by residents to maximize views.
- Chain link fencing shall be required around school areas, walkways and utility lots, in addition to arterial roadways, unless otherwise approved.

All fences shall be constructed on private property, approximately 150 mm from the property line.

A post and cable fence system may be used in passive park areas to control access along roadways. Post and cable fence systems shall consist of 150 mm x 150 mm posts spaced 3 m apart and connected with 15 mm wire rope. Post height shall be a minimum height of 800 mm. Alternatively, a natural arrangement of rock boulders may be used as a means of controlling access to parkland.

Controlled maintenance access points to open spaces shall be considered and coordinated with the Parks Department, with acceptance by the Engineering Department (see Figure EDCG LSC 10.25 Pedestrian and Maintenance Access Gates).

10.7.1.4 Installation

Care shall be taken to ensure that site furnishings are level, plumb, straight and centered, as per details. Components shall be handled carefully to avoid shock, stress and damage to structures and painted finishes. Any cosmetic damage resulting from installation shall be repaired by field painting with two coats. Paint or stain shall be matched to the type originally used by the manufacturer, or as specified.

10.7.2 Playground

10.7.2.1 General

All playground installation shall conform to the latest version of the CAN/CSA - Z614-14; *Children's Play Spaces and Equipment CSA Standards*.

All site plans, playground designs, construction material, playground suppliers and playground development shall be approved by The Parks Department. The Parks Department shall determine the acceptability of materials and the extent of the playground development.

Playgrounds shall be developed to serve a broad range of ages (18 months to 5 years and 5 years to 12 years) and shall be accessible to all levels of ability, as per Accessibility Annex "H".

All playground developments shall include a surface and/or subsurface drainage system with a resilient, washed, 7 mm gyra rock base, and shall be installed to a minimum depth of 300 mm in an approved retainer or border (wood or plastic). A minimum of five pieces of traditional equipment shall be installed within a single retained area.

An alternative rubberized cushion play surface may be used if the material is approved by the Parks Department. Rubberized material shall be installed at the manufacturer's recommended depth and shall confirm to the critical fall height requirements in the latest version of the CAN/CSA - Z614; *Children's Play Spaces and Equipment CSA Standards.*

If two different types of play surfacing materials are being considered for use in one play space site, a proper layout of the play space area shall be required. This will ensure that the gyra rock (pea gravel) play surface is kept at a proper distance from the rubberized play surface, avoiding gravel contamination of the rubberized surface.

Playground equipment selection shall be acceptable to the Parks Department. All equipment shall be purchased from a CSA- approved playground manufacturer. The Town of Canmore reserves the right to remove, without compensation, any or all playground developments on public lands that do not meet safety standards and that have not been approved by the Parks Department.

Consideration for barrier-free accessibility and barrier-free components in playground design and layout shall be made where possible. Although *Accessibility Annex "H"* is not a mandatory section of the CAN/CSA - Z614; *Children's Play Spaces and Equipment CSA Standards*, it is recommended that all designs submitted incorporate some form of barrier-free accessibility and some barrier-free components. The focus of *Accessibility Annex "H"* is on removing barriers, providing supports and increasing opportunities for people of all abilities to grow and learn together through outdoor play. It is intended to make play spaces accessible and usable by persons with physical or sensory disabilities.

Play elements of each play-space shall provide recreation for children as well as sensory stimulation and learning opportunities for both cognitive and motor development. In addition to structural equipment (e.g., swings and platforms), open turf areas shall be provided. Play spaces shall include sunny and shaded areas and shall provide protection from the elements. Contouring and mounding of larger sites shall be considered to provide for a varied play experience.

A seating area for supervising adults (passive area) shall be provided, such as a Town-specified park bench situated in an area of full view of the play structure. A Town-specified picnic table and pedestrian dual waste/recycle container shall be provided within the open turf area at all playground sites.

Play equipment shall be separated from walkways and turf areas.

Equipment which promotes play by a large number of children at one time shall be located to minimize congestion around other equipment, entranceways or walkways. Swings and other moving equipment

shall be located towards the outside of the play lot to reduce conflict with pedestrian movements. Slides and equipment with metal pieces shall face north or be situated in shaded areas.

As part of the playground acceptance process, the following requisites shall accompany the CCC application for the Town's landscaping development file:

- A "Letter of Compliance" from the play equipment supplier, indicating that all inclusive play components have been designed and fabricated to meet the latest version of the CAN/CSA-Z614; *Children's Play Spaces and Equipment CSA Standards*.
- A "Letter of Compliance" from the company/contractor that installed the play equipment and play-surfacing material, indicating that the play equipment and play-surfacing has been installed to meet the latest version of the CAN/CSA-Z614; *Children's Play Spaces and Equipment CSA Standards*.

Safety of the playground equipment users and minimizing liability to the Town shall be a priority in the development of all play space sites. During the two-year warranty/maintenance period, regular inspection and maintenance of the equipment and site is required, with the inspection/repair process diarized. The Town shall provide the inspection form template that the developer must use and follow. All completed inspection forms shall be returned to the Town as part of the FAC application process.

The following safety-related installation and maintenance actions are required:

- Protrusions (nuts, bolts, etc.) shall be minimized or adequately protected where protrusions are unavoidable.
- Vandal-resistant hardware shall be utilized to prevent equipment tampering.
- Cushioned play surfaces surrounding the play equipment shall be maintained.
- Specified age-approximate signs, including user protocols and the Town of Canmore's Parks Department emergency contact information shall be installed, corresponding to the play apparatus' age designation at each playground site.
- Safety-related inquiries or damage noted by the general public during the warranty/maintenance period will be directed to the Town via the age-approximate signage, which will then be deferred back to the developer for immediate follow-up and repair.

10.7.2.2 Sub-Neighbourhood Tot-Lot Park

Sub-neighbourhood tot-lot parks shall be developed to serve children between the ages of 18 months and 5 years and shall be accessible to all levels of ability.

Sub-neighbourhood tot-lot park playgrounds shall be developed to satisfy the four basics of physical play: jumping, swinging, climbing, and sliding. Play structures shall include the following minimum elements: stairs, climber, bridge, slide, tunnel, steering wheel, roofed area and swing(s).

Sub-neighbourhood tot-lot park playgrounds shall be located in small parks or open space areas that are not in close proximity to schools. They shall be located in highly visible areas for safety, security and public awareness considerations.

10.7.2.3 Community Regional Park

Community regional parks shall be developed to serve a broad range of ages (18 months to 5 years, and 5 years to 12 years) and shall be accessible to all levels of ability.

Community regional parks shall contain one play space which contains the two separate age group play structures. Play structures shall be a combination of traditional and creative equipment that satisfy the four basic physical play activities of jumping, swinging, climbing, and sliding. Play structures shall include, at minimum, the following elements: stairs, straight slide, spiral slide, suspension bridge, climber, fire pole, overhead ladder, platforms, roofed area, gliders/sliders and swing(s).

Climbing walls may also be considered and should be installed as stand-alone components within their own protective surfacing. Climbing walls shall have permanent climbing holes in place of adjustable climbing grips. There shall not be any type of removable or adjustable mechanisms for continuous uniformity and user reliability.

10.7.2.4 Playground Installation

Playground sites shall be located in well-drained, dry, high-visibility areas that do not conflict with sports fields, open play areas and wildlife corridors. Sub-surface drainage is required and shall be approved by the Parks Department.

10.7.3 Ball Diamonds

Ball diamond specifications for fastball, slow pitch and hardball are as follows:

Fastball:

- Minimum dimension for a fastball (softball) diamond is 60 m (200 ft.) from home plate to the outfield fence.
- For standard 18.28 m (60 ft.) sized diamonds, the distance from home plate to second base shall be 25.86 m (84 ft. 101/4 in.) with a base line of 18.28 m (60 ft.) from base to base.
- Backstops shall be a minimum of 7.62 m (25 ft.), to a maximum of 9.14 m (30 ft.) from home plate.
- The standard distance from the pitcher's mound to home plate shall be 13.11 m (43 ft.). For high school fastball, the distance between the pitcher's mound and home plate shall be 14.02 m (46 ft.).
- The distance from the pitcher's mound to the outfield radius grass line shall be 18.28 m (60 ft.).
- The standard pitcher's mound plate shall be 60.96 cm (24 in.) x 15.24 cm (6 in.). For Little League, the pitcher's mound plate shall be 45.72 cm (18in.) x 15.24 cm (6 in.).

Slow Pitch:

- Minimum dimension for a slow pitch (softball) diamond is 85 m (275 ft.) from home plate to the outfield fence.
- For 16.76 m (55 ft.) sized diamond, the distance from home plate to second base shall be 23.70 m (77 ft. $9^{1/4}$ in.), with a base line of 16.76 m (55 ft.) from base to base.
- For 18.28 m (60 ft.) sized diamonds, the distance from home plate to second base shall be 25.86 m (84 ft. $10^{1/4}$ in.), with a base line of 18.28 m (60 ft.) from base to base.

- For 19.81 m (65 ft.) sized diamonds the distance from home plate to second base shall be 28.02 m (91 ft. 11 in.), with a baseline of 19.81 m (65 ft.) from base to base.
- Backstops shall be a minimum of 7.62 m (25 ft.) to a maximum of 9.14 m (30 ft.) from home plate.
- The distance from the pitcher's mound to home plate shall be 14.02 m (46 ft.).
- The pitcher's mound plate shall be 60.96 cm (24 in.) x 15.24 cm (6 in.).

For skinned infields, a 16.76 m (55 ft.) and 18.28 m (60 ft.) radius may be used with the front center of the 116.84 cm (46 in.) pitcher's plate as the center point of the arc to determine the distance for the outfield grass line. The following radii are recommended:

- 16.76 m (55 ft.) radius is recommended for 16.76 m (55 ft.) baselines.
- 18.28 m (60 ft.) radius is recommended for 18.28 m (60 ft.) baselines.
- 19.81 m (65 ft.) radius is recommended for 19.81 m (65 ft.) baselines.

Hardball:

- Minimum dimension for a hardball (baseball) diamond is 105 m (350 ft.) from the backstop to the outfield fence.
- All baselines distances shall be 27.43 m (90 ft.) from base to base.
- The distance from the pitcher's mound to home plate shall be 18.44 m (60 ft. 6 in.).
- The distance from home plate to the backstop shall be 18.28 m (60 ft.).
- The pitcher's mound plate shall be 60.96 cm (24 in.) x 15.24 cm (6 in.).
- The distance from the pitcher's mound plate to the outfield radius grass line shall be 28.96 m (95 ft.).
- Major league baseball field dimensions range in size when it comes to the outfield. However, all major league ball parks share the exact same infield measurements. High school and college baseball fields share the same infield dimensions as the major leagues. Little League and youth baseball fields also have a very different measurements regarding the outfield fence. However, the infield dimensions are standardized.

10.7.4 Sports Fields

10.7.4.1 General

The minimum dimensions for a rugby/soccer field shall be 70 m x 145 m. Multi-sport fields can be constructed as a combination major - minor soccer field for regional park applications. Major fields shall have combination football, rugby and soccer goal frames which meeting the following specifications:

- Frames shall be SCOREMASTER model# P-2400C CDN (one goal set equal two goal ends), which includes four hex-type, in-ground sleeves with safety caps or an approved equivalent.
- The goal frames shall be white powder coat finished with tamper-proof stainless steel assembly screws and standard, recessed, smooth stainless-steel net fasteners.
- The goal frame shall be installed with hex type, in-ground sleeves to allow goal frames to be removed in the off-season.

- Two additional goal frames, hex–type, in-ground sleeves, model# SM-GS-PKG, shall be required at each end of the field to provide for the rotation of the goal frame placement location; this will help mitigate center field wear-out conditions. (The rotation design requirements need to be implemented into the field design; this ensures that center field is also adjustable corresponding to the rotation of the goal frame placement locations).
- The soccer goal nets shall be SCOREMASTER model# SM-HD-P2400PRO, or an approved equivalent.
- The SCOREMASTER soccer goal net will require the optional rear stanchion net stays, model#: SM-PRO-Stanchions (c/w four stanchions and four in-ground sleeves with safety caps) and shall be installed as per the manufacturer's design requirements.
- Two additional net stay stanchions with in–ground sleeves (SCOREMASTER SM-GS-PROSTANCHION c/w safety caps) shall be required at each end of the field to allow for goal frame placement rotation and to mitigate center field wear-out conditions.
- All in-ground sleeves must come complete with a safety cap.

Minor soccer goal frames shall meet the following specifications:

- SCOREMASTER model# DM-2400 (SM - DM1200-2400 Series), moveable 24 ft. soccer goal frames (one set equals two goal ends) or approved equivalent.
- The goal frames shall be white powder coat finished, with tamper-proof stainless steel assembly screws and standard, recessed, smooth stainless steel net fasteners.
- The goal net shall be SCOREMASTER SM-HD-NET-DM24-PKG, white in colour with 2 in. square mesh holes.
- SCOREMASTER standard "Z/Spike" ground anchors shall be provided for the goal sets as all goals must be anchored while in use. Different types of fields and soil conditions may require different anchoring methods. Contact SCOREMASTER for an anchoring solution that best meets the existing site conditions. Different anchoring systems will require the Town's approval.

10.7.4.2 Field Dimensions (Industry Standards)

Field dimension for football, rugby and soccer are as follows:

Regulation Canadian football field dimensions:

- 137.16 m / 450 ft. / 150 yards in length
- 59.44 m / 195 ft. / 65 yards in width
- 18.28 m / 60 ft. / 20 yards end zone

Regulation Rugby Field Dimensions:

- 144 m / 472.44 ft. / 157.48 yards in length (including the 10 & 22 meter lines)
- 70 m / 229.66 ft. / 76.55 yards in width

Regulation Soccer Field Dimensions:

- 109.73 m / 360 ft. / 120 yards in length, (including two 9.14 m / 30 ft. / 10 yard end zones)
- 54.86 m / 180 ft. / 60 yards in width

- Adult soccer goal shall be 7.32 m / 24 ft. / 8 yards wide by 2.44 m / 8 ft. / 2.67 yards high.

Sports Field Structures and Fixtures

Sports field fixtures shall be installed on all designated sports fields. All baseball backstops, goal posts, team benches etc. shall be supplied by an approved manufacturer. The specifications for the equipment or fixture shall be approved by the Engineering Department.

10.7.4.3 Super-Standard Amenities

Amenities provided by the developer that exceeds the standard open space amenity requirements outlined in the EDCG are considered to be super-standard amenities. Super-standard amenities are prohibited, unless endorsed and accepted by Town Council as part of the development approval process.

Further information on how to seek approval for super-standard amenities can be found in the *Open Space Develop Guidelines*, Section 5. Additional Guidelines; Sub-Section 5.4 - Policy on Super-Standard Amenities.

The following examples are super-standard amenities that have been identified through the *Recreation Master Plan* process as priorities for the community.

Tennis Courts:

- Tennis courts shall be full size doubles courts, to the approved submitted details as a minimum.
- Specifications for sub-surface, asphalt pad, tennis court rubberized surface materials, net posts/foundations & nets and chain link fencing shall be reviewed by the Engineering Department and must be accepted prior to construction.
- On-site storm control provisions shall be made, with the final court surfacing properly sloped, with a synthetic rubberized surface applied over an asphalt base.
- Provisions shall be made for tennis court divider curtain(s) between courts.
- Provisions shall be made for a non-intrusive practice area.
- Provisions shall be made for a seating/participant temporary storage area (park bench), one bench per each side of court.
- Courts shall be complete with perimeter chain link fencing, utilizing the 1-in. sq. chain link fabric with pedestrian lockable gates that open to the outside of the court.
- Chain link fencing shall have a lower fabric rail that sits flush to the asphalt surface.
- Courts shall be a complete turn-key application and shall have all the required furnishings, signage and protocol kiosk inclusive.

Outdoor Rinks:

- Outdoor ice rinks shall be constructed to the approved details.
- Specifications for sub-surface treatment and final surface materials, interior hockey type boards with the dasher system, appropriate radius corners, lockable latched pedestrian access gates, maintenance equipment (ice re-surfacer) access gates, exterior board treatment and player box areas shall be reviewed and approved by the Parks Department prior to construction.
- Outdoor ices surfaces should include consideration for summer use with basketball, ball hockey and skate boarding /roller blade applications. These will include furnishings, such as removable

basketball posts/nets/back boards that are located and installed on the exterior side of the boards with ground-mounted sleeves, removable, medium-weight hockey goal frames and acceptable, portable skateboarding features.

- Chain link fencing placed at the ends of the ice surface behind the goal shall be a 9 mm gauge galvanized steel HD material.
- Outdoor rinks shall be a complete turn-key application and shall have all the required furnishings, signage and protocol kiosk inclusive.

Additional amenity considerations that could be identified through the *Recreation Master Plan* and/or through public demand and needs assessment surveys that require a suitable landmass are also deemed to be a super-standard amenity.

These types of applications will be dealt with as a stand-alone proposal and will need Town Council's endorsement as part of the off-site requirements under the subdivision agreement. These types of amenities are as follows:

- Disc Golf Course
- Mountain Bike Skills Park
- Off-Leash Dog Park
- Outdoor Adult Exercise Equipment Circuit
- Basketball Courts

10.8 Figures

Figure EDCG LSC 10.1 Deciduous Planting Machine Dug

Figure EDCG LSC 10.2 Shrub Planting

Figure EDCG LSC 10.3 Coniferous Planting Hand Dug

Figure EDCG LSC 10.4 Multi Stem Tree Planting

Figure EDCG LSC 10.5 Tree Planting in Sod Coniferous/Deciduous

Figure EDCG LSC 10.6 Coniferous Planting Machine Dug

Figure EDCG LSC 10.7 Shrub Planting Ground Bed

Figure EDCG LSC 10.8 Mulch Bed Bordered by Rock Scaping

Figure EDCG LSC 10.9 Mulch Bed Within a Concrete Sidewalk – Bed Next to Roadway

Figure EDCG LSC 10.10 Plaza Raised Rock Feature Bed

Figure EDCG LSC 10.11 Sidewalk Raised Rock Feature Bed

Figure EDCG LSC 10.12 Park Bench Type and Installation Details

Figure EDCG LSC 10.13 Picnic Table Type and Installation Details

SECTION 11 – SOLID WASTE

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 11" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The "2025 Engineering Design and Construction Guidelines – Section 11" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

11.0 Solid Waste

For definitions related to solid waste guidelines and specifications, please see the Glossary of Terms in Appendix A, Table 2.

11.1 Guidelines for New and Redeveloped Residential Development

Three stream waste collection for all residential developments is provided by the Town and the waste facilities provided by the Developer must meet the criteria below. Collection for mixed-use residential/commercial developments can either by provided by the Town or a private waste collection agency. Mixed-use developments opting for Town collection must meet the criteria in Section 11.1, whereas mixed-use or other developments utilizing private collection are subject to the criteria in Section 11.2.

11.1.1 Animal Proof Waste, Beyond Curbside Recycling and Food Waste Containers

11.1.1.1 Container Location

Animal proof waste (APW), beyond curbside recycling (BCR) and Food Waste (FW) containers shall be located within a 200m radius from intended users. They should be combined with another container or other utility (e.g., Canada Post mail kiosk) where feasible. The containers shall be located on public land. For multi-family developments over 10 units, the Town may, at its sole discretion, permit APW, BCR and FW containers to be located on private property.

11.1.1.2 Container Enclosure

APW, BCR and FW containers should be screened unless otherwise approved by the Town. Suggested screening shall be artificial screening as illustrated in Figure EDCG SWS 11.1 Animal Proof Waste Container – Artificial Screen Dimensions and detailed in Figure EDCG SWS 11.2 Animal Proof Waste Container – Artificial Screen Detail, or as otherwise approved by the Town.

The Town shall have the authority to place its decals on each APW, BCR and FW containers installed by the developer.

11.1.1.3 Container Quantity

When a Development Permit application that increases the number of residential units is approved, the Developer responsible for the application is required to provide and install containers or provide monies in lieu of containers as per the guidelines below.

- One to 15 new or additional residential dwelling units: Fees per dwelling units apply, refer to the current Town of Canmore Fee schedule.
- Sixteen to 40 new or additional residential dwelling units: Purchase, locate and install one APW container, one BCR and one FW container.
- Over 40 new or additional residential units: Provide APW, BCR and FW containers as per Town specifications.

11.1.2 Pedestrian Waste Containers and Dog Bag Dispensers

Pedestrian waste containers, pedestrian waste/returnable containers and dog bag dispensers are to be provided and installed by the Developer as described below at playgrounds, parks and trailheads if such amenities are part of a new or redeveloped residential development.

Each pedestrian waste container, pedestrian waste/returnable containers and dog bag dispenser shall have a minimum clearance radius of 1.5m from individual containers/dispensers or if grouped, from the outside containers.

Final quantities and locations of all APW container, BCR container, FW, pedestrian waste container, pedestrian waste/returnable container and dog bag dispenser are subject to Town approval.

11.1.2.1 Sub-Neighbourhood Playgrounds

Sub-neighbourhood playgrounds as defined by the Open Space Development Guidelines require the developer to provide and install a minimum of one pedestrian waste container.

11.1.2.2 Neighbourhood and Community Parks

Neighbourhood and community parks as defined by the *Open Space Development Guidelines* require the developer to provide and install a minimum of one pedestrian waste and one pedestrian returnable container.

11.1.2.3 Trailheads

Trailheads for official trail systems require the developer to provide and install a minimum of one pedestrian waste container and one dog bag dispenser.

11.1.2.4 Dog Parks

Dog parks require the developer to provide and install a minimum of one pedestrian waste container and one dog bag dispenser per entrance.

11.2 Guidelines for Commercial Development

11.2.1 Waste Containers, Animal Proof Waste, Beyond Curbside Recycling and Food Waste Containers

11.2.1.1 Container Location

The location requirements for commercial waste and recycling enclosures, whether inside the principal building or in a separate enclosure or location, are regulated through the Town's Land Use Bylaw.

Where an enclosure for a commercial premise is permitted to be attached to or located within a building or structure and is to contain a standard commercial waste or recycling container, the enclosure shall, as a minimum:

- be animal proof (see specifications in Section 11.3 of the EDCG).
- be of similar material and construction as the building or structure it is attached to.
- have a reinforced concrete entrance apron pad (as per Figure EDCG SWS 11.3) at a grade not greater than 2%.
- provide for an adequate approach and turning radius for service vehicles.

If the enclosure for a commercial premise is permitted to be a separate, stand-alone building or structure and is to contain a standard commercial waste or recycling container, final design approval will be subject to the nature of the redevelopment and at the discretion of the Town.

If in-ground containers (i.e. Molok, Earth bins) are proposed, the applicant needs to take into consideration the groundwater levels of the site. If the site is in located within the *High Groundwater Area Overlay*, in ground containers are not permitted. In-ground containers must meet the animal proof specifications in Section 11.3.

11.2.1.2 Container Enclosure and Access

If the waste container to be used at a commercial premise itself is an APW or BCR container that meets the requirements of the Town's *Waste Control Bylaw*, then the container requires screening on three sides as illustrated in Figure EDCG SWS 11.1 Animal Proof Waste Container – Artificial Screen Dimensions and detailed in Figure EDCG SWS 11.2 Animal Proof Waste Container – Artificial Screen Detail for aesthetic purposes only. In addition, a concrete pad shall be constructed as specified in Section 11.6 of the *Engineering Design and Construction Guidelines* (EDCG) and in Figure EDCG SWS 11.3 Animal Proof Waste Container – Pad Construction and Anchor and as illustrated in Figure EDCG SWS 11.4 Animal Proof Waste Container – Double Pad (Large).

Front-loading and side-loading containers shall have sufficient access and an appropriate turning radius for service vehicles to service the containers and enter/exit the property. They should be screened generally as illustrated in Figure EDCG SWS 11.1 and generally detailed in Figure EDCG SWS 11.2.

Enclosures and screening on private sites must comply with the Land Use Bylaw and are subject to approval by the Town's Planning and Development Department.

11.2.1.3 Container Quantity and Size

Commercial premises shall provide the required quantity and size of APW, BCR and FW containers as identified below or otherwise provide for an equivalent waste handling system approved by the Town.

Table 11-1, below, shows the commercial premises guidelines for BCR containers. The guidelines are for number and size of containers and are based on the total floor area measured in square metres.

Table 11-1: Commercial Premises Guidelines for Beyond Curbside Recycling Containers

Commercial Premise Type	Container Size[a)]			
	N/A	**3.0 m^3**	**4.5 m^3**	**4.5 m^3 b)**
Retail	< 400 m^2	> 400 m^2	> 600 m^2	600 m^2
Restaurant	< 300 m^2	> 300 m^2	> 600 m^2	600 m^2
Institution	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Grocer	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Office	< 500 m^2	> 500 m^2	> 750 m^2	750 m^2
Industrial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2
Visitor Accommodation - Commercial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2

Notes:
a) Container floor area shall be a minimum of 3.5m^2 per container.
b) One container required for every square metre factor listed.

Table 11-2, below, shows the commercial premises guidelines for Food Waste Carts. The guidelines are for number of carts and are based on the total floor area measured in square metres.

Table 11-2: Commercial Premises Guidelines for Food Waste Carts

Commercial Premise Type	Number of 240-Litre Carts[a)]			
	1-2 carts	**3-5 carts**	**6-8 carts**	**8 carts b)**
Retail	N/A	N/A	N/A	N/A
Restaurant	< 300 m^2	> 300 m^2	> 600 m^2	600 m^2
Institution	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2
Grocer	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Office	< 900 m^2	900 m^2		
Visitor Accommodation - Commercial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2

Notes:
a) Cart floor area shall be a minimum of 0.21m x 0.21m per cart
b) Number of carts required for every square metre factor listed

Table 11-3, below, shows the commercial premises guidelines for waste containers and APW containers. The guidelines are for number and size of containers and are based on the total floor area measured in square metres.

11-3: Commercial Premises Guidelines for Waste and Animal Proof Waste Containers

Commercial Premise Type	Container Size		
	3.0 m^3	**4.5 m^3**	**4.5 m^3 a)**
Retail	< 400 m^2	> 400 m^2	400 m^2
Restaurant	< 200 m^2	> 200 m^2	200 m^2
Office	< 500 m^2	> 500 m^2	500 m^2
Industrial	< 200 m^2	> 200 m^2	200 m^2

Notes:
a) One container required for every square metre factor listed.

11.2.2 Animal Proof Waste Handling Enclosure

Waste handling enclosures/garage systems for containing standard commercial waste or recycling containers shall be animal proof structures constructed of metal or concrete with doors constructed of metal. The exterior service area shall have a separate access person door.

The area for the service vehicles in front of the access door(s) shall have a slope no greater than 2%. Road access to waste containers shall have a sufficient approach and turning radius for service vehicles to service container and enter and exit the property.

The Town must approve site plan, construction, and final location of animal proof waste handing enclosures.

11.2.3 Pedestrian Waste and Recycling Containers

All pedestrian waste and recycling containers located outside a building shall be animal proof to the satisfaction of the Town.

All new and existing commercial premises located outside the downtown core shall provide and locate one pedestrian waste container and one pedestrian recycling container for every 20 parking stalls. A minimum of one pedestrian waste and one recycling container shall be located at the main pedestrian entrance to the commercial premise. The locations for other required containers shall be to the satisfaction of the Town.

The location of pedestrian waste containers shall be within 3m of the public entrance point into a commercial premise. Each pedestrian waste container shall have a minimum clearance radius of 1.5m.

11.2.4 Used Cooking Oil Container Enclosure

Used Cooking Oil Containers must either locate the container inside an animal-proof waste handling enclosure or a used cooking oil container enclosure described below.

Used cooking oil container enclosures shall be fully enclosed (sides and top) structures constructed of wood or alternative materials as approved by the Town. Access to the enclosure will be a person door that can be securely latched, to ensure the door remains closed when not in use. The enclosure must have adequate space to house the used cooking oil container and allow a person to enter and pour used cooking oil into the container. The structure must also allow for access from the service provider to empty the container. The structure must be able to contain any spillage caused from filling or emptying the used cooking oil container.

11.3 Animal Proof Waste Containers Specifications

11.3.1 Animal Proof Requirement

All containers stored outside of an animal proof waste enclosure to be used for the collection of municipal solid waste shall meet the following animal proof specifications:

- No part of the container shall have any spaces or gaps in width exceeding 3.2mm.
- User doors and dumping lids shall be recessed so that they are flush with the top of the container.
- User doors shall be self-closing.
- User doors shall incorporate a covered stainless steel gravity latch system, which prohibits entry of an animal claw from reaching the latch trigger mechanism.

11.3.2 Container Construction

All containers stored outside of an animal proof waste enclosure to be used for the collection of municipal solid waste shall meet the following container construction specifications:

- All metal shall be no less than 12-gauge galvanized steel unless otherwise specified.
- User doors shall be 14-gauge galvanized steel.
- User door dimensions shall be a minimum of 0.450m x 0.550m.
- All fastenings (bolts, nuts and washers) shall conform to ASTM standard A307.
- All hinges and latches shall be stainless steel.
- Container panels shall be riveted together using plated steel rivets.
- Container shall not have any sharp points or corners.

11.3.3 Container Finish

All waste containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard colour, Neufeld Green, or approved equivalent. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.3.4 Pedestrian Waste Containers

In addition to the pedestrian waste container (PWC) specifications provided in Sections 11.1.2 and 11.2.3, PWCs shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Bag model or approved equivalent.
- The container volume shall be approximately 0.26m^3.
- The height of the user door shall be between 0.9m and 1.0m from the base of the container.
- The entire back panel of the container shall function as a service door.
- The latch system on the service door shall have a locking device.
- The container shall include an internal frame system for bag support, the top of which is larger than and sits just below the user door opening to ensure all waste is deposited in the bag.
- The frame system shall employ a pivot or sliding mechanism to allow for easy bag removal and replacement from the container's service door.
- The concrete pad shall be reinforced with wire mesh and be Type HE cement with a minimum strength of 30 MPa.
- The concrete pad shall have a minimum thickness of 0.1m.

11.3.5 APW and BCR Waste Containers

In addition to specifications provided in Section 11.2 of the EDCG, APW and BCR containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Way model or approved equivalent.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side loading service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather, from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.
- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The container footprint shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.4.
- The container frame shall have two anchor holes in frame tubing at the points identified on drawings Figure EDCG SWS 11.4.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.

- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- The dumping lid shall be 16-gauge galvanized steel and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when the container is lowered.
- Windscreen materials shall be a minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- The dumping angle shall be approximately 45°.
- The user step shall be manufactured using Type HE cement with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.
- Rear corners shall be skirted with galvannealed steel panels.
- A professional engineer shall stamp design drawings for containers.

Error! Reference source not found., below, shows waste container volumes and the corresponding minimum weight capacities required.

11-4: Waste Container Volumes and Weight Capacities

Waste Container Size	Volume	Weight Capacity
Large	4.5 Cubic Metres	1,350 Kg

11.3.6 Front Load Waste Containers

In addition to specifications provided in Section 11.2 of the EDCG, front load waste containers (FLWC) shall meet the following requirements:

- Containers shall be one unit comprised of a hopper with side fork mounts.
- User door height shall not exceed 1.3m.
- The hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- Containers shall have one dumping lid and two user doors.
- The dumping lid shall be 16 gauge and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when container is lowered.
- Windscreen materials shall be minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- Large waste containers shall be a minimum of 1.8m wide and 1.8m long.

- Medium waste containers shall be a minimum of 1.8m wide and 1.3m long.

11.4 Beyond Curbside Recycling Container Specifications

11.4.1 Construction

Beyond curbside recycling (BCR) containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be partitioned into three compartments: mixed paper, glass, and plastic and metal. The mixed paper compartment shall be on the right-hand side of the container and the opening shall have a chute with a stainless steel cover. The glass compartment shall be in the middle of the container and the opening shall be a 0.25m diameter circle with rubber flaps. The plastic and metal compartment shall be on the left-hand side of the container and the opening shall be a 0.25m by 0.5m oval with rubber flaps.

Each compartment shall have a separate dumping lid that has a latch to secure it closed when the container is in the dumping position. The mixed paper dumping lid shall have a hinged brace to support the lid open while in the dumping position.

Each compartment shall have the minimum volume as shown in 11-5, below.

11-5: Beyond Curbside Container Compartment Material and Volume Specifications

Compartment Material	Volume (m^3)
Mixed paper	2.25
Glass	0.75
Plastic and Metal	1.5

In addition to the compartment specifications described above, containers shall meet the following requirements:

- All metal shall be no less than 12-gauge galvanized steel unless otherwise specified.
- All fastenings (bolts, nuts and washers) shall conform to ASTM Standard A307.
- All hinges and latches shall be stainless steel.
- Container panels shall be riveted together using plated steel rivets.
- The container shall not have any sharp points or corners.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side load service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.

- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The footprint of the container shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.4.
- The container frame shall have two anchor holes in the frame tubing at the points identified on Figure EDCG SWS 11.4.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.
- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- Dumping angle shall be approximately 45°.
- The user step shall be manufactured using concrete with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.
- Rear corners shall be skirted with galvannealed steel panels.

11.4.2 Container Finish

Containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard BCR container colour (blue) or approved equivalent. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.5 Food Waste Collection Container

11.5.1 Communal Residential Food Waste Collection Containers

In addition to specifications provided in Section 11.2 of the EDCG, Food Waste containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Way model or approved equivalent.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side loading service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather, from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.

- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The container footprint shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.5 Animal Proof Waste Container – Triple Pad (Large).
- The container frame shall have two anchor holes in frame tubing at the points identified on drawings Figure EDCG SWS 11.5.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.
- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- The dumping lid shall be 16-gauge galvanized steel and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when the container is lowered.
- Windscreen materials shall be a minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- The dumping angle shall be approximately 45°.
- The user step shall be manufactured using concrete with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.

Error! Reference source not found., below, shows waste container volumes and the corresponding minimum weight capacities required.

11-6: Food Waste Collection Container Volumes and Weight Capacities

Waste Container Size	Volume	Weight Capacity
Small	1.5 Cubic Metres	1,350kg

11.5.2 Container Finish

Containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard Food Waste collection container colour or approved equivalent and be wrapped with the approved artwork. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.6 Container Concrete Pad Construction

Animal proof waste containers (APW), beyond curbside recycling (BCR) and Food Waste containers shall be located and secured on a concrete pad as per Figure SWS 11.4.

- Site and base preparation for the concrete pad shall conform to the City of Calgary's *Standard Specifications Roads Construction*, Section 311.02.00 and 3.11.03.00.
- The container pad shall have dimensions as described in Figure SWS 11.4
- Finishing and curing of the concrete pad shall be as defined in the City of Calgary's *Standard Specifications Roads Construction*, Section 311.07.00.
- The container pad shall be constructed of concrete with a minimum strength factor of 30 MPa.
- The container pad shall have a 2% grade to road.

A. APPENDIX A: ABBREVIATIONS AND GLOSSARY OF TERMS

Table 1: Abbreviations

Abbreviation	Complete Term
A	
AASHTO	American Association of State Highway and Transportation Officials
AEMA	Alberta Emergency Management Agency
ANSI	American National Standards Institute
APW	animal proof waste (containers)
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
B	
BCR	beyond curbside recycling
BMP	best management practices
BP	building permit
C	
CAD	Computer Aided Design
CCC	Construction Completion Certificate
CCTV	closed-circuit television
CMP	construction management plan
CNLA	Canadian Nursery Landscape Association
CSA	Canadian Standards Association
CTS	copper tube sizing
D	
DCC	Development Completion Certificate
DP	development permit
E	
EDCG	Engineering Design and Construction Guidelines
ER	environmental reserves
ESC	erosion and sediment control
F	
FAC	Final Acceptance Certificate
FLWC	front load waste containers
FOS	Facture of Safety
FRP	fiberglass reinforced pipe
FTP	file transfer protocol
H	
HDPE	high-density polyethylene
HVAC	heating, ventilation and air conditioning

Abbreviation	Complete Term
I	
ISA	International Society of Arboriculture
ISO	International Organization for Standardization
ITP	*Integrated Transportation Plan* (Canmore)
L	
LPS	low pressure sanitary (system)
LTF	Lowest Top of Footing
LUB	*Land Use Bylaw* (Canmore)
M	
MDP	*Municipal Development Plan* (Canmore)
MR	municipal reserves
MUTCDC	*Manual of Uniform Traffic Control Devices for Canada*
N	
NTP	notice to proceed
O	
OGS	oil-grit separator
O&M	operation and maintenance
P	
PDF	Portable Document Format
PDI	probability of death of an individual
PLC	programmable logic controller
PLS	pure live seed
PRV	pressure reducing valve
PUL	Public Utility Lot
PVC	polyvinyl chloride
PWC	pedestrian waste container
Q	
QRA	quantitative risk analysis
QRP	qualified registered professional
R	
RDP	Roadside Development Permit
ROW	right-of-way
S	
SCADA	supervisory control and data acquisition
SCRA	steep creek risk assessment
SDR	standard dimension ration
T	
TCA	tangible capital asset
TIA	Transportation Impact Assessment
U	
ULA	utility line assignment
UMP	Utility Master Plan

Abbreviation	Complete Term
URW	utility right-of-way
USCS	Unified Soil Classification System

Table 2: Glossary of Terms

Term	Definition
A	
Active Mitigation	Mitigation measures that directly affect the hazard process by reducing the event magnitude and hence reducing the damage potential; remediating, reducing or eliminating the potential of an event from occurring; or deflection of an event to areas where no adverse effects are expected.
Alluvial Fan	A conical accumulation of sediment deposited where a steep channel flows onto a much lower gradient so that much of the sediment load of the channel is deposited. Alluvial fans form where a mountain tributary enters a main valley.
Animal Proof Waste Container	A waste container for disposing of residential or commercial waste that meets the animal proof criteria set forth in Appendix 'A' - *Criteria For Animal Proof Waste Container*. The container shall be constructed of metal, be designed to be collected by automated means and have a volume of no less than 4.5 m^3.
Artificial Screening	A partition constructed of wood and/or metal for the purposes of obstructing the view of an animal proof waste container or recycling container.
B	
Beyond Curbside Recycling Container	A receptacle for disposing of residential or commercial recyclables. The container shall have three partitioned compartments: one for mixed paper (including cardboard, newsprint and any other paper product), one for plastic and metal food containers, and one for glass. The container shall be designed to be collected by automated means and have a volume no less than 4.5 m^3.
C	
Commercial Premises	A building, structure or premises used for the conduct of some profession, business, manufacturing process or other undertaking. This includes institutional, industrial, commercial, restaurant and retail premises as well as any attached residential dwelling units, and includes areas designated as a Mobile Home Park in accordance with the *Land Use Bylaw*.
Commercial Waste Container	A metal container for the collection of commercial waste that does not meet the requirements of an animal proof waste container, is located on a commercial premise in an approved storage location and has a minimum volume of 2 m^3.
Consequence	The outcomes for elements at risk, given impact by a hazard. In the EDCG, consequences considered include potential loss of life, damage to buildings and infrastructure, loss of usage of critical facilities, and direct interruption of business activity.
Consultant	Professionals registered to practice under their respective Acts or Professional Associations in the Province of Alberta, as Engineers, Architects, Landscape Architects, Planners or Technologists
Consulting Engineer	Professional Engineer registered to practice under the Act in the Province of Alberta

Term	Definition
D	
Debris Flood	Very rapid surging flow of water heavily charged with debris in a steep channel.
Debris Flow	Very rapid to extremely rapid surging flow of saturated, non-plastic debris in a steep channel.
Design Flood	For river flooding, the current design standard in Alberta is the one percent flood, defined as a flood whose magnitude has a one percent chance of being equaled or exceeded in any year. Although it can be referred to as a 100-year flood, this does not mean that it will only occur once every hundred years. For steep creek hazard, the design flood is not based on a fixed return-period and changes based on the risk reduction required. It results from the basin-scale and site-specific hazard and risk assessments. Most creeks will use a 100-year to 300-year flood event as the design flood.
Design Flood Level	The calculated elevation or the modelled water elevations for the design flood. This elevation is used in the calculation of the flood construction level.
Developer	A person or company responsible for the financing and/or construction of a development within the Town.
Development	a. an excavation or stockpile and the creation of either of them; b. a building or an addition to, or replacement or repair of a building and the construction or placing in, on, over or under land of any of them; c. a change of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the use of the land or building; and/or d. a change in the intensity of use of land or a building or an act done in relation to land or building that results in or is likely to result in a change in the intensity of use of the land or building
Dog Bag Dispenser	A container for the dispensing of plastic handbags to collect domestic pet waste. A list of acceptable distributors is available through the Town.
Downtown Core Businesses	A commercial premise that fronts on and provides pedestrian entrance and service on 8th, 9th and 10th Streets between 3rd, 5th, 6th, 7th and 8th Avenues.
E	
Element at Risk	Anything considered of value in the area potentially affected by hazards.
F	
Flood	An overflow of water that submerges land that is usually dry. The amount of suspended sediment is insufficient (less than 10% concentration) to substantially affect how flowing water behaves. Water may appear very muddy; but most of the suspended sediment is transported near the bed.
Flood Construction Level (Minimum Floor Elevation)	The elevation of the underside of a wooden floor system or top of concrete slab for habitable buildings that is calculated from the DFL elevation plus the allowance for freeboard. In the case of a manufactured home, the ground

Term	Definition
	level or top of concrete or asphalt pad on which it is located shall be equal to or higher than the above described elevation. The flood construction level also establishes the minimum crest level of a standard dike for river engineering. Where the DFL cannot be determined or where there are overriding factors, an assessed height above the natural boundary of a water-body or above the natural ground elevation may be used.
Flood Proofing	The alteration of land or structures, either physically or in use, to reduce flood damage. This includes the use of building setbacks from water bodies to maintain a floodway and to allow for potential erosion.
Freeboard	A vertical distance added to the DFL. It is used to establish the flood construction level or minimum floor elevation.
H	
Habitable Space	The floor space both above and below grade, which includes stairways, mechanical equipment rooms, closets, hallways, bathroom(s) and enclosed areas used for storage. It excludes elevators, areas dedicated to the parking of motor vehicles (up to 60 m2) and areas devoted exclusively to the mechanical or electrical equipment servicing the development.
Hazard Scenario (Steep Creeks)	Hazard scenarios describe various ways that a steep creek hazard could occur within a specified frequency class. This could, for example, include the blockage of a culvert or an avulsion associated with a log jam.
Hydrogeomorphic Processes	Processes such as debris flows, debris floods and bank erosion that are examples of the geomorphic interaction with the surface water regime. Referred to as steep creek processes in this document.
L	
Lane	public thoroughfare with a right-of-way width of not greater than 9.0 m and not less than 6.0 m
Local Protection (On-Site)	On-site mitigation measures located on the property lot that do not affect creek and river channels, or water bodies. Small-scale local protection refers to detached, duplex or fourplex lots. Medium-scale protection refers to flood protection of condominium buildings or a conglomeration of townhouses. Large-scale protection refers to whole land-use districts or parts of a district where the layout of a development can have great influence on the hazard situation. Large-scale mitigation is out of scope for the Steep Creeks section (9) of the Engineering Design and Construction Guidelines and must be designed by a qualified registered professional
M	
Mortality	The number of potential fatalities divided by the number of persons exposed to a hazard, should the hazard occur.
Multi-residential Dwelling	An apartment building, townhouse or condominium complex which contains five or more self-contained residential dwelling units, each having sleeping, cooking and bathroom facilities.
Municipal Improvement	Works that the Town will own, operate and maintain when all the developer's obligations are met

Term	Definition
O	
Off-site Mitigation	Mitigation measures that are located on a different lot/parcel than the one being protected. They can be within the bed and shore, or on the bank of a creek or river. Functions of off-site mitigation can be to prevent flow from entering the community, prevent erosion, or reduce the magnitude of an event. All off-site mitigation measures are out of scope of the Steep Creeks section (9) of the Engineering Design and Construction Guidelines and must be designed by a qualified registered professional.
P	
Passive Mitigation	Mitigation measures that do not affect the hazard process itself but that reduce the risk. No attempt is made to prevent, modify or control the hazard, instead hazardous areas are avoided. Passive mitigation can be permanent or temporary.
Pedestrian Waste Container	A receptacle for the disposal of pedestrian waste that is animal proof, constructed of metal and designed to be serviced by manual means.
Pedestrian Waste/Returnable Container	A receptacle with a partition separating sections for pedestrian waste and refundable containers as defined by the Alberta Bottle Depot Association. The container shall be animal proof, constructed of metal and designed to be serviced by manual means. The container shall be painted two colours: Neufeld Green (or equivalent) on the waste half and Town of Canmore Blue on the refundable half.
Playground	An outdoor area containing a physical structure in a retained protective surfacing area of washed pea gravel (7 mm, free of sharp edges, also known as gyra rock), or various types of recycled tire rubberized surface material for the purpose of unstructured play.
Play Space	An area containing play equipment, a play structure or play structures, protective surfacing etc., that is intended for use by children 18 months to 5 years old, and/or 5 years to 12 years old.
Playground Apparatus - Traditional	Individual units designed for a specific activity and constructed predominantly of steel. Single purpose structures of a simple design such as swings, slides, climbers, teeter-totters, etc. generally made from metals.
Playground Apparatus - Creative	An individual unit designed for a variety of activities and constructed of steel. Multi-purpose structures consisting of a series of interconnected components and decks, made from a variety of materials including metal and plastic
Q	
Qualified Registered Professional (QRP) (Steep Creeks)	A qualified registered professional for steep creek mitigation work is an engineer (geotechnical, structural, civil), or licensee with appropriate education, training and experience in steep creek mitigation, and design of retaining walls, foundations and berms as described in this document. They may be responsible for signing off on documents and/or drawings prepared for an assessment.
R	

Term	Definition
Recycling Container	A container for the exclusive use and collection of recyclable material.
Residential Dwelling Unit	A single detached dwelling unit and a self-contained dwelling unit in a duplex, triplex, or four-plex.
Risk	The likelihood of (a) hazard scenario(s) occurring and resulting in some severity of consequences. In the EDCG, risk is defined in terms of safety or damage level. For example, this could include the likelihood of debris-flood impact to a building resulting in destruction of the building.
Risk Tolerance	Risk tolerance defines a specific level of risk (e.g., loss of life, economic or environmental losses, losses to intangible values) that is considered tolerable by the decision-making jurisdiction and its stakeholders. If a specific level of risk tolerance is met, further risk reduction may still be warranted.
S	
Steep Creek Hazard	A hydrogeomorphic process with the potential to result in some type of undesirable outcome. For example, a hazard could include a debris-flood or debris flow into a runout area intersecting the footprint of a developed area. The term hazard refers to the specific nature of the process (type, frequency, magnitude), but not the consequences. Hazards are described in terms of *scenarios*, which define events of a certain frequency and magnitude.
Steep Creek Hazard Area (Zone)	An area subject to steep creek hazards.
Street Block	A distance of 150 m.
T	
Town	The Municipal Corporation of the Town of Canmore and any employee who has been delegated the appropriate decision-making authority, or the area contained within the boundaries thereof, as the context requires.
Training Works	Any wall, dike or protective structure used to prevent a stream from leaving its channel at a given location. This includes any debris flow training structures including basins, trash racks or other works.
V	
Visitor Accommodations—Commercial	A hotel, motel or other accommodation with more than 40 self-contained units to be rented for a period not exceeding 28 days.
W	
Waste Control Bylaw	The Town of Canmore's Waste Control Bylaw as amended from time to time.
Watercourse	Any natural or man-made depression with well-defined banks and a bed 0.6 m or more below the surrounding land serving to give direction to a current of water at least six months of the year or having a drainage area of 2 km^2 or more upstream of the point of consideration.

B. APPENDIX B: SAMPLE LETTERS AND TEMPLATES

B1: Sample Notice of Engagement Letter

Sample "Notice of Engagement" letter

(*date*)

Town of Canmore

Engineering Department

902 – 7th Avenue

Canmore, AB T1W 3K1

Attention: Manag

Re.: Notice of Engagement – Consulting Engineering Services

(*insert development name and stage*)

Dear (*manage eering*),

Please be advised that (*insert developers corporate name*) of (*insert developer's complete mailing address*) has retained the services of (*Consulting Engineer's name*) of (*insert Consulting Engineer's complete mailing address*) for the purposes of providing Field Services as defined in the Town of Canmore document entitled "***Engineering Design and Construction Guidelines***".

Sincerely,

ABC Developments (*insert developer's corporate name*)

John Doe (*insert signing authority's name*)

Director (*insert signing authority's title*)

cc. Planning Department

B2: Construction Completion Certificate Templates

Infrastructure:

Town of Canmore
CONSTRUCTION COMPLETION CERTIFICATE
-INFRASTRUCTURE-

Project:_____ **Submission Dated:**_____
Owner: Town of Canmore **SB or DP #:**_____
Contractor:_____ **Utility:**_____
Consulting Engineer:_____
Boundary of Area: *(see attached map)*

CONSULTING ENGINEER'S CERTIFICATE:

I, _____, Professional Engineer, of the firm _____ Consulting Engineers, who are engaged by the Developer to design and supervise construction and installation of Municipal Improvements, do hereby certify that the Municipal Improvements within the area shown on the attached plan have been constructed, installed and inspected, as far as practicably ascertainable, in conformance with the applicable Agreement, the Town of Canmore's Standards, Specifications, accepted drawings or as otherwise required by the Town of Canmore Engineer, and that all defects, deficiencies, work and services have been reported to the Town of Canmore and have been remedied by the Developer.

I confirm that I have been engaged by the Developer to comply with and perform all of the Consulting Engineer's obligations and to provide the Professional Services identified in the most recent edition of the Town of Canmore's "Consultant's Guidelines for Subdivisions and Development".

Inspector: _____ _____
(print name) *(Signature)*

Consulting Engineer: **Permit to Practice:**
(seal, signature)

REJECTION OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE (Manager of Engineering)

Reason:_____

ACCEPTANCE OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE (Manager of Engineering)

Earliest Warranty Period Expiry Date:_____

Landscaping:

Town of Canmore
CONSTRUCTION COMPLETION CERTIFICATE
-LANDSCAPING-

Project:_____ **Submission Dated:**_____
Developer:_____ **SB or DP#:**_____
Contractor:_____ **Landscape Development:**_____
_____
Consulting Landscape Architect:_____

Boundary of Area: (see attached map)

(type each of the above)

LANDSCAPE ARCHITECT'S CERTIFICATE:

I, _____, Professional Landscape Architect of the firm of _____, who are engaged by the Developer to direct the construction and installation of the Municipal Improvements within the area shown on the attached plan, certify that the Municipal Improvements have been constructed, installed and inspected as far as reasonably ascertained, in conformance with the Town of Canmore's Standards & Guidelines, accepted design and otherwise required by the Town of Canmore Representative, and that all defects in workmanship and materials have been reported to the Developer and the Town of Canmore and have been remedied by the Developer.

I confirm that I have been empowered by the Developer to comply with and perform all of the Landscape Architect's obligations and to provide all of the Field Reviews identified in the most recent edition of the Town of Canmore's *"Consultant's Guidelines to Subdivision and Development"*.

Inspector:_____ **Landscape Architect**
(signature) (sign, seal and date)

_____ _____
(print name)

REJECTION OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

Reason:_____

ACCEPTANCE OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

Earliest Warranty Period Expiry Date:_____

B3: Final Acceptance Certificate Template

Infrastructure:

Town of Canmore
FINAL ACCEPTANCE CERTIFICATE
-INFRASTRUCTURE-

Subdivision:_____ **Submission Dated:**_____
Owner: Town of Canmore **SB or DP#:**_____
Contractor:_____ **Utility:**_____
Consulting Engineer:_____
Boundary of Area: *(see attached map)*

CONSULTING ENGINEER'S CERTIFICATE:

I, _____, Professional Engineer, of the firm of _____ lting Engineers, who are engaged by the Developer to design and inspect _____ uct _____ of Municipal Improvements do hereby certify that the Municipal Improve _____ ea sho _____ ched plan, have been constructed, installed and inspected, as far as can be _____ asc _____ in co _____ rma _____ with the applicable Agreement, the Town of Canmore's Standards & Gui _____ Accept _____ des _____ other _____ e required by the Town of Canmore Engineer, and that all defects and de _____ s in w _____ an _____ nate _____ ha _____ een reported to the Town of Canmore and have been remedied by the De _____

I confirm that I have been empowers _____ per to _____ mply _____ perform all of the Consulting Engineer's obligations and to provide all of _____ Ser _____ de _____ ifie _____ the _____ st recent edition of the Town of Canmore's "Consultant's Guidelines for _____ and Deve _____ pr _____ ts".

Inspector: _____ _____ _____
(Signature)

Consult _____ **:** **Permit to Practice:**
(seal, sig _____ te)

REJECTION OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Engineering

Reason:_____

FINAL ACCEPTANCE OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Engineering

Landscaping:

Town of Canmore
FINAL ACCEPTANCE CERTIFICATE
-LANDSCAPING-

Subdivision:_____ **Submission Dated:**_____
Developer:_____ **SB or DP#:**_____
Contractor:_____ **Landscape Development:**_____
_____

Consulting Landscape Architect:_____

Boundary of Area: (see attached map)

(type each of the above)

LANDSCAPE ARCHITECT'S CERTIFICATE:

I, _____ ssio Land chitect, of the firm of _____ aged the B design and inspect the construction and installation of the Municipal Im nt th are how the attached plan, certify that the Municipal Improvements have been , instal a ins , as far as can be practically ascertained, in conformance with the T C 's S ndards Gui elines, accepted designs, or as otherwise required by the Town of Canm ntative, hat and deficiencies in work and materials have been reported to the Develop of Canm and been remedied by the Developer.

I confi e b vere Developer to comply with and perform all of the Landscape Architect's obliga rovide all the Services identified in the most recent edition of the Town of Canmore's "Consul Sub ivi ons and Developments".

Inspector:_____ **Landscape Architect:**
(signature) (sign, seal and date)

_____
(type name)

REJECTION OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

Reason:_____

ACCEPTANCE OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____

TOWN OF CANMORE
Manager of Parks

C. APPENDIX C: STEEP CREEK RISK ASSESSMENT

Basin-scale steep creek risk assessments have been completed for all existing development on an alluvial fan within the Town of Canmore municipal boundary. Table C2 below lists all existing assessment reports completed to date.

The site-specific risk assessment process is very similar to basin-scale risk assessment; however, the scope of work is greatly reduced and not all elements of previous basin-scale assessments may apply to site-specific assessments. Therefore, these guidelines provide guidance for site-specific steep creek risk assessment, only to be utilized for proposed development in an existing steep creek hazard zone

C-1 Site-Specific Steep Creek Risk Assessments

At the onset of a steep creek risk assessment (SCRA) related to development permitting, all parties shall be informed about these guidelines and how they apply to the proposed development project. The qualified registered professional (QRP) undertaking the SCRA shall consult with the Engineering Department to:

- clarify the roles and responsibilities of parties involved in the SCRA
- obtain relevant background information
- clarify the application of these guidelines
- clarify the role of standard and non-standard mitigation works
- clarify the role and applicability of a risk assessment
- clarify the requirements for a development approval
- define the level of effort required for assessment.

Risk assessments should also be undertaken in accordance with any provincial guidelines that may apply.

The following section describes project elements that shall be defined during the beginning stages of the study, including project organization, scope of work and anticipated level of effort.

See the Steep Creek Development Flow Chart in the Municipal Development Plan for a flow chart showing the basic decision-making process when development is proposed in a steep creek hazard zone.

C-1.1 Terminology

The appropriate application of these guidelines requires some understanding of hazard and risk terminology as well as the hazard processes that are the focus of these guidelines. Select terms are defined in the Glossary of Terms found in Appendix A, Table 2. Additional terms are defined as they appear in the text.

For the purposes of this document, a qualified registered professional (QRP) is an engineer (geotechnical, geological) or geoscientist (geologist, geomorphologist or hydrologist), or licensee with appropriate education, training and experience to conduct SCRAs as described in this document. The QRP is responsible for signing-off on documents and/or drawings prepared for the assessment.

C-1.2 Risk Management Framework

The basin-scale SCRAs previously completed follow the risk management framework shown Table D1. It encompasses initial hazard identification through to risk analysis and optimization of risk reduction and monitoring measures. Site-specific SCRAs do not encompass all parts of this framework.

Table C1: Risk Management Framework

Risk Communication and Consultation On an ongoing basis the governing body should keep stakeholders informed about the risk management process.	1. Project Initiation a. Recognize the potential hazard. b. Define the study area/boundary and level of effort. c. Define the roles of the parties involved in the project. d. Identify 'key' risks to be considered in the assessment. e. Identify preliminary geohazard risk scenarios.	Monitoring and Review There should be ongoing review of risk scenarios and risk management process.
	2. Risk Identification a. Collect and review background information. b. Hazard assessment: identify and characterize hazards, develop frequency- magnitude relationship, estimate likelihood, extent and intensity parameters for risk analysis, develop hazard maps. c. Exposure assessment: identify and characterize elements at risk with parameters that can be used to estimate vulnerability to geohazard impact. d. Develop geohazard risk scenarios to be considered in risk analysis.	
	3. Risk Analysis a. Develop risk analysis methodology (quantitative or qualitative). b. Estimate risk for geohazard risk scenarios. c. Communicate the results in an appropriate format (e.g., numerical or qualitative estimates, matrices, graphs, maps).	
	4. Risk Evaluation a. Compare the estimated risk against local or other tolerance criteria. b. Prioritize risks for risk control and monitoring.	
	5. Risk Control a. Identify options to reduce risks to levels considered tolerable by the client or governing jurisdiction. b. Select option(s) providing the greatest risk reduction at least cost. c. Estimate residual risk for preferred option(s).	
	6. Action a. Implement chosen risk control options. b. Define and document ongoing monitoring and maintenance requirements.	

C-1.3 Roles

This section describes typical responsibilities of the parties involved in development approval applications. A QRP shall enter into a professional services agreement with their client prior to undertaking work on a project. The following points shall be considered when developing a professional services agreement:

- Geohazards projects inherently have high potential liability. The agreement shall establish appropriate limitation of liability.
- The agreement shall confirm the scope and deliverables of the project.

- The agreement shall establish a budget estimate, either for hourly services, lump sum or otherwise.

The agreement shall also include a clause that deals with potential disclosure issues. In certain circumstances the professional may have to convey adverse assessment findings to parties who may not be directly involved, but who have a compelling need to know.

C-1.3.1 The Town of Canmore as the Approving Authority

The Town of Canmore's Planning or Engineering Department is the approving authority for SCRAs.

As a prerequisite for development in a steep creek hazard area, the Town may require the proponent to obtain a site-specific SCRA report by a QRP. The report may be required for the following reasons:

- to meet the requirements of the Town of Canmore *Municipal Development Plan* (MDP) and *Land Use Bylaw* (LUB) for a complete application for a development permit and to confirm appropriate conditions for any approvals;
- to ensure that the risk is acceptable for the proposed development.

The responsibilities of the Town are defined for each of the five steps of the risk management framework outlined below.

Step 1: Project Initiation

The Town has significant understanding of steep creek geohazards within the municipality. The MDP and LUB define when SCRAs are required. The Town has completed a baseline risk identification study, including steep creek hazard inventory mapping (hazard and study areas as defined in the LUB for areas of existing and potential development), and an inventory and characterization of existing development within these areas. Expectations regarding consideration of climate change in the SCRA are not yet defined and should be discussed.

Steps 2 and 3: Risk Identification and Analysis

The Town has already undertaken basin-scale SCRAs for existing development. These assessments will inform the scope of work and likely reduce the cost of site-specific SCRAs within these areas. The LUB defines steep creek hazard zones with SCRA requirements depending on where the proposed development is located within these areas.

Step 4: Risk Evaluation

The MDP establish risk-tolerance criteria against which the SCRA results can be compared. These policies consider risk-tolerance criteria for existing and proposed development, and how to manage societal risk where existing and proposed development overlap (e.g., densification).

The criteria used to measure risk are related to safety and economic cost.

1) Safety

Two metrics are used to measure safety risk:

a. Individual Risk

Individual Risk is the risk of an individual being killed in an event. Individual Risk can be assessed for persons in any given year. Individual risk takes into account the magnitude and frequency of the hazard, the location of the person exposed to the risk and the structure type for persons within buildings, and the probability of a person being present during an event. The resultant measure is referred to as the annual probability of death of an individual (PDI).

b. Group Risk

Group risk is the potential for multiple deaths in a single event. A greater number of persons exposed to the same hazard results in increased risk. As society has a very low tolerance for group risk, new development needs to be maintained within acceptable thresholds. Group risk has already been determined through the basin-scale studies completed and, therefore, does not need to be re-evaluated.

2) Economic Risk

Economic risk includes damage to building structures and damage to municipal infrastructure including roads and utilities. Other areas of economic risk that may be required to be considered include:

- cost of constructing and maintaining mitigation
- business losses
- franchise utilities
- transportation impacts
- property loss beyond damage to building structures, for example building contents and land improvements.

The Town has not established economic risk tolerance criteria. However, the annualized economic damages to building shall be minimized. Maximum annualized costs of $500/year/dwelling unit are attainable and should be targeted.

Risk analysis, vulnerability and loss estimation are described in Appendix D

Step 5: Risk Control

The Town will help define how responsibilities may be shared between the Town and the proponent in terms of individual and societal risk management. Both the steep creek hazard source and preferred risk control measures may be located upstream and outside the development area, and the risk control measures may reduce risk to a wider area than the proposed development.

Before an SCRA is initiated, the Town of Canmore shall complete the following tasks:

- Inform the proponent why a SCRA is required.
- Inform the proponent of risk-tolerance criteria, as defined in the MDP and these guidelines, that will be used to evaluate the results of the assessment.
- Identify known flood hazard information and reports relevant to the project (such as flood reports and maps) and describe how to access the documents. Provide the proponent the relevant flow data from the basin-scale hazard assessment.
- Provide the proponent with information regarding existing structural mitigation works and input on the need for additional works.

- Advise the proponent of any key policies or procedures that have the potential to affect the outcome of the assessment.
- Provide an indication of any desired interaction with the professional during preparation of the report.

After the assessment is submitted the Town will:

- Review the assessment report.
- If necessary, discuss the report with the proponent and/or professional.
- Outline any applicable next steps in the land development process.

C-1-3.2 The Proponent/Client

The proponent is the applicant for the development permit application (which from a QRP's perspective is typically also the client). The proponent shall provide the QRP with the following information for assessments carried out for development approval applications:

- process, procedures and requirements for the applicable land development application within the area of jurisdiction.
- legal description of the land parcel(s) as registered with the Land Title Office and Survey Authority, and a copy of the current land registration including any relevant restrictive covenants.
- a survey plan of the land parcel(s) and the location of the legal parcel boundary markers on the ground in digital (CAD or GIS) format.
- plans of existing buildings or structures, location of the proposed development and drawings of the proposed development in digital (CAD or GIS) format.
- assessment data about the property as typically collected for appraisal and tax purposes.
- relevant background information (written or otherwise) related to the property and the existing and proposed development, including previous assessment reports conducted for the proponent.
- unrestricted access to the property.

After a SCRA has been completed, the proponent shall complete the following tasks:

- Review the assessment report and understand the limitations and qualifications that apply.
- If necessary, discuss the report with the QRP who prepared the report and seek clarification where needed.
- Direct the QRP to complete an assessment assurance statement and provide the statement and the assessment report to the Town.
- Allow the QRP to confirm that his/her recommendations have been followed.
- Notify the QRP if land use, site development or other conditions change or vary from those described in the report.

C-1.3.3 The Qualified Registered Professional

Prior to carrying out a SCRA, a QRP shall meet the following professional responsibilities:

- Be knowledgeable about any of the applicable approval processes for the proposed land development project.
- Confirm that he/she has appropriate training and experience to carry out the assessment in view of the terrain characteristics, the type of potential flood hazard, and the type of mitigation works potentially needed.
- Understand the roles and limitations of a professional engineer vs. professional geoscientist and understand those tasks that are necessarily overlapping.
- Appropriately educate the client regarding pertinent aspects of SCRAs as clients may not be familiar with such studies.
- Consult with the Town regarding applicable regulations, available information, application of the Guidelines, role of structural mitigation works, applicability of risk assessment and requirements for development approval.
- Consider the need for the involvement of other specialists.
- Establish an appropriate mechanism for internal checking and review.
- Consider the need for independent peer review.
- Obtain a copy of any guidelines or regulations that are pertinent to carrying out an assessment and/or preparing an assessment report.

A QRP shall adhere to the following additional general professional responsibilities when conducting a SCRA:

- If necessary, assist the client in obtaining relevant information.
- Make reasonable attempts to obtain from the client and others all relevant information related to flood hazards on and beyond the property.
- Notify the client as soon as reasonably possible if the project scope and/or budget estimate requires modification.
- Write the report clearly, concisely and completely to conform to applicable guidelines and regulations.
- Ensure that the project work is subject to an appropriate checking and review by qualified personnel.
- Where appropriate, obtain an independent peer review.
- Address any significant comments arising from the reviews.
- Where appropriate, submit a draft report for client review and review by other parties.
- Review the draft report with the Town and the technical advisory staff.
- When a report recommends a significant variance from a guideline (e.g., variance of a bylaw minimum floor elevation that covers a wide area), it is strongly recommended that variance be discussed with the Town prior to final submission.
- When the project work is complete, the QRP must submit a signed, sealed and dated copy of the final report and assurance statement (Appendix D). The final report shall explicitly indicate reviews that were performed.
- Where deliverables include interactive web maps and tools, responsibilities for the format, content, and maintenance of such products will need to be negotiated with the client.

After completing a SCRA, the QRP shall carry out the following steps:

- Clarify questions the client and/or the Town may have with regards to the assessment, report, and/or assessment assurance statement.

- Carry out follow-up work if agreed with the client.

If aspects of a SCRA are delegated, they shall only be carried out under direct supervision of the QRP, who assumes responsibility for all work delegated.

The QRP shall advise the client of the potential implications if recommendations are disregarded. This is especially relevant where the QRP identifies a steep creek hazard that was previously unknown to the Town or provides the first detailed study of a known hazard.

Reviewers

The Town may use in-house experts or retain an independent QRP to provide advisory services during a SCRA, or to review a SCRA report. Such a QRP may provide advice regarding the type of SCRA that is appropriate, may informally review documents submitted by a QRP retained by a project proponent, and may provide advice on improving the local flood management approach and developing new local guidelines and regulations.

The Town or the client may also initiate an independent peer review of a report submitted by a QRP. The need for an independent peer review on behalf of the Town is determined on a case-by-case basis. If an independent peer review is being conducted, the proponent and the QRP responsible for the initial report of the review will be informed of such review. The reasons for the review will be provided and documented.

C-1.4 Common Forms of Project Organization

SCRAs for development permits are, in most cases, initiated by the Proponent. The project proponent typically retains a QRP to carry out a SCRA and prepare a report. The proponent then forwards that report in support of a development application. The SCRA report may be subject to review by the Town, occasionally with assistance by an independent professional.

In most cases the landowner or development consultant is the client, with whom the QRP establishes an agreement for professional services. The QRP should be aware reports will be reviewed by the Town, and possibly other professionals.

The client should be aware that the findings and recommendations of the QRP could result in the refusal of a development permit application by the Town, or a development proposal requiring modification. Therefore, it is more efficient if the SCRA is commenced early in the development planning process.

The role of the QRP in relation to the client and the Town shall be clearly defined. The QRP shall inform the client about land development approval processes and these guidelines, especially if the client has not previously been involved in land development or SCRAs, nor engaged a professional. In such situations, the QRP should consider reviewing with the client the typical responsibilities listed in this document. This will help to establish an appropriate agreement for professional services and to inform the client of the expectation of appropriate and adequate compensation.

C-1.5 Study Boundary

A site-specific SCRA study boundary shall be defined at the onset of a study. It may be further refined (enlarged or contracted) during the study. The initial boundary shall be delineated by a QRP by reviewing existing basin-scale hazard and risk assessment and a field visit. The boundary may need to be expanded to assess the potential for risk transfer associated with any proposed risk control measures.

C-1.6 Scope and Effort

Site-specific SCRAs are required for proposed development in hazard zones that were previously assessed at a basin-scale level of detail. Development proposals within these lands are regulated in accordance with the *Municipal Development Plan* and the *Land Use Bylaw*. These regulations require completion of a SCRA at a level of effort to be determined by a QRP in consultation with the Town and with reference to these guidelines.

Where a steep creek assessment has been prepared for a specific development, it may not be applicable to other development proposals and a higher level of assessment may be required. The assessment is specific to the type of hazard, the proposed development and local site conditions.

Site-specific SCRAs shall follow the risk assessment framework described in these guidelines and shall generally require some of the elements of previous basin-scale assessments. However, as deemed appropriate by the QRP, not all elements of previous basin-scale assessments typically apply to the site-specific assessment. As such, the perspective of the site-specific assessment is different, and the level of effort is usually substantially less than was required for baseline assessment.

When completing site-specific SCRAs, the QRP is reliant upon previous work. The QRP, client and the Town should be aware of the limitations of previous work and this should be taken into consideration when establishing the professional services agreement.

When completing a site-specific SCRA, the QRP shall identify factors that may change the level of hazard and risk compared to previous assessments, or evidence that previous assessment data and results should be updated. The following questions provide examples of factors that should be checked, but is not intended to be an exhaustive list:

- Was/were the previous basin scale SCRA(s) undertaken in accordance with these guidelines? A list of existing steep creek hazard and risk assessment reports is found in Table D2, below.
- Do conditions exist that post-date previous assessments and that necessitate updates to the baseline SCRA (e.g., new geohazard events, geomorphic changes in the upper basin such as landslides, forest fires, beetle infestations, mining activities, new development, construction of risk control measures, etc.)?
- Do site-specific hazard mechanisms exist above, at, or below the proposed development site that were not identified at the scale of previous studies? If so, should such hazard mechanisms be assessed in more detail (e.g., avulsion points or localized bank erosion and instability, encroachment of the receiving creek, or site alterations caused by the proposed development)?
- Do site-specific conditions affect hazard intensity (destructive potential) that were not identified at the scale of previous studies and should be assessed in more detail (e.g., local terrain factors or site-specific alterations that change the path, velocity or depth of flows)?
- For redevelopment of existing buildings, do the renovations change the temporal probability of building occupancy compared to what was assumed in previous studies and used as the basis for risk estimates (e.g., a change from full-time to seasonal occupancy)?
- For redevelopment of existing buildings, do the renovations change the estimated level of building vulnerability to geohazard impact compared to what was assumed in previous studies and used as the basis for risk estimates (e.g., by adding a habitable basement with windows or doors at ground level)?
- Does proposed development densification change the number of people exposed to hazard, with a commensurate increase in group safety risk?

Table C2: Available Hazard and Risk Assessment Reports

Cougar Creek reports	*Cougar Creek Debris Flood Hazard Assessment*. Final report prepared for the Town of Canmore, March 2014. BGC Engineering Inc.
	Cougar Creek Debris Flood Risk Assessment. Final (Revised) report prepared for the Town of Canmore, June 2014. BGC Engineering Inc.
Three Sisters Creek reports	*Three Sisters Creek Debris-Flood Hazard Assessment*. Final report prepared for the Town of Canmore. October 2014. BGC Engineering Inc.
	Three Sisters Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. January 2015. BGC Engineering Inc.
Stone Creek reports	*Stone Creek Debris-Flow Hazard Assessment*. Final report prepared for the Town of Canmore. January 2015. BGC Engineering Inc.
	Stone Creek Debris-Flow Risk Assessment. Final report prepared for the Town of Canmore. October 2015. BGC Engineering Inc.
Stoneworks Creek reports	*Stoneworks Creek Debris-Flood Hazard Assessment*. Final (Rev A) report prepared for the Town of Canmore. November 2015. BGC Engineering Inc.
	Stoneworks Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. September 2016. BGC Engineering Inc.
Pigeon Creek reports	*Pigeon Creek Hazard Assessment*. Final report prepared for the Town of Canmore. November 2016. TetraTech EBA Inc.
	Pigeon Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. September 2017. BGC Engineering Inc.
Stones Canyon report	*Stones Canyon Creek Development*. Level 2 Debris-Flow Risk Assessment. Final report prepared for Hillcroft Developments Ltd. October 2015. BGC Engineering Inc.
Stewart Creek report	*Stewart Creek Hazard and Risk Assessment*. Final report prepared for Three-Sisters Mountain Village Properties Ltd. July 2017. BGC Engineering Inc.

Echo Canyon Creek report	*Steep Creek Hazard and Risk Assessment: Echo Canyon Creek*. Final Report prepared for the Town of Canmore. December 2018. BGC Engineering Inc.
X, Y, Z Creeks (above Peaks of Grassi) report	*Steep Creek Hazard and Risk Assessment: X, Y, and Z Creeks*. Final Report prepared for the Town of Canmore. December 2018. BGC Engineering Inc.

C-1.7 Suggested SCRA Table of Contents

Table C3, below, provides a suggested table of contents for site-specific SCRAs required for development permit applications in hazard zones defined by the Town, based on previous basin-scale SCRAs.

This information is provided to assist a QRP in completing steps of the SCRA but should not preclude the QRP from selecting a different report structure or contents as deemed to be appropriate and acceptable to the Town. Not all items listed in the table may be relevant to all studies.

Table C3: Suggested Table of Contents for Site-Specific SCRAs

Section	Subsection	Key Items to Include
1. Introduction	1.1 Terms of Reference	• client • consultant • current property owner
	1.2 Location	• fan and creek name(s) • street address • legal address, parcel and building ID • map/figure
	1.3. Proposed Development	• Describe the proposed development (i.e., the element at risk and the vulnerability). • Describe site-specific features relevant to the risk assessment (list). • Describe proposed landscape alterations if any
2. Baseline Hazard Assessment	2.1 General	• Describe the hazard related to the site as determined in previous studies. • Assess whether additional baseline hazard assessment is required for the specific development proposal.
	2.2 Methodology	• If additional assessment required, provide hazard scenario descriptions, justification and parameters (probability, mechanisms, destructive potential or intensity). • Describe and assess any additional site-specific factors not captured by previous assessments that have implications for hazard levels and associated risk.

Section	Subsection	Key Items to Include
	2.3 Results	• hazard probability and justification • hazard intensity (destructive potential) • describe limitations and uncertainties.
3. Baseline Risk Assessment	3.1 Methodology	If additional assessment required, provide risk analysis methodology and definition of risk parameters.
	3.2 Risk Parameters	If additional assessment required, provide justifications for values assigned to risk parameters.
	3.3 Results	• individual risk estimate (PDI) • economic risk estimate • comparison to risk tolerance criteria • describe limitations and uncertainties
4. Risk Control	4.1 Proposed Risk Control Measures	If risk control measures are required, provide: • description of proposed mitigation measures; reference EDCG • description of design basis including how the design will achieve the target level of risk reduction and avoid risk transfer • drawings showing details of proposed measures.
5. Residual Risk Assessment for Proposed Development	5.1 Revised Risk Parameters	If required, provide: • hazard probability value and justification • spatial probability value and justification • temporal probability value and justification • vulnerability value and justification • elements at risk value.
	5.2 Risk Evaluation	If required, provide: • individual residual risk estimate (PDI) • economic residual risk estimate • comparison to risk tolerance criteria • describe limitations and uncertainties.
6. Conclusions		• limitations • quality assurance statement • seal and signature
7. References		• as appropriate

D. APPENDIX D: RISK ANALYSIS, VULNERABILITY AND LOSS ESTIMATION FOR SITE SPECIFIC STEEP CREEK RISK ASSESSMENTS

D-1 Introduction

Risk analysis involves estimating the likelihood that potentially damaging events will occur, impact elements at risk, and cause certain types and severities of consequences (such as loss of life or economic losses). Each of these components (event likelihood, elements at risk, consequences) is estimated separately and then combined. Although every assignment requires professional judgement, the objective is to provide a systematic, repeatable assessment with an appropriate level of detail for the information available and decisions required.

For safety risk (risk of loss of life), risk to life may be estimated for individuals and groups (societal risk). Individual risk considers the probability that a hazard scenario results in loss of life for a single individual, referred to as probability of death of an individual (PDI). Individual risk levels are independent of the number of persons exposed to risk. In contrast, group (societal) risk considers the probability of a certain number of fatalities within the hazard zone. Unlike individual risk, exposing a greater number of people to the same hazard will increase the risk.

This section defines the quantitative approach to risk analysis that has been used in previous basin-scale steep creek risk assessments (SCRAs). This approach should be used for site-specific SCRAs.

D-2 Quantitative Risk Analysis

Quantitative risk analysis (QRA) uses numerical estimates of risk parameters to calculate a probability of some level of damage or loss. Results of a QRA can be presented as a numerical estimate, in a matrix, or graphically as the cumulative probability of consequences.

Quantitative risk analysis is not inherently more accurate than more qualitative methods, and the science underpinning numerical risk estimates requires as much judgement as qualitative estimates. Numerical approaches are also not practical or appropriate in all cases. Quantitative risk analysis is best suited to situations where it is possible to define a logical event chain leading from a hazard occurrence to direct consequences. Moreover, QRA represents a powerful way to consider multiple risk scenarios, evaluate results against adopted risk tolerance thresholds or other types of risks, and measure the effectiveness of measures to reduce risk. It can also allow more transparent communication of uncertainties for each risk parameter (e.g., by the use of uncertainty bounds or ranges). Quantitative risk analysis may also be the most appropriate risk *analysis* tool even when the most appropriate way to *communicate* results is in qualitative terms. It is the preferred risk analysis method for estimating risk to life because the results can be evaluated against quantitative risk tolerance thresholds.

D-3 Geohazard Risk Scenarios

A geohazard is a geological hazard that may lead to widespread damage or risk. For the purposes of the EDCG, geohazards include flood, debris flood and debris flow. Geohazard risk scenarios previously developed during the basin-scale assessment will become the basis for risk analysis. The starting point for QRA scenario development is to divide the geohazard frequency-magnitude relationship into one or more intervals that will represent the range of event magnitudes to be assessed.

Table E1, below, lists typical geohazard scenario return period intervals used in basin-scale assessments. Together, these intervals extend across a frequency-magnitude relationship ranging from <10 to >1,000 years. The justification to assess a higher spectrum of return periods than might be typical for clear-water floods is that their typically high intensity, combined with little warning, has the potential to result in greater risk to life.

For example, the 1:30 – 1:100-year range is the incremental probability of events at least as large as a 1:30 year event, but not as large as a 1:100 year event. The bounds of the range are exceedance probabilities. For a scenario with the annual probability range P_{min} to P_{max}, the probability of events within this range would correspond to Equation D-1, below.

$$P(H)_i = P_{min} - P_{max} \quad \text{[D-1]}$$

For example, for a 1:30 – 1:100-year hazard scenario range, this would correspond to:

$$P(H)_i = \frac{1}{30} - \frac{1}{100} = \frac{1}{43}$$

When summed, the total probability of all scenarios, including no geohazard event, should equal 1 (certainty).

For the largest event considered, the scenario probability is the probability the event is at least as large as the largest event considered in the hazard analysis. However, to select an event representing the scenario, it is necessary to define an upper magnitude bound

Table D1: Geohazard Scenario Return Periods

Geohazard Scenario (Annual Return Period Interval)[1]	Probability of Scenario	Typical Representative Return Period (Years)[2]
<10	1/1-1/10 = 0.9	5([3])
10-30	1/1 – 1/30 = 0.07	15
30-100	1/30-1/100 = 0.02	65
100-300	1/100 – 1/300 = 0.007	200
300-1000	1/300 – 1/1000 = 0.002	650
1000-3000 (>1000)	1/1000 = 0.001	2000

Notes:

1. These return period intervals are not intended to preclude a Qualified Registered Professional (QRP) or an approving authority from selecting other intervals deemed to be appropriate when their use and application can be supported by a suitable level of analysis and relevant documentation.
2. e.g., return period to be modelled and used to prepare hazard intensity maps.
3. A 5-year event is shown as representative here, but for many debris flow or debris flood SCRAs, no events might be assumed to occur beyond some lower cutoff.

The scenario intervals shown in Table D1 are typical for site specific SCRAs.

Geohazard scenarios and the risk equation can also be shown on an event tree, as shown in Figure D1, below . The partial risk that a geohazard occurs, reaches the element(s) at risk when they are present in the hazard zone, and

results in consequences, can be calculated from each branch of a tree. Summing the partial risk for each branch (p_E) yields the total risk (P_E) expressed as a probability.

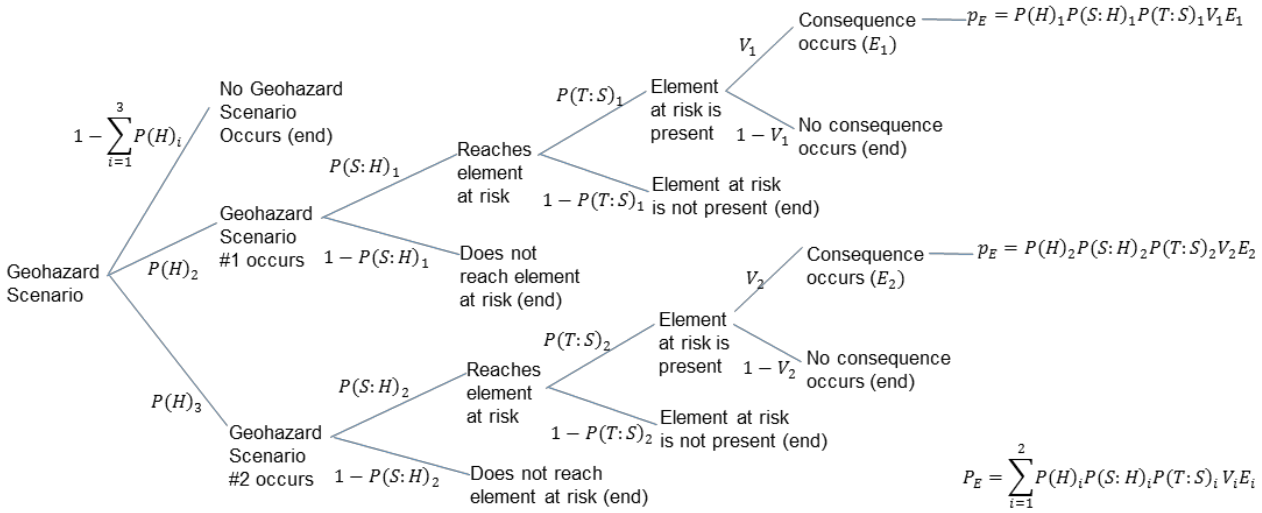


Figure D1: Generic Event Tree Showing Probability of Consequences for Two Geohazard Scenarios

D-4 Risk Equation

Risk can be quantified in terms of the following equation [D-2]:

$$P_E = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \, V_i E_i \qquad \text{[D-2]}$$

The product of the first three parameters define the encounter probability with elements at risk, where:

$P(H)_i$ is the incremental hazard probability of geohazard scenario i of n, where n is the total number of scenarios. It addresses the question, "how likely is the event"? Geohazard scenarios are commonly defined as annual frequency ranges where the bounds of a given range are exceedance probabilities (Table E1). When summed, the total probability of all scenarios, including no geohazard event, should equal 1 (certainty).

$P(S:H)_i$ is the spatial probability that, given occurrence, the geohazard would reach the element at risk. Spatial probability may need to be considered in up to 3 dimensions depending on the assessment. In the horizontal plane, it could consider the exceedance probability the hazard reaches at least as far as the element at risk (longitudinal axis) and conditional probability that, given it reaches this far, it impacts the element or passes to either side (lateral axis). In the vertical plane, it could consider the exceedance probability the process reaches at least down to a buried element such as a utility (e.g., by channel scour).

SCRAs that require analysis of spatial probability along more than one dimension can be tricky to set up, particularly for group safety risk estimation and moving elements (e.g., vehicles). Even one dimension can be challenging (e.g., when plotting debris flow runout exceedance probability contours with spatially distributed elements at risk). In relative risk analyses considering only one geohazard risk scenario, spatial probability may also be implicitly assumed in the choice of hazard probability, such as by choosing the most frequent event assumed to result in impact. The use of event trees can help identify and avoid logical errors. This component of risk analysis requires careful review.

$P(T:S)_i$ is the temporal probability that the element at risk would be in the impact zone at the time of impact. Note that this variable considers temporal components of the element at risk, not the hazard. It answers the question, "what is the chance of someone or something being in the area affected by the hazard when it occurs"? For example, it could quantify the proportion of time a person occupies a building, the probability that oil will be present within a pipeline, or the probability that moving vehicle(s) will be present in the hazard zone.

For assessment of permanent structures that are certain to be present, this variable equal 1 and may be omitted from the calculation. For non-permanent elements at risk, temporal probability may be considered from two different perspectives: the chance that a *particular* element at risk is present, or the average chance that element(s) (E_i) are present. This has bearing on analysis of individual or societal (group) safety risk, which consider risk for a particular individual or groups of (e.g., 1 or more) individuals, respectively. For example, analysis of individual safety risk for persons within buildings might assign a higher value of $P(T:S)_i$ to an individual most-at-risk (e.g., elderly or very young) who occupies the building most of the time. For analysis of group risk, an average value for building occupants could be used.

The last two parameters describe the consequences (N), where:

V_i is the vulnerability, which is the probability elements at risk will suffer consequences given hazard impact with a certain severity. For example, vulnerability for persons is defined as the likelihood of fatality given geohazard impact. For buildings, it could be defined as the level of damage, measured as a proportion of the building replacement cost or as an absolute cost.

Vulnerability estimates are typically based on criteria relating hazard intensity to a certain severity of damage or loss. Damage may have spatial or temporal components, or both (e.g., destruction level or duration of loss of function). Vulnerability criteria may be related to direct impact, or indirect outcomes of event occurrence. For example, vulnerability of persons within buildings may be estimated as an indirect outcome of building damage or collapse, using criteria related to building damage level. Vulnerability and loss estimation is further described in a section below.

Estimation of vulnerability can be subject to high levels of uncertainty, and some types of vulnerability cannot be assessed quantitatively. Consequently, the QRP should calibrate vulnerability criteria based on historic events with known damage levels at the site of assessment, if possible, or on comparable sites elsewhere. In this process, the ideal comparison is to damage generated from the same hazard type, although where not possible, known damage from another hazard type may be used as a proxy. The QRP should also document limitations on the use of vulnerability estimates. For example, criteria used to estimate average damage levels for multiple buildings may not be appropriate for site-specific vulnerability assessment of a single building.

E_i is a measure of the elements at risk, quantifying the value of the elements that could potentially suffer damage or loss (e.g., number of persons, value of infrastructure, value of loss of function, or level of environmental loss).

Risk (P_E) is determined by calculating the partial risk for each individual geohazard scenario (i) and summing the results.

The results of Equation [E-2] may be also be presented graphically on an F-N curve. The Y-axis shows the annual cumulative frequency,f_i, of each hazard scenario, and the X-axis shows the estimated consequences, N_i, where:

$$f_i = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \quad \text{[D-3]}$$

where the value of $P(T:S)_i$ is estimated for group (not individual) risk

and N_i is the product of two factors as follows:

$$N_i = V_i E_i \quad \text{[D-4]}$$

F-N curves are developed by assembling $f_i - N_i$ pairs sorted in order of increasing N, and then calculating cumulative frequency (F) to arrive at F-N pairs to be plotted.

D-5 Encounter Probability

Encounter probability is the cumulative probability that geohazard(s) occur and reach elements at risk at the time they are present:

$$P_E = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \quad \text{[D-5]}$$

Note that temporal probability ($P(T:S)_i$) may not be included for assessment of permanent structures, where it is equal to 1.

Estimating encounter probability may be helpful where:

- It can be used to demonstrate that encounter probability (and therefore risk) is negligible. For example, elements at risk could be located outside the reach of the maximum credible hazard

($P(S:H)_i \approx 0$). Or, elements at risk could be extremely unlikely to be present at the time of an event ($P(T:S)_i \approx 0$), such as for a life safety risk assessment of a very rarely occupied building.

- For relative risk estimation where vulnerability and consequences are assumed to be similar between sites. For example, this could include risk-based prioritization of different steep creek hazard areas along the same road.
- Where event impact can be assumed to cause loss of facility function, and facility function is the over-riding consideration for risk reduction. For example, debris flood impact to a critical facility, such as a care facility, could be assumed to result in closure irrespective of the destructive potential of the geohazard.

If it is demonstrated that geohazards do pose a credible threat to elements at risk, or vulnerability and consequences cannot be assumed to be similar between sites, then formal estimation of risk is preferred over estimates of encounter probability.

D-6 Vulnerability and Loss Estimation

Vulnerability is defined in the EDCG as the degree of loss of a given element at risk that results from geohazards with a certain level of destructive power. For human life loss it addresses the question, "what is the chance of fatality for persons within buildings, should the building be impacted by a geohazard?" For development, it addresses the question, "what level of direct damage will occur if the development is impacted by a debris flood or debris flow?"

Developing vulnerability criteria is a challenging component of SCRA. This section describes vulnerability criteria for buildings and persons within buildings, based on estimated levels of destructive power and resistance to impact. Description of methods to assess the vulnerability of roads and utility systems (e.g., buried infrastructure) is outside the scope of this document. Methods to assess economic vulnerability for the local or regional economy, or for temporary closure of transportation corridors, are also outside the scope of this document.

Applying vulnerability criteria requires estimates of peak flow velocity and depth during a geohazard scenario. This section refers to debris flood "intensity", I_{DF} as a proxy for destructive power related to flow velocity and depth, calculated as follows:

$$I_{DF} = (d)(v^2) \qquad \text{[D-6]}$$

where:

I_{DF} is the intensity index.

d is the modelled flow depth.

v is the modelled flow velocity.

Values of I_{DF} are typically reported without units given that it represents a proxy for intensity. Note that the above approach represents the destructive potential for only direct flow impact. It does not include other possible mechanisms of damage such as bank erosion, which may also need to be considered when estimating vulnerability.

D-7 Buildings and Occupants

The following sections describe vulnerability criteria applicable for lower and higher intensity flows. Both approaches may be required to assess hazard areas subject to variable flow intensities (e.g., debris flows on the upper fan that transform to watery after-flow and backwater flooding on the distal fan).

Low Intensity Flows (IDF<1)

Lower intensity flows are defined in these guidelines as flows on steep creeks where the intensity index (IDF) is less than one. Damages associated with these low intensity flows is typically limited to flood damage. While the possibility of fatalities can never be entirely ruled out, it may be negligible for persons within buildings except where site-specific conditions result in higher vulnerability (e.g., habitable basements, or still-water inundation at depths well exceeding a building first floor elevation). Low intensity flows are typical for low steep creek hazard zones. Therefore, flood damage can be limited by applying the design and engineering principles outlined in Section 9.3 of the EDCG.

Higher Intensity Flows (IDF>1)

Higher intensity flows are defined in these guidelines as modelled flows where IDF is greater than 1. These flows have the potential to result in structural building damage due to dynamic and static impact pressure and are considered to have credible potential to cause loss of life. Vulnerability ratings for these flows consider the likelihood of fatalities as an indirect consequence of building damage or collapse, given that persons are within the building. Intensity flows (IDF) of 1 to 10 are typical for moderate steep creek hazard zones.

Table E2 shows ranges in building structure vulnerability criteria applied in existing basin-scale SCRAs in Canmore. Table E3 shows ranges of criteria applied to estimate the vulnerability of persons within buildings to fatalities, where vulnerability is primarily an indirect outcome of building damage or collapse. These criteria are approximate averages applied to assessments completed at an alluvial fan level of detail. Unlike depth-damage curves, all building types are represented in a single set of criteria. For re-enforced concrete buildings, the lower vulnerability range is likely more appropriate. For standard wood-frame buildings and mobile homes, the mid to upper vulnerability range is likely more appropriate. The upper end of the range may also be more applicable for debris flow processes, which typically contain a higher proportion of bouldery debris than debris floods.

Group safety risk analyses of multi-unit, multi-story residential buildings should consider the difference in vulnerability for units on the ground floor versus upper floors, depending on the intensity of flow impact. For example, consider a scenario where hazard intensity is too low to result in credible life safety risk to occupants in the second or higher floor units, but there is credible threat to ground floor residents. Individual risk would consider the occupant most at risk on the ground floor. Group risk would consider the number of elements at risk on the ground floor (E_i), not the entire building population.

This simplified approach reflects uncertainties in debris flood or debris flow modelling and factors that are typically poorly known in a study, such as variations in the structure of a given building. For human vulnerability, the location and behavior of persons within the building at the time of impact is also typically not known (except for basic assumptions that may be made for populations within multi-unit buildings). These may strongly influence the actual level of vulnerability, particularly for moderate intensity debris flows (IDF = 1 to 10) that have the highest variability in building damages (Table D2).

Building structure damage and life loss vulnerability criteria due to debris flows or debris floods should be calibrated by the QRP for a given SCRA. Ranges in vulnerability estimates may be carried through the risk analysis to account for uncertainty. Comparison of risk analysis results within basin-scale assessments can help determine whether the vulnerability criteria are reasonable. For building- specific assessments, the QRP should check whether site-specific factors exist that would justify more conservative criteria, such as bedroom windows at ground floor on the upstream side of the building

Table D2: Debris Flow and Debris Flood Vulnerability Criteria for Buildings

Hazard Intensity Index (Range)	Canmore Steep Creek Hazard Zone	Building Damage Description		Building Structure Vulnerability Range[1] (Approx. Average)
		Categor	Description	
<1	Low	Slight	Low likelihood of building structure damage due to impact pressure. High likelihood of major sediment and/or water damage. Damage level and cost primarily a function of flood-related damages.	n/a[2]
1-10	Moderate	Moderate	High likelihood of moderate to major building structure damage due to impact pressure. Certain severe sediment and water damage. Building repairs required, possibly including some structural elements.	0.25 – 0.75 (0.5)
10-100	High/Extreme	Severe	High likelihood of major to severe building structure damage due to impact pressure. Certain severe sediment and water damage. Major building repairs required including to structural elements.	0.75 - 0.9 (0.8)
>100	High/Extreme	Complete	Very high likelihood of complete building structure damage or collapse. Complete building replacement required.	0.9 – 1.0 (1.0)

Notes:

1. Values indicate estimated proportion of building replacement value.
2. Stage-damage criteria are typically a more appropriate measure of damage at low flow intensities.

Table D3: Debris Flood and Debris Flow Vulnerability Criteria for Persons Inside Buildings

Hazard Intensity Index (Range)	Canmore Steep Creek Hazard Zone	Human Vulnerability Range[1] (Approx. Average)
<1	Low	~0
1-10	Moderate	~0 – 0.1 (0.05)
10-100	High/Extreme	0.1 – 0.5 (0.3)
100+	High/Extreme	0.5 – 1 (0.8)

[1] Vulnerability ratings indicate the estimated likelihood of fatalities as an indirect consequence of building damage or collapse, given that persons are within the building.

D-8 Business Activity

In many cases, it will be very difficult to determine the vulnerability of businesses to loss of function, and associated economic losses as a result of event impact. For example, a retail store could suffer loss of inventory and business function, whereas a business generating revenue elsewhere could suffer office-related damages without necessarily losing their source of revenue.

While more sophisticated models of direct and indirect economic losses are commonly developed for large scale flood assessments, such work is rarely undertaken for SCRAs due to the effort involved in relation to the relatively limited areas of impact. In the simplest case, the annual revenue of businesses potentially impacted by a geohazard scenario can be either estimated at time of development proposal or obtained from commercial data providers for existing businesses and used as a relative proxy for the "importance" of economic activity in these areas.

E. APPENDIX E: QUALITY ASSURANCE STATEMENT FOR SITE-SPECIFIC STEEP CREEK RISK ASSESSMENTS

To: The Town of Canmore
902 7th Ave, Canmore, AB
T1W 3K1

Date: _____

For the Development[1]:

_____

Legal description and civic address of the Development, and creek name

The undersigned hereby gives assurance that he/she is a *Qualified Registered Professional* and is a *Professional Engineer* or *Professional Geoscientist*.

I have signed, sealed and dated, and thereby certified, the attached *SCRA* report on the Development in accordance with the SCRA guidelines. That report must be read in conjunction with this Statement. In preparing that report I have carried out a study which has been approved by the local jurisdiction as being appropriate for the SCRA in this case.

As part of this study, I (our firm) have (check to the left of applicable items)

☐ 1. Collected and reviewed appropriate background information on the hazard and potential consequences as appropriate for this level of study

☐ 2. Reviewed the proposed development plans on the fan or the Development

☐ 3. Conducted field work on and, if required, beyond (fan/watershed) the Development

☐ 4. Reported on the results of the field work on and, if required, beyond the Development

☐ 5. Considered any changed conditions on and, if required, beyond the Development

☐ 6. Included aspects of climate change where appropriate

7. For the SCRA I have:

☐ 7.1 reviewed and characterized, as commensurate with this level of study, any hydrogeomorphic hazard that may affect the Development

☐ 7.2 quantified the hydrogeomorphic hazard as appropriate for this level of study

☐ 7.3 identified existing and anticipated future elements at risk on and, if required, beyond the Development/Fan/Channel

☐ 7.4 estimated the potential consequences to those elements at risk

8. Regarding the level of life loss risk tolerance, I have:

☐ 8.1 compared the level of risk tolerance adopted by the Town with the findings of my investigation

☐ 8.2 found that (mark as indicated)

Individual risk is: acceptable ☐, unacceptable ☐

Group risk is: acceptable ☐, tolerable☐, unacceptable ☐, N/A ☐

☐ 8.3 made recommendations to reduce hydrogeomorphic hazard risks *(where applicable as part of the scope)*

☐ 9. Reported on the requirements for future inspections of the Development/Fan/Watershed and recommended who should conduct those inspections.

I hereby give my assurance that, based on the conditions contained in the attached SCRA report, the hydrogeomorphic hazards and risks potentially subjecting the development have been appropriately and adequately characterized and quantified.

Name (print): _____ Date: _____

Signature: _____

Address: _____

_____

(Affix Professional seal here)

Telephone: _____

If the *Qualified Professional* is a member of a firm, complete the following.

I am a member of the firm _____

and I sign this letter on behalf of the firm. _____

F. APPENDIX F: PLANT SPECIES LIST

The following tables list trees (Tables F1 and F3), shrubs (Tables F2 and F4) and wildflowers (Table F5) that are native to the Province of Alberta. These plant species are acceptable for the microclimate areas of landscape planting in the Town of Canmore.

Plants in the following tables that are marked with an asterisk (*) are non-native. They are suitable for re-vegetation in natural areas, and in particular high saline areas. They are drought-resistant and ideal for boulevards.

If a plant is a wildlife attractant, the comments section of the table includes information (in brackets and marked with a double asterisk) about the species that is/are attracted to the plant. The fruit, seeds, foliage and the bark of the plant material that is a designated wildlife attractant are palatable to bears, birds and ungulates (deer/elk). These identified wildlife attractant plants should be used on a site-specific basis for remediation, reclamation, habitat enhancement and strategic planning to discourage the likelihood of human and wildlife interactions.

Table F1: Coniferous (Evergreen) Trees

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Lodgepole Pine	*Pinus contorta latifolia*	High	Low	Generally found in Sphagnum (peat) covered bogs to montane dry or moist areas. Elk may harm saplings during rutting season & during winter. (**Wildlife Attractant – Ungulates)
Limber Pine	*Pinus Flexilis*	High	Low	Generally found forming open forests in the sub alpine to alpine zones, often in semi-arid areas. Usually found on dry rocky ridges and peaks. Established plants tolerate drought. A fairly wind-resistant species, the plants often colonize exposed mountain slopes in the wild, their deep taproot anchoring them firmly. Long living species, generally not available through Nurseries. Suitable for Xeriscape.
Engleman Spruce/ aka Mountain Spruce	*Picea engelmannii*	High	Low	Generally found in the montane regions to the treeline, especially by swamps. Often found on poor, thin rocky soils, though the best specimens are growing in deep, well-drained clay-loam soils. Young growth is occasionally browsed by ungulates but is not an important food item and is probably eaten as a last resort. (**Wildlife Attractant – Ungulates)

Common Name	*Scientific Name*	Flammability	Palatability (Ungulates)	Comments
White Spruce	*Picea glauca*	High	Low	Generally found in forested areas with good soils, along streams and lakes, and on rocky hills and slopes, succeeding in a variety of soil conditions. A fairly wind-resistant tree, it can be grown as part of a shelterbelt planting. Trees should be planted into their permanent positions when they are quite small, between 30 and 90 cm. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance.
Black Spruce	*Picea Mariana*	High	Low	Generally found on cool slopes and bogs. Found on well-drained soils in the north of its range and swamps in the south. Found on a variety of soil types, it grows best in those that are moist and acidic. Moose occasionally browse saplings, but White-Tailed Deer eat it only under starvation conditions. (**Wildlife Attractant – Ungulates)
Douglas Fir	*Pseudotsuga Menziesii var.Glauca*	Medium	Medium	Generally found in moist to very dry areas from sea level to near the treeline. The best specimens are found on well-drained deep loamy soils with plenty of moisture. May be browsed when young and flexible. (**Wildlife Attractant – Ungulates)

Table F2: Coniferous (Evergreen) Shrubs

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Common Juniper	*Juniperus communis*	High	Medium	More prickly than Creeping Juniper. Suitable for Xeriscape.
Creeping Juniper	*Juniperus horizontalis*	High	Medium	Many cultivars are available. Suitable for Xeriscape.
Rocky Mountain Juniper	*Juniperus scopulorum*	High	Low	Plants have a vertical growth pattern vs. horizontal. Suitable for Xeriscape.
Kinnickinnick	*Arctostaphylos uva-ursi*	High	Low	Plants are hard to establish. Suitable for groundcover and Xeriscape. (**Wildlife Attractant - Bears)

Table F3: Deciduous Trees

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Rocky Mountain Maple	*Acer glabrum*	Low	Medium	A very attractive species. It should be available in the near future from native nurseries.
River Birch	*Betula occidentalis*	Low	Low	Tough, smaller multi-branched small tree or tall shrub.
Paper Birch	*Betula papyrifera*	Low	Low	Tree has delicate bark and needs lots of water. It is currently not available from native plant nurseries
Alpine Larch	*Larix lyallii*	Low	Low	Tree is found at tree line elevations.
Western Larch	*Larix occidentalis*	Low	Medium	This tree is native to Kananaskis. It should be available in the near future from native nurseries.
Balsam Poplar	*Populus balsamifera* (male only)	Low	High	Ungulates eat the bark of this tree. (**Wildlife Attractant – Ungulates)
Trembling Aspen	*Populus tremuloides*	Low	High	This tree is more resistant to ungulate browsing. (**Wildlife Attractant – Ungulates)
Green Ash (*)	*Fraxinus pensylvanica Lanceolata*	Low	High	Deer will browse on this tree and tend to over-browse when other preferred species are unavailable. (**Wildlife Attractant – Ungulates)
Brooks #6 Poplar (*)	*Opulus X* "Brooks #6"	Low	High	If possible, avoid non-native varieties – there is a high potential for genetic contamination of native poplars.

Table F4: Deciduous Shrubs

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Green Alder	*Alnus crispa*	Low	Medium	This shrub prefers moister sites.
Labrador Tea	*Ledum groenlandicum*	Low	Medium	This shrub has white flowers and evergreen leaves. It grows in boggy wet areas.
Twining Honeysuckle	*Lonicera dioica*	Low	Medium	This shrub has yellow flowers, and twines around other vegetation. (**Wildlife Attractant – Hummingbirds)
Bracted Honeysuckle	*Lonicera involucrata*	Low	Low	This shrub prefers damp woodlands.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Mountain Rhododendron	*Rhododendron albiflorum*	Low	Low	This shrub is a very attractive specimen, but very toxic to ungulates and humans.
Bebb's Willow / Beaked Willow	*Salix Bebbiana*	Low	High	This plant grows as a large shrub or tall tree.
Pussy Willow	*Salix discolor*	Low	High	This is an attractive larger shrub.
Smooth Willow / Gray-leaved Willow	*Salix glauca*	Low	High	This erect shrub prefers moist areas.
Shrubby Cinquefoil	*Potentilia fruiticosa*	Low	Low	This shrub produces attractive yellow flowers. It is the best choice of all the shrubs to grow in the Bow Valley area. It is not attractive to ungulates or bears and many cultivars are available. The native species has silver leaves as opposed to shiny green leaves for the cultivars.
Prickly Rose	*Rosa acicularis*	Low	High	This is an earlier flowering plant. Most commercial shrub roses are non-native varieties. This shrub is very adaptive to different locales.
Common Wild Rose / Western Wild Rose	*Rose Rosa woodsii*	Low	Medium	This rose is generally found in areas of moist soils of draws, hillsides, along streams and in open valleys. It often forms thickets in open positions and prefers moist woods. It flowers a bit later then Prickly Rose. It succeeds in most well-drained soils, preferring a circum-neutral soil and a sunny position. It also grows well in heavy clay soils, but dislikes water-logged soils. (**Wildlife Attractant – Bears)
Meadowsweet / Birch Leaved Spiraea / White Spiraea	*Spiraea betulifolia*	Low	Low	This shrub is found on stream banks/ lake shores, open to wooded valleys and hillsides often in rockslides from the foothills to subalpine zones. It has showy white flowers.
Common Snowberry	*Symphoricarpos albus*	Low	Medium	This shrub tends to colonize. It is a good tall ground cover. It grows in shady and moist mountain and forest habitat, in woodlands and on floodplains and riverbanks from the foothills to subalpine zones. (**Wildlife Attractant – Bears, Ungulates and Birds)

Table F5: Wildflowers

Common Name	Scientific Name	Comments
False Dandelion	*Agoseris glauca*	This plant has a yellow flower and looks like a Dandelion with long narrow leaves. It blooms mid-summer. It prefers full sun and a sandy or gravelly loam low in nutrients.
Nodding Onion	*Allium cernuum*	This plant cannot grow in the shade. It requires moist soil and can tolerate drought. (Deer-resistant; members of this genus are rarely if ever troubled by browsing deer.)
Wild Chives	*Allium schoenoprasum*	An easily grown plant, it prefers a sunny position in a rich moist but well-drained soil, though it succeeds in most soils. It can grow in semi-shade (light woodland) or no shade. (A good bee plant, members of this genus are rarely if ever troubled by browsing deer.)
Pearly Everlasting	*Anaphalis margaritacea*	This plant prefers a light, well-drained soil and a sunny position. It succeeds in most soils, including poor ones. (Plants seem to be immune to the predations of rabbits.)
Fairy Candelabra / Pygmy Flower	*Androsace septentrionalis*	This plant has white flowers and blooms very early.
Cut-leaved Anemone / Wind Flower	*Anemone multifida*	This plant succeeds in ordinary garden soil but prefers a moist, well-drained woodland peaty soil in some shade. It tolerates drought during its summer dormancy. A greedy plant, it inhibits the growth of nearby plants, especially legumes. (Plants seem to be immune to the predations of rabbits.)
Prairie Crocus / Pasque Flower	*Anemone patens*	This plant requires a well-drained, humus-rich, gritty soil and a sunny position and is lime-tolerant. It is a very ornamental plant. Large plants transplant badly. A greedy plant, it inhibits the growth of nearby plants, especially legumes. It cannot grow in the shade. It requires moist soil.
Lowly Everlasting / Small-Leaved Everlasting / Nuttal's Pussytoes	*Antennaria parvifolia* *Aka : nitida*	This plant has white flowers and grows as an herb mat. It blooms early summer.
Showy Everlasting	*Antennaria pulcherrima*	This plant has white flowers and blooms mid-summer.
Rosey Everlasting / Rosey Pussytoes	*Antennaria rosea*	This plant has pink flowers and blooms mid-summer.
Blue Columbine	*Aquilegia brevistyla*	This plant succeeds in ordinary garden soil, preferring a moist but not wet soil and a sunny position. A greedy plant, it inhibits the growth of nearby plants, especially legumes. (Plants seem to be immune to the predations of rabbits.)
Yellow Columbine	*Aquilegia flavescens*	This plant succeeds in ordinary garden soil, preferring a moist but not wet soil and a sunny position. It is intolerant of heavy clay. It is a very ornamental plant. A greedy plant, it inhibits the growth of nearby plants especially legumes. (Plants seem to be immune to the predations of rabbits.)

Common Name	*Scientific Name*	Comments
Heartfelt Arnica	*Arnica cordifolia*	This plant is found in woodland garden setting with sunny edges. It prefers a moist, well-drained, humus-rich soil, preferably lime-free, and prefers a mixture of sand, loam and peat. It can grow in semi-shade (light woodland) or no shade. The whole plant is toxic.
Pasture Sagewort / Fringed Wormwood	*Artemisia frigida*	This plant requires a sunny position and a well-drained soil that is not too rich. Established plants are very drought tolerant. Plants are longer lived, hardier and more aromatic when they are grown in a poor dry soil. It is a very ornamental plant. (Members of this genus are rarely if ever troubled by browsing deer.)
Prairie Sage	*Artemisia ludoviciana*	This plant requires sun and dry soil conditions. It shows silvery, silky foliage
Alpine Aster	*Aster alpinus*	This plant has purple flowers and blooms in the late summer.
Smoothing Aster	*Aster laevis*	This plant has purple flowers and blooms in the late summer.
Arctic Aster	*Aster sibiricus*	This plant has purple flowers and blooms in the late summer. Although basically an alpine plant, Arctic Aster can be found on gravely river flats and other rocky areas.
Indian Milk Vetch	*Astragalus aboriginum*	This plant has yellowish white flowers and blooms in the early summer. It requires a dry, well-drained soil in a sunny position. Plants are intolerant of root disturbance and are best planted in their final positions whilst still small. This species has a symbiotic relationship with certain soil bacteria. Many members of this genus can be difficult to grow; this may partly be due to a lack of their specific bacterial associations in the soil. This plant can fix Nitrogen.
Timber Milk Vetch	*Astragalus Miser a.k.a - A. decumbens*	This plant has purplish flowers and blooms mid-summer. It is very common in Lodgepole Pine forests. (It is very toxic to ungulates.)
Ascending Purple Milk Vetch / Standing Milk Vetch	*Astragalus striatus a.k.a. – A. adsurgens*	This plant has purple flowers and blooms early June.
Bluebells / Harebells	*Campanula rotundifolia*	A very easily grown plant, it succeeds in most fertile, well-drained soils though it prefers a moist but well-drained rich sandy loam and a neutral or alkaline soil in sun or partial shade. It succeeds in poor soils. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)

Common Name	*Scientific Name*	Comments
Yellow Indian Paintbrush	*Castilleja accendalis*	Paintbrush (Castilleja) is one of the most abundant and variable plants within the Canadian Rockies. The much-branched rootstock is a root-parasite, which makes transplanting the Paintbrush to a home garden almost impossible. There are at least ten species of Paintbrush in the southern Canadian Rockies. Their identification can be frustrating even for botanical experts. The many hues of the Paintbrush dominate well-drained slopes and rocky edges, from low elevations to alpine meadows. This plant species prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil. The Red Indian Paintbrush is the Town of Canmore's Official Flower.
Red Indian Paintbrush	*Castilleja mineata*	
Pink Indian Paintbrush	*Castilleja c. raupii*	
Alpine Paintbrush	*Castilleja rhexifolia*	
Field Chickweed / Mouse eared Chickweed	*Cerastium Arvense*	This is an abundant species that grows in meadows, sandy or gravely places and on rocky slopes scattered across the boreal forest.
Golden Aster	*Chrysopsis villosa*	This plant prefers dry sandy soil with full exposure to the sun.
Blue Clematis	*Clematis accidentalis*	This plant likes shade to part sun, and moist to well-drained soil. It produces blue flowers with a vine that creeps up trellis or tree or spreads on the ground.
Bunchberry	*Cornus canadensis*	This plant succeeds in any soil of good or moderate fertility. It prefers a damp soil and can grow in semi-shade (light woodland) or no shade. It is a good dense ground cover plant, growing well in light woodland.
Low Larkspur	*Delphinium bicolor*	Growing from prairie meadows to alpine ridges, this strikingly handsome plant blooms from May to July, depending on elevation. Low Larkspur is poisonous to cattle, particularly in early spring.
Tall Larkspur	*Delphinium glaucum*	This plant prefers a rich moist but well-drained soil and dislikes waterlogged soils. It requires an open sunny position. A greedy plant, it inhibits the growth of nearby plants especially legumes. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires moist soil.
Mountain Shooting Star	*Dodecatheon conjugens*	This plant prefers a moist, rich, well-drained soil and some shade. It prefers woodland conditions or a cool moist shady border. Plants prefer a dry period when dormant in the summer. Shooting Star grows easily from seed and it will readily seed itself in future years.
Shooting Star	*Dodecatheon pulchellum*	This plant prefers a moist, rich, well-drained soil and some shade. It prefers woodland conditions or a cool moist shady border. Plants prefer a dry period when dormant in the summer. Shooting Star grows easily from seed and it will readily seed itself in future years.

Common Name	*Scientific Name*	Comments
Yellow Mountain Avens / Yellow Dryad	*Dryas drummondii*	This plant is a common pioneer on gravel flats, rocky slopes, and roadsides in the montane zone. It flourishes in sunny, well-drained situations and makes an interesting and unusual rock garden plant. It is suitable for groundcover and Xeriscape.
White Mountain Avens	*Dryas octopetala a.k.a. hookeriana*	This plant is easily grown in ordinary gardening soil, preferring a sunny position and limestone soils. It prefers a gritty well-drained peaty soil. It is a good plant for a rock garden, and it succeeds on banks and on walls. A very ornamental plant is suitable for groundcover and Xeriscape.
Fireweed	*Epilobium angustifolium*	This easily grown plant prefers a well-drained but moisture retentive soil in a sunny position, though it succeeds in most soils. It spreads vigorously by means of a creeping rhizome, and often forms large patches. It is apt to become a weed especially through its seed, which is very light and capable of travelling long distances in the wind. It is a good bee plant.
Mountain Fireweed / River Beauty	*Epilobium latifolium*	This plant prefers a well-drained but moisture retentive soil in a sunny position but succeeds in most soils. The roots are somewhat spreading and can become invasive.
Tufted Fleabane	*Erigeron caespitosus*	This plant grows in rocky soils from moderate elevations to the alpine zone.
Cut-Leaved Fleabane / Compound–Leaved Fleabane / Daisy Fleabane	*Erigeron compositus*	This plant grows in rocky soils from moderate elevations to the alpine zone.
Smooth Fleabane	*Erigeron glabellus*	This plant is generally found in moist prairies, meadows and open woods. It prefers a moderately fertile well-drained soil in a sunny position and does best in a sandy dry soil but will succeed in fairly heavy soils. It is a good butterfly and moth plant. It succeeds in very exposed positions. There are some named varieties selected for their ornamental value. Very few members of this genus will hybridize with other members of the genus. This plant does well in the border areas or in a rock garden.
Umbrella Plant / Sulphur Buckwheat	*Eriogonum umbellatum*	The plant is widely distributed on exposed sites from low elevations to alpine ridges.

Common Name	*Scientific Name*	Comments
Wild Strawberry	*Fragaria virginiana*	Wild Strawberry is common from the montane to the alpine region, but while it blooms profusely in the subalpine and alpine region, it frequently does not set fruit because of the cold nights and short growing season. It prefers a fertile, well-drained, moisture retentive soil in a sunny position. Plants tolerate semi-shade though fruit production will be reduced when plants grow in such a position. The plants appreciate a mulch of pine or spruce leaves. The fruit is eaten by a number of birds and mammals, so caution should be taken with placement. (**Wildlife Attractant – Bears & Birds)
Gaillardia / Indian Blanket / Blanket Flower / Brown-Eyed Susan	*Gaillardia aristata*	This plant requires a position in full sun and will succeed in any moderately fertile well-drained soil. It performs well in poor soils and copes well with hot dry conditions. It requires winter protection, especially in areas experiencing heavy snows. Covering the plants with brush wood should be enough. (Members of this genus are rarely if ever troubled by browsing deer.)
Northern Bedstraw	*Gallium boreale*	This plant prefers a loose moist leafy soil in some shade. It tolerates dry soils but the leaves quickly become scorched when growing in full sun. This species does not thrive in a hot climate. The seed can be sown in spring though it may be very slow to germinate. This plant does not really need any help to reproduce itself. Division can be done in spring or throughout the growing season if the plants are kept well-watered. This is a very easy plant, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well and then plant them out in the spring.
Felwort / Northern Gentain	*Gentianella amarella*	This plant requires a damp humus-rich soil and should be planted in a situation approaching its native habitat. An aggregate species, individual plants may show unusual features and determinations should be based on small samples of the population. The plant prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil.
Fringed Gentian	*Gentianella crinata*	This plant is found in moist meadows, shores and calcium-rich ferns, occasional in southern boreal forest and parkland of prairie provinces. It grows best in moist areas, blooms in the late summer with purple flowers and is difficult to propagate.
Wild White Geranium	*Geranium richardsonii*	This is one of the most appealing plants found in aspen glades along the lower slopes of the mountains. It succeeds in any moderately fertile retentive soil in a sunny position. It tolerates a wide range of soil types, succeeding in dry soils. It grows well on woodland edges. The whole plant has an unpleasant aroma; the foxy smell is particularly pronounced after rain. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)

Common Name	*Scientific Name*	Comments
Sticky Purple Geranium	*Geranium viscosissimum*	This plant is found in open woods and meadows. It is plentiful in medium-dry to moist or even wet soils of open woods, roadsides, creek banks and meadows to an elevation of 2,700 m. It succeeds in any good soil in sun or partial shade. Plants are hardy to about -25°C. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)
Prairie Smoke / Old Man's Whiskers / Three-flowered Avens	*Geum triflorum*	This plant is easily grown in any moderately good garden soil that is well drained. It prefers a soil rich in organic matter and a rather damp soil. Plants are hardy to about -20°C. This plant hybridizes freely with other members of this genus.
Alpine Hedysarum	*Hedysarum alpinum*	This plant is easily grown in ordinary garden soil in a sunny position, preferring a deep well-drained sandy loam. Plants strongly resent root disturbance and should be placed in their permanent positions as soon as possible. This plant has poisonous seeds.
Northern Hedysarum / Sweet Vetch	Hedysarum boreale	This plant is easily grown in ordinary garden soil in a sunny position, preferring a deep well-drained sandy loam. Plants strongly resent root disturbance and should be placed in their permanent positions as soon as possible. Great care is needed if moved since the plant dislikes root disturbance.
Yellow Hedysarum / Yellow Sweet-vetch	*Hedysarum sulphurescens*	This unmistakable plant grows in dense clumps along stream banks, in moist woods and occasionally in alpine sites. It is a very important food plant for grizzly bears, which eat the roots in spring and fall. (**Wildlife Attractant – Bears)
Beautiful Sunflower	*Helianthus laetiflorus*	This plant likes sun to light shade and well-drained soil.
Richardson's Alumroot	*Hencheria richardsonii*	This plant prefers sun to light shade and well-drained soil. It produces pink/purple flowers.
Cow Parsnip	*Heracleum lanatum*	This plant is found in areas of rich damp soils of prairies and mountains, especially along streams and in open woods. This species does best in woodland gardens with dappled shade, at a shady edge or in deep shade. It succeeds in any ordinary garden soil, doing best in moist soils or deep woodland.
Yellow Peavine / Cream Coloured Vetchling	*Lathyrus ochroleucus*	This plant prefers areas of dry or moist woods, slopes and rocky banks. An easily grown plant, it succeeds in any moderately good garden soil but prefers a position in full sun. The plant prefers well-drained acidic, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil. It may not transplant well so care should be taken when moving it.

Common Name	*Scientific Name*	Comments
Western Wood Lily / Tiger Lily	*Lilium philadephicum*	This lily prefers heavy, often somewhat alkaline, meadows to montane forest. It is usually found in drier woodlands on acid sandy loams and requires a well-drained humus-rich soil and a cool moist root run. It likes a warm position with moisture in summer. Plants are rather difficult to establish. A very ornamental plant, it requires protection from rain in winter. The plant should be protected against rabbits and slugs in early spring. If the shoot tip is eaten out, the bulb will not grow in that year and will lose vigor.
Twinflower	*Linnaea borealis*	This plant prefers acid soils and can grow in very acid soil. It can grow in full shade (deep woodland) or semi-shade (light woodland) and requires moist soil. It prefers a rather shaded position in a rock garden in a moist peaty soil. It grows well in pine woods. Plants can be rather difficult to establish.
Wild Blue Flax / Western Blue Flax	*Linum lewisii*	This plant is found in calcareous grassland and prairies to alpine ridges, usually on dry well-drained soils in western North America. It prefers a light, dry, well-drained, moderately fertile, humus-rich soil in a sunny sheltered position. It prefers an alkaline soil. It is a very ornamental plant that is not generally very long-lived, though it normally self-sows freely. Established plants are drought tolerant and suitable for Xeriscape.
Yellow Puccoon / Woolly Gromwell / Western	*Lithospernum ruderale*	This plant is found in open, fairly dry places from the foothills to moderate elevations. It prefers a sunny position in a moderately fertile, well-drained soil. It does well in cultivated beds. I should be planted out into permanent positions in late spring or early summer, after the last expected frosts.
Blunt- Leaved Sandwort	*Moehringia lateriflora*	This plant is found in moist meadows, shorelines, thickets and woods.
Wild Bergamot / Horse Mint / Bee-Balm	*Monarda fistulosa*	This plant is found in dry thickets, clearings and woodland edges. It is easily grown in ordinary garden soil so long as it is not too dry, it also grows well in heavy clay soils. It generally requires a moist soil and a sunny position, though it also succeeds in light shade. This species will thrive when grown in a dry soil. It is a very ornamental plant and a good bee plant.
Alpine Forget-me-not	*Myosotis alpestris*	This plant is generally found growing in damp woodlands and meadows, usually on basic rock formations. It prefers a well-drained, gritty soil. The flowers are deliciously fragrant in the evening and nighttime though there is little or no scent in the daytime. It can be used in a woodland garden along the sunny edge and can tolerate dappled shade or be placed along a shady edge or within a bog garden. (Members of this genus are rarely if ever troubled by browsing deer.)

Common Name	*Scientific Name*	Comments
Reflexed Locoweed	*Oxytropis deflexa*	This plant is found in open woods, moist thickets, banks, shores and gravel bars. Many Locoweeds including Reflexed Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.
Early Yellow Locoweed / Silk Locoweed	*Oxytropis sericea*	This plant is found in dry prairies, calcareous gravels and bluffs. It is easily grown in an ordinary garden soil but prefers a sandy loam. It does best in a deep, gritty perfectly drained soil in full sun and can be used in cultivated beds. The plant strongly resents winter wet. It is a very ornamental and variable plant.
Showy Oxytropis / Showy Locoweed	*Oxytropis splendens*	This plant is generally found in open woods, clearings and riverbanks common in prairie and parkland, occasional in boreal forest. An attractive legume, this boldly handsome plant is widely distributed throughout low-elevation grasslands.
Late Yellow Oxytropis / Late Yellow Locoweed	*Oxytropis campestris [O. monticola*	This is a highly variable species and is common on the prairies and in open woodland. Many Locoweeds including Late Yellow Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.
Viscid Locoweed	*Oxytropis viscida*	This is a highly variable species and is common on the prairies and in open woodland. Many Locoweeds including Viscid Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.
Silky Scorpionweed / Silky Phacelia / Mountain Phacelia	*Phacelia sericea*	This perennial graces open slopes, screes and rock crevices at high altitudes.
Shrubby Beardtongue	*Penstermon fruiticosus*	This plant likes the sun and is found on dry gravely slopes or rocky sites. It grows as a dense shrub that creeps across the ground. Penstemon species are often used in xeriscape landscaping, as many are native to desert or alpine regions and thus quite hardy.
Yellow Beardtongue / Yellow Penstemon	*Penstemon confertus*	This plant is found in fairly moist, open or wooded places, often in meadows or by streams, in lowland and foothills to moderate elevations in the Rockies. It succeeds in ordinary rich garden soil so long as it is well-drained. It succeeds in dry soils and requires a position in full sun. It is very cold hardy, but some protection from winter wet is beneficial for this plant. Plants are evergreen in mild winters. This plant is recommended to be used in cultivated beds.

Common Name	*Scientific Name*	Comments
Slender Penstemon	*Penstemon procerus*	This plant is native to western North America where it grows in mountain habitat such as meadows, often in alpine climates. It likes sun and prefers dry to well-drained soil. The plant's inflorescence is made up of one or more clusters of tubular flowers with lipped, lobed mouths. Each flower is no more than one centimeter long and is purple to blue in color, often with a white throat.
Jacob's Ladder	*Polemonium pulcherrimum*	A very easily grown plant, it prefers a moist, well-drained, fertile soil in sun or semi-shade. Plants are fairly short-lived in cultivation unless they are divided regularly and moved to fresh soil. (Cats are strongly attracted by the smell of this plant and will frequently roll on it and injure it.)
White Cinquefoil	*Potentilla arguta*	This plant thrives in full sun to partial shade. It is drought tolerant but will tolerate seasonal moisture in a well-drained site. It produces pale yellow flowers throughout the summer that resemble strawberry blossoms. It is preferred by butterflies. The plant has great fall colours. (**Wildlife attractant – Ungulates)
Silverweed	*Potentilla anserina*	Silverweed is found at lakeshores, riverbanks and damp meadows in ditches and moist calcareous soils. It is a common weed of cultivation. It can be utilized in woodland gardens along the sunny edge and can handle dappled shade. I can also be sown into lawns and open meadows and can be used in cultivated beds. These attractive perennials transplant well to rock gardens and borders but are notorious for reaching out to cover new ground.
Graceful Cinquefoil	*Potentilla gracilis*	This plant is found in open woods, grasslands and waste places. It is widespread across southern boreal forest and parkland.
Yellow Rattle / Rattlebox	*Rhinanthus minor a.k.a R. crista-galli*	This plant can be grown in a meadow and is useful when establishing wildflower meadows. If planting wildflower plugs into existing grass, success is improved by reducing immediate competition while the wildflower establishes itself. This can be achieved by raking Yellow Rattle seed (Rhinanthus minor) into the grass in spring or autumn. This plant is a semi-parasite on grass and once established it will reduce the vigor of the original grass by up to 50%. All ancient meadows have this plant.
Spotted Saxifrage	*Saxifrage bronchialis*	This plant grows in rocky openings on cliffs, scree, crevices, in subalpine and alpine areas. It likes sun to part shade and dry soil conditions. It is a great plant for rock gardens.
Lance Leaved Stonecrop	*Sedum lanceolatum*	This plant is native to western North America and is found throughout western Canada and the United States. It grows in exposed, rocky mountainous habitat at moderate and high elevations, up to 4,048 m in the Rocky Mountains. The plant's inflorescence is made up of one or more erect arrays of several flowers. The flowers have yellow petals sometimes tinged with red, each lance-shaped petal just under a centimeter long. It likes sunny, dry, rocky sites.

Common Name	*Scientific Name*	Comments
Groundsel	*Senecio spp.*	This plant is often found growing in loose sprawling clumps on scree slopes of the alpine or subalpine zones.
Prairie Groundsel / Woolly Groundsel	*Senecio canus*	Although this plant is typical of the prairies, it may be found in dry and exposed sites almost to timberline.
Balsam Groundsel / Canadian Groundsel / Canadian Butterweed	*Senecio pauperculus*	This plant is found in moist open woods, meadows, stream banks, lake shores and roadsides. It is widespread across boreal forest and parkland. It generally grows on shores, in moist to dry meadows or open coniferous forest.
Moss Campion	*Silene acaulis*	This plant is generally found in Arctic regions and is also found further south on mountains in North America, situated on mountain ledges and scree. It is easily grown in a light soil in full sun, doing best on a moraine. It prefers a cool climate and plants can be difficult to bring into flower in the garden. Plants form a rooting carpet and can be grown as a ground cover when planted about 25 cm apart each way. Established plants are drought tolerant and good for Xeriscape.
False Solomon's-Seal / False Spikenard	*Smilacina racemosa*	This lovely plant is found in moist to dry open woodlands, open meadows, riverbanks and lakeshores. Widespread across the Bow Valley region.
Star-Flowered False Solomon's Seal	*Smilacina stellata*	Found in moist to dry open woodlands, open meadows, riverbanks and lakeshores. It is widespread across the Bow Valley region.
Canadian Goldenrod	*Solidago canadensis*	This plant is generally found in dry to damp thickets, on roadsides, slopes and clearings. It avoids acid soils and succeeds in any moderately fertile, moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The flowers attract butterflies and moths. The plant also attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden. It can be used in a woodland garden at the sunny edge with moderate dappled shade.
Missouri Goldenrod / Low Goldenrod /Prairie Golden Rod	*Solidago missouriensis*	This plant is found in the dry prairies, gravels and rocky slopes. It succeeds in any moderately fertile, moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The plant attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden.
Mountain Goldenrod / Spike–like Goldenrod / Coast Goldenrod	*Solidago spathulata a.k.a S. deumbens*	This plant succeeds in any moderately fertile moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The plant attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden.

Common Name	*Scientific Name*	Comments
White Meadowsweet	*Spirea betulifolia*	This plant is found in open, dry to moist forests and rocky slopes. It is easily grown in average, medium, well-drained soils in full sun. It tolerates a wide range of soils. Specimen or group plant for rock gardens. Mass or group plant in shrub borders. It can be grown as a low hedge for paths and walkways. It incorporates well into foundation plantings.
Long-stalked Chickweed / Long-stalked Starwort	*Stellaria longipes*	This plant is generally found in dry to moist open areas and woodlands. It is widespread throughout the Bow Valley region, northwards and upwards (elevation) into tundra and is circumpolar. This plant inhabits exposed rocky ridges and slopes within the alpine zone. Several species of Chickweed are found in the Canadian Rocky Mountains. They are not always easily identified because they tend to be highly variable.
Blue-Eyed Grass	*Sisyrinchium montanum*	This plant is generally found on moist slopes and meadows. It is widespread across the Bow Valley region. It prefers a moist but well-drained, humus-rich, loamy soil and a position in full sun, though it will tolerate part-day shade.
Western Meadow Rue	*Thalictrum occidentale*	Western Meadow Rue is common and widely distributed in moist woods, thickets, meadows and along streams.
Veiny Meadow Rue	*Thalictrum venulosum*	This Rue is generally found in moist prairies, thickets and open woods. It is fairly common across the Bow Valley region.
Golden Bean	*Thermopsis rhombifolia*	This is one of the most striking and colourful early spring flowers. It usually grows in large patches from running rootstock. The plant is common in dry, sandy grasslands.
Wild Vetch	*Vicia americana*	This plant is generally found in damp or gravelly slopes, thickets and meadows. It succeeds in any well-drained soil in a sunny position if the soil is reliably moist throughout the growing season, otherwise it is best grown in semi-shade. It is a climbing plant that attaches itself to supports by means of tendrils. This species has a symbiotic relationship with certain soil bacteria; these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is used by the growing plant but some can also be used by other plants growing nearby. It can be used in cultivated beds.
Early Blue Violet	*Viola adunca*	This plant is found on damp banks and edges of meadows in most forest communities, at elevations of 1,500 to 2,400 m. It prefers a cool, moist, well-drained, humus-rich soil in partial or dappled shade and protection from scorching winds. It tolerates sandstone and limestone soils but becomes chlorotic if the pH is too high and prefers a pH between 6 and 6.5. It works well in a woodland garden along the sunny edge but will tolerate dappled shade and will also do well at the shady edge of the garden.

Common Name	*Scientific Name*	Comments
Western Canada Violet	*Viola Canadensis a.k.a V. rugulosa*	This plant is found in rich soils in deciduous woods and forests in the mountains. It is easily grown in any fertile soil in full sun or partial shade. It prefers a cool position in a moist, well-drained, humus-rich soil in partial or dappled shade and protection from scorching winds. It tolerates sandstone and limestone soils but becomes chlorotic if the pH is too high and prefers a pH between 6 and 6.5. It works well in a woodland garden along the sunny edge but will tolerate dappled shade and will also do well at the shady edge of the garden.
White Camas / Mountain Death Camas	*Zigadenus [Zygadenus] elegans*	This plant is generally found in open woods and damp open meadows from low elevations to alpine areas and is widespread across the Bow Valley region. Like other members of this genus, White Camas contains an alkaloid and all parts can be poisonous to humans and grazing animals.
Heart-Leaved Alexander / Meadow Parsnip	*Zizia aptera*	This member of the carrot family is most likely found in damp/moist meadows, stream banks, and low ground areas up to timberline across the Bow Valley region. It requires a moist soil and a position in full sun. It is suitable for the wild garden and other informal plantings as well as collections of native wildflowers and can be utilized in a woodland garden placed along the sunny edge.

Wildflower Notes:

- Flammability: Most wildflowers have a low flammability rating.
- Wildlife: Many wildflowers are eaten by ungulates. Fruits may be eaten by birds, rodents or bears. Bears will dig up roots and corns of some members of the pea, lily and Purslane families.
- Deer Resistant Wildflowers: If deer are very hungry, they will eat just about anything. This is especially true during extreme weather conditions such as droughts or severe winters. The identified deer-resistant plants are very low on their list of favourite foods.

G. APPENDIX G: CONSTRUCTION MANAGEMENT PLAN

Construction Management Plan (CMP) Guidelines

(As a reference source to developers and builders)

When a construction management plan (CMP) is required as part of a subdivision servicing agreement or development agreement or development permit application (in which case the CMP is to be **provided prior to construction**), it must be specific to the proposed development and address the following issues, as applicable:

Outlining how the developer proposes to mitigate the adverse effects of construction and deal with such items as:

1) the stockpiling and temporary storage of excavation materials;
2) stockpiling and laydown areas for construction materials;
3) parking for contractor and employee vehicles;
4) access for construction vehicles and/or equipment;
5) access for emergency vehicles;
6) permanent location of disposal of excess excavation materials (if any);
7) dewatering and disposing of groundwater (if required);
8) controlling storm water runoff, minimizing erosion and off-site transport of sediment and deposition of sediment in storm sewers;
9) screening and storage of supplies and building materials;
10) site fencing and access control to protect public safety;
11) fencing or other approved methods of preservation of existing vegetation within setback and non-disturbance areas;
12) noise, litter, dust and mud control and mitigation, including vehicle baths at the site entrance (see: Erosion and Sediment Control plan below);
13) Spill response plan;
14) weed control (if the project is of sufficient duration);
15) reduction of construction waste through segregation, re-use and recycling;
16) haul routes to maximize use of established truck routes (see Figure A) and to minimize impact on adjacent streets;
17) methods to prevent access and damage to adjacent municipal properties (i.e. parks, municipal and environmental reserves, PUL's);
18) signage to indicate 24/7 emergency contact telephone numbers;
19) management of concrete truck wash-out;
20) demonstrate that Provincial and Federal regulations in regards to Migratory Birds are respected when tree clearing is proposed;
21) dedicated animal proof waste containers for food waste;
22) management of wildlife encounters;
23) sanitary facilities;
24) muster stations;
25) Contact list including contractor, Engineer and Emergency contacts.
26) identification and location of overhead cranes, their swing radius and crane swing limitations (No Fly Zones);
27) location of limits of excavation adjacent to roads or laneways and proposed means of protection (i.e. concrete Jersey barriers or engineered extensions of the shoring piles)
28) location of street and sidewalk closures expected to last longer than three weeks

Prior to Construction, the Developer shall submit a comprehensive and detailed photo record of existing Municipal Infrastructure including the date of capture. This record will be used to resolve disputes regarding damage to existing infrastructure.

In addition, the Developer, should provide a written commitment by signing below, to indicate that they have read and understand the related articles of the Development Agreement or Subdivision Servicing Agreement as applicable to the development, and the contents of Bylaw 15-2001, and will not:

a) place any building materials, building tools, machinery, or construction device on;
b) park, leave, stand or station a mobile crane or other mobile building construction machine on;
c) load or unload material, machinery or equipment of any kind used in connection with a building operation of any nature upon; or
d) leave standing a portable garbage container on any portion of a Public Roadway or Public Lands unless separate application has first been made to, and approval has been granted by the Town for a Road Use or Excavation & Road Use Permit in accordance with Bylaw No. 2020-03.

and

Submit Erosion and Sediment Control documentation in accordance with the City of Calgary standards.

and

No Person shall, during the process of Construction Activities at a Construction Site or demolition at a Demolition Site, cause or allow to be caused, any damage to Municipal Improvements or Municipal Lands.

No Person shall operate, or allow to be operated, a Vehicle on any street, lane, sidewalk or Municipal Lands, as part of Construction Activities or demolition, in a manner that causes, or allows the causing of damage to Municipal Improvements or Municipal Lands.

Any work or works conducted on Municipal Improvements or Municipal Lands (including service connections, extensions, installations, repairs, upgrades and rehabilitation of Municipal Lands) as part of Construction Activities approved by the Town through a Development Permit or Building Permit, shall be done to the satisfaction of the Town and in accordance with the Town of Canmore Engineering Design Guidelines, Construction and Landscaping Standards, or other directions that may be provided in writing by the Town.

The Construction Management Plan submitted shall be followed through all stages of construction. If Town Bylaws are being violated or if the accepted Construction Management is not being adhered to, a Stop Work order will be delivered without warning and all construction shall cease until all violations have been rectified to the satisfaction of the Town of Canmore.

I have read and understand the above requirements and will abide by these requirements:

_____	_____	_____
Signed	Name	DP Number
_____	_____	
Phone Contact	Date	

_____

Agent for:

_____

Site Address and Legal Description

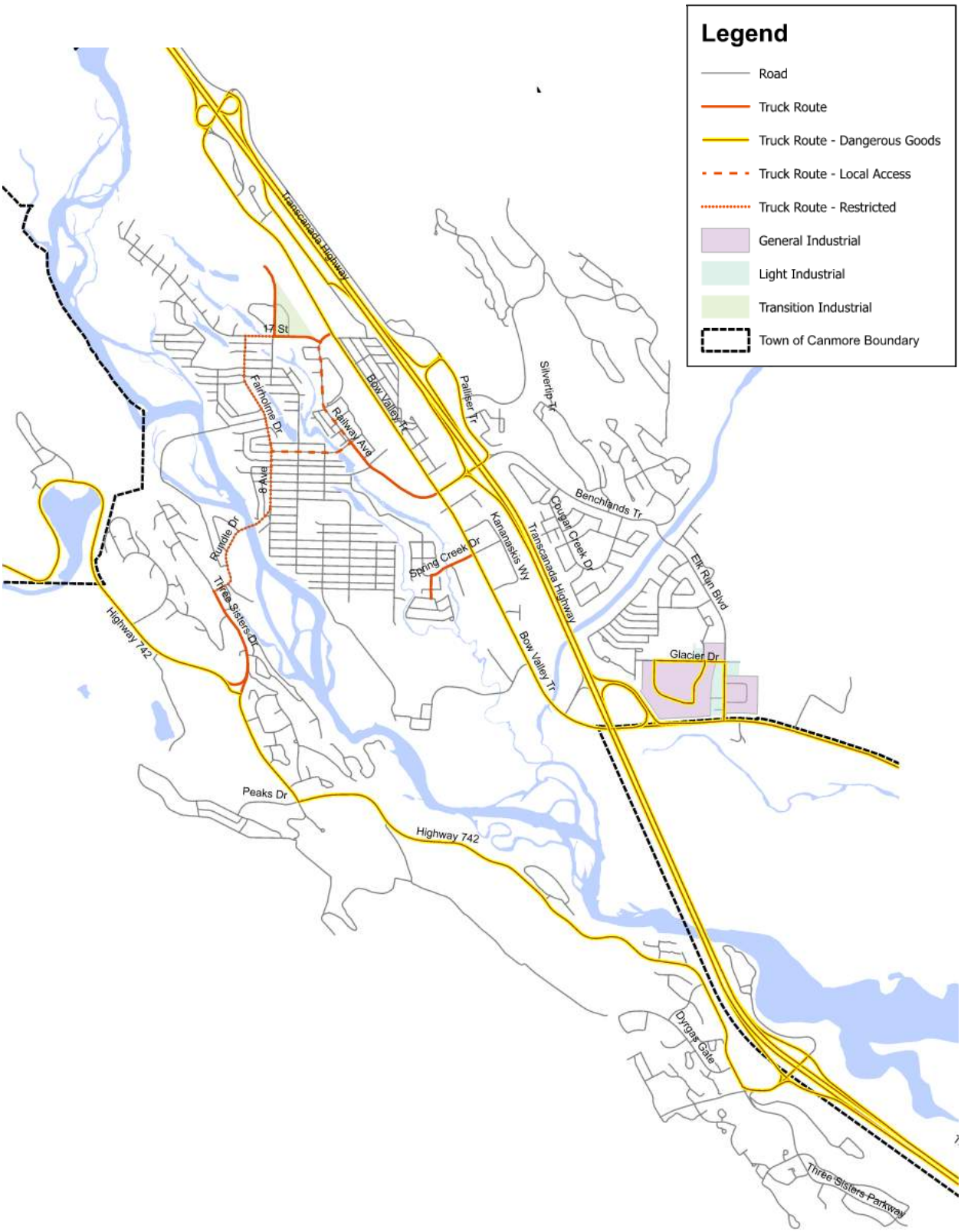


Figure A: Truck Routes and Dangerous Goods Movement Routes

H. APPENDIX H: FIGURES

LIST OF FIGURES

1. INTRODUCTION

No Figures

2. APPLICATIONS AND PERMITS

3. SITE GRADING AND DRAINAGE

4. WATER SYSTEM

5. SANITARY SYSTEM

6. STORMWATER

7. TRANSPORTATION SYSTEMS

8. SHALLOW UTILITIES

9. HAZARDS AND LOCAL CONDITIONS

10. LANDSCAPE DESIGN GUIDELINES

11. SOLID WASTE

GRADING PLAN REQUIREMENTS

ITEM REQUIRED	SIZE OF DEVELOPMENT		
	SMALL	MED & LARGE	LARGE SUBDIVISION
LAND USE	REQUIRED	REQUIRED	–
LOT #	REQUIRED	REQUIRED	N/A
CIVIC ADDRESS	REQUIRED	REQUIRED	N/A
LEGAL FOOTPRINT OF EXISTING LOT SHOWING SETBACKS (TO SCALE)	REQUIRED	REQUIRED	N/A
LEGAL FOOTPRINT OF PROPOSED LOTS (TO SCALE)	REQUIRED	N/A	REQUIRED
LEGAL FOOTPRINT OF PROPOSED/EXISTING ROW'S (TO SCALE)	REQUIRED	REQUIRED	REQUIRED
AREA OF BUILDING FOOTPRINT	REQUIRED	REQUIRED	N/A
AREA OF HABITABLE BUILDING SPACE	REQUIRED	REQUIRED	N/A
EXISTING AND PROPOSED GRADES ALONG PROPERTY LINES – MIN. EVERY 5m	REQUIRED	REQUIRED	REQUIRED
EXISTING AND PROPOSED GRADES ALONG BUILDING FACES – MIN. EVERY 5M	REQUIRED	REQUIRED	N/A
AVERAGE LOT ELEVATION – PRE DEVELOPMENT	REQUIRED	REQUIRED	REQUIRED
AVERAGE LOT ELEVATION – POST DEVELOPMENT (SEE NOTE 1)	REQUIRED	REQUIRED	REQUIRED
MAIN FLOOR ELEVATION (SEE NOTE 2)	REQUIRED	REQUIRED	REQUIRED
LOWEST GARAGE/PARKADE ELEVATION (IF APPLICABLE)	REQUIRED	REQUIRED	REQUIRED
100 YEAR GROUNDWATER ELEVATION (SEE NOTE 4)	REQUIRED	REQUIRED	REQUIRED
LOWEST TOP OF FOOTING	REQUIRED	REQUIRED	REQUIRED
FILL BEARING CERTIFICATE – LETTER FROM GEOTECHNICAL ENGINEER	REQUIRED	REQUIRED	REQUIRED
WEEPING TILE REQUIRED – LETTER FROM GEOTECHNICAL ENGINEER	REQUIRED	REQUIRED	REQUIRED
LOWEST INVERT OF WEEPING TILE – AT FOOTING	REQUIRED	REQUIRED	N/A
LOWEST INVERT OF WEEPING TILE – AT DISCHARGE	REQUIRED	REQUIRED	N/A
SANITARY INVERT AT PROPERTY LINE (SEE NOTE 3)	REQUIRED	REQUIRED	REQUIRED
SANITARY INVERT AT BUILDING FACE	REQUIRED	REQUIRED	N/A
STORM INVERT AT PROPERTY LINE (SEE NOTE 3)	REQUIRED	REQUIRED	REQUIRED (IF APPLICABLE)
STORM INVERT AT BUILDING FACE	REQUIRED	REQUIRED	N/A
WATER SERVICE – LOT(S) PRE SERVICED (YES/NO)	YES/NO	YES/NO	YES/NO
CC IN PLACE (YES/NO)	YES/NO	YES/NO	YES/NO
DIAMETER OF WATER SERVICE	REQUIRED	REQUIRED	REQUIRED
GROUNDWATER CONTOUR ELEVATIONS 0.5m ELEVATIONS	NO	NO	IF APPLICABLE

NOTE 1 – FOR BUILDING FOOTPRINT, TAKE ELEVATION OF UNDERSIDE OF LOWEST SLAB

NOTE 2 – MAIN FLOOR ELEVATION WILL BE DICTATED AT SUBDIVISION STAGE, GRAVITY SERVICING WILL BE REQUIRED FOR THIS ELEVATION

NOTE 3 – SUBDIVISIONS WILL BE REQUIRED TO PROVIDE INVERTS AT SERVICE STUB LOCATION FOR ALL LOTS, DEVELOPMENTS WILL BE REQUIRED TO REFERENCE SUBDIVISION PLAN

NOTE 4 – ALL PLANS (ARCH, CIVIL AND LEGAL), MUST BE CLEAR WHEN SPECIFYING THE 100 YEAR GWL. THE DRAWING REFERENCED SHOULD BE STATED

All dimensions in Metric meters unless otherwise noted

SCALE: N/A	FIGURE NO.: AP 2.1	GRADING PLAN REQUIREMENTS					
3	01/27/25	2D25 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/23/23	2D23 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 RM APEGA ID# DATE Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2D19 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

CANMORE

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SAMPLE ELEVATIONS

- ℄ REAR ELEVATION
- LAND USE
- LOT #
- CIVIC ADDRESS
- MAXIMUM BUILDING HEIGHT ELEVATION AS CALCULATED USING TOWN LAND USE BYLAW (F = FRONT, R = REAR) }

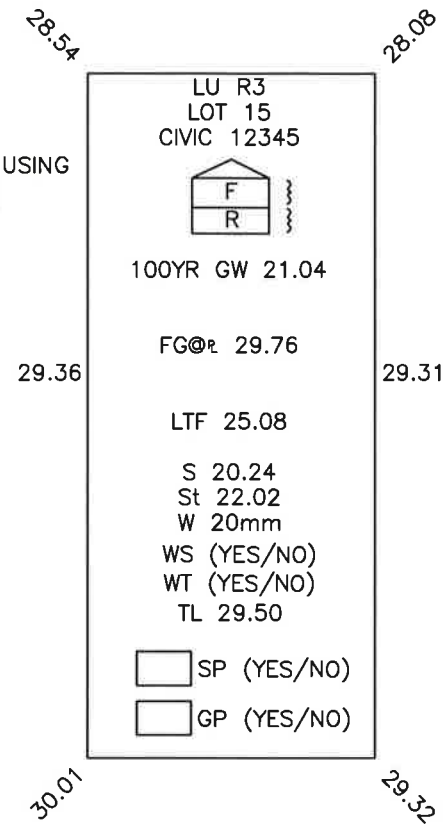
- 100YR GROUNDWATER ELEVATION
- GRADES AT CORNERS OF PROPERTY AND AT MIDPOINTS WHERE LENGTHS GREATER THAN 10M
- RECOMMENDED FRONT GRADE AT HOUSE
- MID–LOT GRADE AT PROPERTY LINE

- LOWEST TOP OF FOOTING

- SANITARY INVERT AT STUB
- STORM INVERT AT STUB (IF APPLICABLE)
- DIAMETER OF WATER SERVICE (SEE NOTE 1.)
- WATER SERVICE (COILED & BOXED) (Y OR N)
- WEEPING TILE TO STORM (IF APPLICABLE)
- TRAPPED LOW MAX. ELEVATION (IF APPLICABLE)

- SUMP PUMP REQUIRED (Y OR N)
- SANITARY GRINDER PUMP REQUIRED (Y OR N)

- DRAINAGE FEATURES (BERMS, SWALE, ETC)
- DRIVEWAY LOCATION
- FRONT ELEVATION (IF APPLICABLE)



NOTES

1. LOTS REQUIRING PRESSURE REDUCTION TO BE DESIGNATED BY ADDING P.R. IMMEDIATELY AFTER THE SERVICE SIZE (I.E. W 20 MM P.R.).
2. LETTER FROM GEOTECHNICAL ENGINEER WILL BE REQUIRED IF WEEPING TILE IS NOT INSTALLED.
3. FILL BEARING CERTIFICATE REQUIRED FOR ALL LOTS.
4. DEVELOPERS ARE ENCOURAGED TO ADD ADDITIONAL INFORMATION WHERE NEEDED FOR GUIDANCE AND CLARITY.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: AP 2.2	BUILDING GRADE PLAN - MINIMUM REQUIREMENTS					
3	01/27/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
2	10/23/23	2023 EDCG	BWM	BK	BK			
1	04/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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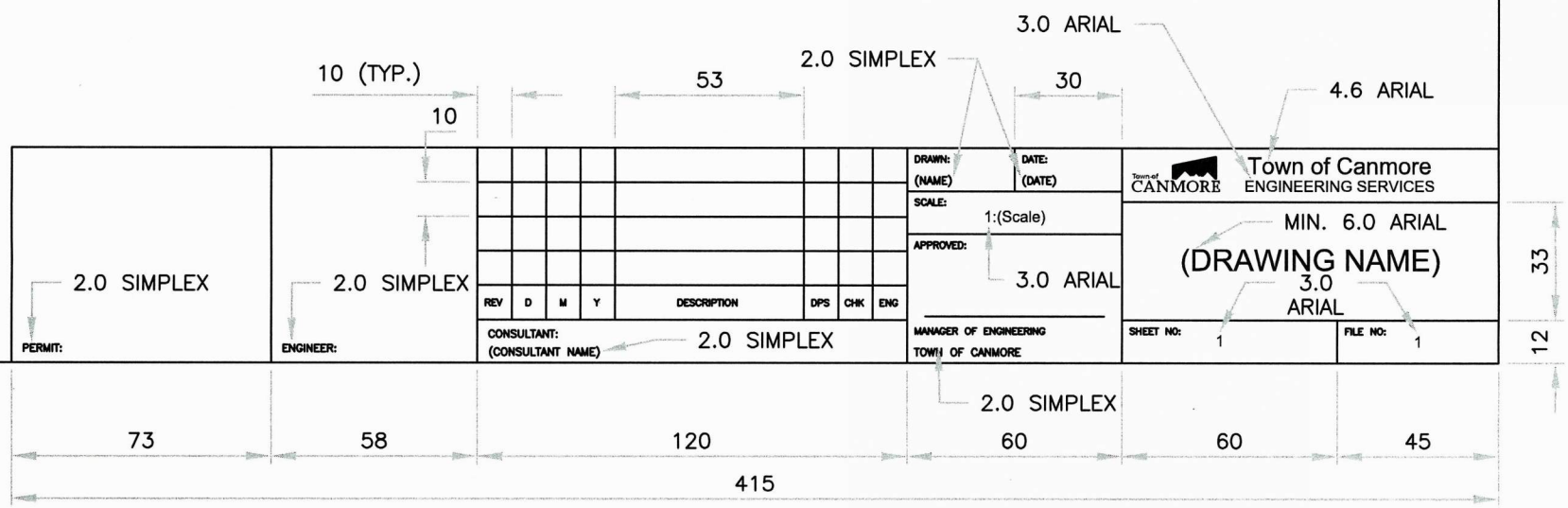

NOTES

1. ALL TEXT TO BE SIMPLEX STYLE, HEIGHT 1.8 EXCEPT WHERE NOTED. DIMENSIONS IN MILLIMETRES.
2. DIGITAL COPIES IN AUTOCAD FORMAT CAN BE OBTAINED BY CONTACTING THE ENGINEERING DEPARTMENT AT 403 678 1548

All dimensions in Metric meters unless otherwise noted

SCALE: 1:2	FIGURE NO.: AP 2.3	DRAWING TITLE BLOCK SPECIFICATIONS - HORIZONTAL LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3	01/27/25	2025 EDCG	BWM	BK	BK
2	08/14/19	2019 EDCG	BWM	BB	BB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

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BRIAN KINZIE
ID 66135

Town of CANMORE

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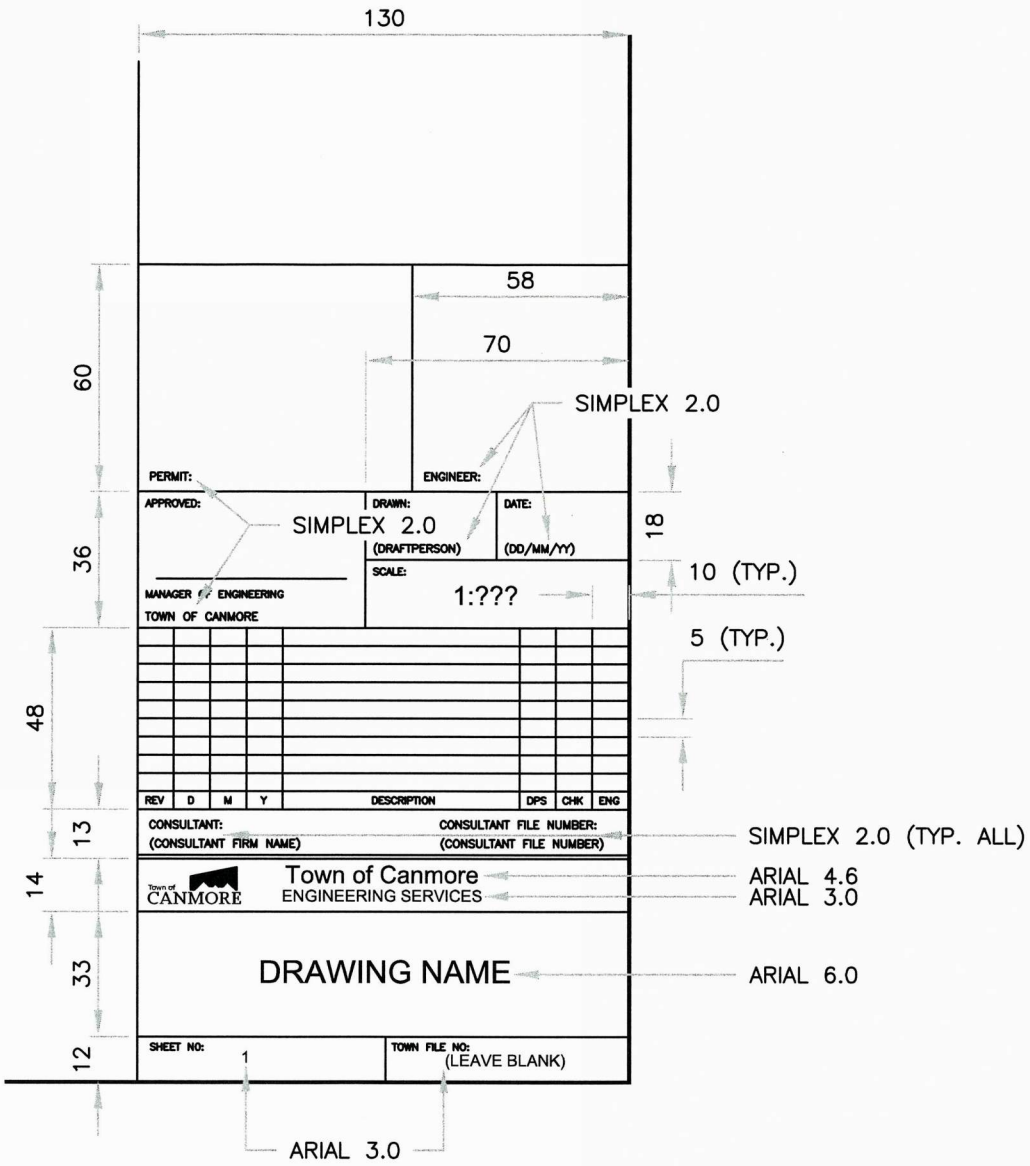

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2. DIGITAL COPIES IN AUTOCAD FORMAT CAN BE OBTAINED BY CONTACTING THE ENGINEERING DEPARTMENT AT 403 678 1548

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SCALE: 1:2		FIGURE NO.: AP 2.4	DRAWING TITLE BLOCK SPECIFICATIONS - VERTICAL LAYOUT				
3	01/27/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	08/14/19	2019 EDCG	BWM	BB	CB		
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE

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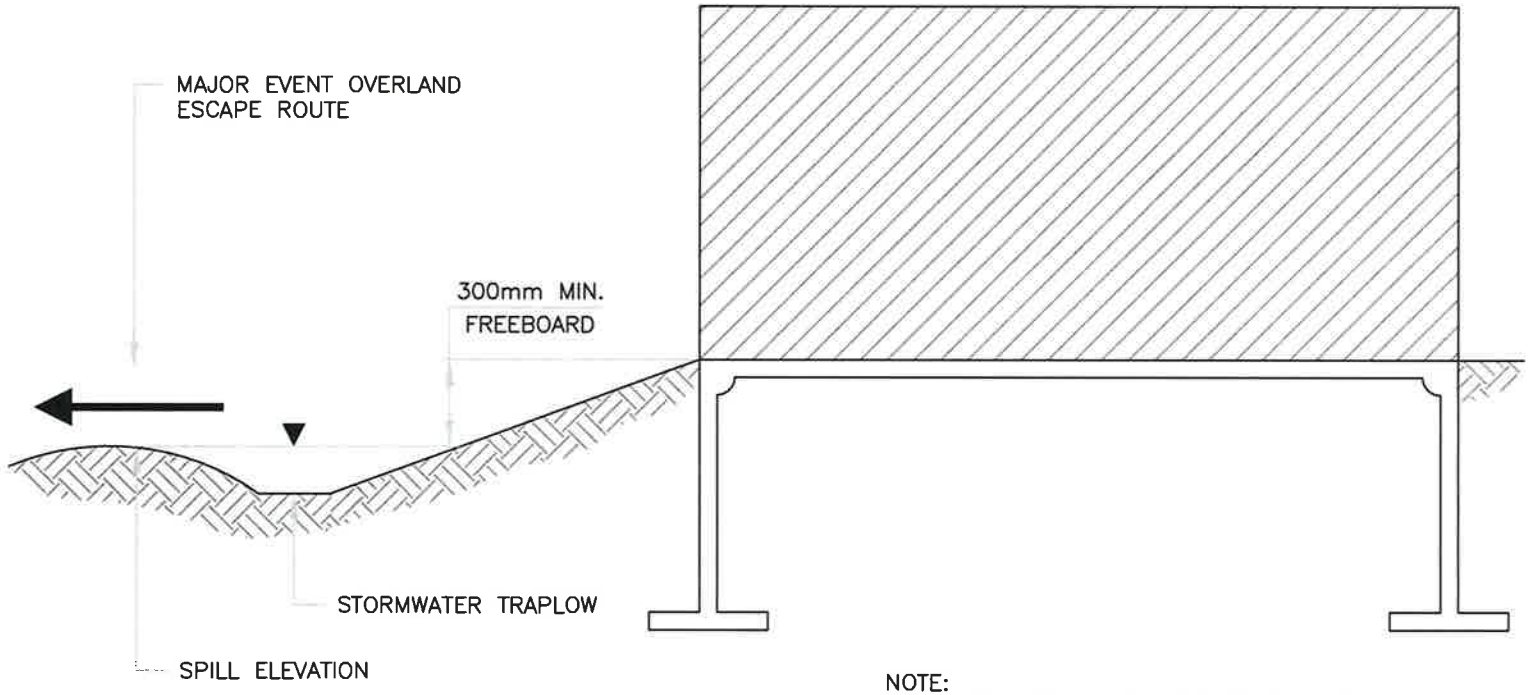

NOTE:
REFER TO CITY OF CALGARY STORMWATER MANAGEMENT GUIDELINES FOR MINIMUM FREEBOARD REQUIREMENTS. MINIMUM FREEBOARD FOR OVERLAND FLOW ROUTES IS 300mm, HOWEVER 150mm MAY CONSIDERED IN EXTENUATING CIRCUMSTANCES AND ONLY WHERE OVERLAND FLOW IS CONVEYED VIA HARD SURFACING.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: GRD 3.1	OVERLAND ESCAPE ROUTE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/23/23	2023 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BK	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

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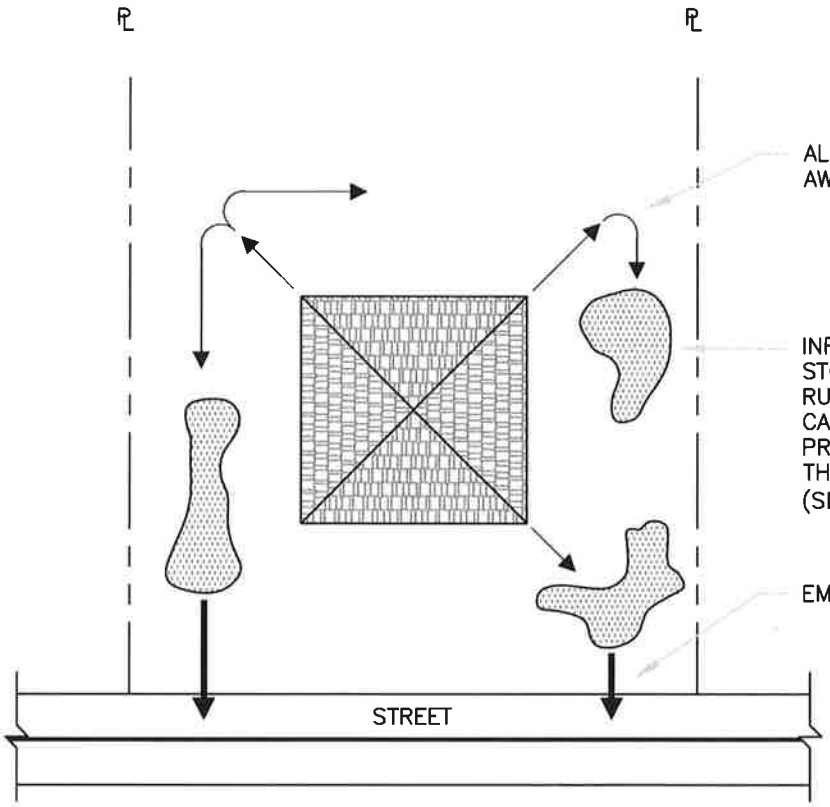

ALL OVERLAND DRAINAGE TO BE DIRECTED AWAY FROM FOUNDATIONS

INFILTRATION GARDENS TO CATCH SMALLER STORMS – TO BE PLACED PRIOR TO RUNOFF REACHING MOTOR VEHICLE CARRIAGE WAY. PLACEMENT DEPENDS ON PRACTICALLY AND EXISTING VEGETATION THAT WILL REMAIN.
(SEE STORM WATER SECTION FOR DETAILS)

EMERGENCY (MAJOR EVENT) ESCAPE ROUTE

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.2	LOTS IN VALLEY BOTTOM - GENERAL GRADING					
3						PERMIT	SEAL	
2	D1/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 DATE Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
1	D8/14/19	2D19 EDCG	BWM	BK	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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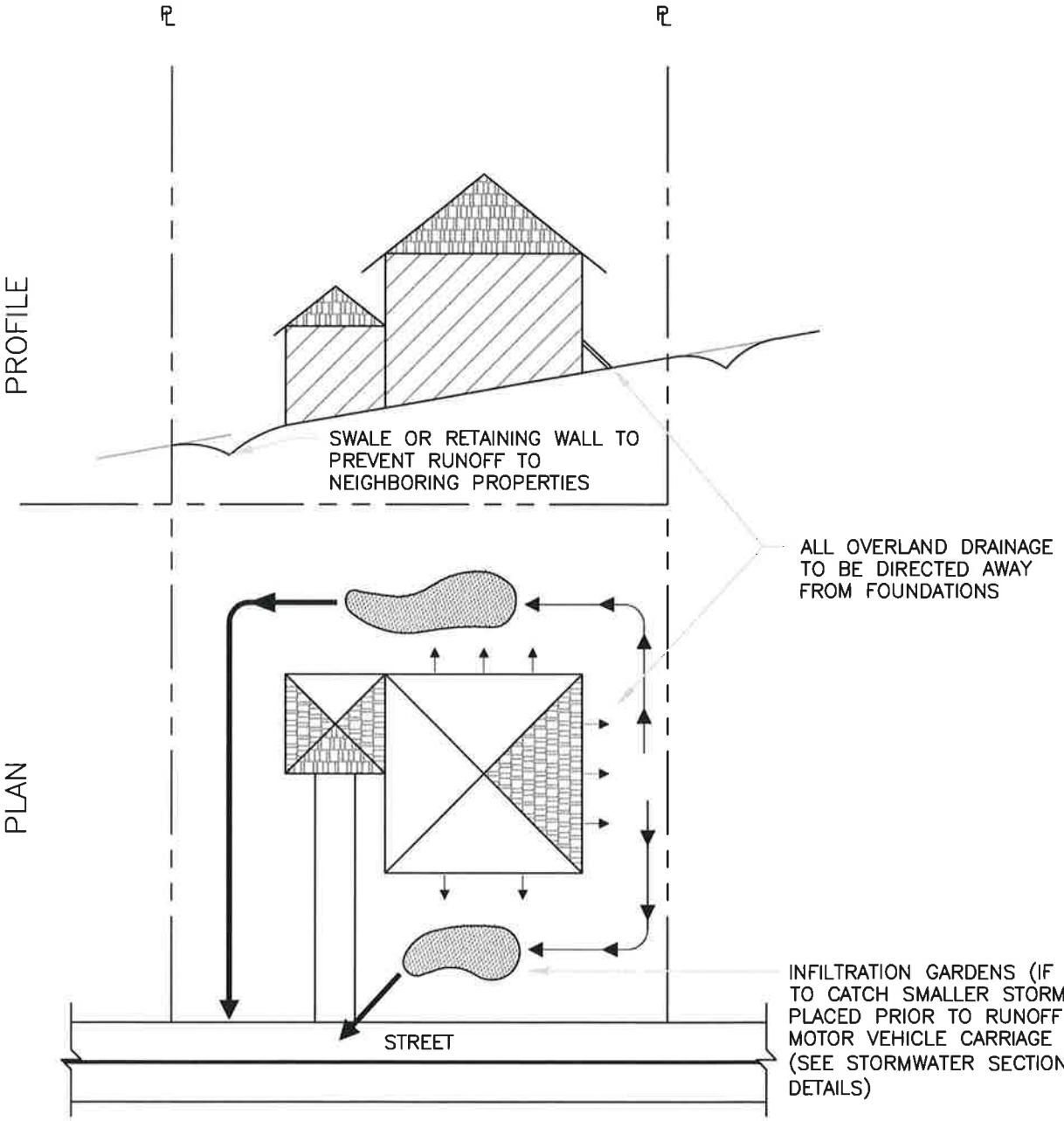

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: GRO 3.3	LOTS ON SLOPES - GENERAL GRADING

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	08/14/19	2019 EDCG	BWM	BK	CB

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BRIAN KINZIE
ID 66135

Town of CANMORE

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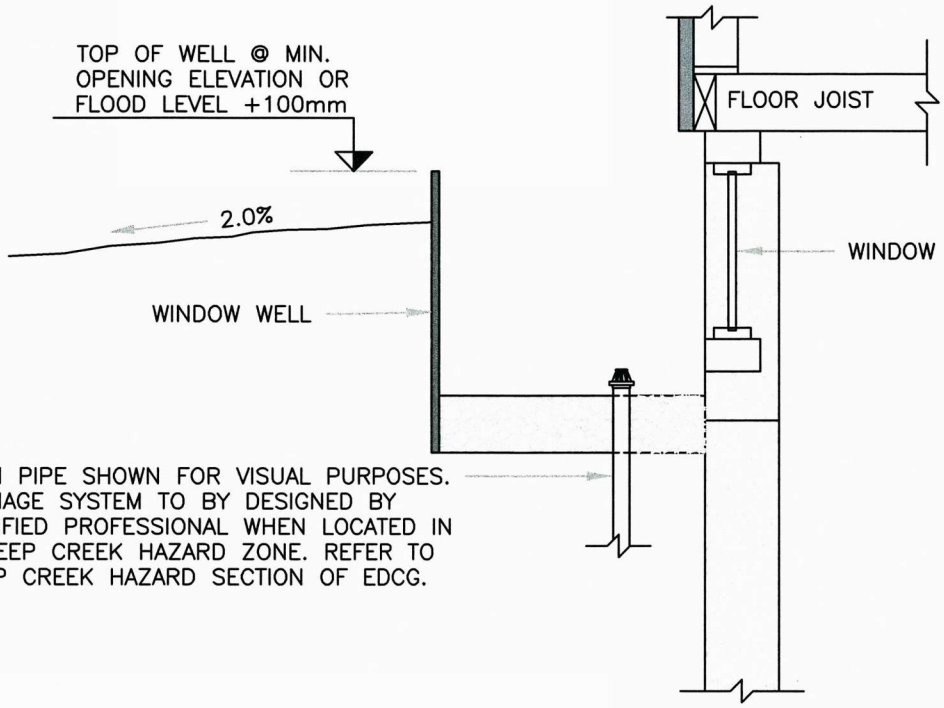
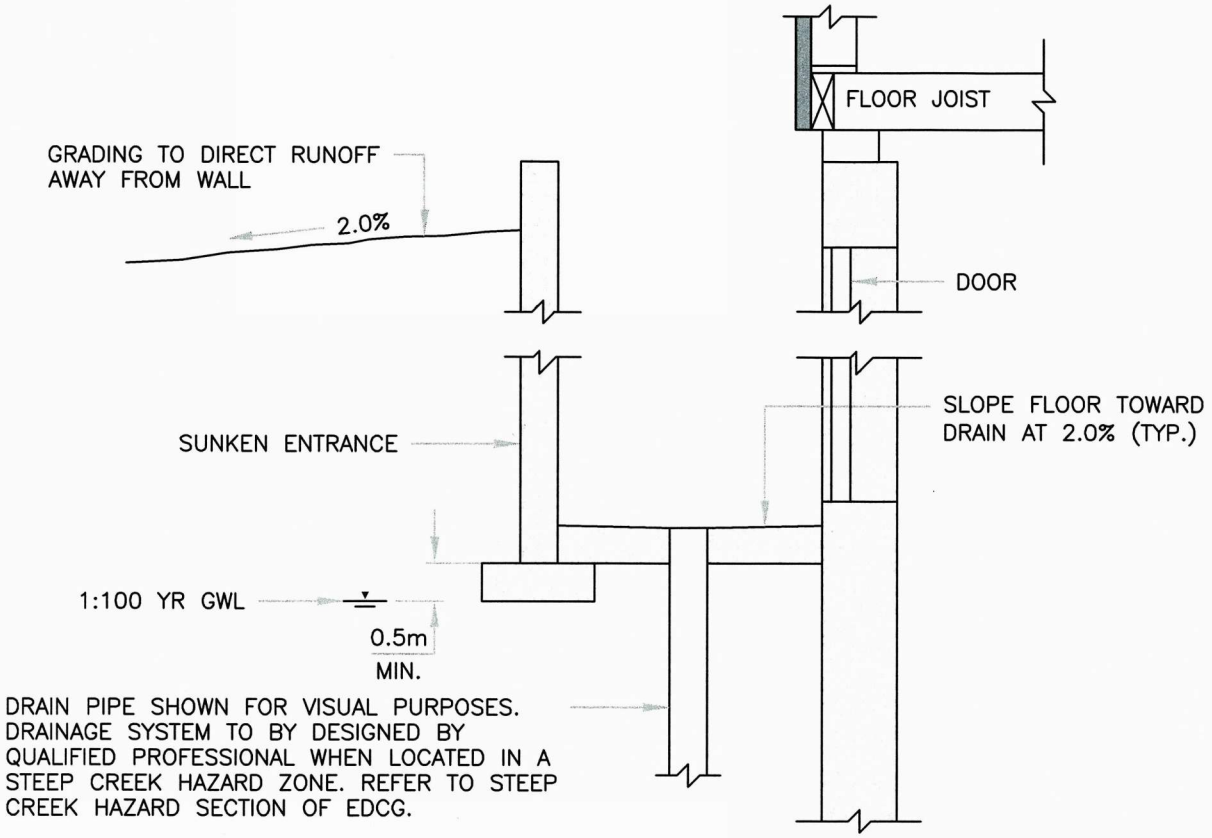


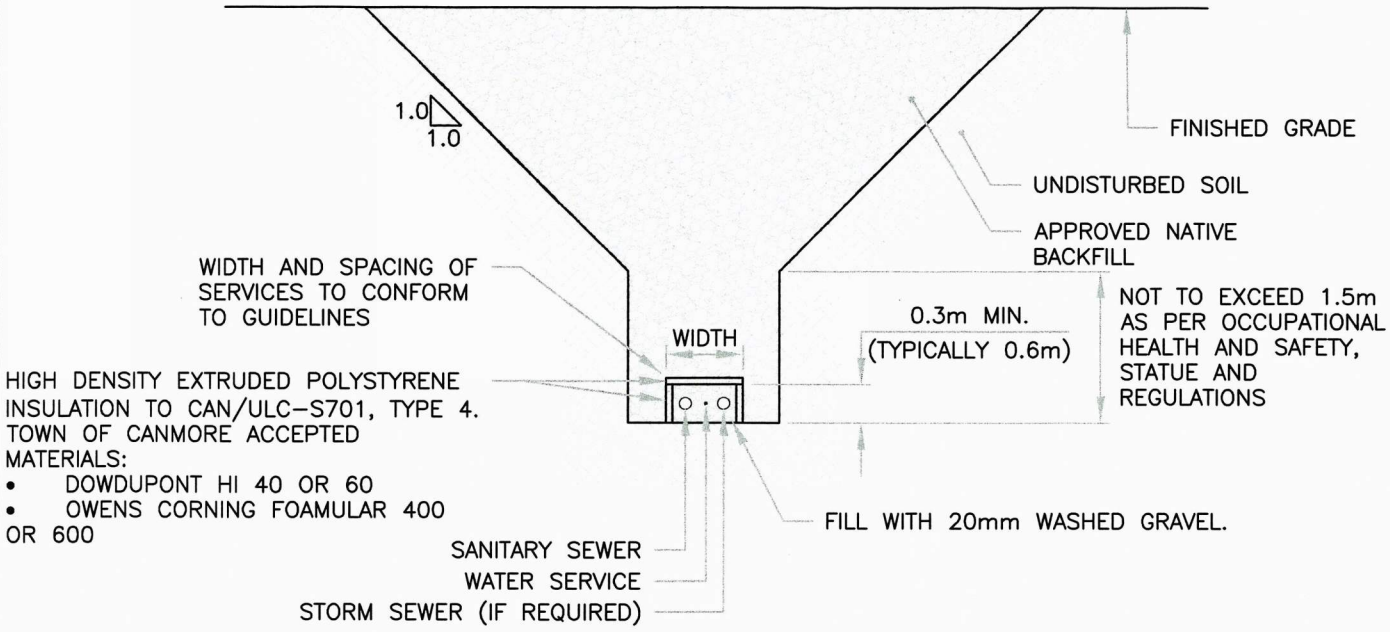
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.4	WINDOW WELL DRAIN					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: [signature] RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA FELIX CAMIRE ID 155442 [signature] FEB 28, 2025	Town of CANMORE
2	10/23/23	2023 EDCG	BWM	FC	BK			
1	08/14/19	2019 EDCG	BWM	FC	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.5	SUNKEN ENTRANCES					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA FELIX CAMIRE ID 155442 Feb 28, 2025	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	FC	BK			
1	08/14/19	2019 EDCG	BWM	FC	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



BOX (INVERTED 'U') INSULATION REQUIREMENTS

GRAVITY SEWER SERVICES INDEPENDENT OF OTHER SERVICES TO BE INSULATED AS FOLLOWS			
Depth of Cover	Insulation Width (m)	Vertical Leg Height (m)	Insulation Thickness (mm)
1.00 - 1.149	1.8	0.6	100
1.150-1.299	1.8	0.6	100
1.300-1.449	1.2	0.6	100
1.450-1.599	1.2	0.6	75
1.600-1.749	0.8	0.6	75
1.750-1.899	0.8	0.6	50
1.900-2.049	0.8	0.6	50
2.050-2.199	0.8	0.6	50
2.200-2.349	0.8	0.6	50
2.350-2.499	0.6	0.6	50

COMBINED SERVICES: WATER, GRAVITY SEWER AND LOW PRESSURE SEWER TO BE INSULATED AS FOLLOWS			
Depth of Cover	Insulation Width (m)	Vertical Leg Height (m)	Insulation Thickness (mm)
1.00 - 1.149	2.4	0.6	100
1.150-1.299	2.4	0.6	100
1.300-1.449	2.4	0.6	100
1.450-1.599	1.8	0.6	100
1.600-1.749	1.8	0.6	100
1.750-1.899	1.8	0.6	100
1.900-2.049	1.8	0.6	75
2.050-2.199	1.8	0.6	50
2.200-2.349	1.8	0.6	50
2.350-2.499	1.2	0.6	50
2.500-2.649	1.2	0.6	50
2.650-2.799	0.6	0.6	50
2.800-2.949	0.6	0.6	50
2.950-3.099	0.6	0.6	50
3.100-3.249	0.6	0.6	50
3.250-3.399	0.6	0.6	50

NOTES

1. FOR SERVICES LARGER THAN 150mm, SITE SERVICING PLANS AND INSULATION DETAILS TO BE IN ACCORDANCE WITH CITY OF CALGARY, STANDARD SPECIFICATIONS. WATERWORKS CONSTRUCTION EXCEPT INSULATION MATERIALS TO BE AS NOTED ABOVE.
2. WHERE THE MINIMUM FROST PROTECTIVE COVERS CANNOT BE ACHIEVED, THE TOWN MAY ALLOW AN EXEMPTION IF AN ENGINEER CAN DEMONSTRATE INCORPORATION OF APPROPRIATE SPECIAL PRECAUTIONS IN THE SELECTION OF PIPE, BEDDING AND INSULATION MATERIAL.
3. AN ALTERNATIVE INSULATION DETAIL TO THE INVERTED "U" SHOWN IS A HORIZONTAL LAYER OF INSULATION TO THE SAME THICKNESS SHOWN AND WIDTH EQUAL TO THE INSULATION WIDTH PLUS TWO TIMES THE VERTICAL LEG HEIGHT SHOWN IN THE TABLES ABOVE.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.2	BOX INSULATION REQUIREMENTS - SERVICES & MAIN 150mm & SMALLER					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL	
2	08/14/19	2019 EDCG	BWM	BB	CB	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	05/04/10	2010 EDCG	SP	PN	PN			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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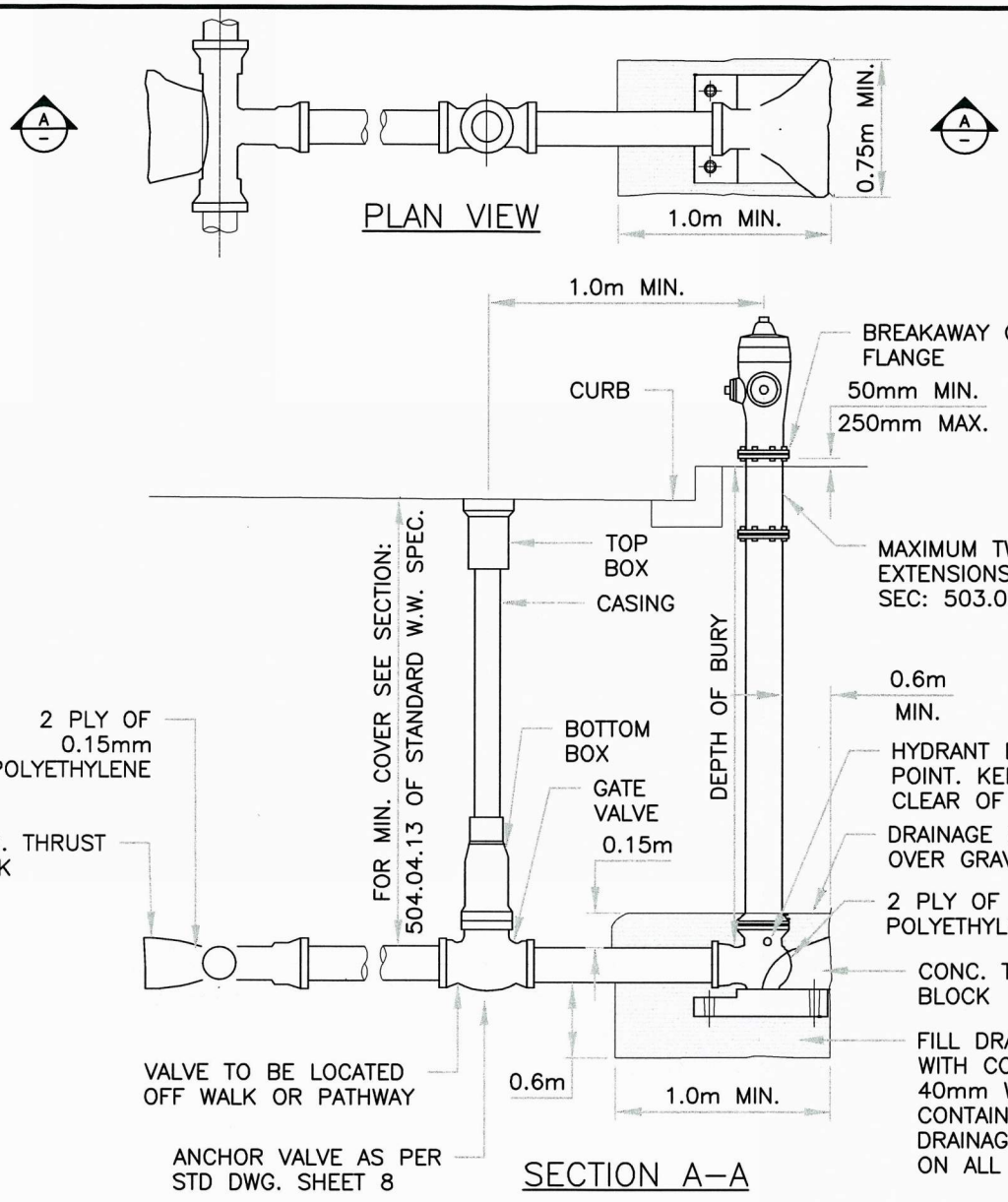

NOTES

1. THE EXTERIOR OF THE HYDRANT SHALL BE COATED AS SPECIFIED IN SECTION 503.02.00.
2. HYDRANTS IN HIGH WATER TABLE REQUIRED TO HAVE DRAINS PLUGGED. BE PAINTED RED AND MARKED. "FOR FIRE USE ONLY"
3. THE HYDRANT SHALL BE PLACED ON A CONCRETE PAD AS SHOWN IN DRAWING 453.1002.002.
4. DRAINAGE MEMBRANE SHALL BE PLACED OVER THE TOP OF THE STONES TO PREVENT THE SPACES BETWEEN THE STONES FROM BEING FILLED WITH
5. NON PERMEABLE MATERIAL.
6. PLACE 2 PLY OF 0.15MM POLYETHYLENE BETWEEN PIPE AND POURED CONCRETE.
7. CONCRETE SHALL BE SULFATE RESISTANT, 20 MPA @ 28 DAYS.
8. DRAINAGE MEMBRANE, SEE SEC. 319.00.00, STD. SPEC. ROADS CONSTRUCTION.
9. FOR CATHODIC PROTECTION REQUIREMENTS SEE SECTION 504.07.00.
10. REFERENCE TO SECTIONS AND STD. DWG. IS CITY OF CALGARY, STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: WAT 4.4	HYDRANT DETAILS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	08/14/19	2019 EDCG	BWM	BB	CB

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TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
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The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

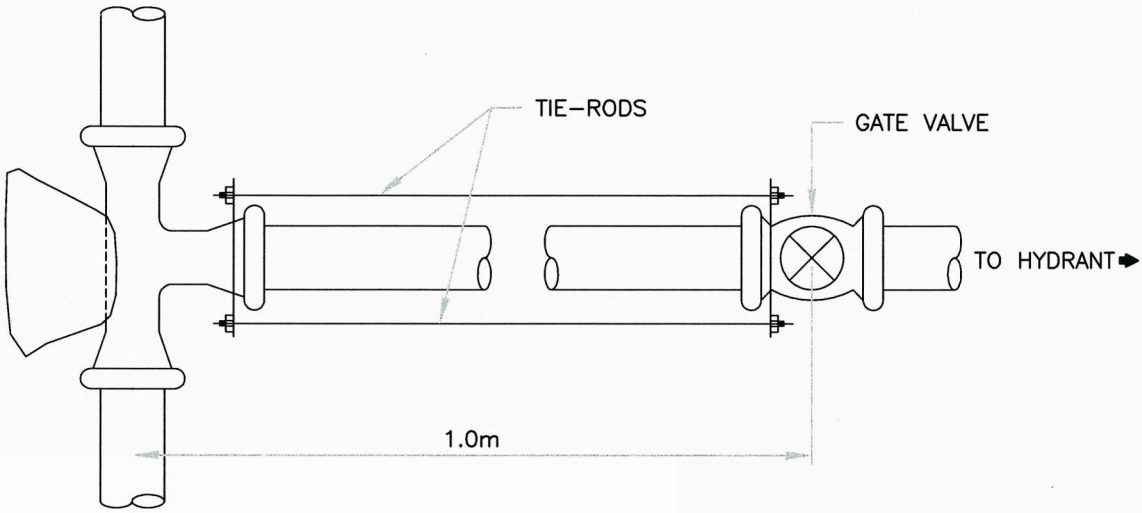
SEAL

PROFESSIONAL ENGINEER ALBERTA
BRIAN KINZIE
ID 66135

FEB. 28, 2025

Town of CANMORE

MODIFY CITY OF CALGARY DRAWING FILE NO.: 453.1002.001
TO INCLUDE THE FOLLOWING TIE BACK DETAIL FOR ALL HYDRANT VALVES:



NOTES

1. HYDRANT TEE TO BE CAST IRON, DUCTILE OR APPROVED EQUIVALENT.
2. TIE–BACK RODS, WASHERS AND HEXAGONAL NUTS TO BE FABRICATED FROM HIGH STRENGTH, LOW ALLOY STEEL IN ACCORDANCE WITH ANSI/AWWA C111/A21.11
3. COAT AND WRAP THE COMPLETED TIE–ROD AND COMPRESSION SLEEVE COUPLING INSTALLATION WITH DENSO MASTIC AND TAPE TO ENSURE ALL METAL COMPONENTS COVERED.
4. TYPICAL DETAIL FOR INSTALLING TEE AND GATE VALVE (HYDRANT LEAD) IN EXISTING WATER MAIN.

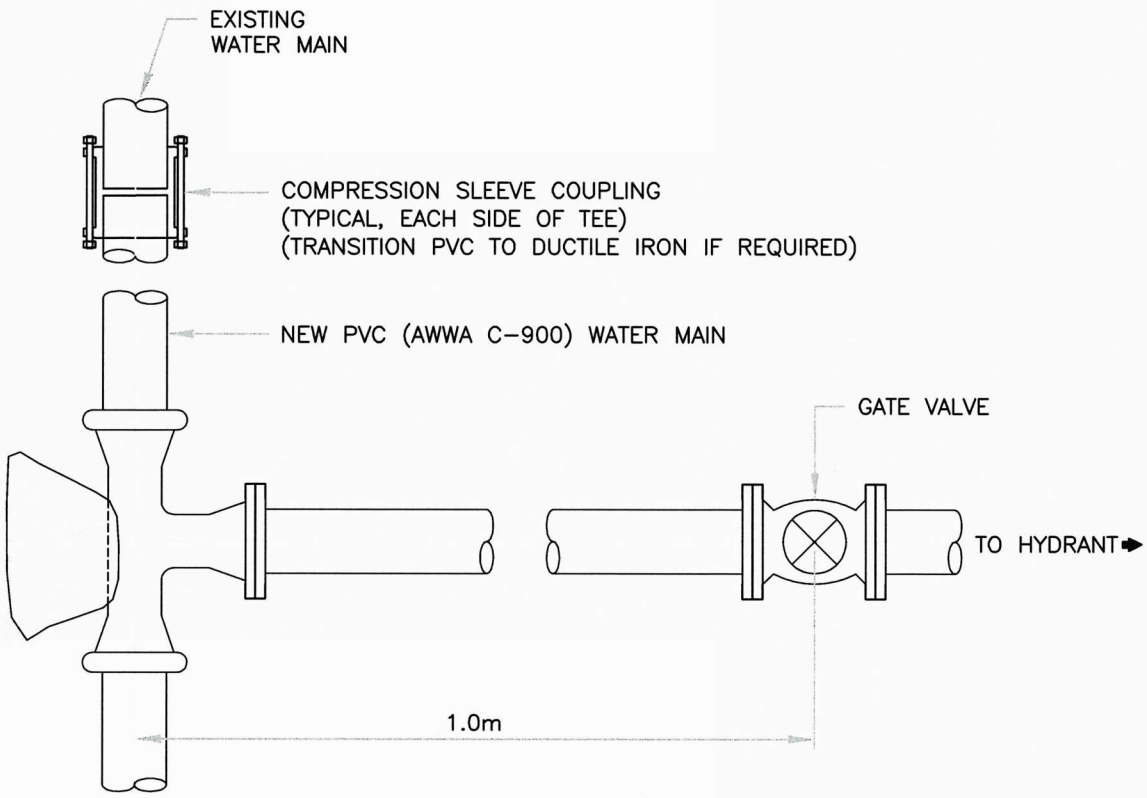
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.5	HYDRANT VALVE TIE-BACK				
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE

FEB. 28, 2025

MODIFY CITY OF CALGARY DRAWING FILE NO.: 453.1002.001
TO INCLUDE THE FOLLOWING TIE BACK DETAIL FOR ALL
HYDRANT VALVES:
(ALTERNATIVELY, FLANGED VALVE TO FLANGED TEE)



NOTES

1. HYDRANT TEE TO BE CAST IRON, DUCTILE OR APPROVED EQUIVALENT.
2. TIE-BACK RODS, WASHERS AND HEXAGONAL NUTS TO BE FABRICATED FROM HIGH STRENGTH, LOW ALLOY STEEL IN ACCORDANCE WITH ANSI/AWWA C111/A21.11
3. COAT AND WRAP THE COMPLETED TIE-ROD AND COMPRESSION SLEEVE COUPLING INSTALLATION WITH DENSO MASTIC AND TAPE TO ENSURE ALL METAL COMPONENTS COVERED.
4. TYPICAL DETAIL FOR INSTALLING TEE AND GATE VALVE (HYDRANT LEAD) IN EXISTING WATER MAIN.

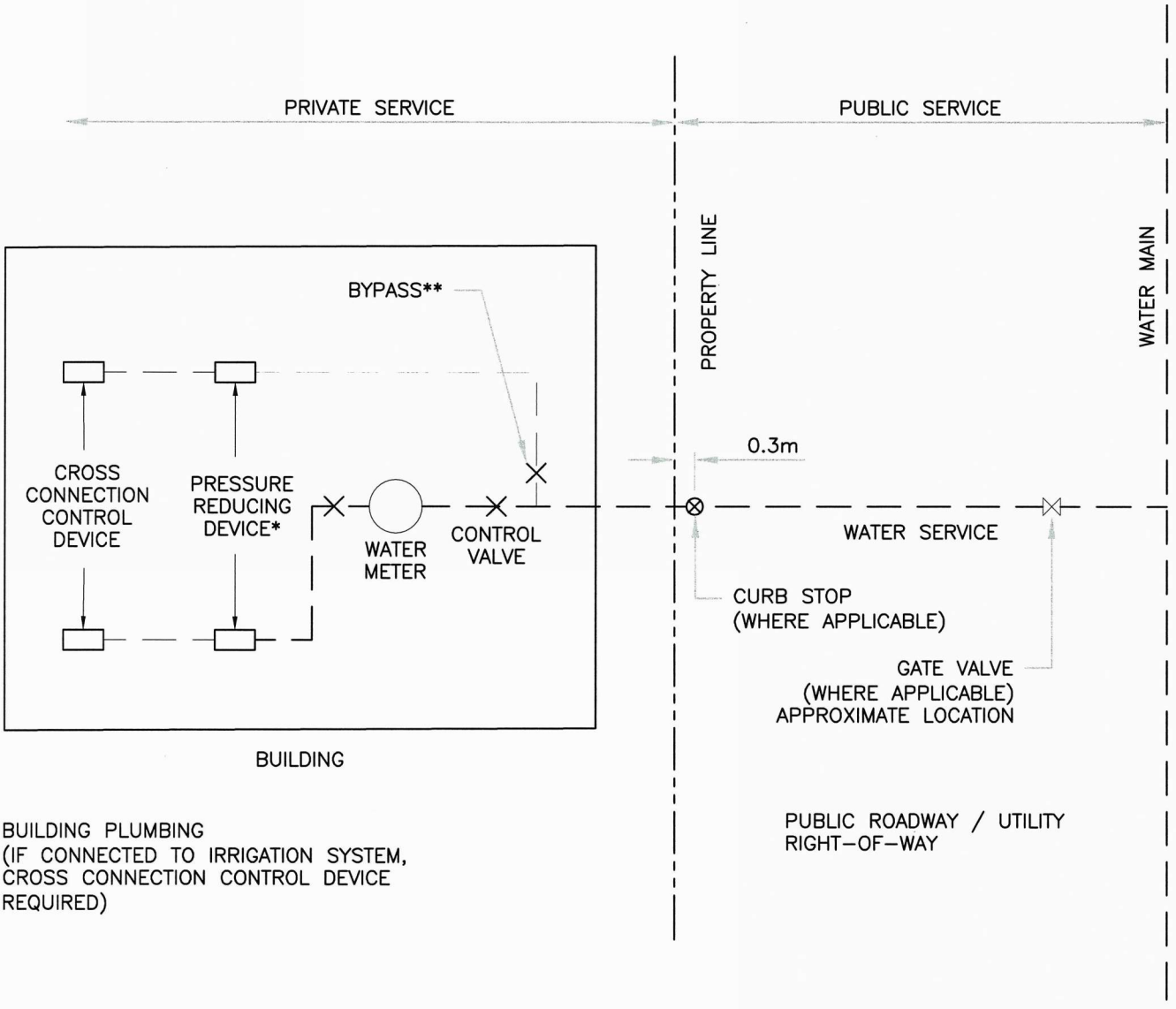
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.6	HYDRANT VALVE TIE-BACK - FLANGED VALVE TO FLANGED TEE					
3						PERMIT	SEAL	
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

BYLAW

TOWN OF CANMORE – WATER BYLAW

SCHEDULE 3 – WATER SERVICE

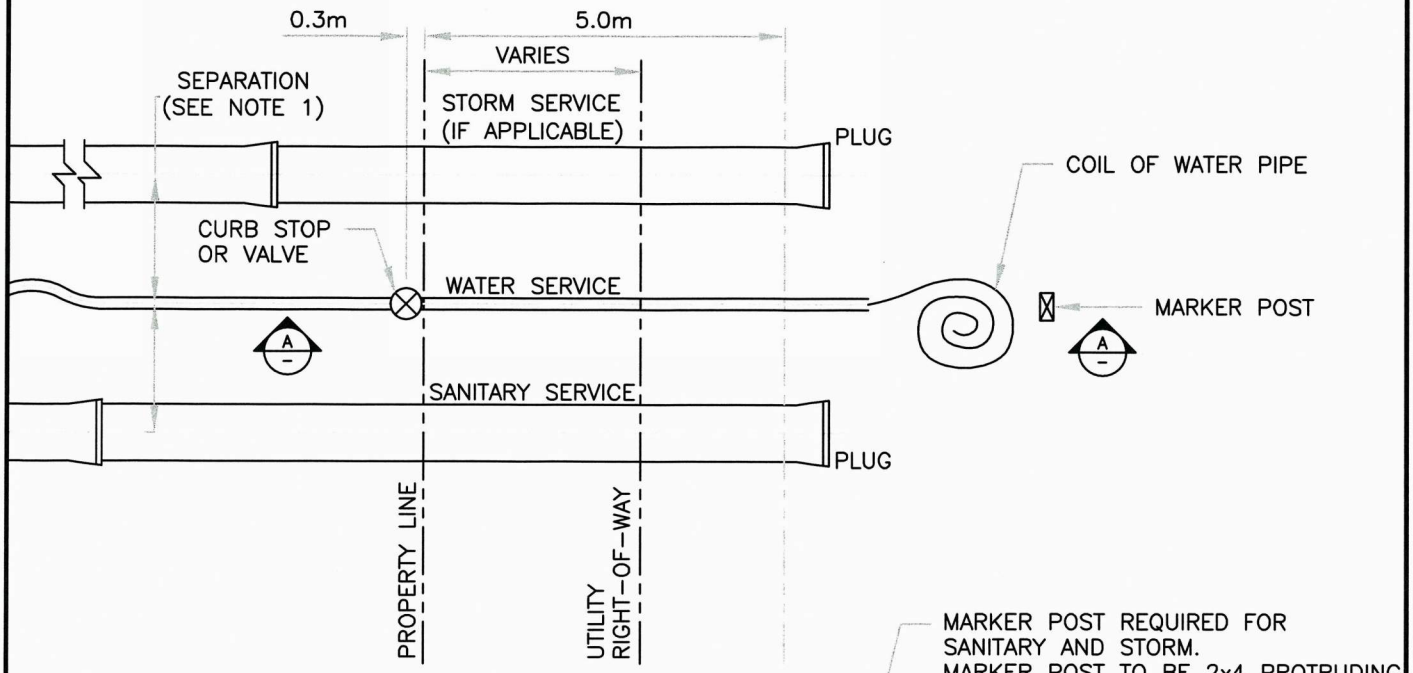


* IF REQUIRED BY TOWN

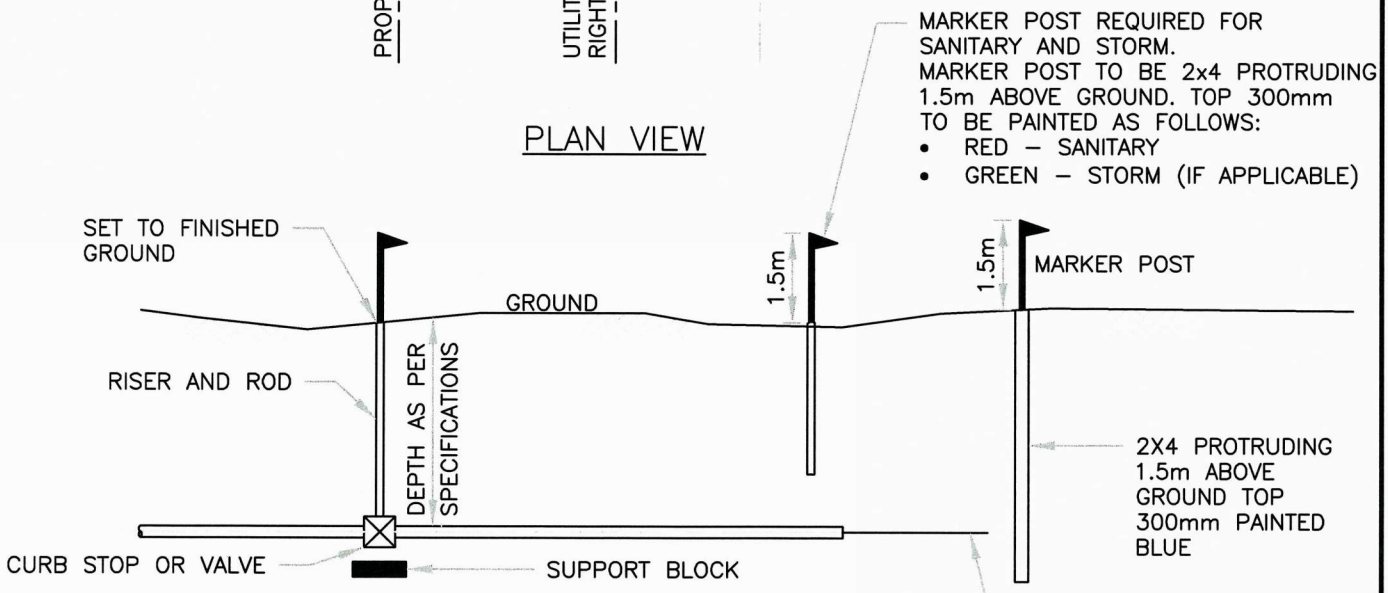
** AS PERMITTED BY TOWN (FOR FIRE PROTECTION SYSTEM)

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.7	WATER SERVICE OWNERSHIP			
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE; RM SIGNATURE: [signature]; RM APEGA ID #: 95819; DATE: Feb. 28, 2025; PERMIT NUMBER: P006522; The Association of Professional Engineers and Geoscientists of Alberta (APEGA)
2	01/28/25	2025 EDCG	BWM	BK	BK	SEAL: PROFESSIONAL ENGINEER ALBERTA, BRIAN KINZIE, ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB	Town of CANMORE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG	



PLAN VIEW



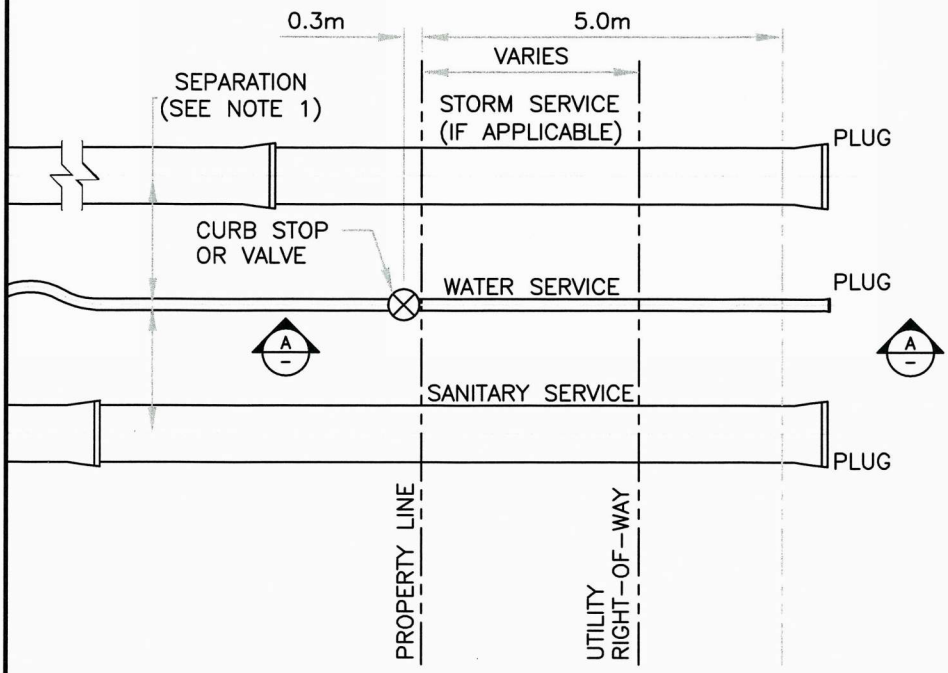
SECTION A–A
(WATER SERVICE)

NOTES

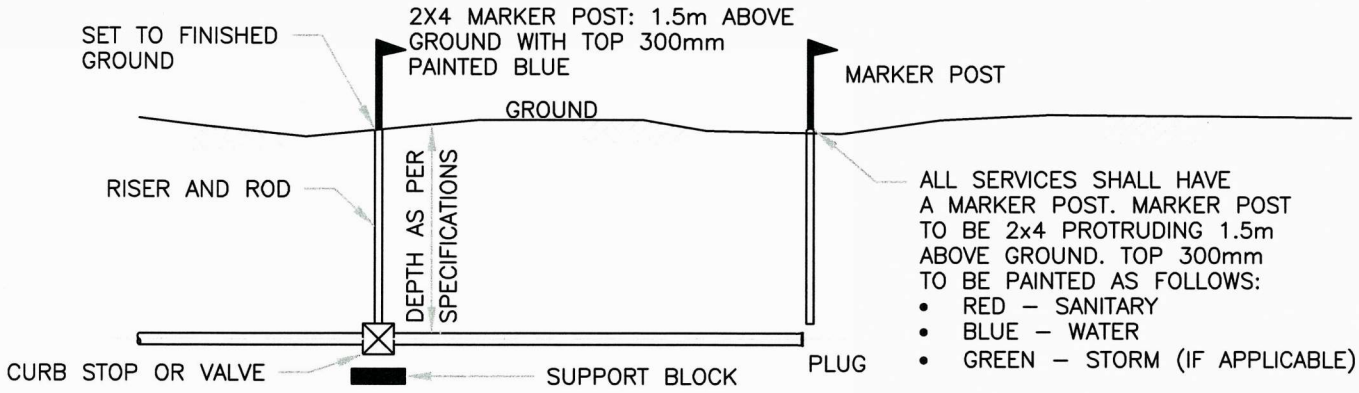
1. SERVICE MAY BE IN A COMMON TRENCH EXCEPT WHERE WATER SERVICE IS BELL AND SPIGOT PIPE THEN SEPARATION TO BE AS PER ALBERTA ENVIRONMENT STANDARDS AND GUIDELINES.
2. REFER TO CITY OF CALGARY STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION, FIGURES 23 TO 26 INCLUSIVE FOR GENERAL DETAILS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.8	PRE-SERVICE CONNECTION DETAIL - FLEXIBLE PIPE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95879 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	BB	CB			
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



PLAN VIEW



SECTION A–A
(WATER SERVICE)

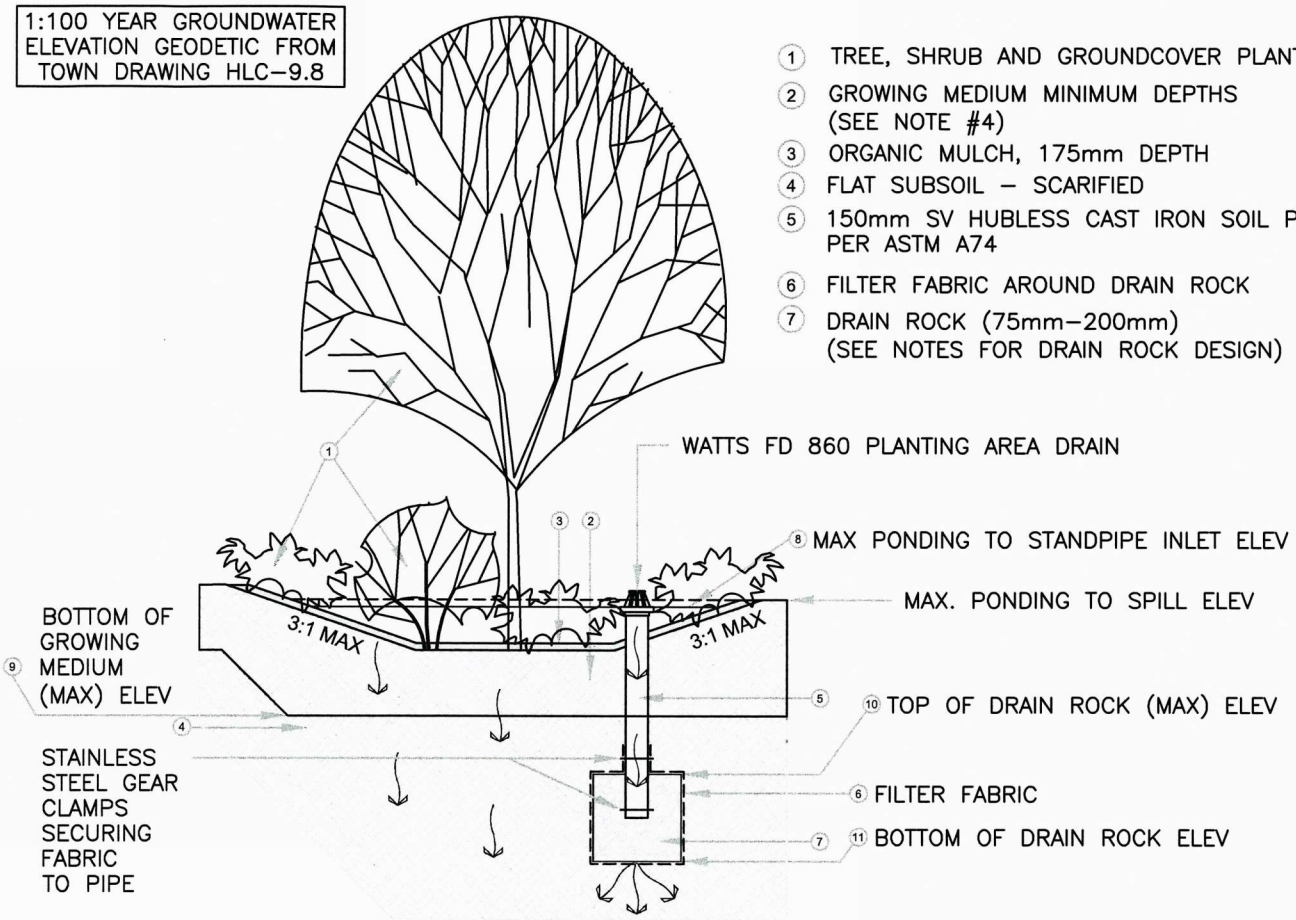
NOTES

1. SERVICE MAY BE IN A COMMON TRENCH EXCEPT WHERE WATER SERVICE IS BELL AND SPIGOT PIPE THEN SEPARATION TO BE AS PER ALBERTA ENVIRONMENT STANDARDS AND GUIDELINES.
2. REFER TO CITY OF CALGARY STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION, FIGURES 23 TO 26 INCLUSIVE FOR GENERAL DETAILS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.9	PRE-SERVICE CONNECTION DETAIL - NON-FLEXIBLE PIPE					
3						PERMIT	SEAL	
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

1:100 YEAR GROUNDWATER ELEVATION GEODETIC FROM TOWN DRAWING HLC–9.8



1. TREE, SHRUB AND GROUNDCOVER PLANTINGS
2. GROWING MEDIUM MINIMUM DEPTHS (SEE NOTE #4)
3. ORGANIC MULCH, 175mm DEPTH
4. FLAT SUBSOIL – SCARIFIED
5. 150mm SV HUBLESS CAST IRON SOIL PIPE PER ASTM A74
6. FILTER FABRIC AROUND DRAIN ROCK
7. DRAIN ROCK (75mm–200mm) (SEE NOTES FOR DRAIN ROCK DESIGN)

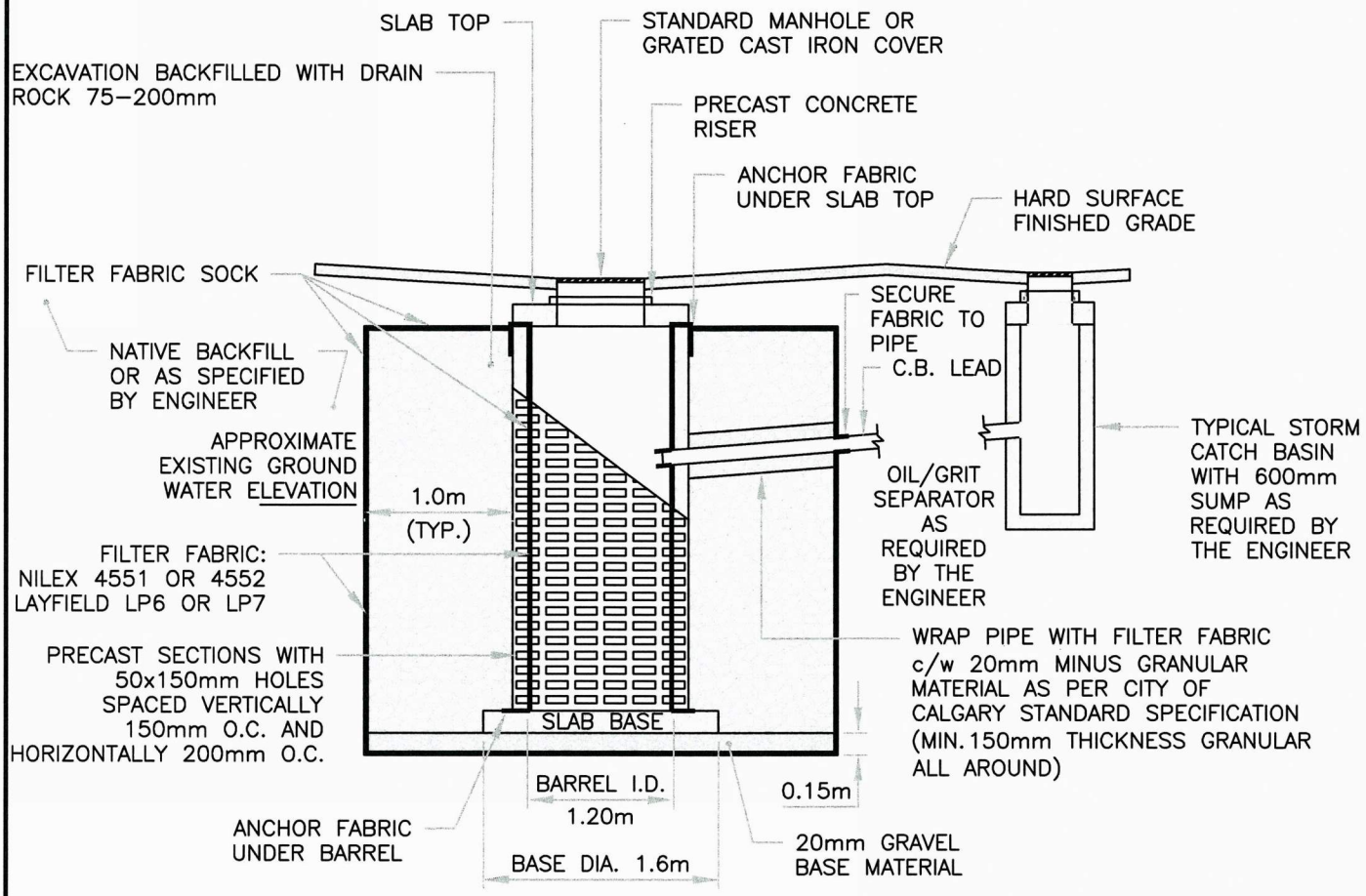
NOTES

1. INFILTRATION AS SHOWN ON THIS DETAIL SHALL ALWAYS BE THE PRIMARY CHOICE OF RUNOFF DISPOSAL, PARTICULARLY FOR ALL LOW LYING AREAS CANMORE (TEE PEE TOWN, SOUTH CANMORE, RUNDLE, LARCH ETC). OTHER AREAS WHERE THE GEOTECHNICAL PROPERTIES OF THE SOIL PREVENT INFILTRATION WILL BE HANDLED ON A CASE BY CASE BASIS.
2. ALL EFFORTS ARE TO BE MADE TO SEPARATE ROOF AND LANDSCAPING RUNOFF FROM RUNOFF THAT HAS TRAVELED ACROSS A VEHICLE CARRIAGE WAY.
3. ALL LAND AREAS THAT SLOPE TOWARDS THE PROPERTY OR CONTRIBUTE RUNOFF TO THE SITE ARE TO BE TAKEN INTO ACCOUNT FOR DRAINAGE CALCULATIONS.
4. GROWING MEDIUM (SHOWN IN ILLUSTRATION AS #2):
   a. 300MM DEPTH FOR ALL LANDSCAPE AND ROOF ONLY RUNOFF (1 DRIVEWAY ACCEPTABLE, BUT NOT DESIRABLE).
   b. 450MM DEPTH FOR ALL RUNOFF INCLUDING VEHICLE CARRIAGE WAYS AND MULTIPLE DRIVEWAYS.
5. ELEVATIONS ARE REQUIRED FOR ALL INDIVIDUAL RAIN GARDENS.
6. DRAIN ROCK TO BE 75mm–200mm WASHED STONE.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: STM 6.2	RAIN GARDEN - FULL INFILTRATION (TYPICAL SECTION)				
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE; RM SIGNATURE: [signature]; RM APEGA ID #: 95819; DATE: Feb 28, 2025; PERMIT NUMBER: P006522; The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA, BRIAN KINZIE, ID 66135	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	BK	BK			
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

FEB 28, 2025



NOTES

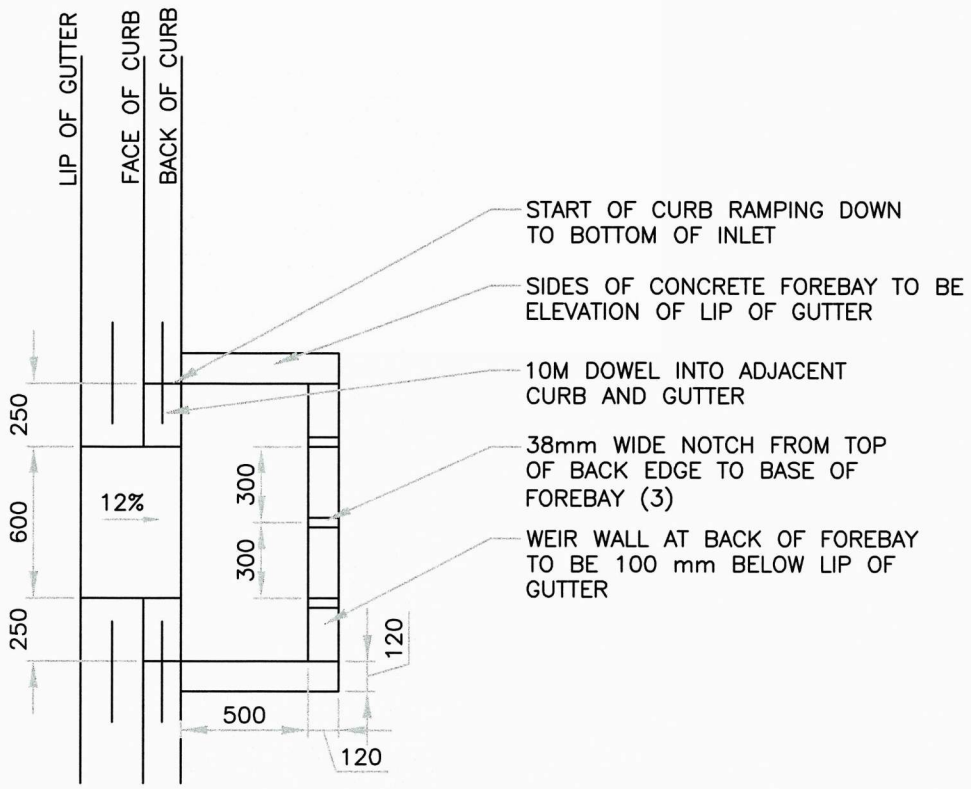
1. DRYWELL IS PERFORATED, AND MAY BE USED WITH OR WITHOUT CATCHBASIN.
2. DRYWELL DEPTH, DRAIN ROCK DIAMETER AND PERFORATED PIPE LENGTH TO BE CALCULATED FOR SPECIFIC SITE RUNOFF, NATIVE SOIL INFILTRATION RATE AND GROUNDWATER ELEVATION. CALCULATIONS TO BE SUBMITTED TO ENGINEER FOR ACCEPTANCE AND APPLIED TO DESIGN DRAWINGS.
3. FILTER FABRIC SOCK INSIDE PRECAST BARREL TO BE ANCHORED TOP AND BOTTOM BETWEEN CONCRETE SLAB AND BARREL UNITS.
4. FABRIC TO BE OVERLAPPED AT SEAMS AND STITCHED TOGETHER TO PREVENT MATERIAL AND DEBRIS BYPASSING THE FABRIC.
5. SECURE FABRIC TO PIPE WITH STAINLESS STEEL STRAP OR CLAMP.

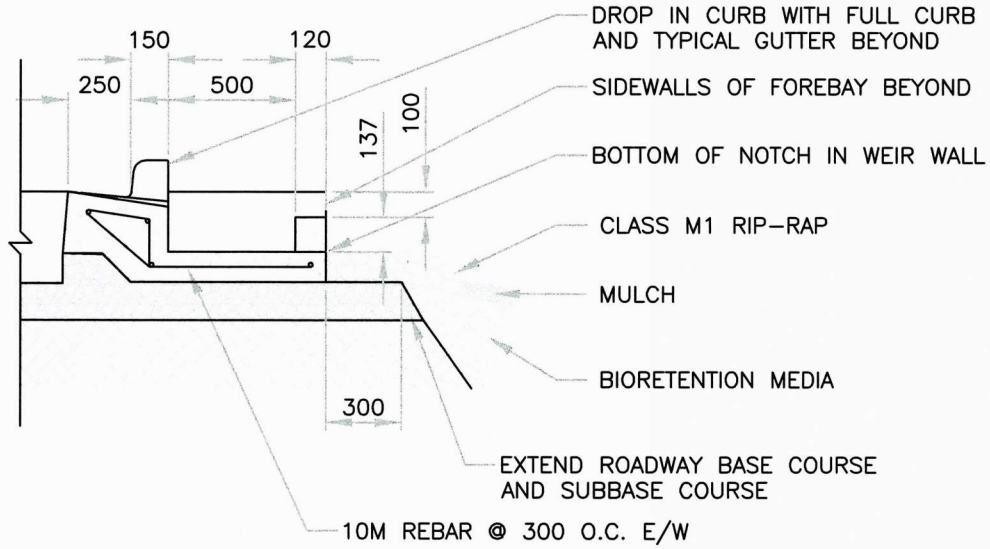
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: STM 6.3	TYPICAL DRAINAGE WELL				
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

FEB. 28, 2025





All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: STM 6.4	BIORETENTION/BIOSWALE INLET DETAIL					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	10/24/23	2023 EDCG	BWM	BK	BK		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

DESIGN ELEMENTS FOR URBAN THOROUGHFARES

TOWN OF CANMORE CLASSIFICATIONS:	LOCAL	COLLECTOR	ARTERIAL
GENERAL			
SHEET NO.	STR 7.3	STR 7.5	STR 7.6
DESIGN/POSTED SPEED (km/h)	30	30	50
TAC CLASSIFICATION	ULU 30	-	UAD 50
BASE CROSS-SECTION			
BASIC ROW WIDTH (m)	15.30	22.00	30.00
NUMBER OF LANES	2	2	2
DRIVING SURFACE WIDTH (m) (1)	6.00	7.10 (6)	7.10 (6)
TRAVEL LANE WIDTH (m) (2)	3.00	3.25 - 3.55 (7)	3.25 - 3.55 (7)
MEDIAN WIDTH (m)	-	-	3.90
PARKING	PARKING BOTH SIDES (IN BAYS)	PARKING BOTH SIDES (IN BAYS)	NO PARKING
PARKING LANE WIDTH (m) (3)	1.95	1.95	-
STANDARD CURB AND GUTTER WIDTH (m)	0.415	0.415	0.415
CONC. INVERT CROSSING WIDTH (m) (4)	0.415 - 0.525	0.415 - 0.525	0.415 - 0.525
SIDEWALK STYLE	BOULEVARD	BOULEVARD	BOULEVARD
SIDEWALK WIDTH (m)	1.8	1.80 - 2.50	1.80 - 3.00
HORIZONTAL ALIGNMENT			
MINIMUM RADIUS (m) (5)	30	30 (8)	80 (8)
MINIMUM STOPPING DISTANCE - ssd (m)	35	35	65
MAXIMUM SUPERELEVATION - e (m/m)	+0.02	+0.02	+0.04
VERTICAL ALIGNMENT			
MAXIMUM GRADE (%)	8.00	8.00	7.00
MINIMUM RATE OF VERTICAL CURVATURE - K	2	2	7

Notes:

1. EXCLUDING TURN BAYS AND PARKING BAYS AS MEASURED FROM FACE OF CURB.
2. TRAVEL LANE MEASURED FROM FACE OF CURB. TRAVEL LANES MAY REQUIRE WIDENING ON CURVES.
3. BACK OF CONCRETE INVERT CROSSING TO FACE OF CURB.
4. INVERT CROSSING WIDTH MAY VARY TO MATCH WIDTH OF ADJACENT CURB TYPE:
   - 0.415m FOR STANDARD CURB
   - 0.525m FOR ROLLED CURB
5. MINIMUM RADII SHOWN ARE CALCULATED BASED ON +0.04 SUPERELEVATION. MINIMUM RADII AND SUPERELEVATION TO BE DETERMINED BY DESIGNER FOR EACH CASE TO ENSURE APPROPRIATE VEHICLE SPEED.
6. 6.00m WHERE A MEDIAN EXISTS.
7. 3.25 WHERE A MEDIAN EXISTS.
8. A MINIMUM RADIUS OF UNDER 150m WILL REQUIRE BUFFER AREAS OR MEDIANS THAT MAY NECESSITATE LOCALIZED WIDENING OF ROAD RIGHT-OF-WAY.

SCALE: NTS	FIGURE NO.: STR 7.1	DESIGN ELEMENTS FOR URBAN THOROUGHFARES

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	CE	CB

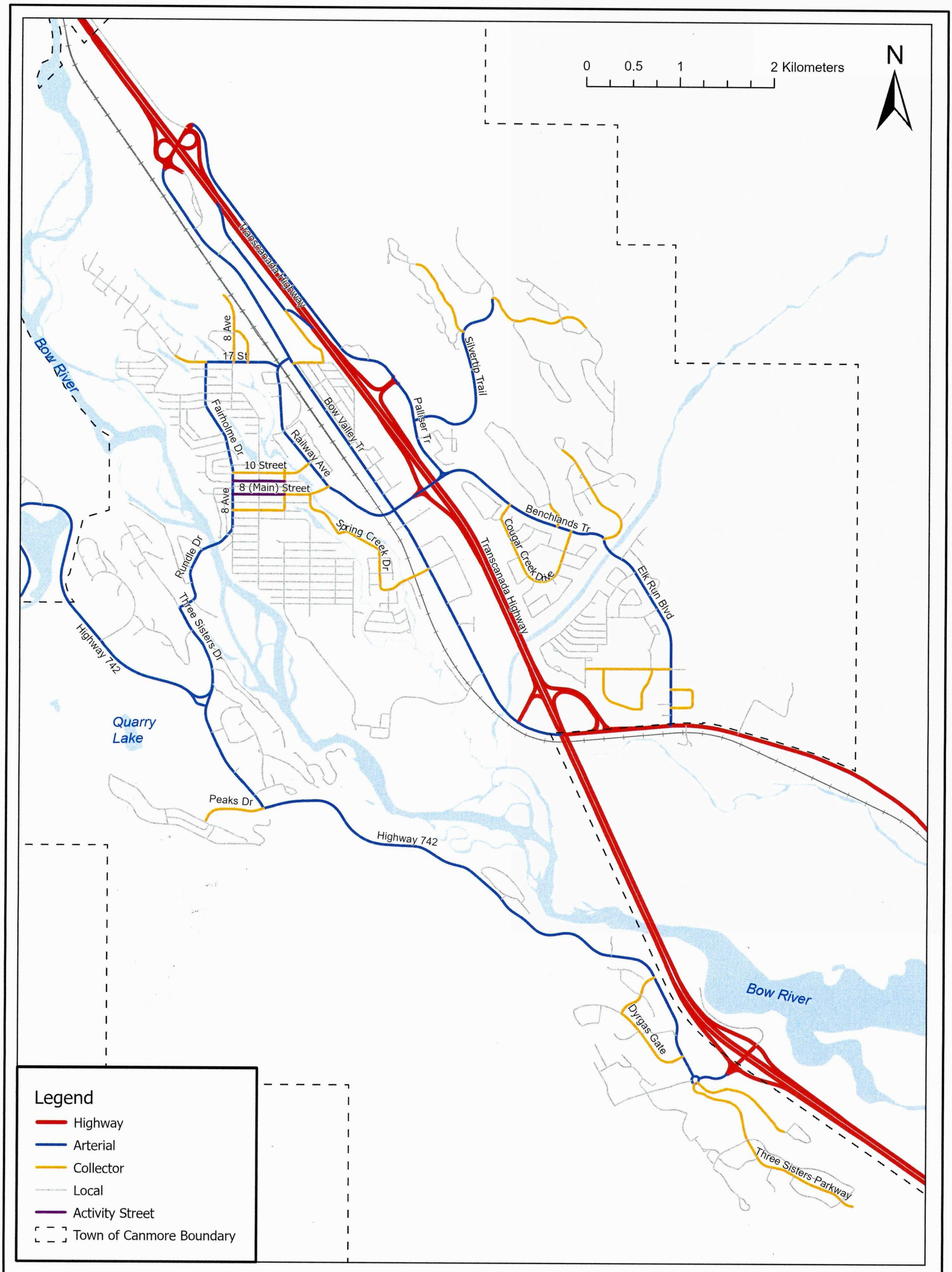
PERMIT

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL

PROFESSIONAL ENGINEER ANDY ESARTE PROVINCE OF ALBERTA
Feb 28, 2025
ID 95819

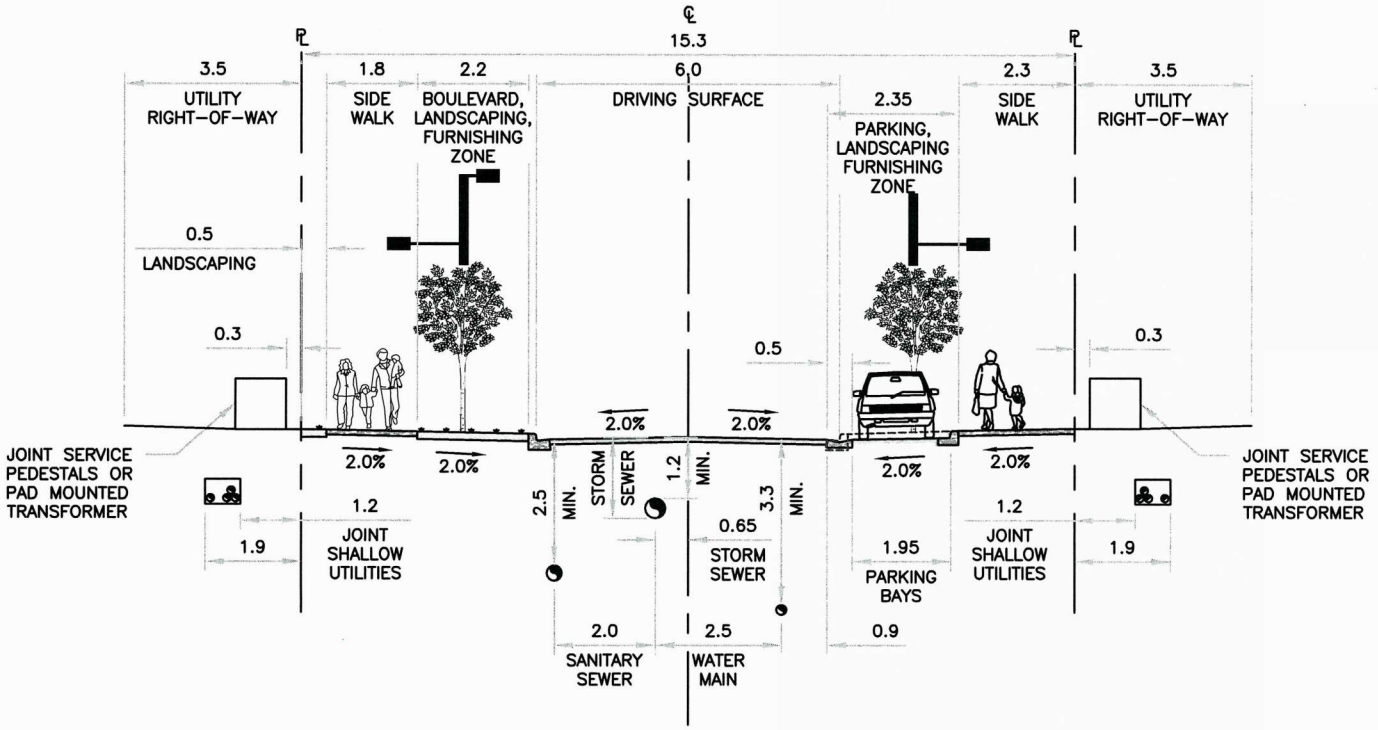
Town of CANMORE



All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: STR 7.2	ROAD CLASSIFICATION					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	CE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA CLAIRE ELLICK ID 70445 Feb. 28 2025
1	12/10/19	2019 EDCG	BWM	CE	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES OR MEWS WHEN PROVIDED.
4. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
5. SEE STR 7.7 FOR PARKING BAY DETAIL.
6. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
7. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
8. WHERE SIDEWALK IS NOT ADJACENT TO A PARKING BAY, A 1.8m SIDEWALK WIDTH IS TO BE APPLIED, WITH A SMOOTH TRANSITION FROM THE 2.3m WIDTH.
9. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS AND MAY BE CONSIDERED ADJACENT TO BOULEVARD SIDEWALK.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.3	LOCAL (ULU 30) PARKING BOTH SIDES - CROSS SECTION

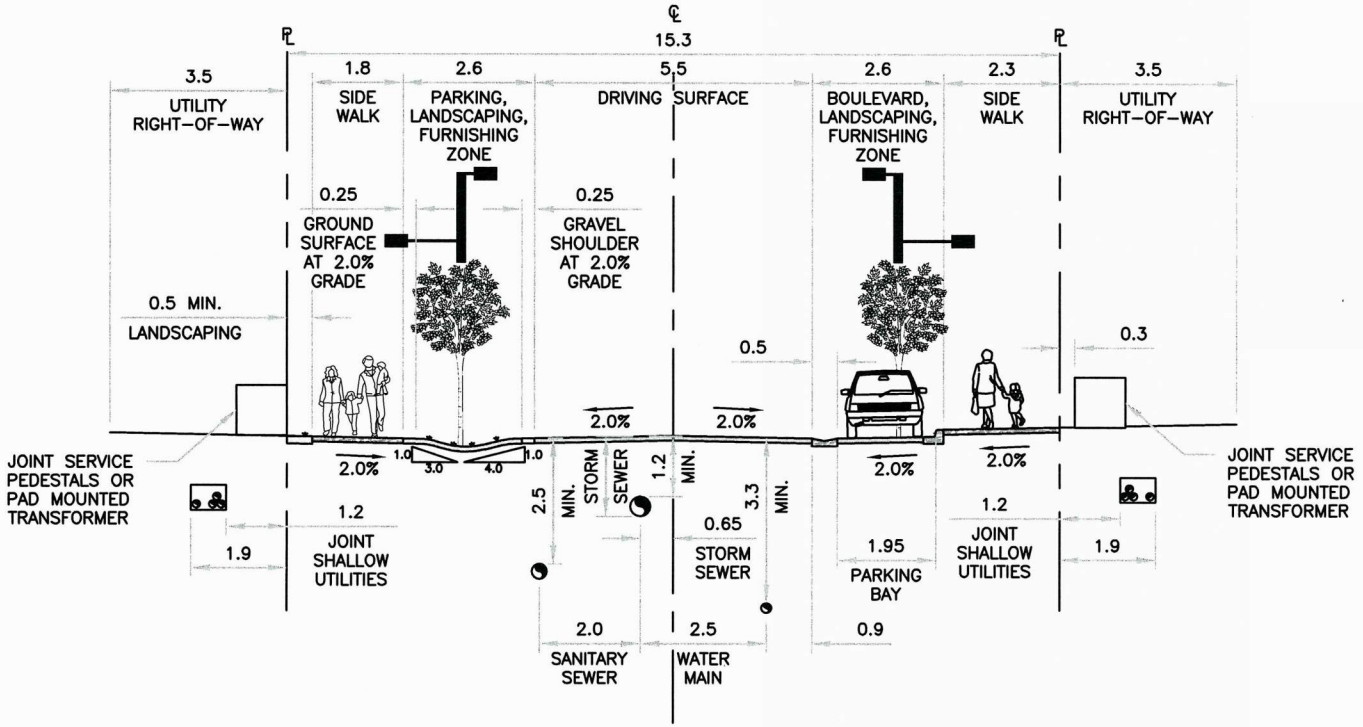
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA

Feb. 28, 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM EDGE OF PAVEMENT.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR OR MEWS LANES WHEN PROVIDED.
4. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
5. SEE STR 7.7 FOR PARKING BAY DETAIL.
6. GRAVEL SHOULDER TO BE CONSTRUCTED TO A LOAD–BEARING CAPACITY OF 38,556kg (85,000lbs).
7. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
8. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
9. WHERE SIDEWALK IS NOT ADJACENT TO A PARKING BAY, A 1.8M SIDEWALK WIDTH IS TO BE APPLIED, WITH A SMOOTH TRANSITION FROM THE 2.3M WIDTH.
10. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.4	LOCAL RURAL PARKING BOTH SIDES - CROSS SECTION

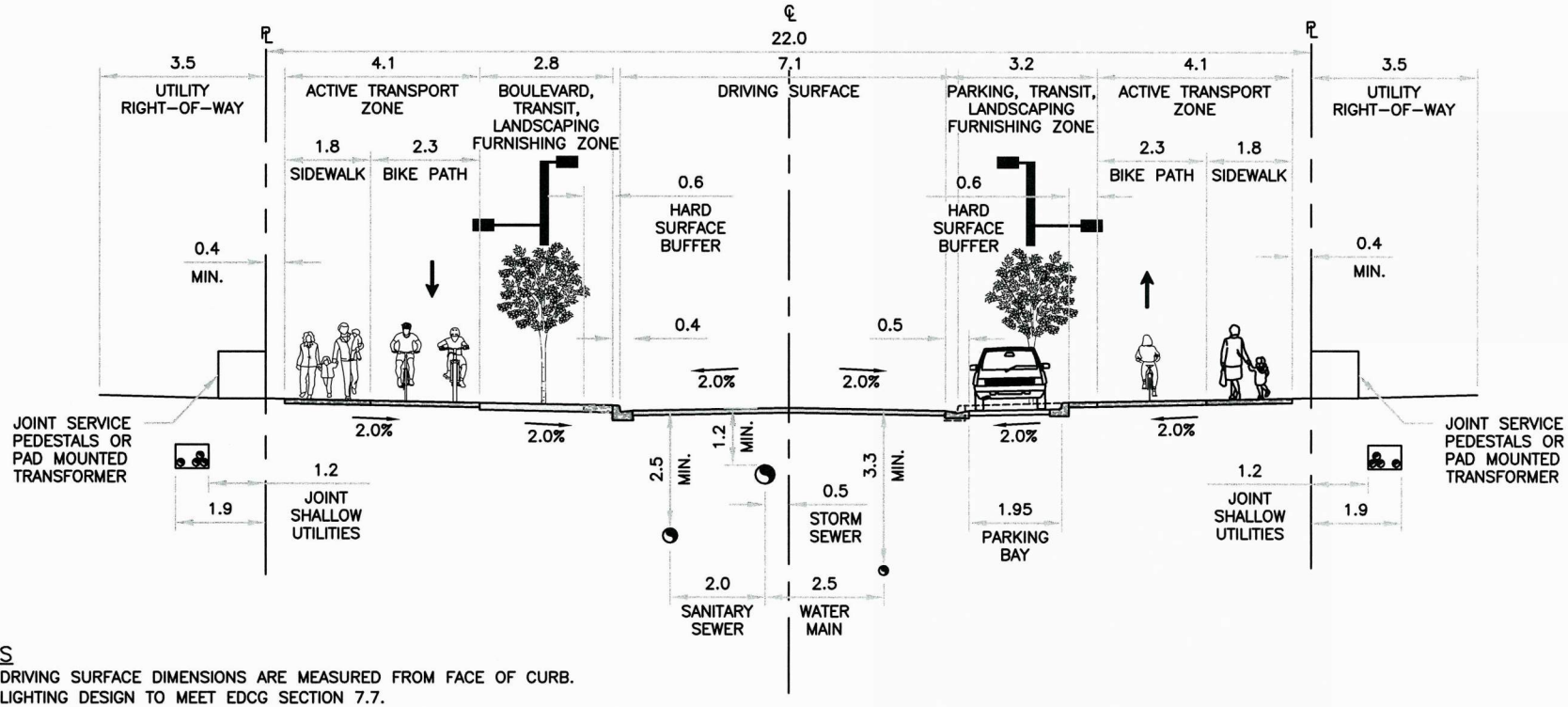
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/11/19	2019 EDCG	BWM	CE	CB

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

Feb 28 / 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. ACTIVE TRANSPORTATION FACILITY WIDTHS TO BE DETERMINED BASED ON CONTEXT.
4. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES WHEN PROVIDED.
5. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
6. SEE STR 7.7 FOR PARKING BAY DETAIL.
7. POCKET EASEMENTS AND RIGHT–OF–WAY ADJUSTMENTS MAY BE REQUIRED TO ACCOMMODATE TRANSIT INFRASTRUCTURE, AS DETERMINED BY THE TOWN OF CANMORE.
8. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
9. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
10. ADJACENT TO TRANSIT STOPS, THE ACTIVE TRANSPORT ZONE MAY BE SHIFTED CLOSER TO THE PROPERTY LINE TO ALLOW A FULL 3.0m TRANSIT ZONE. OUTSIDE OF TRANSIT ZONES, THE ACTIVE TRANSPORT ZONE SHOULD OTHERWISE FOLLOW THE ALIGNMENT SHOWN IN THE FIGURE ABOVE.
11. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS.

All dimensions in Metric meters unless otherwise noted

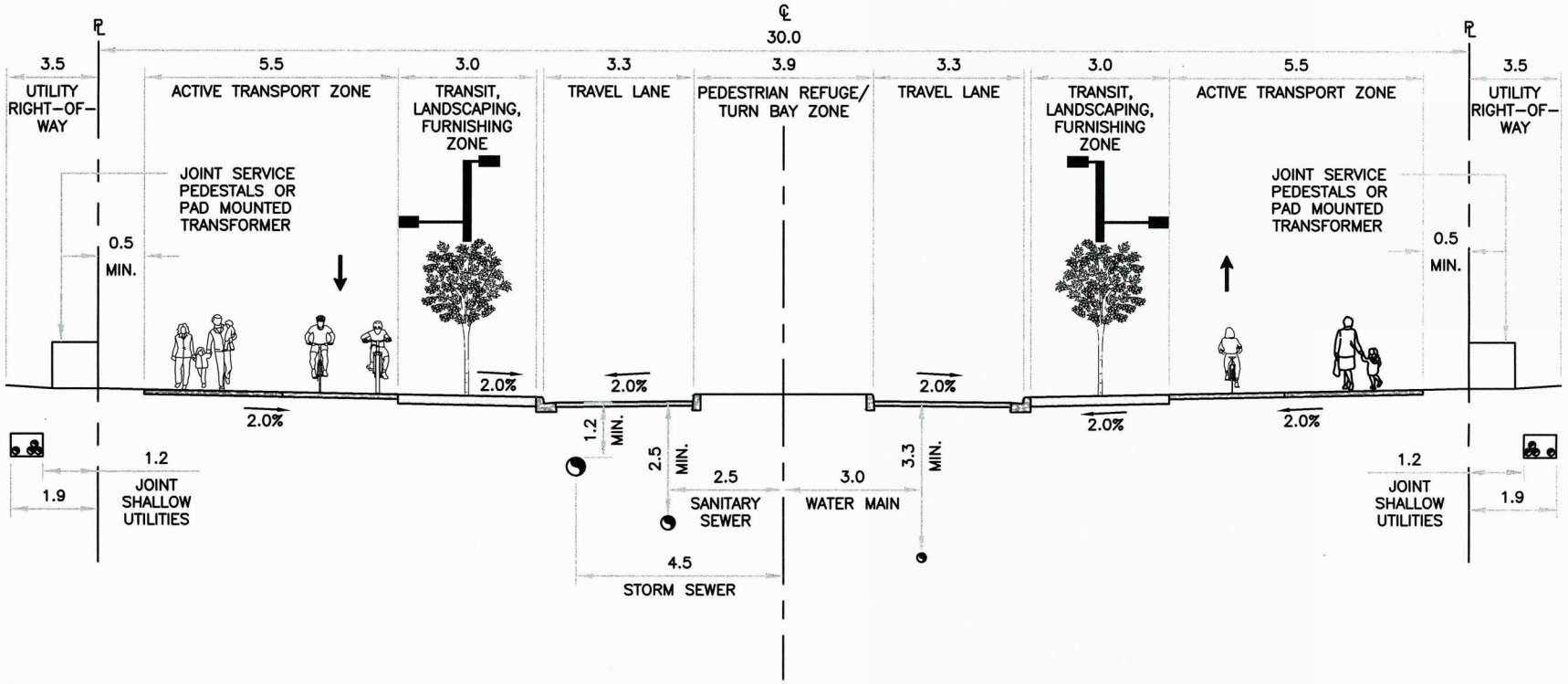
SCALE: 1:150	FIGURE NO.: STR 7.5	COLLECTOR PARKING BOTH SIDES - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDITS	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE
Feb 28, 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES WHEN PROVIDED.
4. ACTIVE TRANSPORTATION FACILITY WIDTHS TO BE DETERMINED BASED ON CONTEXT. REFER TO TABLE 7–5.
5. OVERALL R.O.W. WIDTH MAY BE ADJUSTED BASED ON WIDTH OF SIDEWALK FACILITIES, AS DETERMINED BY THE TOWN OF CANMORE.
6. POCKET EASEMENTS MAY BE REQUIRED TO ACCOMMODATE TRANSIT INFRASTRUCTURE, AS DETERMINED BY THE TOWN OF CANMORE.
7. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
8. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
9. MEDIAN CURB TYPE AND FILL TO BE DETERMINED ON A PROJECT TO PROJECT BASIS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.6	ARTERIAL (UAD 50) NO PARKING - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

PERMIT

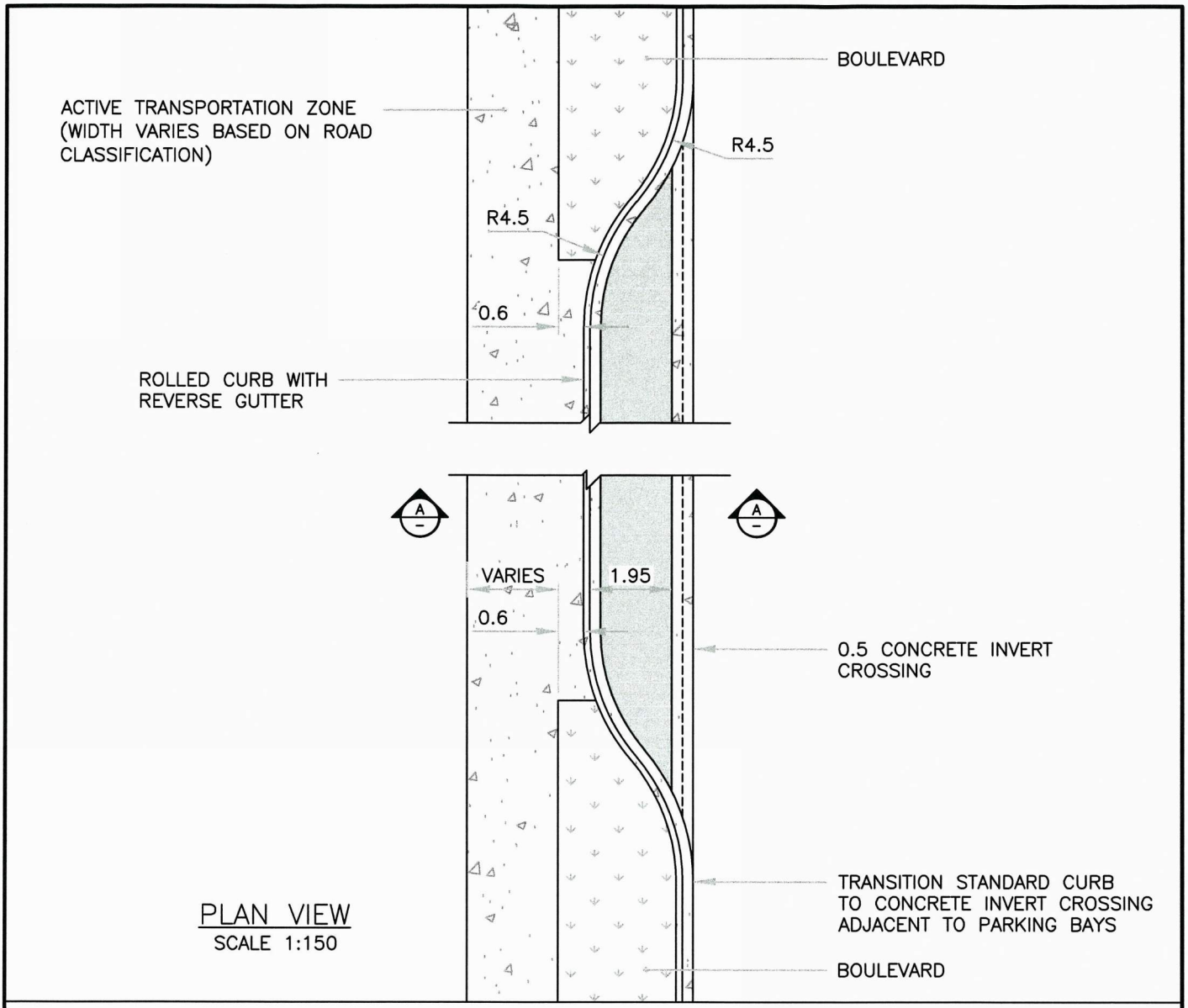
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE: Cindy Esarte
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL

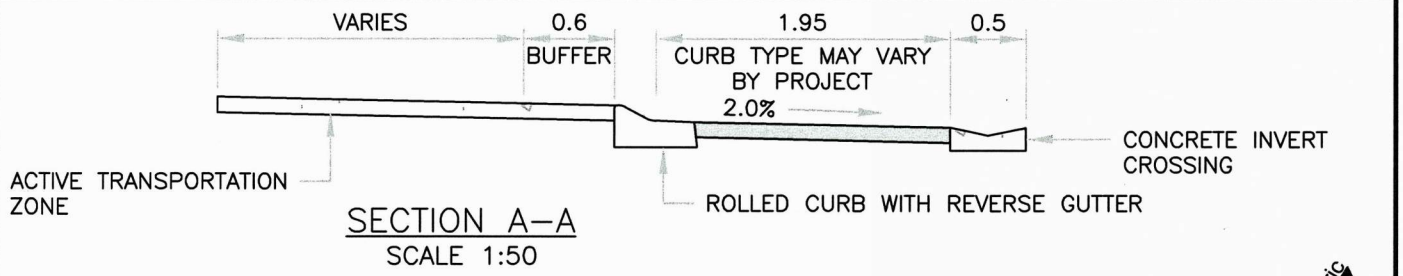
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

Town of CANMORE

Feb. 28, 2025
ID 95819



PLAN VIEW
SCALE 1:150

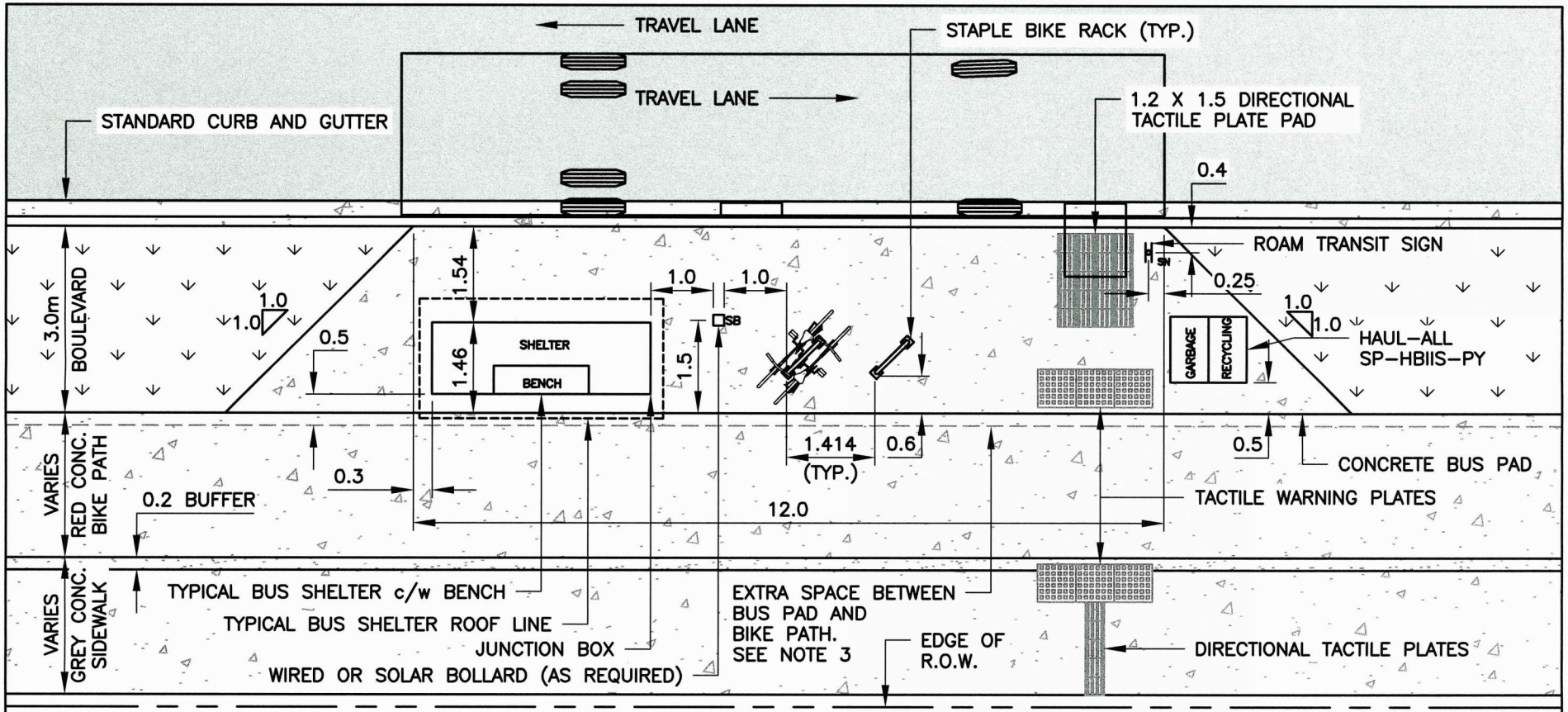


SECTION A–A
SCALE 1:50

All dimensions in meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.7	PARKING BAY					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	CE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER CLAIRE ELLICK ID 70445 ALBERTA Feb. 28, 2025
1	12/09/19	2019 EDCG	BWM	CE	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



NOTES

1. ELECTRICAL CONNECTION FOR BUS STOP HEATER OR BOLLARD LIGHT MAY BE REQUIRED DEPENDING ON STOP LOCATION, AT THE DISCRETION OF THE TOWN. IF REQUIRED, PROVIDE 32MM HDPE CONDUIT FROM NEAREST POWER SUPPLY TO JUNCTION BOX IN BUS SHELTER AND BOLLARD. CONDUIT UNDER THE ROADWAY AND BUS STOP SHALL BE RUN THROUGH A 100MM DB2 CONDUIT.
2. SHELTER DIMENSIONS MAY VARY BASED ON MANUFACTURERS SPECIFICATIONS.
3. ADDITIONAL LOCALIZED WIDENING OF ROAD ROW MAY BE NECESSARY TO ACCOMMODATE FULL–SIZE BUS STOP AND ACTIVE TRANSPORTATION FACILITIES. WIDENED AREA TO BE CONSTRUCTED IN THE SAME MATERIAL AS ADJACENT ACTIVE TRANSPORTATION FACILITY
4. WIDTH OF SIDEWALK AND BIKE PATH VARY BASED ON ROADWAY CLASSIFICATION.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	
1:100	STR 7.8	BUS STOP LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	CE
1	12/09/19	2019 EDCG	BWM	CE	CB

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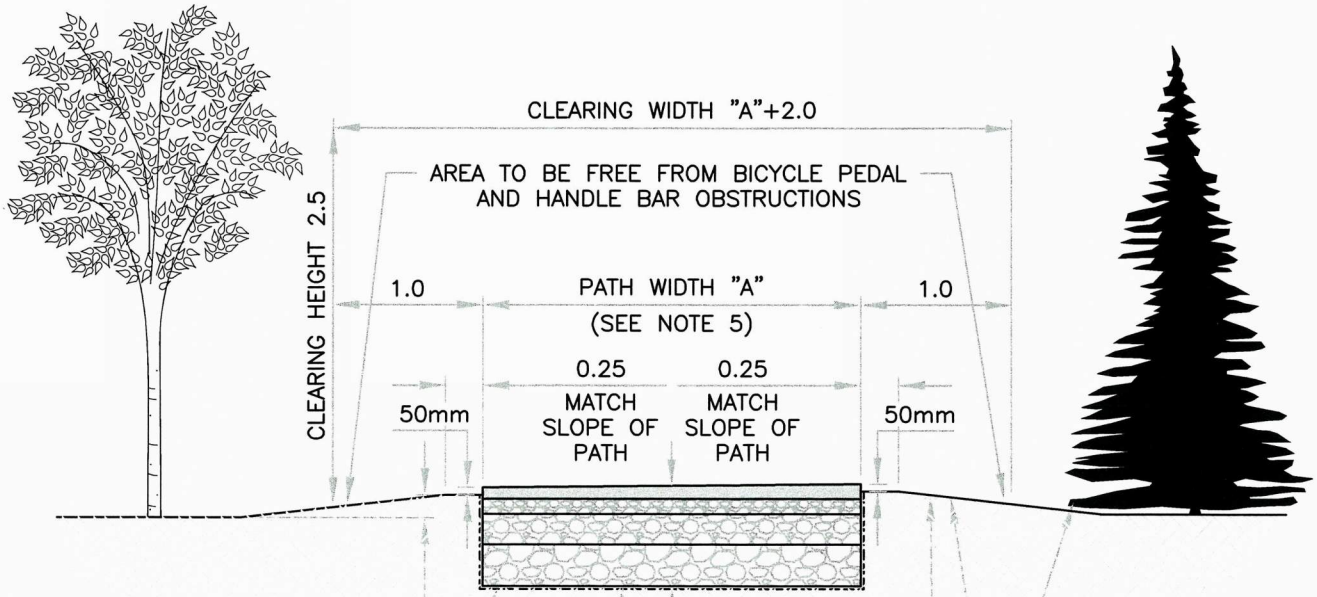
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95817
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
CLAIRE ELLICK
ID 70445
Feb. 28, 2025

Town of CANMORE



MIN. 150mm ABOVE SURROUNDING GRADES (TYP. BOTH SIDES)

INSTALL POLYSPUN 300 ROOT BARRIER (BOTH SIDES AND BOTTOM) EXTRA ROOT BARRIER CAN BE BURNED FLUSH WITH GROUND FOLLOWING PAVING, AND PRIOR TO SEEDING

REMOVE ORGANIC MATERIAL TO 500mm DEPTH. REPLACE WITH 275mm OF 75mm PITRUN WHERE OVER EXCAVATED BEYOND STRUCTURE DEPTH.

5:1 MAX. GRADE (TYP. BOTH SIDES) SEE NOTE 11

DO NOT DISTURB EXISTING VEGETATION (TYP. BOTH SIDES)

BLEND EXISTING TOPSOIL INTO EXISTING VEGETATION AT A GRADE OF 5:1. TOPSOIL AND SEED ALL DISTURBED AREAS (TYP. BOTH SIDES)

- 75mm ASPHALT SURFACE HOT MIX "B"
- 100mm BASE OF 25mm CRUSHED GRAVEL COMPACTED TO 95% S.P.D.
- 200mm SUB-BASE OF 75mm MINUS PITRUN COMPACTED TO 95% S.P.D.
- PITRUN (ADDITIONAL LIFT(S) MAY BE REQUIRED BASED ON GEOTECHNICAL CONDITIONS)
- ROOT BARRIER

NOTES

1. 2% CROSS-SLOPE ORIENTED TOWARDS THE SUN OR DOWNHILL SLOPE, ON PATH AS DIRECTED BY THE TOWN, EXCEPT WHERE SUPERELEVATION IS REQUIRED ON A CURVE BASED ON SITE SPECIFIC CONSTRAINTS.
2. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ENGINEER FOR THE TRAIL ALIGNMENT AND SUB-BASE (IE: COMPACTION AND DEPTH OF GRAVEL) PRIOR TO SURFACING WITH ASPHALT.
3. USE EXISTING SITE SOIL OVER IMPORTING NEW SOIL WHERE POSSIBLE. COBBLES, DEBRIS AND ROOTS MUST BE REMOVED FROM EXISTING SOIL IF BEING REUSED.
4. IF NEW TOP SOIL IS USED, IT MUST BE WEED-FREE.
5. PATH WIDTH "A" SHALL BE A MINIMUM OF 3.5m FOR BIDIRECTIONAL FACILITIES, AND WIDER WHERE HIGH VOLUMES OF WALKING AND CYCLING ARE EXPECTED.
6. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2mm THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
7. POLYSPUN 300 ROOT BARRIER TO BE INSTALLED IN AREAS WHERE POPLARS, WOLF WILLOW AND OTHER SUCKERING VEGETATION ARE PRESENT.
8. SALVAGED BOULDERS ARE TO BE SET ASIDE FOR USAGE ONSITE AS DIRECTED BY THE ENGINEER.
9. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2MM THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
10. CLEAR ZONES MAY BE REDUCED FROM 1.0M TO 0.5M MINIMUM CLEARANCE FOR SITE SPECIFIC CONSTRAINTS.
11. A SLOPE OF 3:1 MAY BE CONSIDERED BASED ON SITE SPECIFIC CONSTRAINTS, AND AS DEEMED APPROPRIATE BY GEOTECHNICAL ENGINEER.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	TYPICAL MULTI USE PATHWAY CROSS SECTION - ASPHALT SURFACE
1:50	STR 7.9	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	CE	CB

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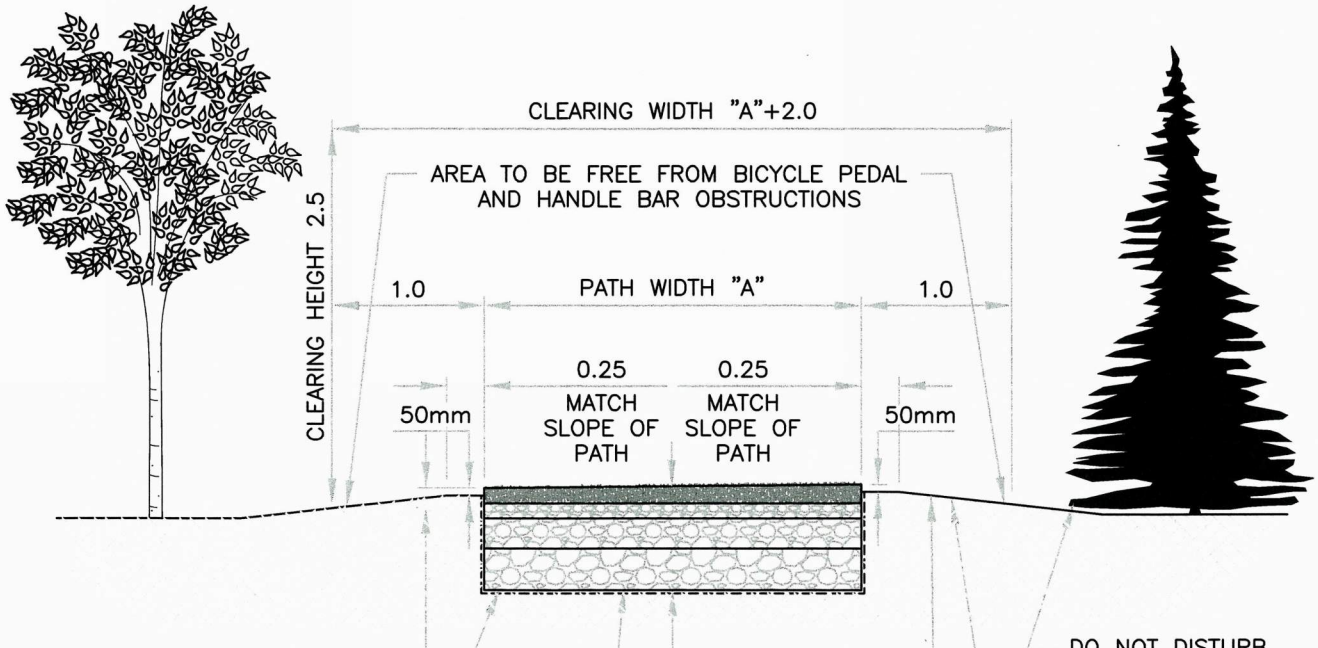
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL

PROFESSIONAL ENGINEER ALBERTA ANDY ESARTE

Feb. 28, 2025
ID 95819

Town of CANMORE



MIN. 150mm ABOVE SURROUNDING GRADES (TYP. BOTH SIDES)

INSTALL POLYSPUN 300 ROOT BARRIER (BOTH SIDES AND BOTTOM) EXTRA ROOT BARRIER CAN BE BURNED FLUSH WITH GROUND FOLLOWING PAVING, AND PRIOR TO SEEDING

REMOVE ORGANIC MATERIAL TO 500mm DEPTH. REPLACE WITH 275mm OF 75mm PITRUN WHERE OVER EXCAVATED BEYOND STRUCTURE DEPTH.

5:1 MAX. GRADE (TYP. BOTH SIDES) SEE NOTE 11

DO NOT DISTURB EXISTING VEGETATION (TYP. BOTH SIDES)

BLEND EXISTING TOPSOIL INTO EXISTING VEGETATION AT A GRADE OF 5:1. TOPSOIL AND SEED ALL DISTURBED AREAS (TYP. BOTH SIDES)

- 100mm TRAIL MIX (see note 2)
- 100mm BASE OF 25mm CRUSHED GRAVEL COMPACTED TO 95% S.P.D.
- 200mm SUB-BASE OF 75mm MINUS PITRUN COMPACTED TO 95% S.P.D.
- PITRUN (ADDITIONAL LIFT(S) MAY BE REQUIRED BASED ON GEOTECHNICAL CONDITIONS)
- ROOT BARRIER

NOTES

1. SAMPLE OF THE PROPOSED TRAIL MIX TO BE PROVIDED TO THE CONSULTANT 7 DAYS PRIOR TO DELIVERY ON SITE FOR ACCEPTANCE. UPON DELIVERY ON SITE THE TRAIL MIX IS TO BE VERIFIED BY THE ENGINEERING SERVICES TO BE IN COMPLIANCE TO THE STANDARDS AND THE SAMPLE PROVIDED PRIOR TO PLACEMENT.
2. 100MM DEPTH TRAIL MIX: CITY OF CALGARY PARKS GRAVEL TRAIL MIX PRODUCED AT LAFARGE SPYHILL. MOISTURE CONTENT AND TIMELY COMPACTION ARE IMPORTANT WHEN PLACING THIS MATERIAL
3. 2% CROSS SLOPE ORIENTED TOWARDS THE SUN OR DOWNHILL SLOPES.
4. USE EXISTING SITE SOIL OVER IMPORTING NEW SOIL WHERE POSSIBLE. COBBLES, DEBRIS AND ROOTS TO BE REMOVED FROM EXISTING SOIL IF BEING REUSED.
5. POLYSPUN 300 ROOT BARRIER TO BE INSTALLED IN AREAS WHERE POPLARS, WOLF WILLOW AND OTHER SUCKERING VEGETATION ARE PRESENT.
6. NEW SOIL IF USED MUST BE WEED-FREE.
7. PATH WIDTH "A" TO BE DETERMINED BASED ON SECTION 7.5 OF THE EDCG.
8. SALVAGED BOULDERS ARE TO BE SET ASIDE FOR USAGE ONSITE AS DIRECTED BY THE ENGINEER.
9. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2MM THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
10. CLEAR ZONES MAY BE REDUCED FROM 1.0M TO 0.5M MINIMUM CLEARANCE FOR SITE SPECIFIC CONSTRAINTS.
11. A SLOPE OF 3:1 MAY BE CONSIDERED BASED ON SITE SPECIFIC CONSTRAINTS, AND AS DEEMED APPROPRIATE BY GEOTECHNICAL ENGINEER.

Metric
All dimensions in meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.10	TYPICAL MULTI USE PATHWAY CROSS SECTION - GRAVEL/CLAY SURFACE

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	LG	CB

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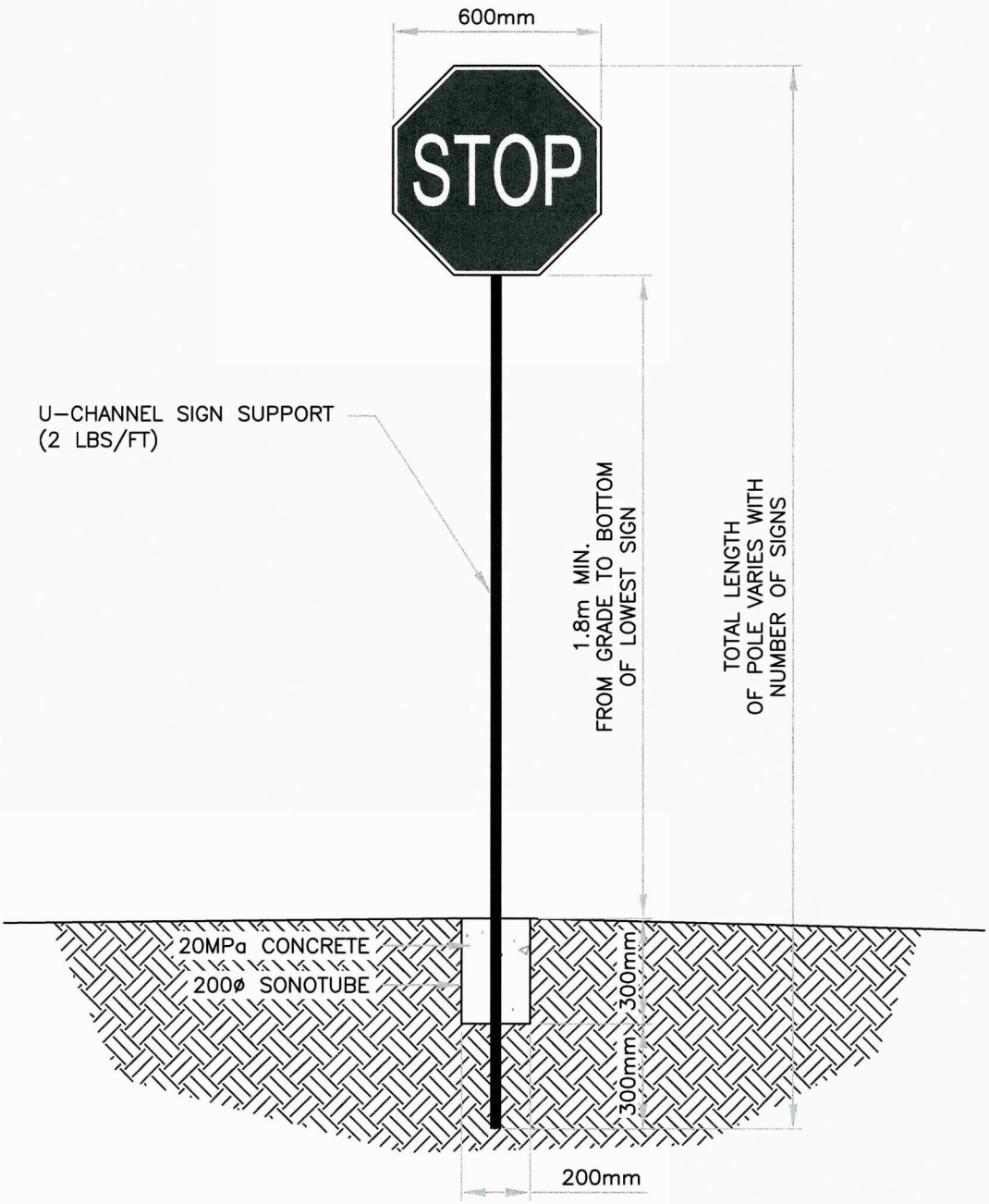
TOWN OF CANMORE
RM SIGNATURE: [signature]
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA
[signature]
Feb. 28, 2025
ID 95819

Town of CANMORE



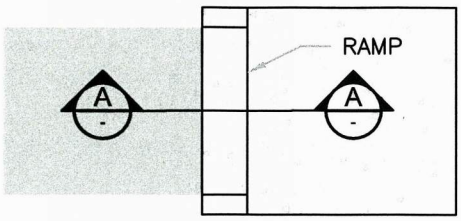
NOTES

1. ALL SIGNS TO BE ORIENTED AND INSTALLED IN ACCORDANCE WITH TAC AND MUTCDC GUIDANCE.
2. AN ALTERNATE FLUSH MOUNT BASE FOR U–CHANNEL SIGN SUPPORT MAY BE CONSIDERED FOR MOUNTING ON 100mm CONCRETE SIDEWALK. CONTACT ENGINEERING DEPARTMENT FOR APPROVAL AND DETAILS.
3. CROSSWALK SIGNS SHALL BE FITTED WITH REFLECTIVE PANELS, BRITESIDE MODEL BSX–372DGFYG DIAMOND GRADE 4083 YELLOW OR APPROVED EQUAL TO SUIT MOUNTING ON BOTH SIDES OF POST.
4. MINIMUM 0.5m OFFSET FROM EDGE OF ANY SIDEWALK, CYCLING FACILITY OR CURB RAMP.

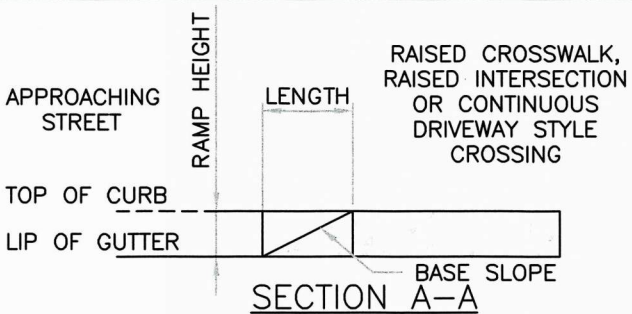
All dimensions in Metric meters unless otherwise noted

SCALE: 1:20	FIGURE NO.: STR 7.11	TYPICAL STREET SIGN INSTALLATION					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	AE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95519 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA Feb. 28, 2025 10 95819
1	05/10/10	2010 EDCG	SP	PN	PN		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



PLAN VIEW
SCALE 1:200

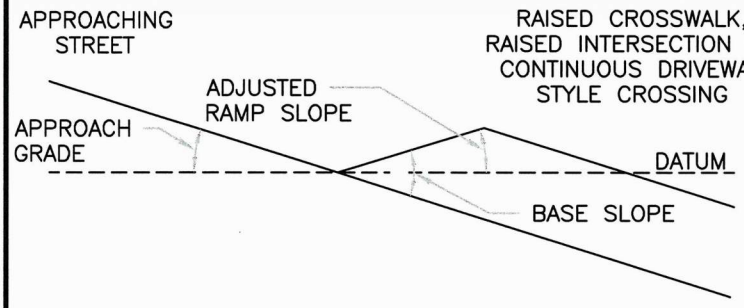


SECTION A–A
SCALE H 1:100
V 1:25

RAMP DESIGN SPEED OF 20km/h			
CURB TYPE	RAMP HEIGHT (m)	LENGTH (m)	BASE SLOPE
LOW PROFILE ROLLED CURB WITH 250mm GUTTER	0.08	0.80	10.0%
STANDARD CURB WITH 250mm GUTTER	0.12	1.20	10.0%

RAMP DESIGN SPEED OF 30km/h			
CURB TYPE	RAMP HEIGHT (m)	LENGTH (m)	BASE SLOPE
LOW PROFILE ROLLED CURB WITH 250mm GUTTER	0.08	1.00	8.0%
STANDARD CURB WITH 250mm GUTTER	0.12	1.50	8.0%

RAMP DESIGN SPEED BY CLASSIFICATION	
TOWN OF CANMORE CLASSIFICATION	RAMP DESIGN SPEED (km/h)
LOCAL (RESIDENTIAL)	20
COLLECTOR	30



EXAMPLE CALCULATION

ADJUSTED RAMP SLOPE = BASE SLOPE + APPROACH GRADE

ADJUSTED RAMP SLOPE = 8.0% + −2.0%

ADJUSTED RAMP SLOPE = 6.0%

RELATIVE RAMP GRADE ADJUSTMENT

NOTES
1. RAMP MATERIAL TO BE CONCRETE.
2. CONSTRUCT ALL RAMPS TO THEIR ADJUSTED RAMP SLOPE USING THE CALCULATION SHOWN ABOVE. APPROACH GRADE IS NEGATIVE FOR A DOWNHILL APPROACH AND POSITIVE FOR AN UPHILL APPROACH.
3. RAMP DESIGN SPEED DOES NOT MATCH THE DESIGN SPEED OF THE STREET. RAMPS ARE INTENDED TO PROVIDE ADDITIONAL TRAFFIC CALMING EFFECTS AND SHOULD BE PLACED AT THE DISCRETION OF THE ENGINEER.

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.12	RAMP LAYOUT			
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG

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TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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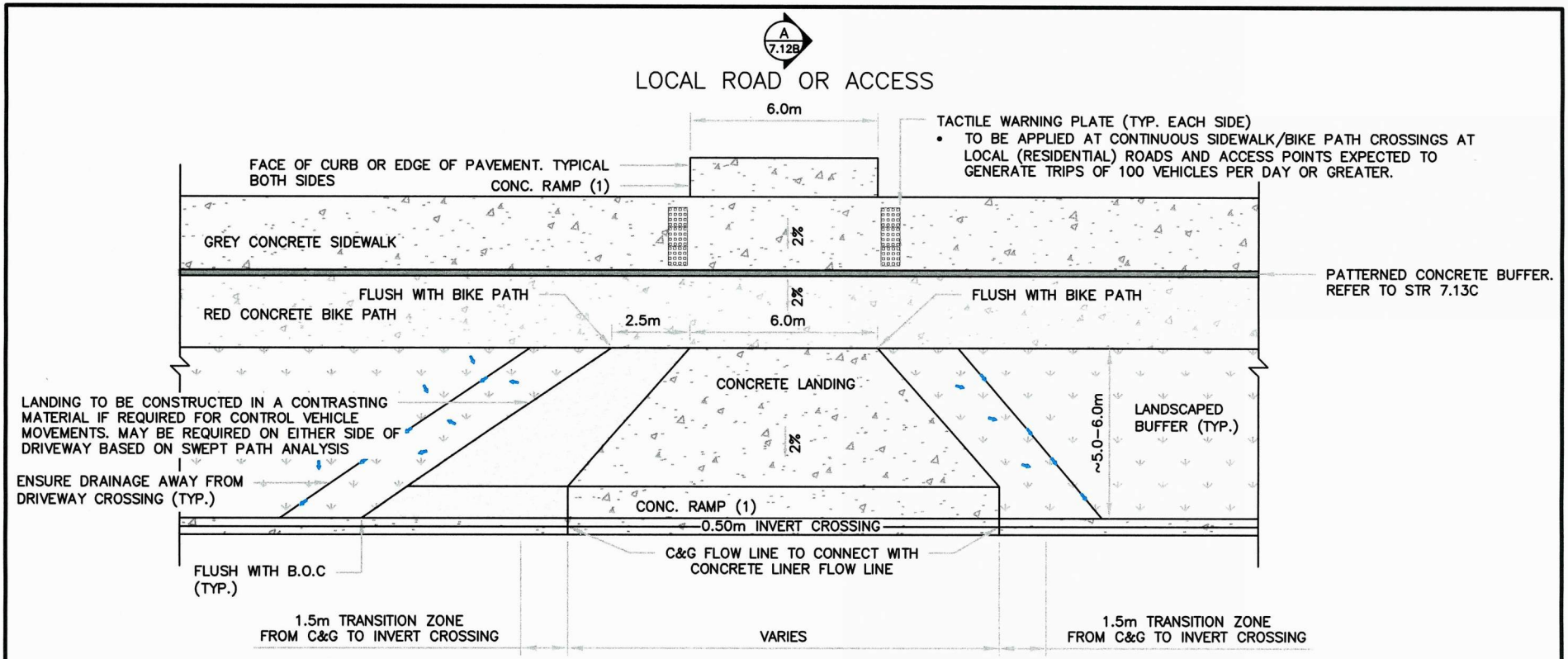
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE
Feb. 28, 2025
ID 95819

Town of CANMORE



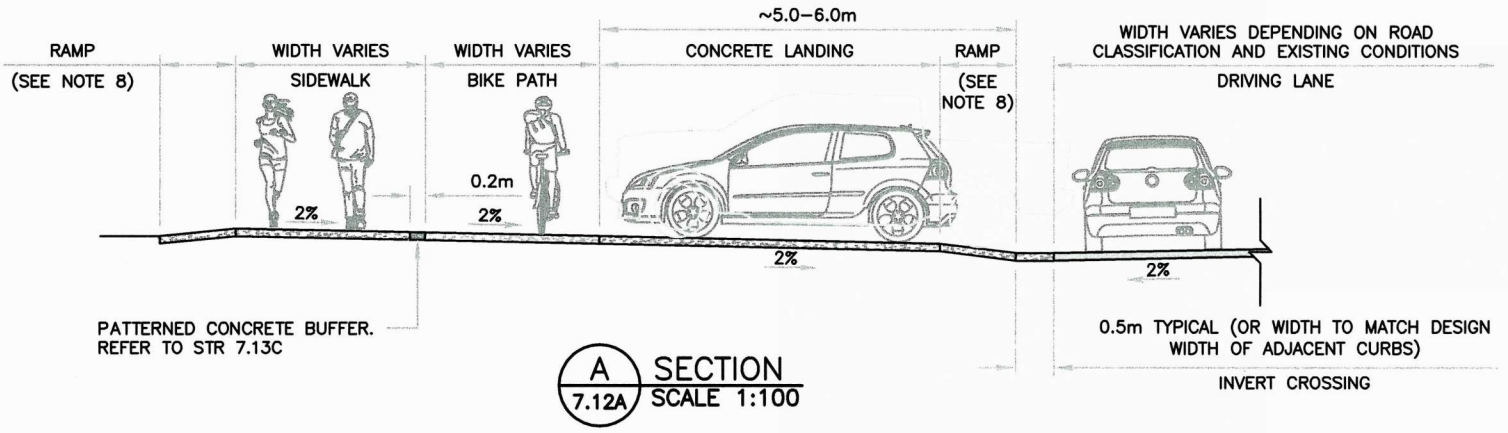
NOTES

1. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.12A	BEND OUT DRIVEWAY CROSSING - PLAN VIEW				PERMIT	SEAL	
3						PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA ANDY ESAAU	Town of CANMORE
2								
1	01/28/25	2025 EDCG	BWM	ISL	AE			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

Feb. 28, 2025
ID 95819



A / 7.12A SECTION
SCALE 1:100

NOTES

1. ROAD AND PATH STRUCTURE TO MATCH EXISTING, OR TO MATCH CITY OF CALGARY STANDARD SPECIFICATIONS, BASED ON SITE SPECIFIC GEOTECHNICAL RECOMMENDATIONS AND ENGINEERING DESIGN DRAWINGS. ROAD AND PATH STRUCTURE MAY VARY BASED ON EXISTING CONDITIONS AND ROAD CLASSIFICATION.
2. PRIVATE DRIVEWAY REINFORCED CONCRETE THICKNESS 100mm, UNLESS SPECIFIED OTHERWISE.
3. COMMERCIAL DRIVEWAY REINFORCED CONCRETE THICKENESS 150mm, UNLESS SPECIFIED OTHERWISE.
4. TYPICAL STRUCTURES SHOWN BELOW ARE FOR A COMMERICAL DRIVEWAY CROSSING ON A CANMORE ARTERIAL ROAD CLASSIFICATION.
5. BIKE PATH AT DRIVEWAY CROSSING
   - RED CONCRETE FOR BIKES TO BE BROOM FINISHED WITH SAWCUT CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm RED FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm. COLOR INTERSTAR SEDONA JO–6435R @ 2 BAGS PER CUBIC YARD.
   - 100mm OF 25mm MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80mm MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
6. PEDESTRIAN SIDEWALK AT DRIVEWAY CROSSING
   - GREY CONCRETE FOR PEDESTRIANS TO BE BROOM FINISHED WITH TOOLED CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm.
   - 100mm OF 25MM MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80MM MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
7. RAMPS AND CONCRETE LANDING TO MATCH PEDESTRIAN SIDEWALK STRUCTURE, UNLESS SPECIFIED OTHERWISE.
8. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.12B	BEND OUT DRIVEWAY CROSSING - SECTION VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/14/25	2025 EDCG	BWM	ISL	AE

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RM SIGNATURE:
RM APEGA ID #: 95819
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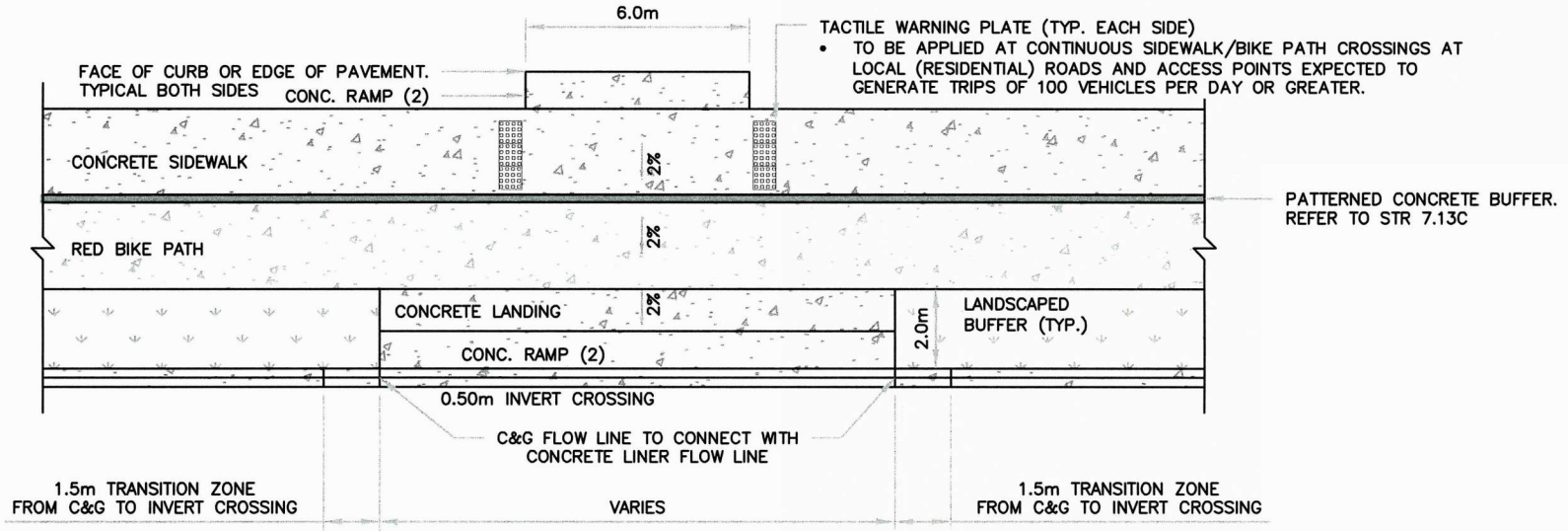
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

Feb. 28, 2025
ID 95819

Town of CANMORE

A
7.13B

LOCAL ROAD OR ACCESS



DRIVING LANE

A
7.13B

PLAN VIEW
SCALE 1:200

NOTES
1. SURFACE DRAINAGE SHALL BE MANAGED WITH CATCH BASINS ADJACENT TO THE RAMP. A BREAK IN THE RAMP ADJACENT TO THE CURB AND COVERED WITH A PLATE IS DISCOURAGED DUE TO THE MAINTENANCE BURDEN.
2. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.13A	BEND IN DRIVEWAY CROSSING - PLAN VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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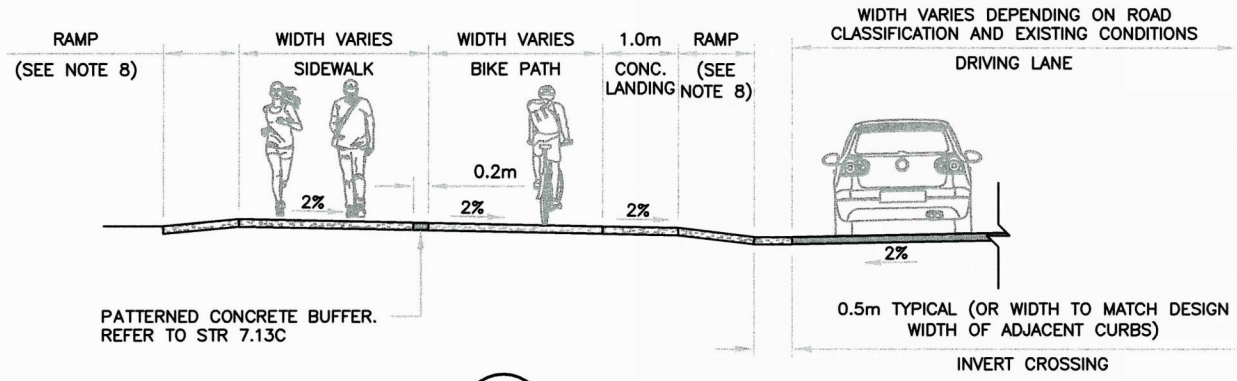
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA ANDY ESARTE

Feb. 28, 2025
ID 95819

Town of CANMORE



A / 7.13A SECTION
SCALE 1:100

NOTES

1. ROAD AND PATH STRUCTURE TO MATCH EXISTING, OR TO MATCH CITY OF CALGARY STANDARD SPECIFICATIONS, BASED ON SITE SPECIFIC GEOTECHNICAL RECOMMENDATIONS AND ENGINEERING DESIGN DRAWINGS. ROAD AND PATH STRUCTURE MAY VARY BASED ON EXISTING CONDITIONS AND ROAD CLASSIFICATION.
2. PRIVATE DRIVEWAY REINFORCED CONCRETE THICKNESS 100mm, UNLESS SPECIFIED OTHERWISE.
3. COMMERCIAL DRIVEWAY REINFORCED CONCRETE THICKENESS 150mm, UNLESS SPECIFIED OTHERWISE.
4. TYPICAL STRUCTURES SHOWN BELOW ARE FOR A COMMERICAL DRIVEWAY CROSSING ON A CANMORE ARTERIAL ROAD CLASSIFICATION.
5. BIKE PATH AT DRIVEWAY CROSSING
   - RED CONCRETE FOR BIKES TO BE BROOM FINISHED WITH SAWCUT CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm RED FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm. COLOR INTERSTAR SEDONA JO–6435R @ 2 BAGS PER CUBIC YARD.
   - 100mm OF 25mm MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80mm MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
6. PEDESTRIAN SIDEWALK AT DRIVEWAY CROSSING
   - GREY CONCRETE FOR PEDESTRIANS TO BE BROOM FINISHED WITH TOOLED CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm.
   - 100mm OF 25MM MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80MM MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
7. RAMPS AND CONCRETE LANDING TO MATCH PEDESTRIAN SIDEWALK STRUCTURE, UNLESS SPECIFIED OTHERWISE.
8. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.13B	BEND IN DRIVEWAY CROSSING - SECTION VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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SEAL
PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA
Feb. 28 2025
ID 95819

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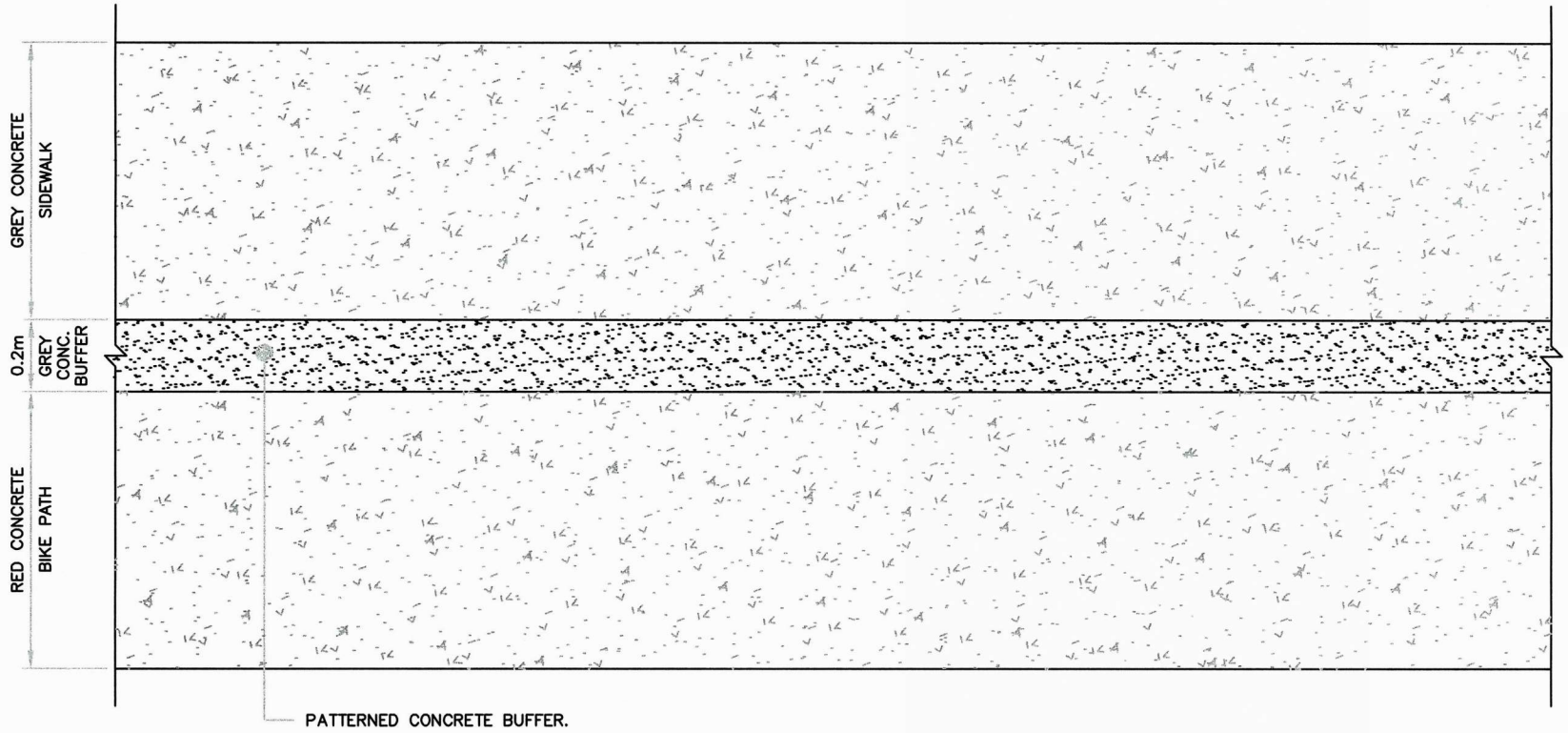

NOTES

1. TEXTURED CONCRETE BUFFER IS PART OF GREY CONCRETE SIDEWALK.
2. TEXTURED CONCRETE BUFFER TACTILE DELINEATION BETWEEN GREY CONCRETE SIDEWALK AND RED CONCRETE BIKE PATH TO CONSIST OF 200mm WIDE BUFFER WITH SEALED 10mm AGGREGATE SANDBLASTED TO EXPOSE THE AGGREGATE.
3. SURFACE TO HAVE SKID RESISTANCE EQUIVALENT TO BROOM FINISHED CONCRETE TO AVOID THE CREATION OF A SLIP HAZARD IN ICY CONDITIONS.
4. SANDBLASTED AREA TO BE SEALED WITH SIKAGARD A-50 LO-VOC IN CONCRETE GREY COLOR.
5. RED CONCRETE BIKE PATH COLOUR TO BE: INTERSTAR SEDONA JO-6435R @ 2 BAGS/CUBIC YARD.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	PATTERNED CONCRETE BUFFER DETAIL
1:20	STR 7.13C	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
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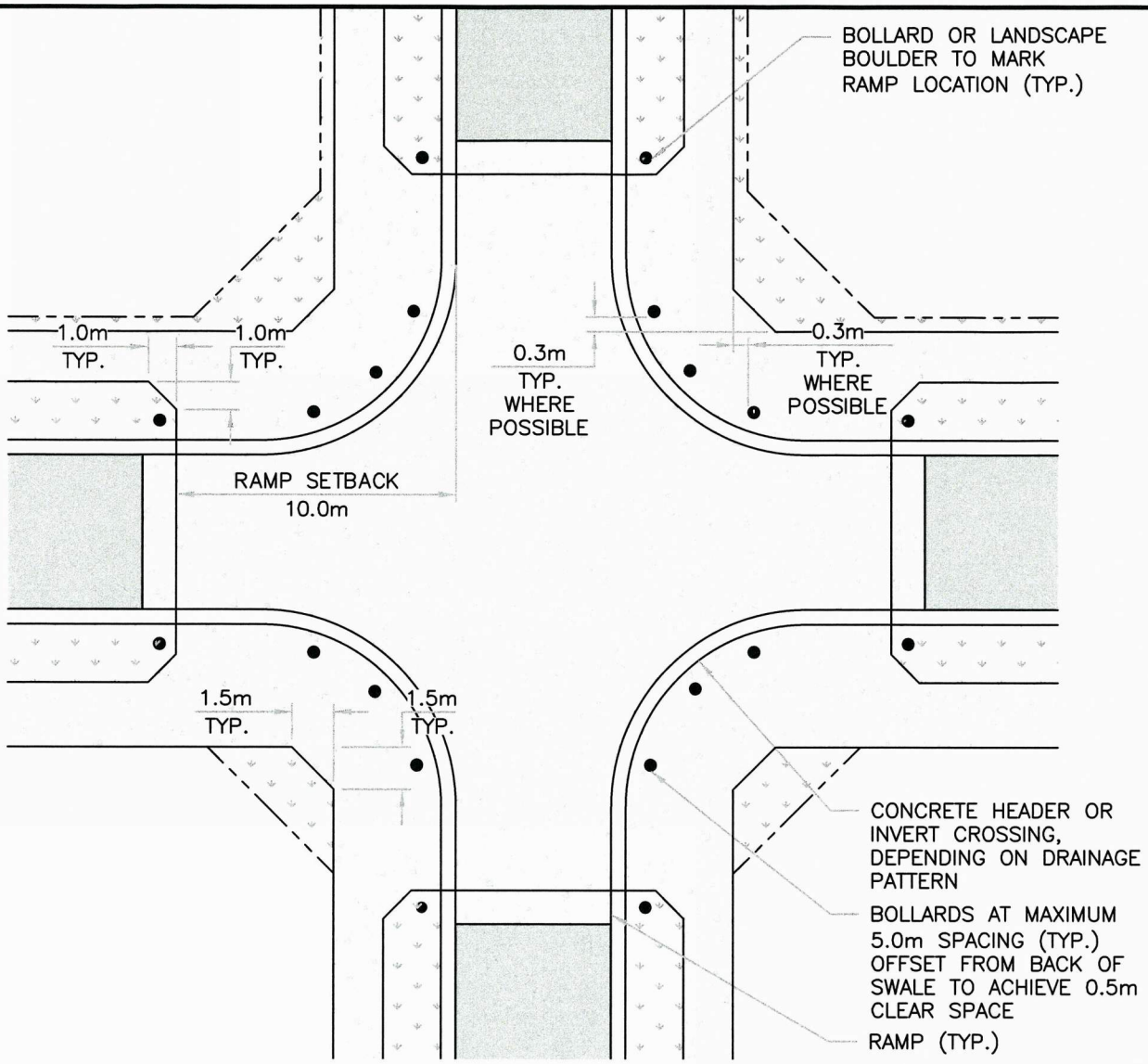

NOTES

1. REFER TO STR 7.12 FOR RAMP DIMENSIONS.
2. TYPICAL RAMP SETBACK SHALL BE 10.0m FROM EDGE OF INTERSECTING STREET. EXTEND RAMP SETBACK AROUND CURVES AS NEEDED TO ACHIEVE A CLEAR LINE OF SIGHT FROM APPROACHING ROAD.
3. SIDEWALK SHALL BE DIRECTLY ADJACENT TO RAISED INTERSECTION, UNLESS APPROVED BY THE TOWN TO ACCOMMODATE DRAINAGE OR LANDSCAPING.
4. MINIMUM 1% SLOPE REQUIRED FOR DRAINAGE ON ALL AREAS OF THE RAISED INTERSECTION.
5. RAMP AND RAISED INTERSECTION MATERIAL SHALL BE CONCRETE.
6. BOLLARD PLACEMENT SHOULD NOT IMPEDE PRIMARY TRAVEL LINES FOR WALKING.
7. TACTILE WARNING PLATES TO BE PROVIDED AT THE INTERFACE BETWEEN EXCLUSIVE PEDESTRIAN ZONE AND THE SHARED WALKING/DRIVING SURFACE.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:250	FIGURE NO.: STR 7.14	TYPICAL RAISED INTERSECTION - LOCAL ROADS					
3						PERMIT	SEAL
2						PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA ANDY ESARTE
1	01/28/25	2025 EDCG	BWM	ISL	AE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Feb 28, 2025
ID 95819

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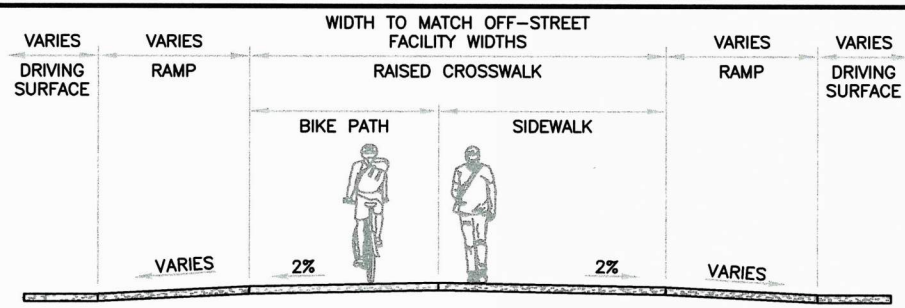
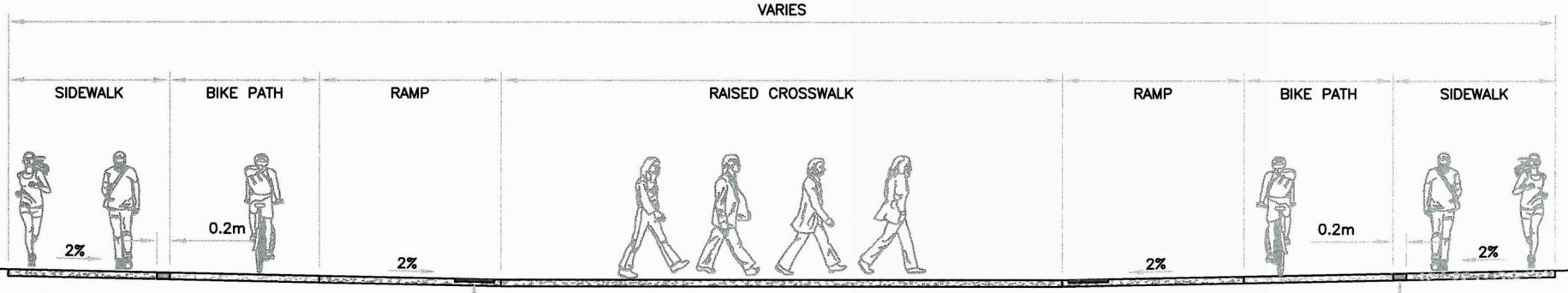


NOTES

1) A 2% CROSSFALL FOR BIKE PATH AND SIDEWALK ARE REQUIRED FOR A LEVEL ROAD PROFILE. IF CROSSWALK IS TO BE ADDED TO A ROAD WITH A >2% GRADE, THE CROSSWALK SURFACE CAN BE PARALLEL TO THE ROAD PROFILE.

VIEW PARALLEL TO DRIVING DIRECTION



TACTILE WARNING PLATES. (TYP. BOTH SIDES)

VIEW PERPENDICULAR TO DRIVING DIRECTION

PATTERNED CONCRETE BUFFER. REFER TO STR 7.13C (TYP. BOTH SIDES)

SECTION
SCALE 1:100

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	RAISED CROSSWALK - SECTION VIEW
1:100	STR 7.14A	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

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ID 70445
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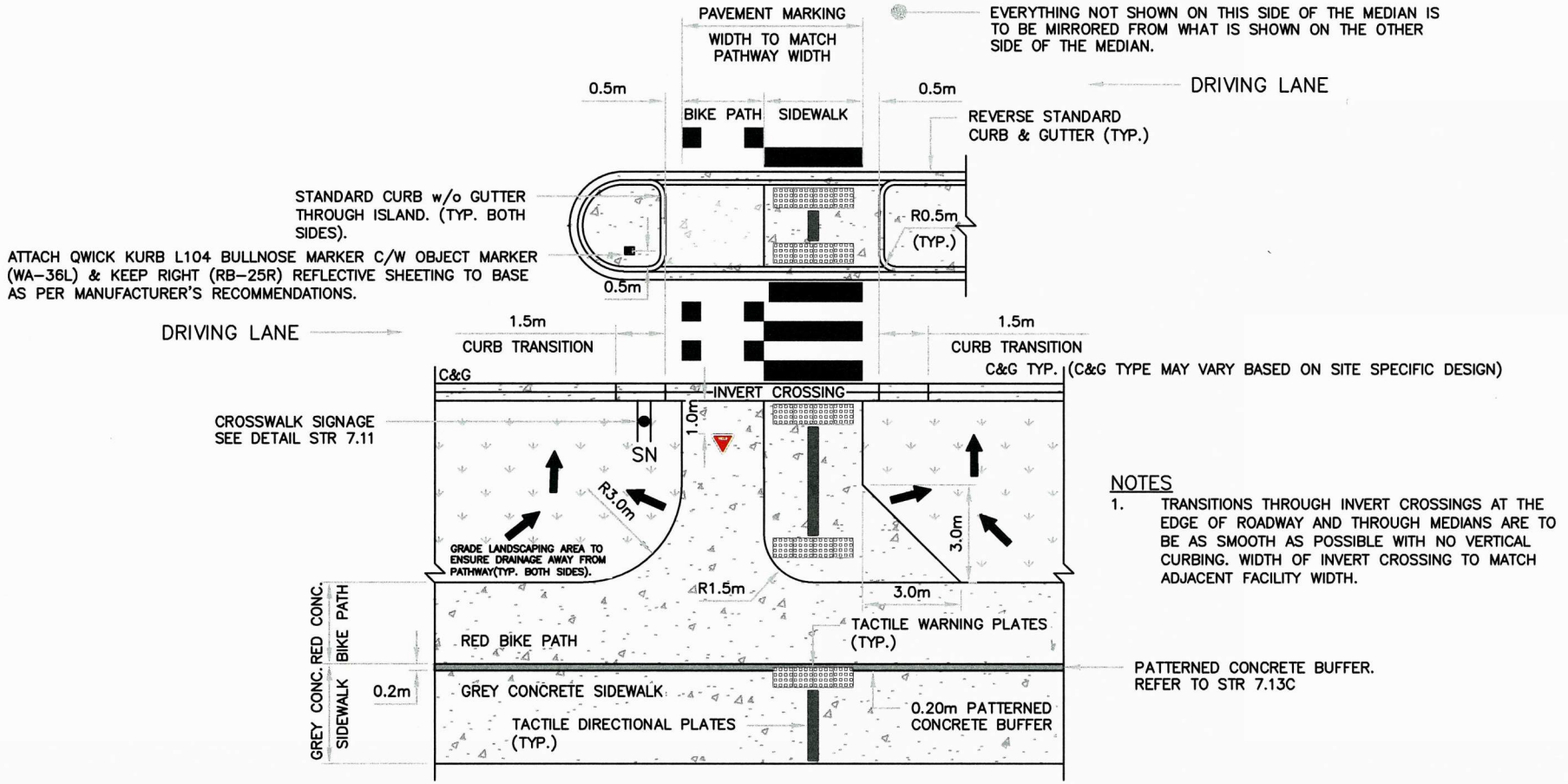

PLAN VIEW
SCALE 1:200

NOTES
1. TRANSITIONS THROUGH INVERT CROSSINGS AT THE EDGE OF ROADWAY AND THROUGH MEDIANS ARE TO BE AS SMOOTH AS POSSIBLE WITH NO VERTICAL CURBING. WIDTH OF INVERT CROSSING TO MATCH ADJACENT FACILITY WIDTH.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.15	ARTERIAL AT GRADE CROSSING WITH MEDIAN REFUGE

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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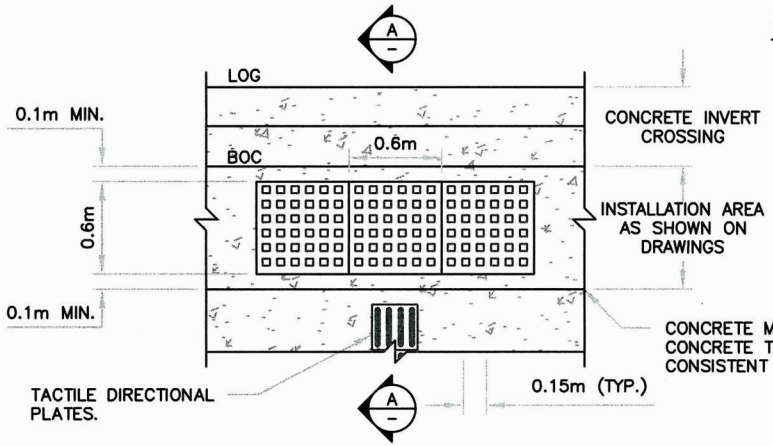
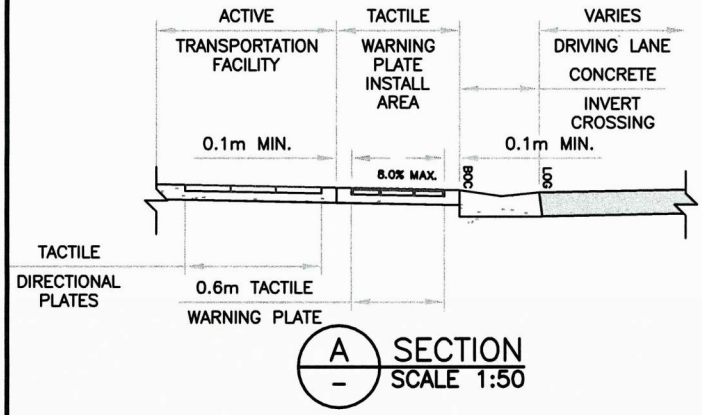
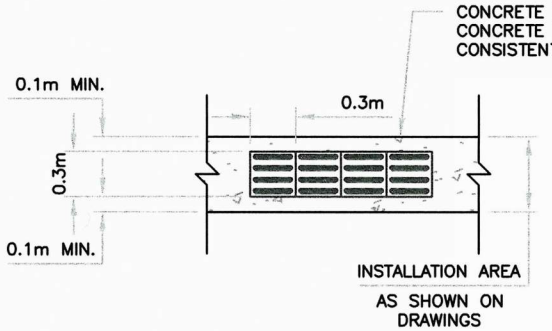


PLAN VIEW
SCALE 1:50



A – SECTION
SCALE 1:50

NOTES
1) TACTILE HAZARD PLATES TO BE TROJAN INDUSTRIES DURALAST DETECTABLE CAST IRON WARNING PLATE OR APPROVED EQUIVALENT. TACTILE HAZARD PLATES MUST HAVE ANCHOR TABS ON BOTTOM OF PLATE.
2) TACTILE GUIDANCE PLATES TO BE KINESEK ENGINEERED PRODUCTS ADVANTAGE BAR CAST IRON 295MM X 295MM (AVAILABLE FROM COMPLIANCE SOLUTIONS CANADA) OR APPROVED EQUIVALENT. TACTILE GUIDANCE PLATES MUST HAVE ANCHOR TABS ON BOTTOM OF PLATE.
3) ALL TACTILE PLATES TO BE INSTALLED WITH MINIMUM 100MM CLEARANCE TO EDGE OF CONRETE PANEL(S) THEY ARE INSTALLED IN. REFER TO MANUFACTURER'S INSTALLATION RECOMMENDATIONS.
4) TRANSITIONS THROUGH INVERTS CROSSINGS AT THE EDGE OF ROADWAY AND THROUGH MEDIANS ARE TO BE AS SMOOTH AS POSSIBLE WITH NO VERTICAL CURBING. WIDTH OF INVERT CROSSING TO MATCH ADJACENT CURB WIDTH.
5) CERTAIN SITUATIONS DO NOT REQUIRE AN INVERT CROSSING, REFER TO SITE SPECIFIC DRAWINGS.



PLAN – **TACTILE DIRECTIONAL PLATES**
SCALE 1:50

NOTES
1) TACTILE PLATE TO BE CAST IRON KINESEK ENGINEERED PRODUCTS ADVANTAGE BAR CAST IRON 295mm X 295mm (AVAILABLE FROM COMPLIANCE SOLUTIONS CANADA OR APPROVED EQUIVALENT). SUPPLY SAMPLE FOR APPROVAL PRIOR TO INSTALLATION MOCK–UP. PLATES COMPLETE WITH ANCHOR TABS ON BOTTOM OF PLATE.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.16	TACTILE WARNING PLATES (AT CURB RAMPS)

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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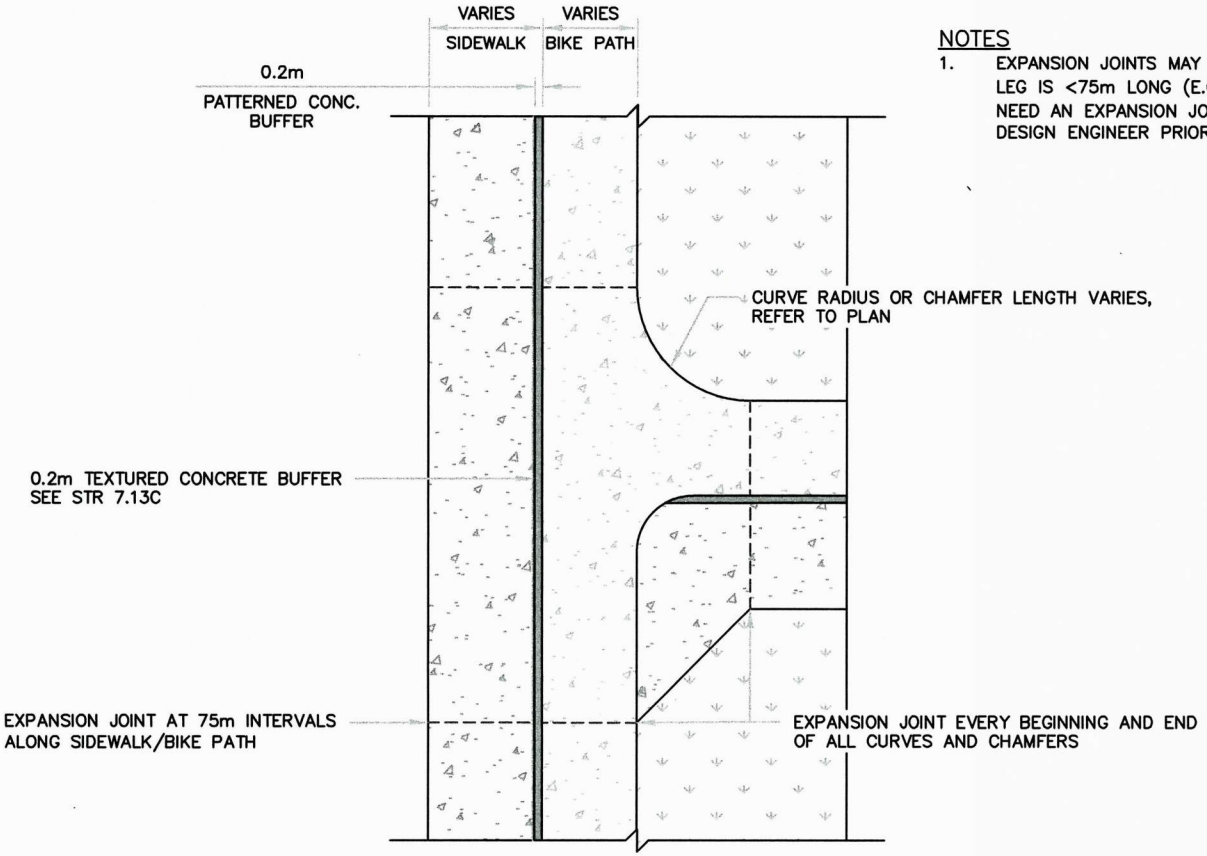

PLAN VIEW
SCALE 1:200

NOTES

1. EXPANSION JOINTS MAY NOT BE NEEDED ON ALL LEGS OF PATHWAY INTERSECTIONS IF ONE LEG IS <75m LONG (E.G. – A CROSSWALK CONNECTION A FEW METRES LONG WOULD NOT NEED AN EXPANSION JOINT). CONTRACTOR TO REVIEW EXPANSION JOINT LOCATIONS WITH DESIGN ENGINEER PRIOR TO INSTALLATION.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.17	EXPANSION JOINT LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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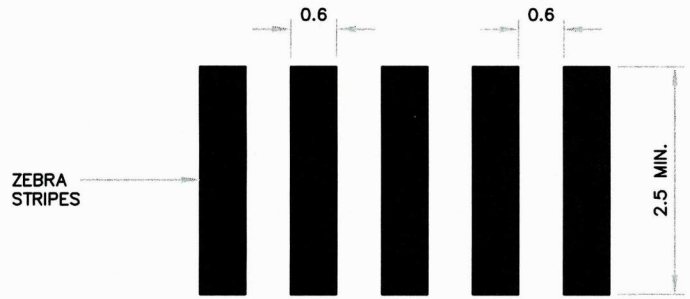
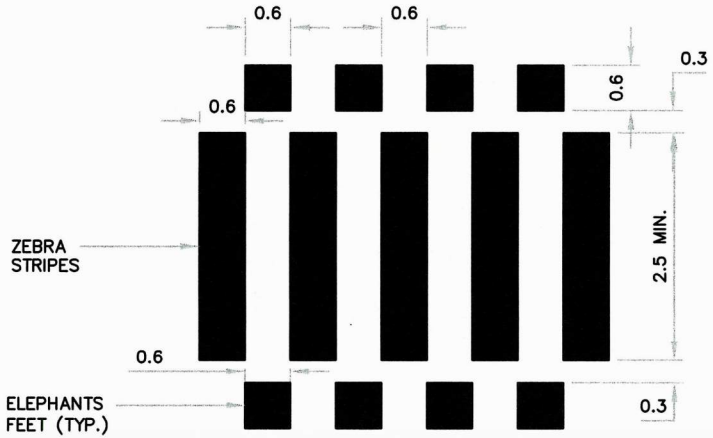
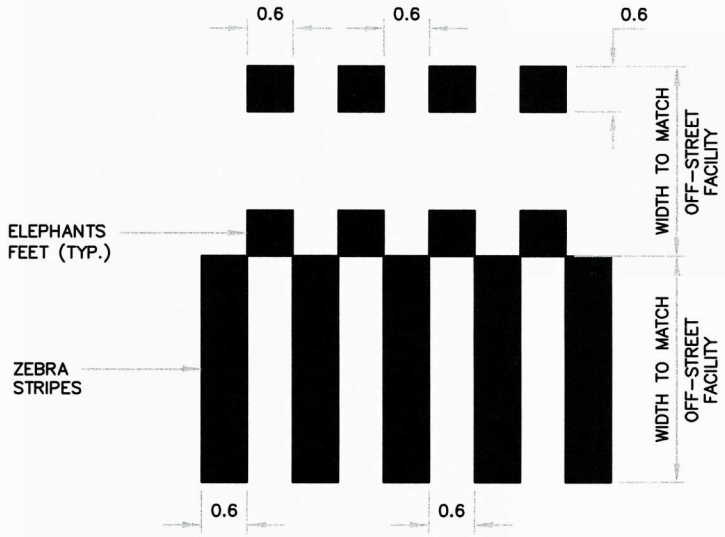


SIDEWALK CROSSING



MULTI USE PATHWAY CROSSING
(SEE NOTE 2)



SIDE BY SIDE SIDEWALK/BIKE PATH CROSSING

NOTES

1) ALL PAVEMENT MARKINGS TO BE CONSTRUCTED WITH SURFACE APPLIED THERMOPLASTIC OR MMA.
2) WHERE APPLIED ON RAISED CROSSINGS, WIDTH OF CROSSING SURFACE SHOULD BE WIDE ENOUGH TO ACCOMMODATE MARKINGS AS SHOWN.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.18	CROSSWALK AND ELEPHANTS FEET PAVEMENT MARKINGS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

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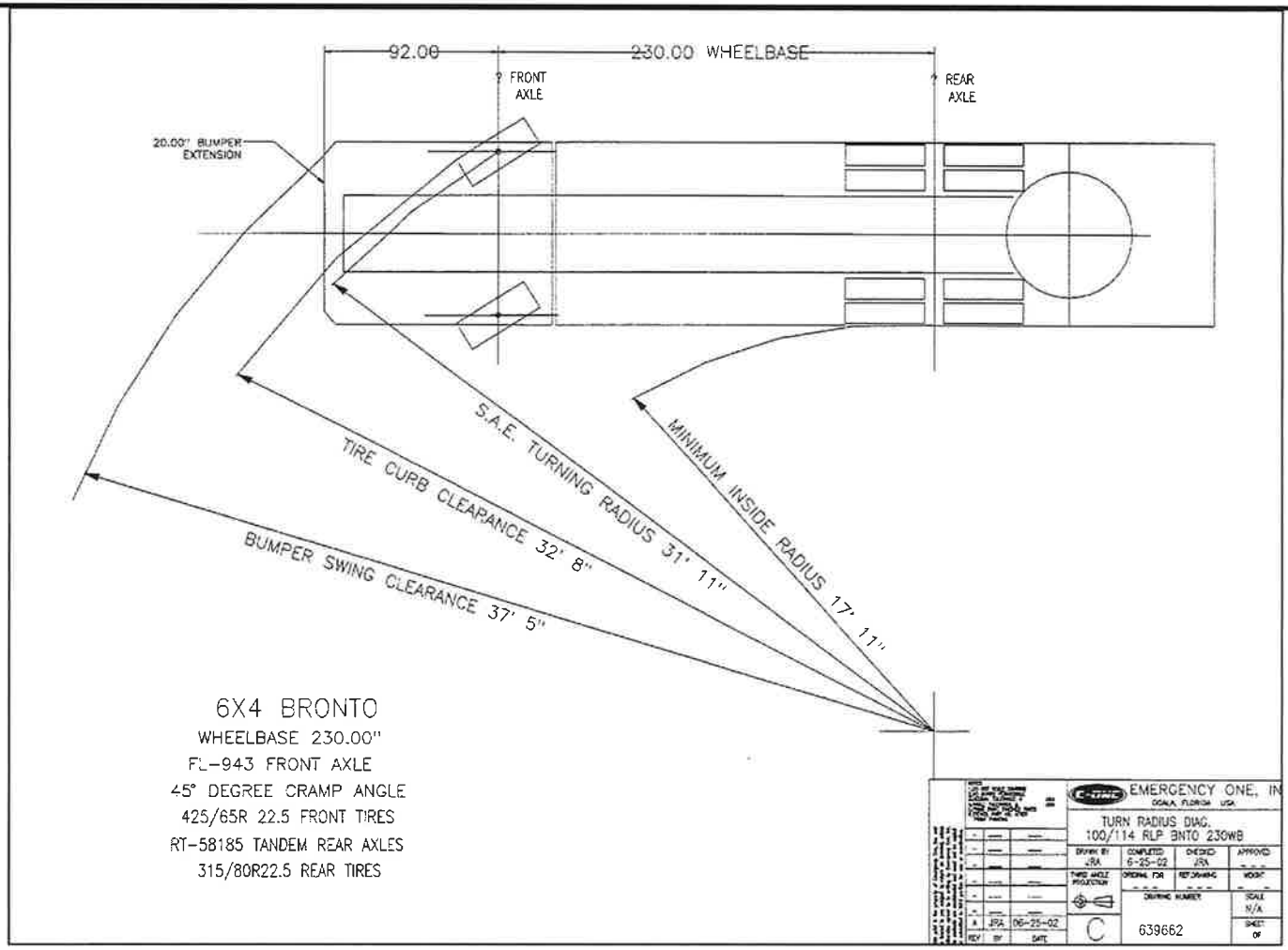

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.19	RLP BRONTO 230WB - TURN RADIUS DIAGRAM

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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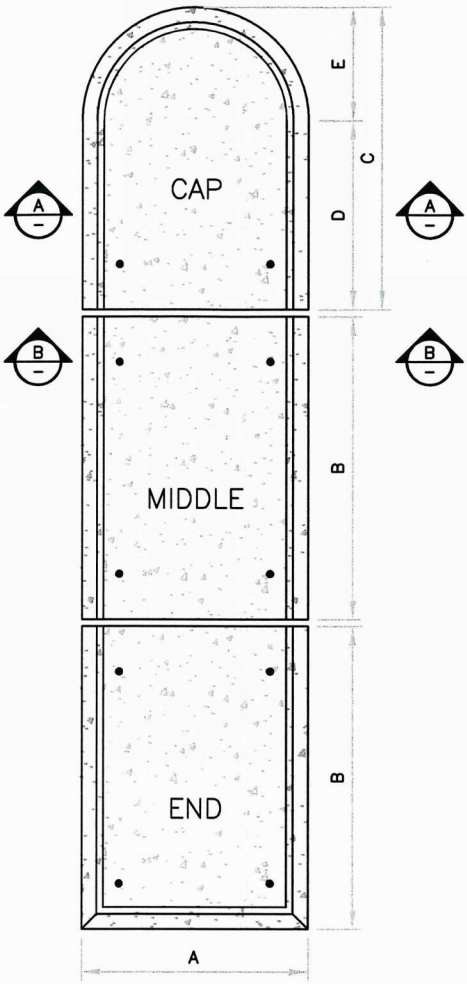
	A	B	C	D	E
600	600	1200	1200	900	300
1000	1000	2000	2000	1500	500
1500	1500	2000	2000	1250	750



PLAN
1:50

GENERAL NOTES

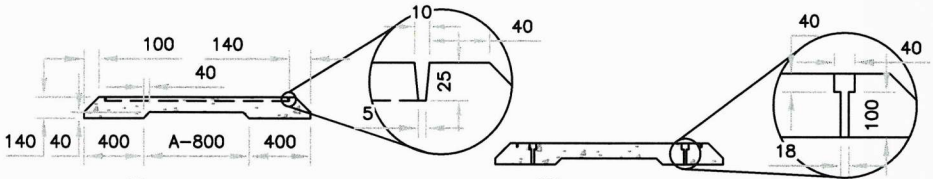
1. THE ELEMENTS ARE DELIVERED WITH:
   – ATTACHED LIFT DEVICES: SCREW SLEEVES SUITABLE FOR M20 HOISTING RINGS.
   – FIXING HOLES FOR ANCHORING WITH RECESS FOR SCREW BOLT M16.
   – PLASTIC SEALING CAPS FOR SCREW SLEEVES.
   – PLASTIC SEALING CAPS FOR MOUNTING HOLES.
   – 4 RUBBER GU GRANULATE ADHESIVE STRIPS FOR POSSIBLE UNEVENNESS IN ASPHALT.
2. OPTIONALLY TO BE APPLIED IN ELEMENTS:
   – ANCHOR ANCHORS 4xM10 FOR ATTACHMENT COLUMN AND TRAFFIC SIGN D2.
   – AFTER APPROVAL DRAWING.

PRECAST CONCRETE NOTES

1. CONCRETE MATERIALS, QUALITY. MIXING, PLACING, FORM WORK AND OTHER PRECAST CONCRETE CONSTRUCTION PRACTICES TO CONFORM TO CSA–A23.1.
2. PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED AND SUPPLIED BY A MANUFACTURER QUALIFIED IN ACCORDANCE WITH CSA–A23.4.
3. MATERIALS AND METHODS OF CONSTRUCTION TO CONFORM TO CSA–A23.4.
4. SUPPLY CONCRETE USING TYPE GU CEMENT THAT MEETS EXPOSURE CLASS C–1 HAVING A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 35 MPa, MAXIMUM AGGREGATE SIZE OF 20mm, AND MAXIMUM WATER–TO–CEMENTING MATERIALS RATION OF 0.40.
5. MAXIMUM FLY ASH CONTENT NOT TO EXCEED 15% OF TOTAL CEMENTING MATERIAL.
6. DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.

PRECAST CONCRETE NOTES

1. REINFORCEMENT STEEL TO CONFORM TO CSA–G30.18, GRADE 400.
2. DO NOT WELD REINFORCEMENT UNLESS SPECIFICALLY NOTED. REINFORCEMENT TO BE WELDED TO CONFORM TO CSA–G30.18, GRADE 400W. WELDING ONLY PERMITTED BY AN ORGANIZATION CERTIFIED TO CSA–W186.
3. CLEAR CONCRETE COVER TO REINFORCEMENT:
   a. LONGITUDINAL BARS HAVING 60mm UNLESS NOTED OTHERWISE, OR
   b. STIRRUPS AND TIES HAVING 40mm UNLESS NOTED OTHERWISE.
4. USE STANDARD END HOOK LENGTHS FOR REINFORCEMENT UNLESS NOTED OTHERWISE.
5. USE REINFORCEMENT SPLICES UNLESS NOTED OTHERWISE.
6. WELDED WIRE MESH TO CONFORM TO ASTM A497/A497M.



A SECTION
1:50

B SECTION
1:50

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.20A	PRECAST CONCRETE MEDIAN - 600mm-1500mm			
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG

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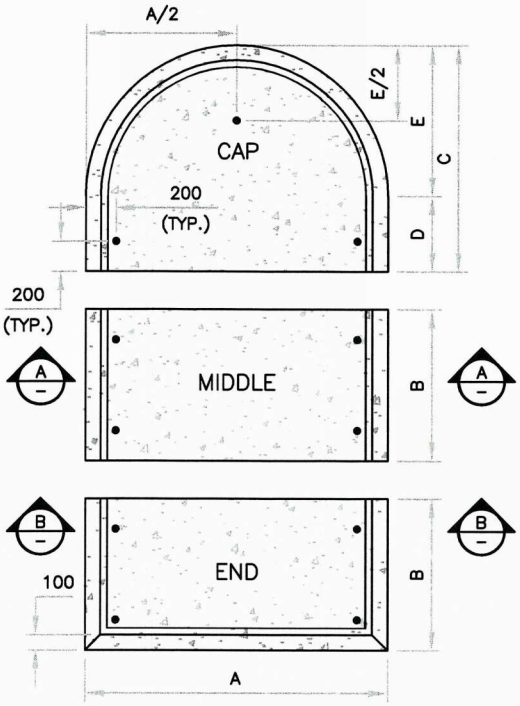


PLAN
1:50

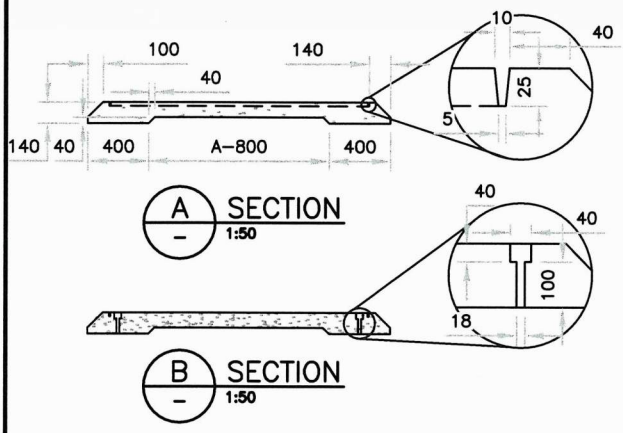
	A	B	C	D	E
2000	2000	1000	1500	500	1000
2500	2500	1000	1500	250	1250
3000	3000	1000	1500	–	1500

GENERAL NOTES

1. THE ELEMENTS ARE DELIVERED WITH:
   - ATTACHED LIFT DEVICES: SCREW SLEEVES SUITABLE FOR M20 HOISTING RINGS.
   - FIXING HOLES FOR ANCHORING WITH RECESS FOR SCREW BOLT M16.
   - PLASTIC SEALING CAPS FOR SCREW SLEEVES.
   - PLASTIC SEALING CAPS FOR MOUNTING HOLES.
   - 4 RUBBER GU GRANULATE ADHESIVE STRIPS FOR POSSIBLE UNEVENNESS IN ASPHALT.
2. OPTIONALLY TO BE APPLIED IN ELEMENTS:
   - ANCHOR ANCHORS 4xM10 FOR ATTACHMENT COLUMN AND TRAFFIC SIGN D2.
   - AFTER APPROVAL DRAWING.

PRECAST CONCRETE NOTES

1. CONCRETE MATERIALS, QUALITY. MIXING, PLACING, FORM WORK AND OTHER PRECAST CONCRETE CONSTRUCTION PRACTICES TO CONFORM TO CSA–A23.1.
2. PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED AND SUPPLIED BY A MANUFACTURER QUALIFIED IN ACCORDANCE WITH CSA–A23.4.
3. MATERIALS AND METHODS OF CONSTRUCTION TO CONFORM TO CSA–A23.4.
4. SUPPLY CONCRETE USING TYPE GU CEMENT THAT MEETS EXPOSURE CLASS C–1 HAVING A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 35 MPa, MAXIMUM AGGREGATE SIZE OF 20mm, AND MAXIMUM WATER–TO–CEMENTING MATERIALS RATION OF 0.40.
5. MAXIMUM FLY ASH CONTENT NOT TO EXCEED 15% OF TOTAL CEMENTING MATERIAL.
6. DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.



A – SECTION
1:50

B – SECTION
1:50

PRECAST CONCRETE NOTES

1. REINFORCEMENT STEEL TO CONFORM TO CSA–G30.18, GRADE 400.
2. DO NOT WELD REINFORCEMENT UNLESS SPECIFICALLY NOTED. REINFORCEMENT TO BE WELDED TO CONFORM TO CSA–G30.18, GRADE 400W. WELDING ONLY PERMITTED BY AN ORGANIZATION CERTIFIED TO CSA–W186.
3. CLEAR CONCRETE COVER TO REINFORCEMENT:
   a. LONGITUDINAL BARS HAVING 60mm UNLESS NOTED OTHERWISE, OR
   b. STIRRUPS AND TIES HAVING 40mm UNLESS NOTED OTHERWISE.
4. USE STANDARD END HOOK LENGTHS FOR REINFORCEMENT UNLESS NOTED OTHERWISE.
5. USE REINFORCEMENT SPLICES UNLESS NOTED OTHERWISE.
6. WELDED WIRE MESH TO CONFORM TO ASTM A497/A497M.

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.20B	PRECAST CONCRETE MEDIAN - 2000mm-3000mm

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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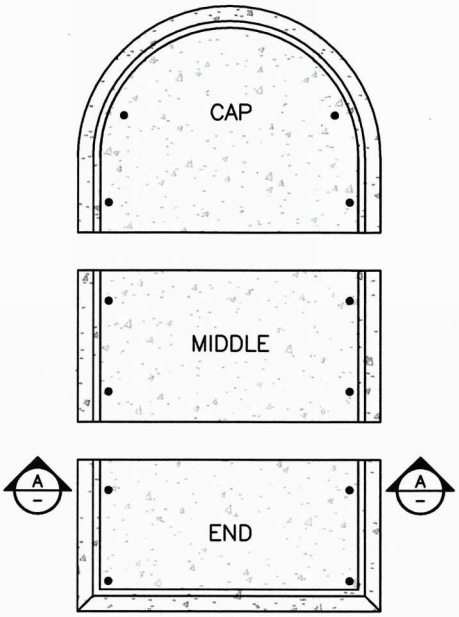


PLAN VIEW
SCALE 1:50

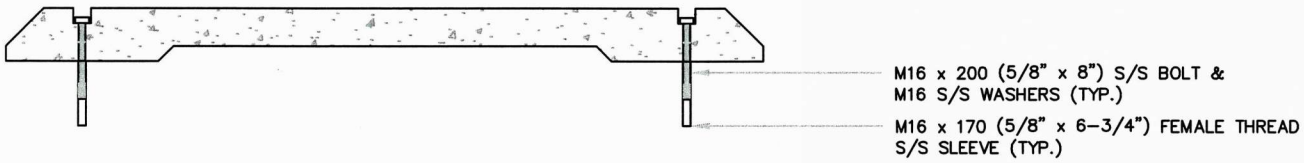
ANCHOR NOTES

REQUIRED MATERIALS AND TOOLS:

- M16X170 (5/8" x 6–3/4") STAINLESS STEEL FEMALE THREAD SLEEVE.
- M16X200 (5/8" x 8") STAINLESS STEEL BOLTS.
- M16 (5/8") STAINLESS STEEL WASHERS.
- M20 (3/4") STAINLESS STEEL HOISTING RINGS OR SLINGS.
- MOUNTING MORTAR (FOR EXAMPLE HILTI TYPE HY–200).
- CAULKING SYRINGE AND MIXING NOZZLES.
- BATTERY OR ELECTRIC DRILL SUITABLE FOR DRILLING IN ASPHALT.
- ATTACHMENT FOR DRILLING DIAMETER 18mm AND DEPTH 170 MM.
- BLOW PUMP OR COMPRESSED AIR.
- ALLEN KEY FOR SCREWING IN INNER THREADED SLEEVE M16.
- MIXING NOZZLES SUITABLE FOR CASSETTE.
- COPPER GREASE (WHEN REMOVING THE SCREWS, IT IS EASIER TO LOOSEN THEM).

METHOD:

- PLACE THE ELEMENT AND MARK THE CIRCUMFERENCE AND BOLT HOLE LOCATIONS.
- CHECK WHETHER THE CENTER GUIDE IS STABLE. APPLY THE SUPPLIED RUBBER STRIPS IF NECESSARY.
- PRE–DRILL THE DRILLING POINTS AND RE–INSERT THE ELEMENT.
- DRILLING DIAMETER OF 18 MM AND A DEPTH OF 170 MM.
- REMOVE THE DUST FROM THE DRILL HOLES BY MEANS OF A BLOW PUMP OR COMPRESSED AIR.
- PLACE THE FIXING MORTAR IN THE DRILL HOLES.
- SCREW THE INNER THREADED SLEEVE INTO THE BOREHOLE WITH FIXING MORTAR.
- REPLACE THE CENTER GUIDE IN THE MARKED AREA.
- CHECK THAT THE HOLES OF THE CENTER CONDUCTOR ARE PROPERLY ALIGNED WITH THE MOUNTING HOLES IN THE ASPHALT.
- TIGHTEN SCREW BOLTS WITH WASHER. USE COPPER GREASE ON THE END OF THE SCREW BOLT.
- SEAL THE MOUNTING HOLES AND LIFTING DEVICES WITH THE PLASTIC CAPS.



A – SECTION
SCALE 1:20

All dimensions in Metric meters unless otherwise noted

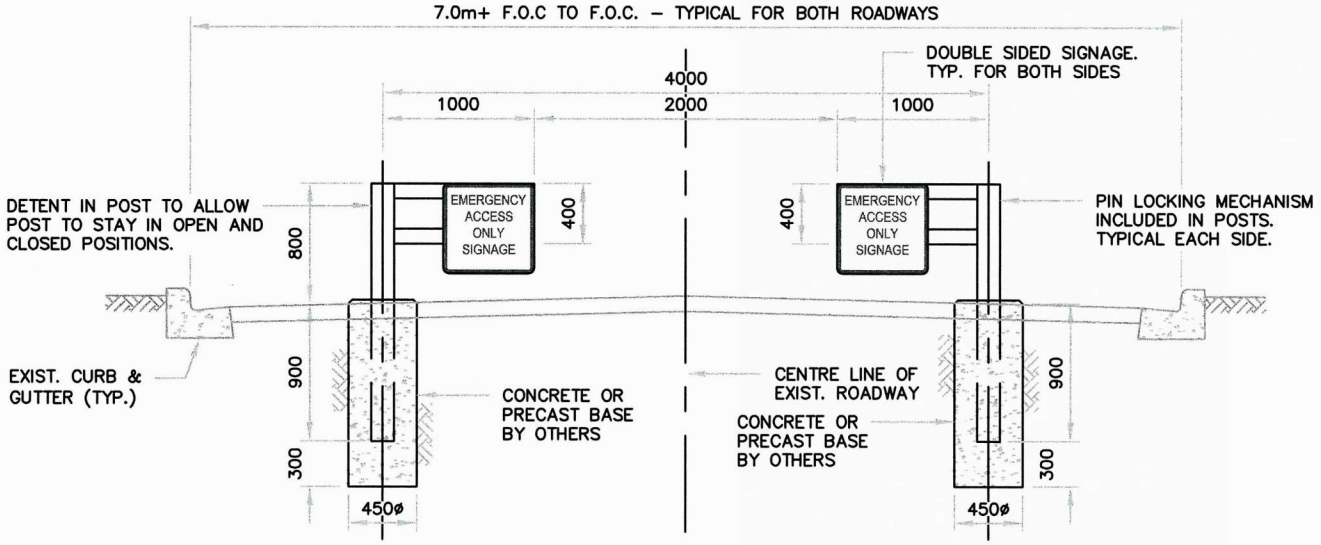
SCALE: AS NOTED	FIGURE NO.: STR 7.20C	PRECAST CONCRETE MEDIAN - ANCHORING DETAILS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE: [signature]
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

town of CANMORE



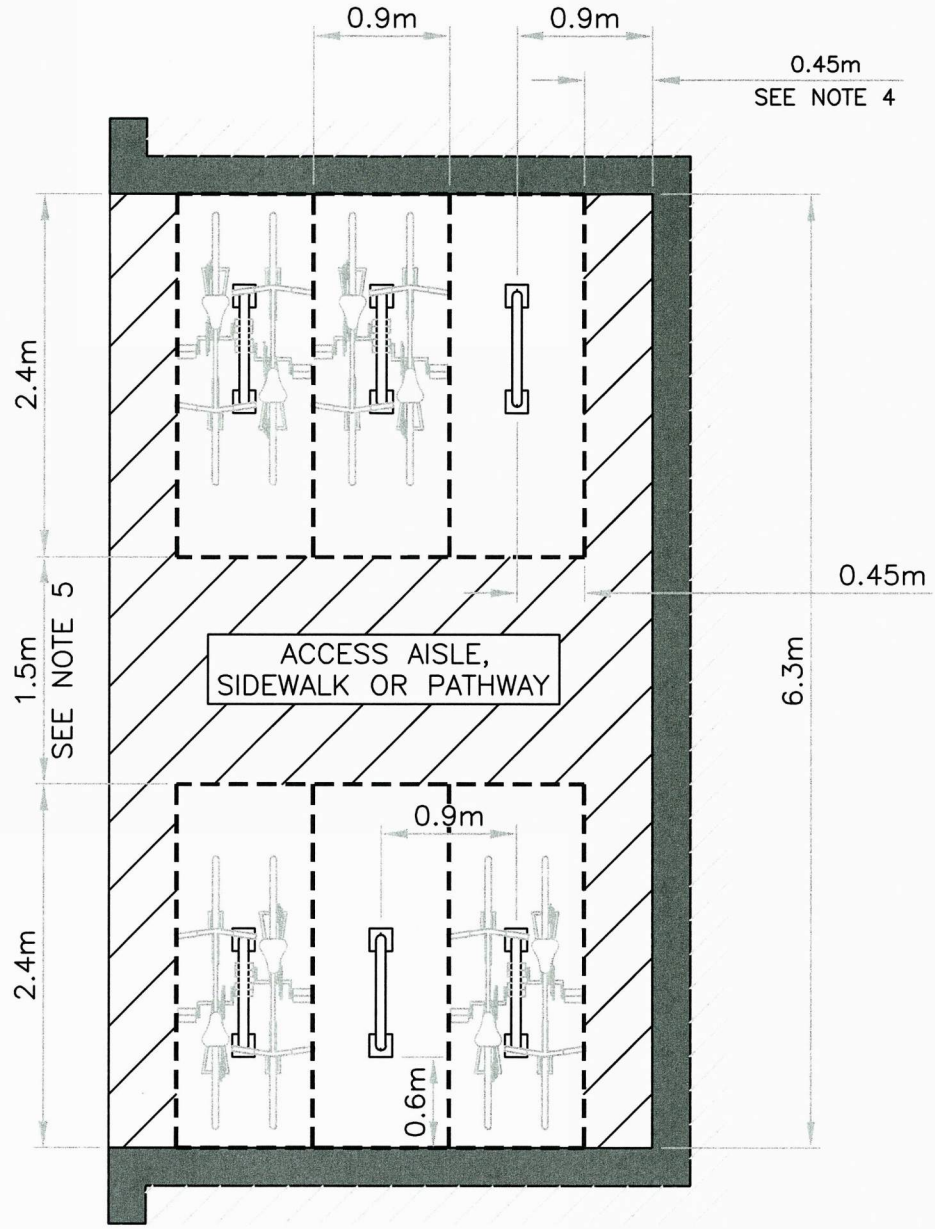
NOTES

1. DIMENSIONS ARE SHOWN IN MILLIMETRES.
2. SWINGING GATE AND POST MATERIAL TO BE POWDER COATED BLACK SQUARE TUBING, GALVANIZED STEEL. DIMENSIONS AND WALL THICKNESS TO BE DETERMINED BY A STRUCTURAL ENGINEER.
3. LOCKING MECHANISM ON EACH POST TO INCLUDED.
4. LOCK TO BE PROVIDED BY THE TOWN OF CANMORE.
5. ABILITY TO LOCK GATE IN PERPENDICULAR AND PARALLEL POSITIONS TO ROADWAY.
6. CONCRETE BASES SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa AT 28 DAYS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.21	SWINGING EMERGENCY GATE ACCESS					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA ANDY EDARTE
2							
1	01/28/25	2025 EDCG	BWM	ISL	AE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Feb. 28, 2025
ID 95819



NOTES

1. ALL DIMENSIONS ARE TYPICAL UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHOWN ARE THE MINIMUM DIMENSIONS REQUIRED.
3. BICYCLE PARKING LAYOUT IS APPLICABLE TO BOTH INTERIOR AND EXTERIOR BICYCLE PARKING AREAS.
4. A BUFFER WIDTH OF 0.15m FROM THE EDGE OF THE BICYCLE PARKING ENVELOPE TO A WALL/VERTICAL OBSTRUCTION MAY BE CONSIDERED IN CONSTRAINED SCENARIOS. SPACING BETWEEN ALL OTHER BIKE RACKS SHOULD BE MAINTAINED AT A MINIMUM OF 0.9m, INCLUDING UNDER CONSTRAINED SCENARIOS.
5. A MINIMUM WIDTH OF 1.2m MAY BE CONSIDERED IN CONSTRAINED SCENARIOS.

All dimensions in Metric meters unless otherwise noted

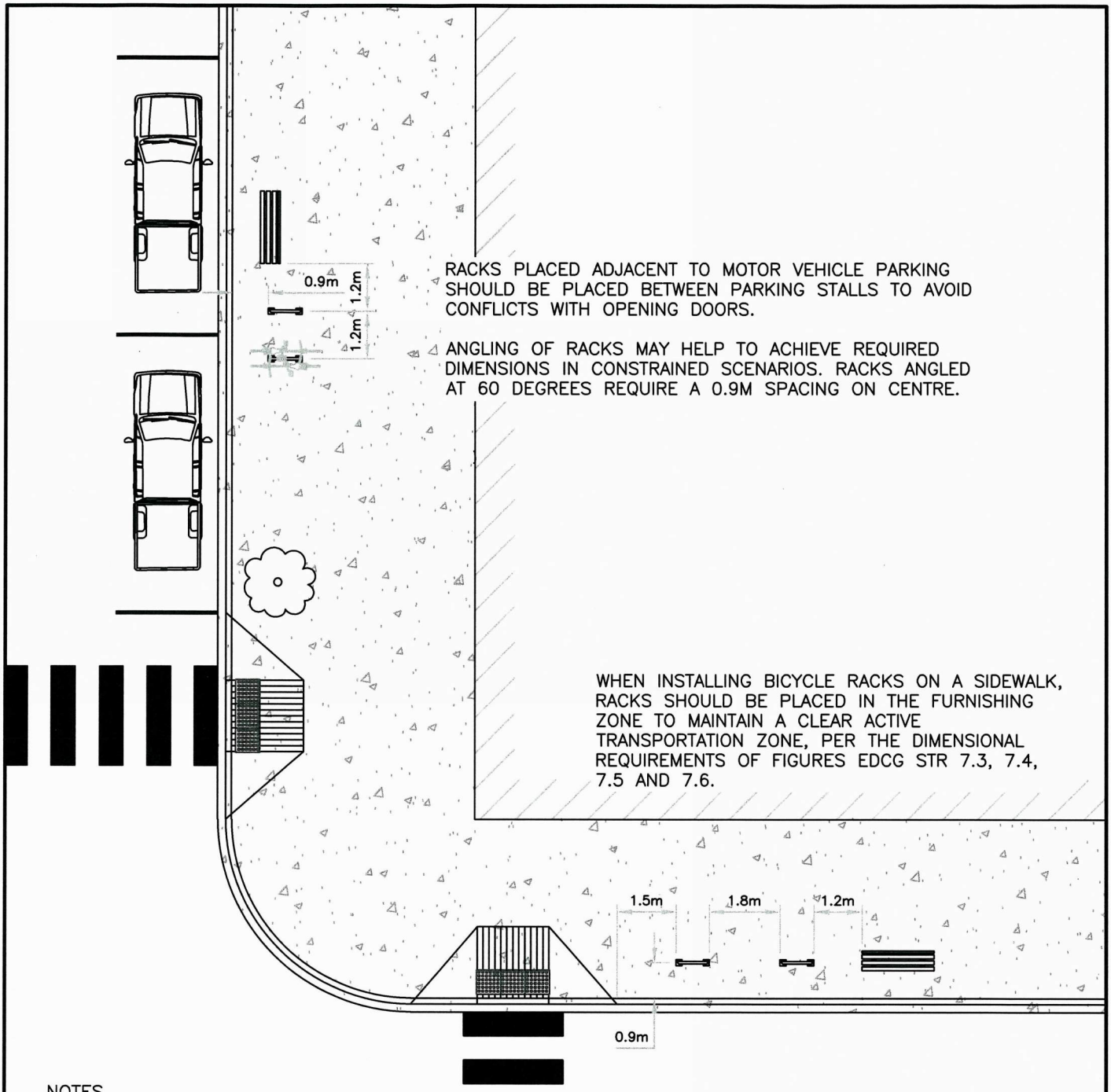
SCALE: 1:50	FIGURE NO.: STR 7.22	LONG/SHORT TERM BICYCLE PARKING DIMENSIONS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
CLAIRE ELLICK
ID 70445
Feb. 28, 2025

Town of CANMORE



RACKS PLACED ADJACENT TO MOTOR VEHICLE PARKING SHOULD BE PLACED BETWEEN PARKING STALLS TO AVOID CONFLICTS WITH OPENING DOORS.

ANGLING OF RACKS MAY HELP TO ACHIEVE REQUIRED DIMENSIONS IN CONSTRAINED SCENARIOS. RACKS ANGLED AT 60 DEGREES REQUIRE A 0.9M SPACING ON CENTRE.

WHEN INSTALLING BICYCLE RACKS ON A SIDEWALK, RACKS SHOULD BE PLACED IN THE FURNISHING ZONE TO MAINTAIN A CLEAR ACTIVE TRANSPORTATION ZONE, PER THE DIMENSIONAL REQUIREMENTS OF FIGURES EDCG STR 7.3, 7.4, 7.5 AND 7.6.

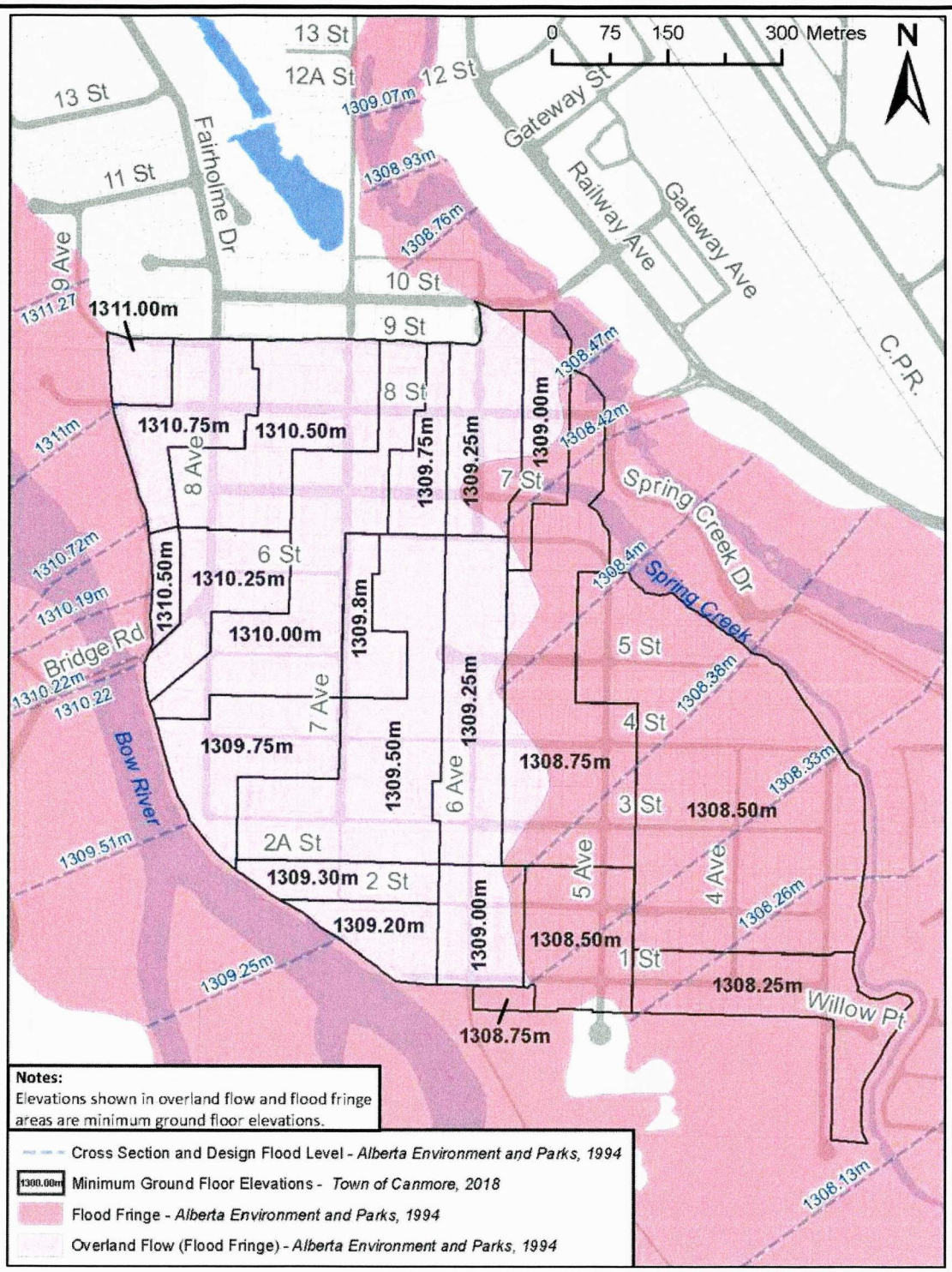
NOTES

1. OTHER CONFIGURATIONS MAY BE CONSIDERED, SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEERING DEPARTMENT.
2. PLACEMENT OF SIDEWALK RACKS VARIES FROM PLACEMENT OF RACKS WITHIN AN INDOOR OR OUTDOOR BIKE PARKING NODE, AS SHOWN IN EDCG FIGURE STR 7.22.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.23	ON STREET BICYCLE PARKING					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA CLAIRE ELLICK ID 70445 Feb. 28, 2025
2							
1	01/28/25	2025 EDCG	BWM	ISL	CE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



Notes:
Elevations shown in overland flow and flood fringe areas are minimum ground floor elevations.

- Cross Section and Design Flood Level - *Alberta Environment and Parks, 1994*
- 1300.00m Minimum Ground Floor Elevations - *Town of Canmore, 2018*
- Flood Fringe - *Alberta Environment and Parks, 1994*
- Overland Flow (Flood Fringe) - *Alberta Environment and Parks, 1994*

All dimensions in Metric meters unless otherwise noted

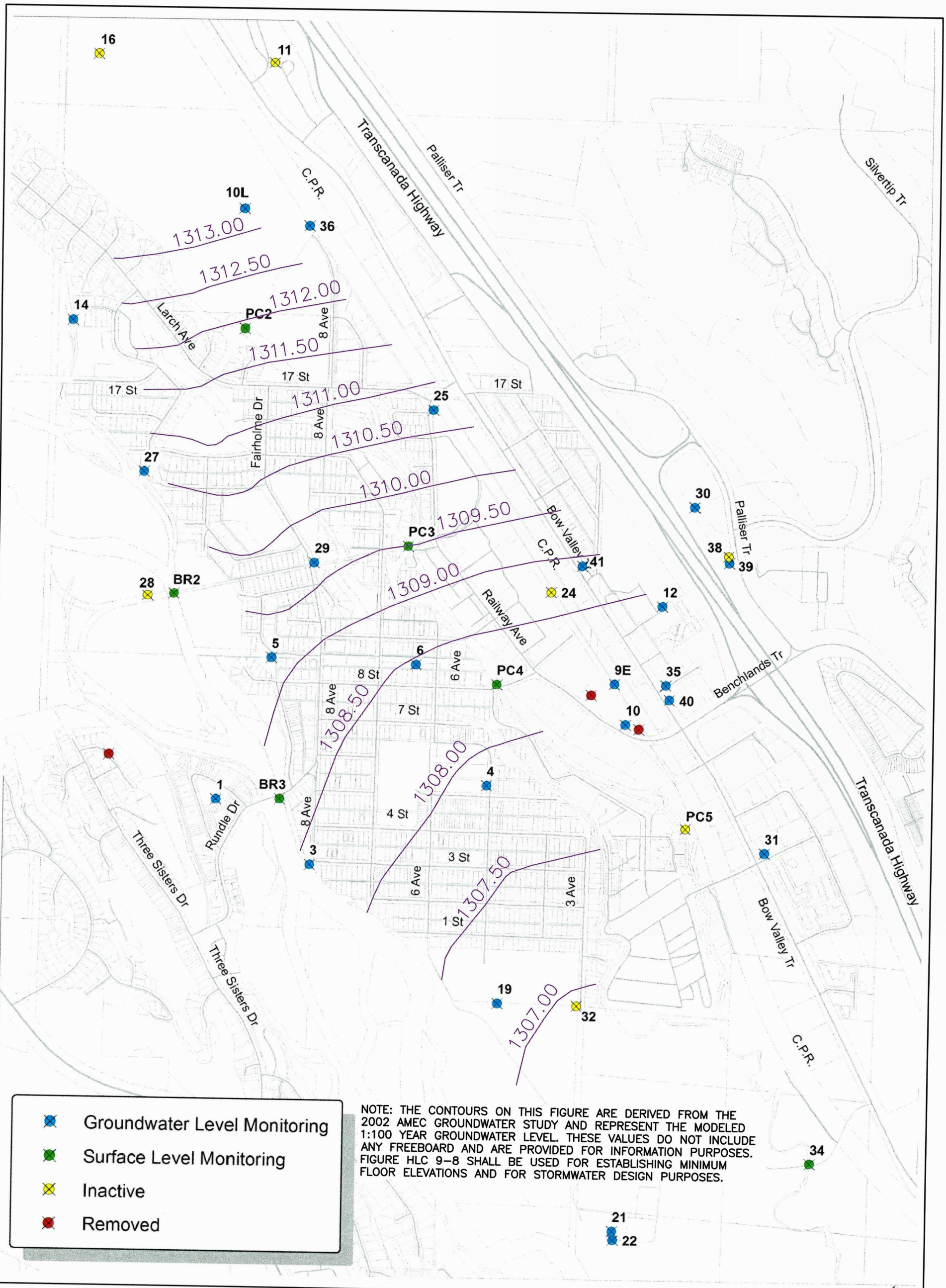
SCALE: NTS	FIGURE NO.: HLC 9.3	OVERLAND FLOW ELEVATIONS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	12/13/19	2019 EDCG	BWM	CB	CB

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
BRIAN KINZIE
ID 66135
FEB. 28/2025

Town of CANMORE

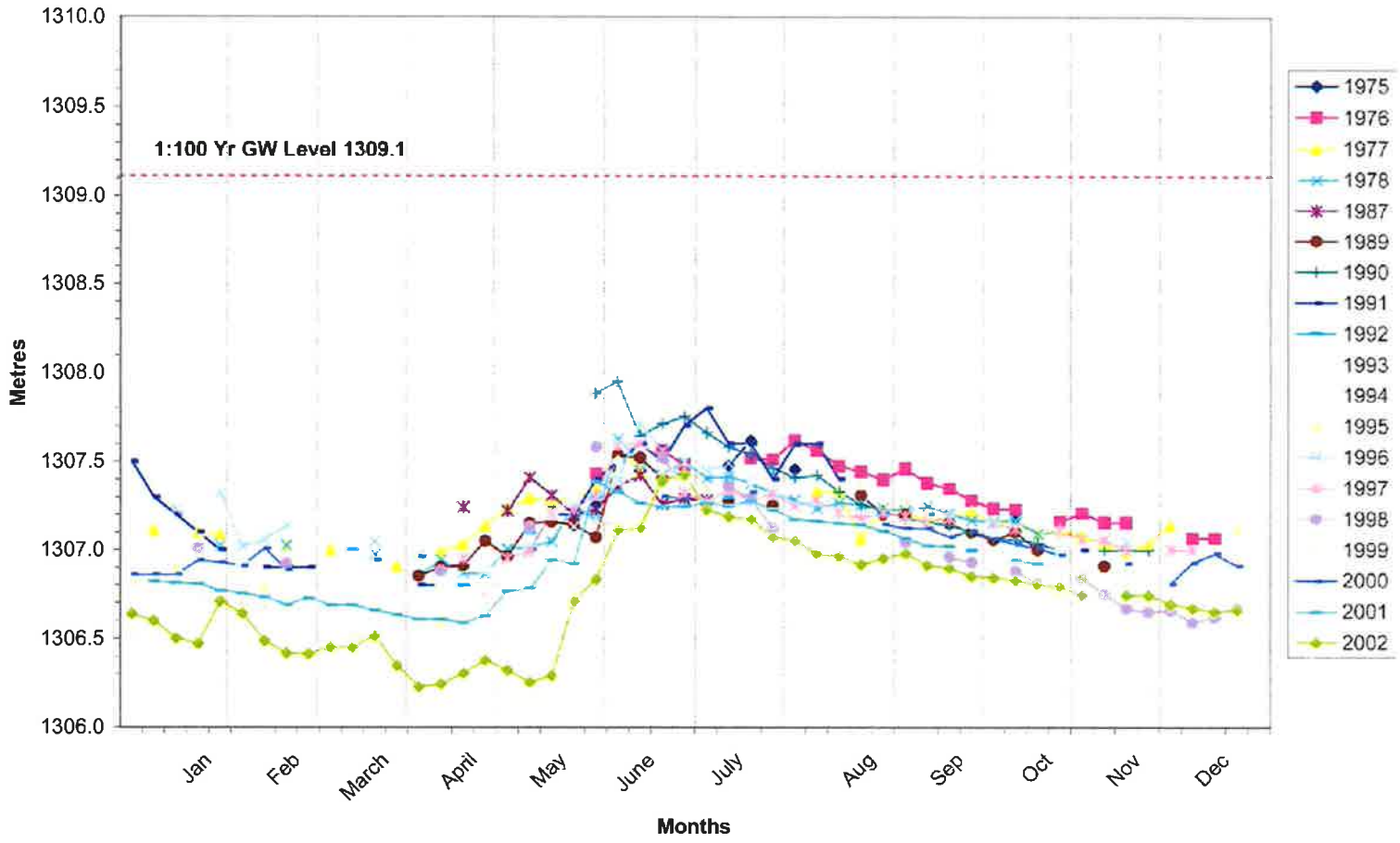


All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: HLC 9.6	PEIZOMETER AND STAFF GAGE LOCATION					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE	SEAL
2	10/27/23	2023 EDCG	BWM	FC	BK	PM SIGNATURE: PM APEGA ID #: 95819 DATE: Feb. 28, 2025	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZEL ID 66135
1	08/14/19	2019 EDCG	BWM	FC	CB	PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	Town of CANMORE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

FEB. 28, 2025

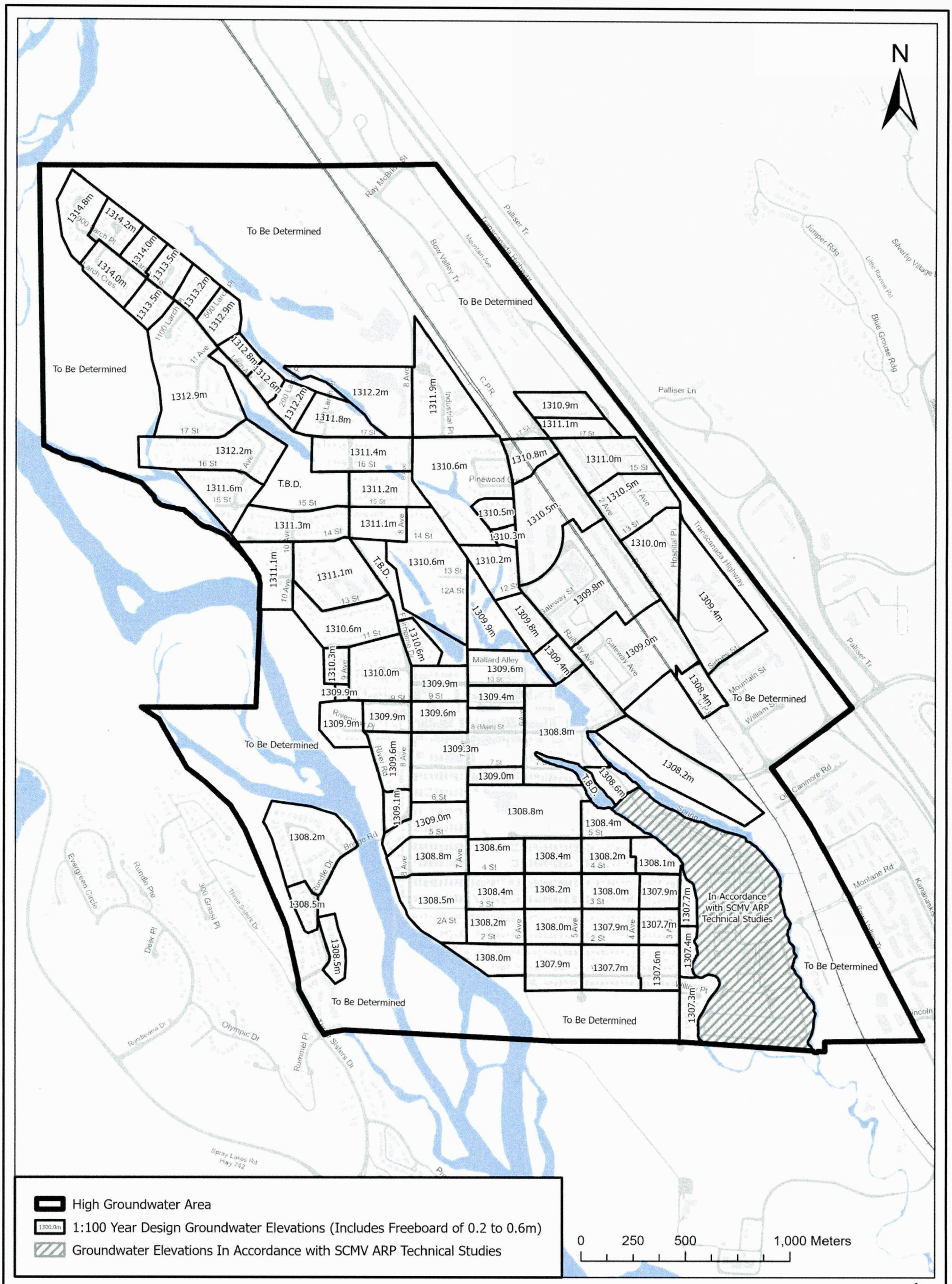
Piezometer #12 - TeePee Town (Panorama Plaza)



All dimensions in Metric meters unless otherwise noted

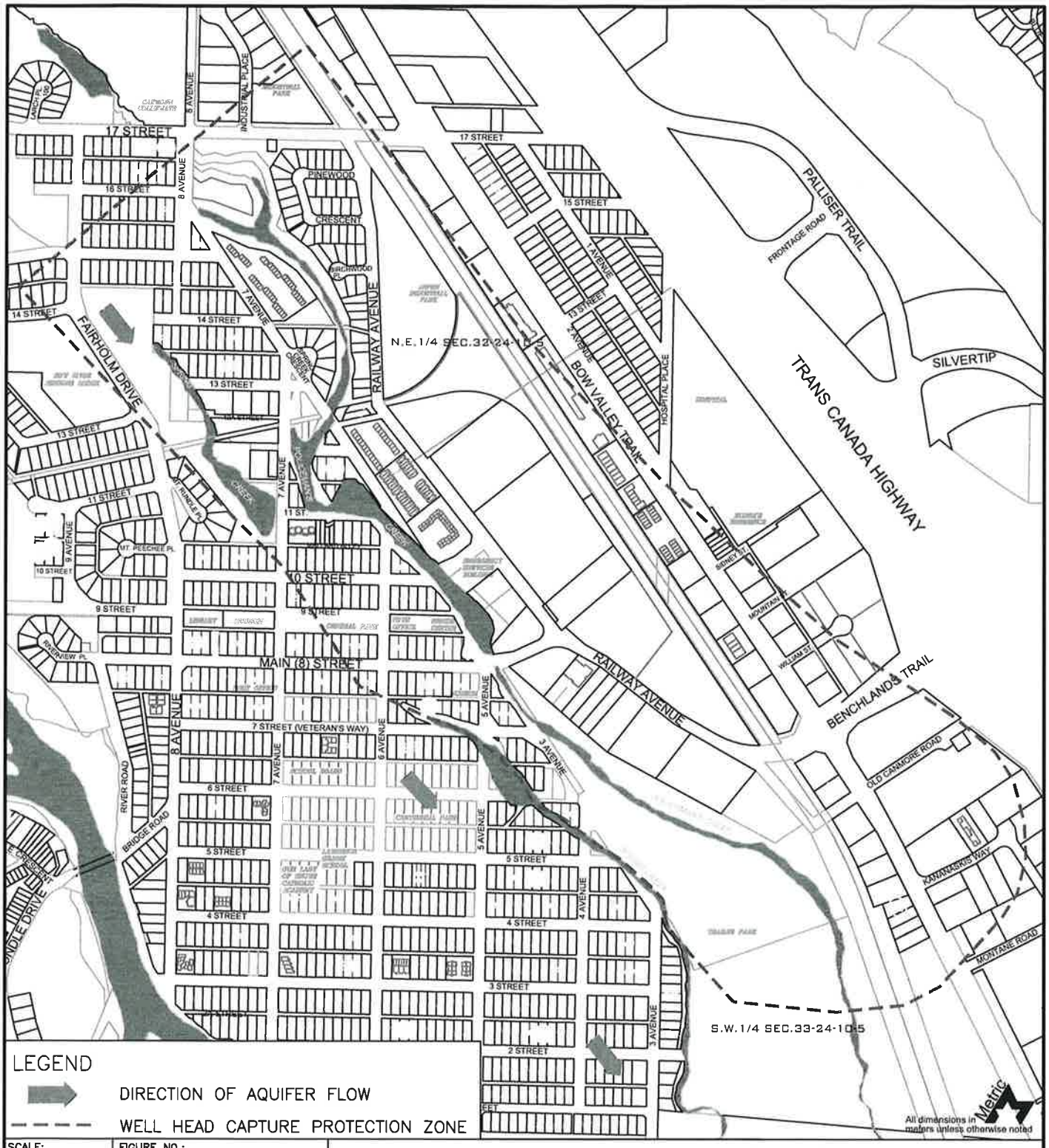
SCALE: NTS	FIGURE NO.: HLC 9.7	TYPICAL WATER LEVEL FLUCUATION					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 RM APEGA ID# DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	01/28/25	2025 EDCG	BWM	BK	BK		
1	08/14/19	2019 EDCG	BWM	FC	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

CANMORE

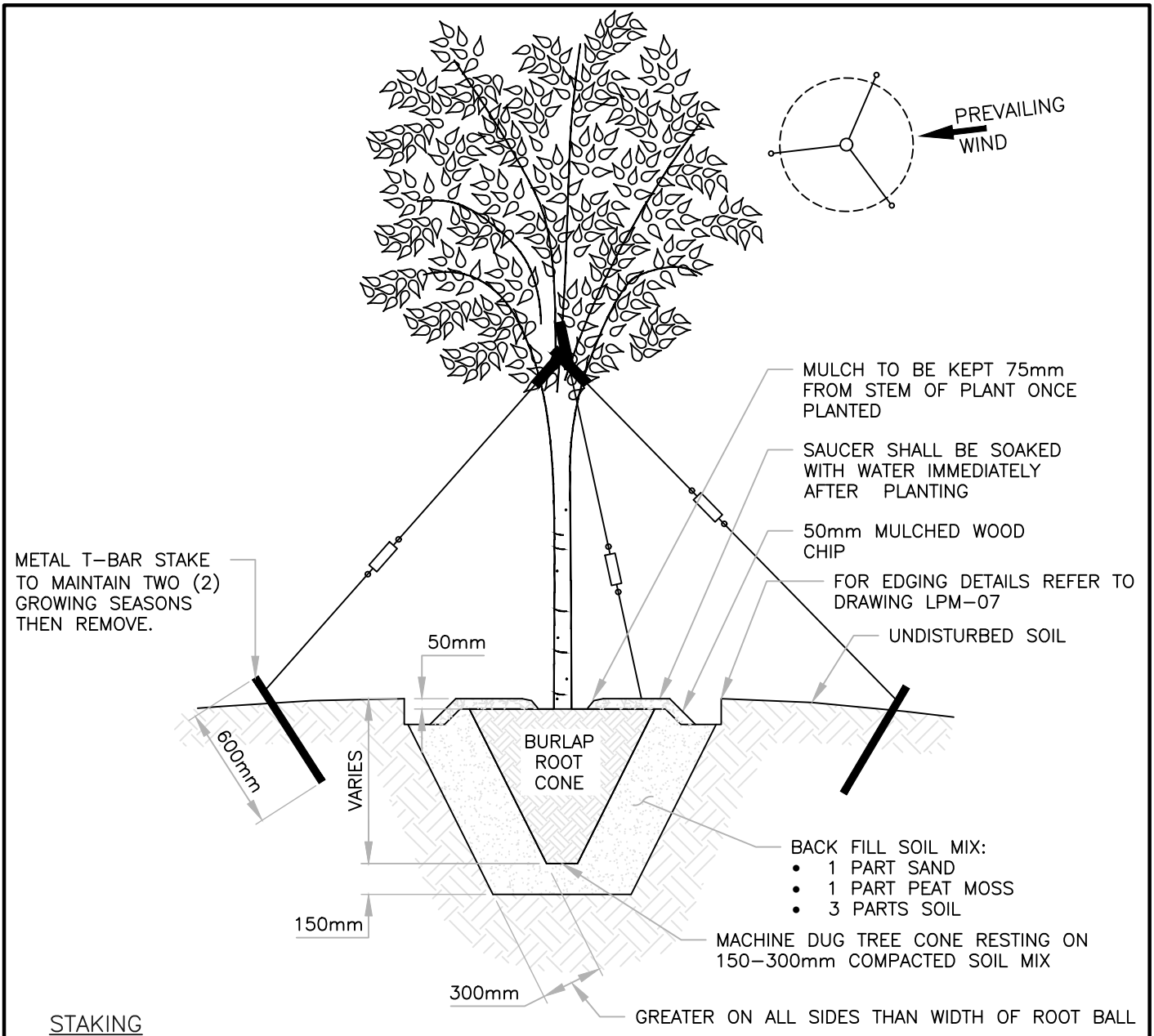


All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: HLC 9.8	1:100 YEAR DESIGN GROUNDWATER ELEVATIONS					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/27/23	2023 EDCG	BWM	FC	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95879 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135 FEB. 28, 2025
1	08/14/19	2019 EDCG	BWM	FC	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		



SCALE: NTS		FIGURE NO.: HLC 9.9	WELLHEAD CAPTURE PROTECTION ZONE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA # 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
2	08/14/19	2019 EDCG	BWM	FC	CB			
1	05/10/10	2010 EDCG	SP	PN	PN			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



STAKING

- (3) EACH 12mmø BLACK RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3-4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE – TO BE PLACED AT SAME LOCATION ON ALL 3 WIRES.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

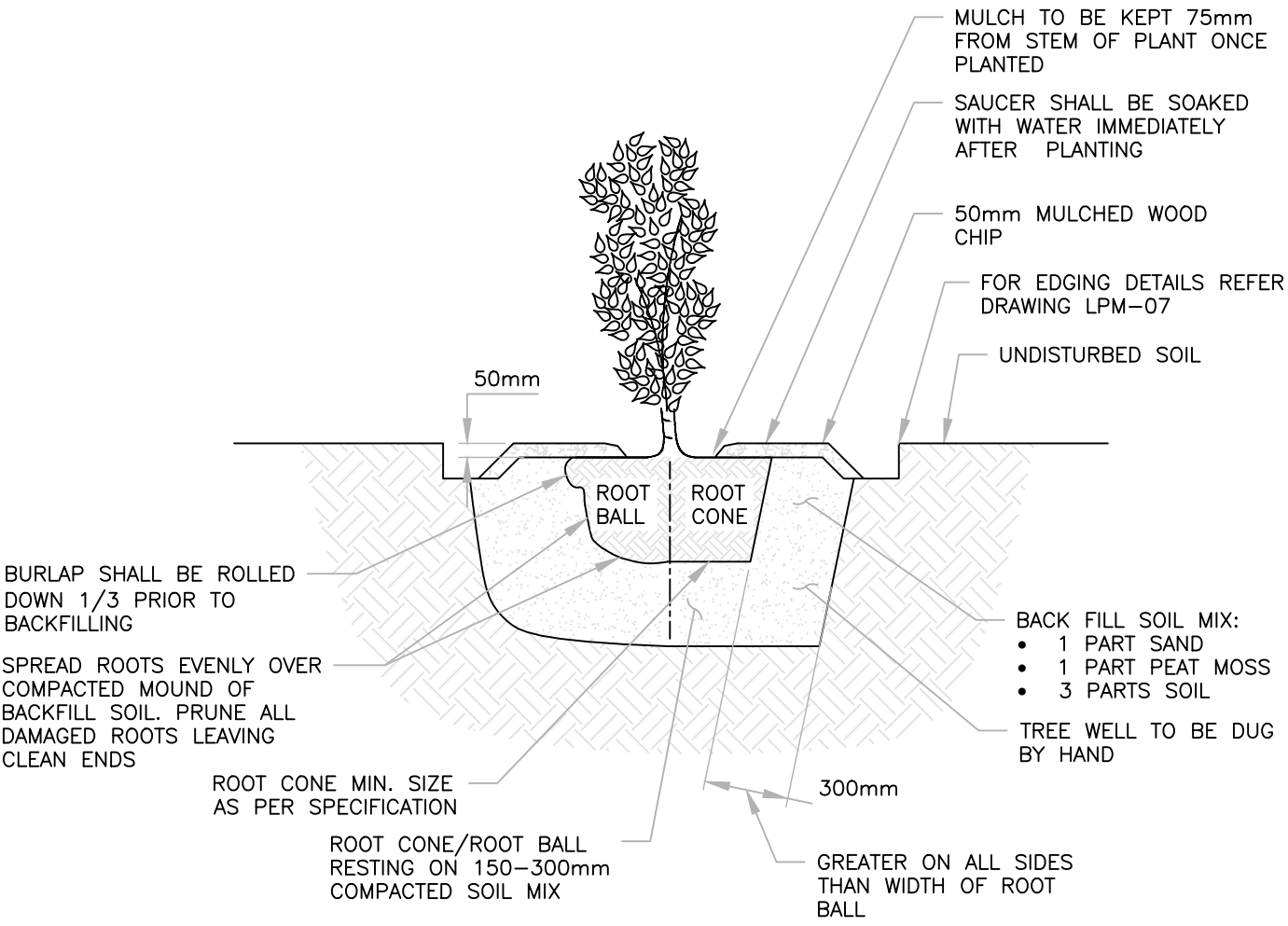
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

DECIDUOUS PLANTING MACHINE DUG

SCALE: 1:30 | FIGURE NO.: LSC 10.1



NOTES

1. PRUNE BRANCHES AND TWIGS BY 1/3 RETAINING NORMAL TREE SHAPE.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. CONTAINER STOCK PLANTED IN SAME MANNER AS ABOVE DETAIL. CONTAINER IS TO BE CUT CAREFULLY AWAY FROM ROOT SYSTEM SO AS TO NOT DISTURB THE PLANT. SHRUB SHALL NOT BE PULLED FROM THE CONTAINER.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

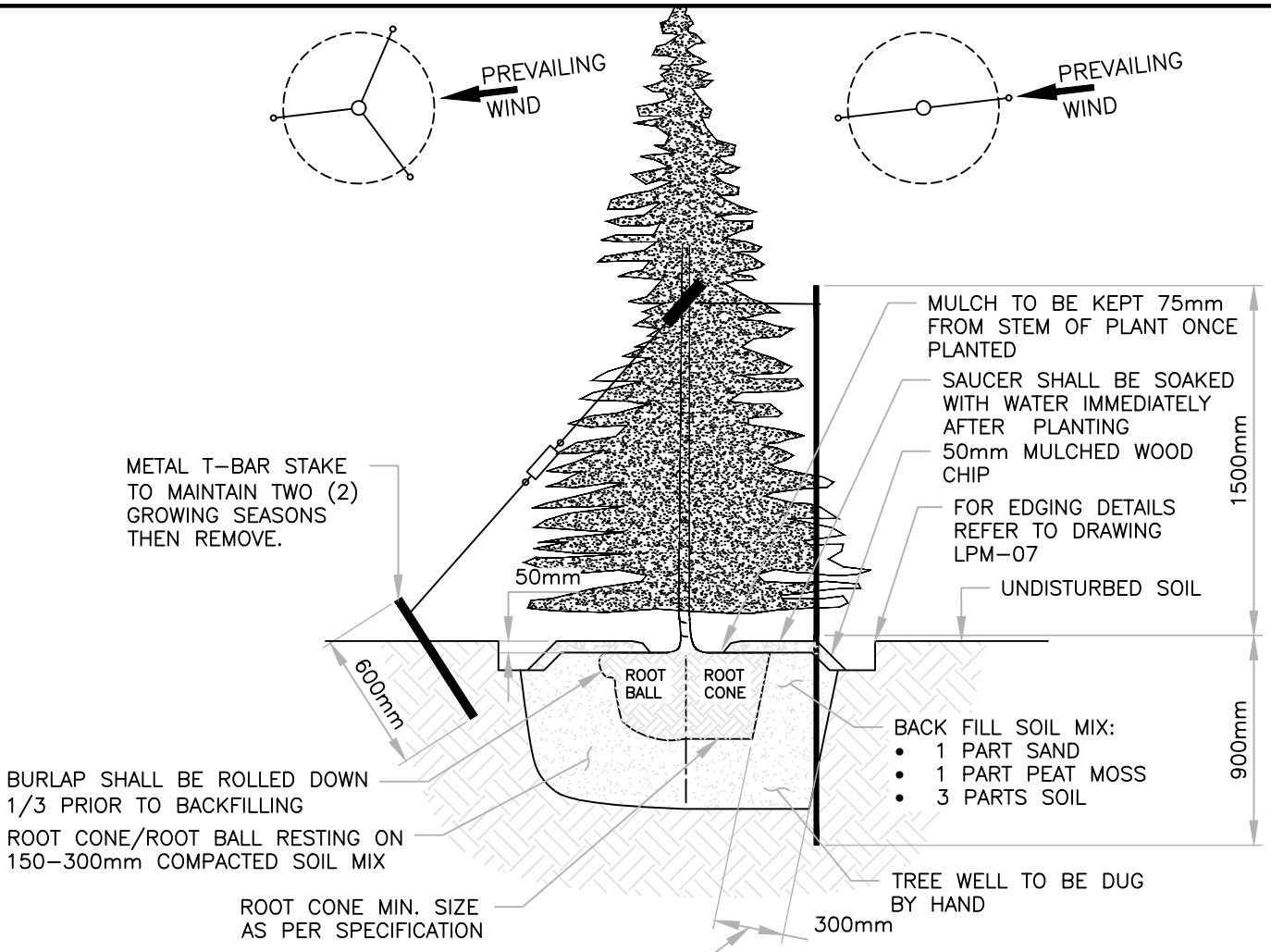
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

SHRUB PLANTING

SCALE: 1:25
FIGURE NO.: LSC 10.2



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3-4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS EITHER T-BAR POST OR GUY STAKE SYSTEM.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

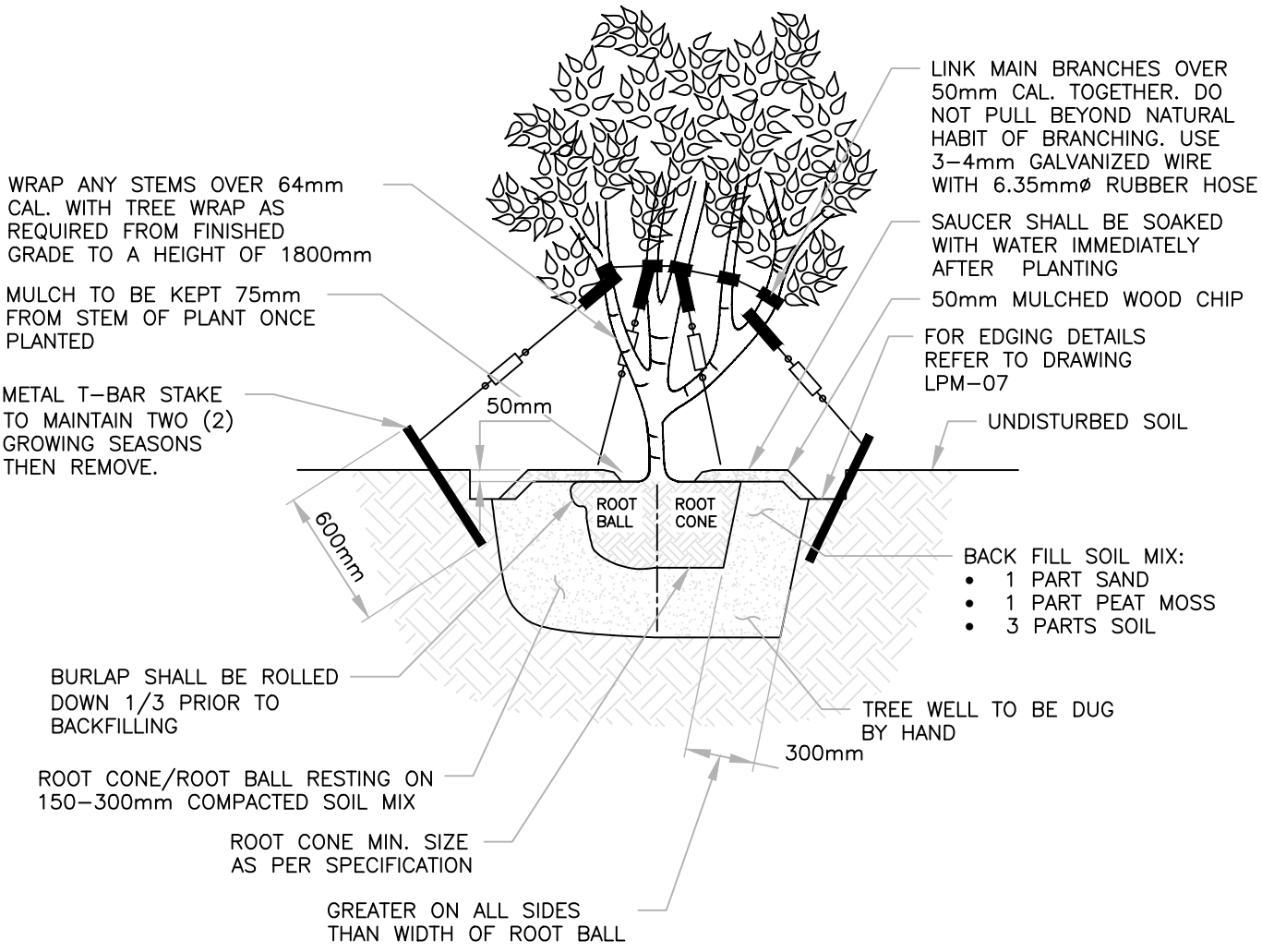
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

CONIFEROUS PLANTING HAND DUG

SCALE: 1:30
FIGURE NO.: LSC 10.3



STAKING

- MINIMUM FOUR (4) EACH, TWO (2) ON MAIN BRANCHES
- 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 HEIGHT OF THE TREE.
- LOOP BRANCHES TOGETHER TO MAINTAIN PLANT SHAPE.
- DOUBLE STRAND 3–4mm MALLEABLE GALVANIZED WIRE FOR GUYING.
- ORANGE FLUORESCENT GALVANIZED WARNING TAGS 1/3 HEIGHT OF TREE.
- GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE, ON EACH GUY.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS EITHER T–BAR POST OR GUY STAKE SYSTEM.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

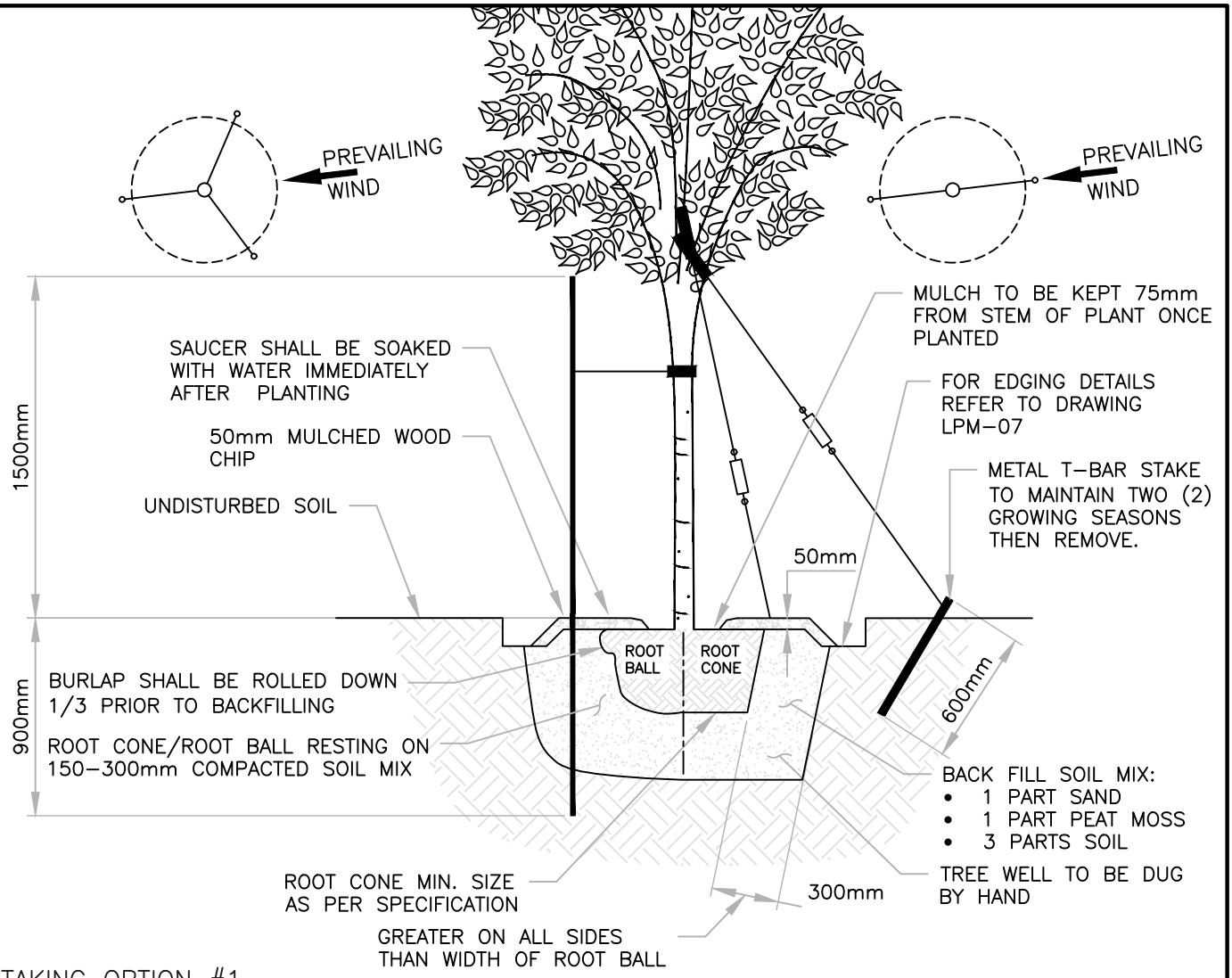
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

MULTI STEM TREE PLANTING

SCALE: 1:30 | FIGURE NO.: LSC 10.4



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3–4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

All dimensions in Metric meters unless otherwise noted

1. PRUNE BRANCHES BY 1/3 RETAINING NORMAL PLANT SHAPE AND REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS T–BAR POST WHEN PLANTING IS IN NEW SOD, GUY STAKE SYSTEM IN PRE–EXISTING ESTABLISHED CONDITIONS.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

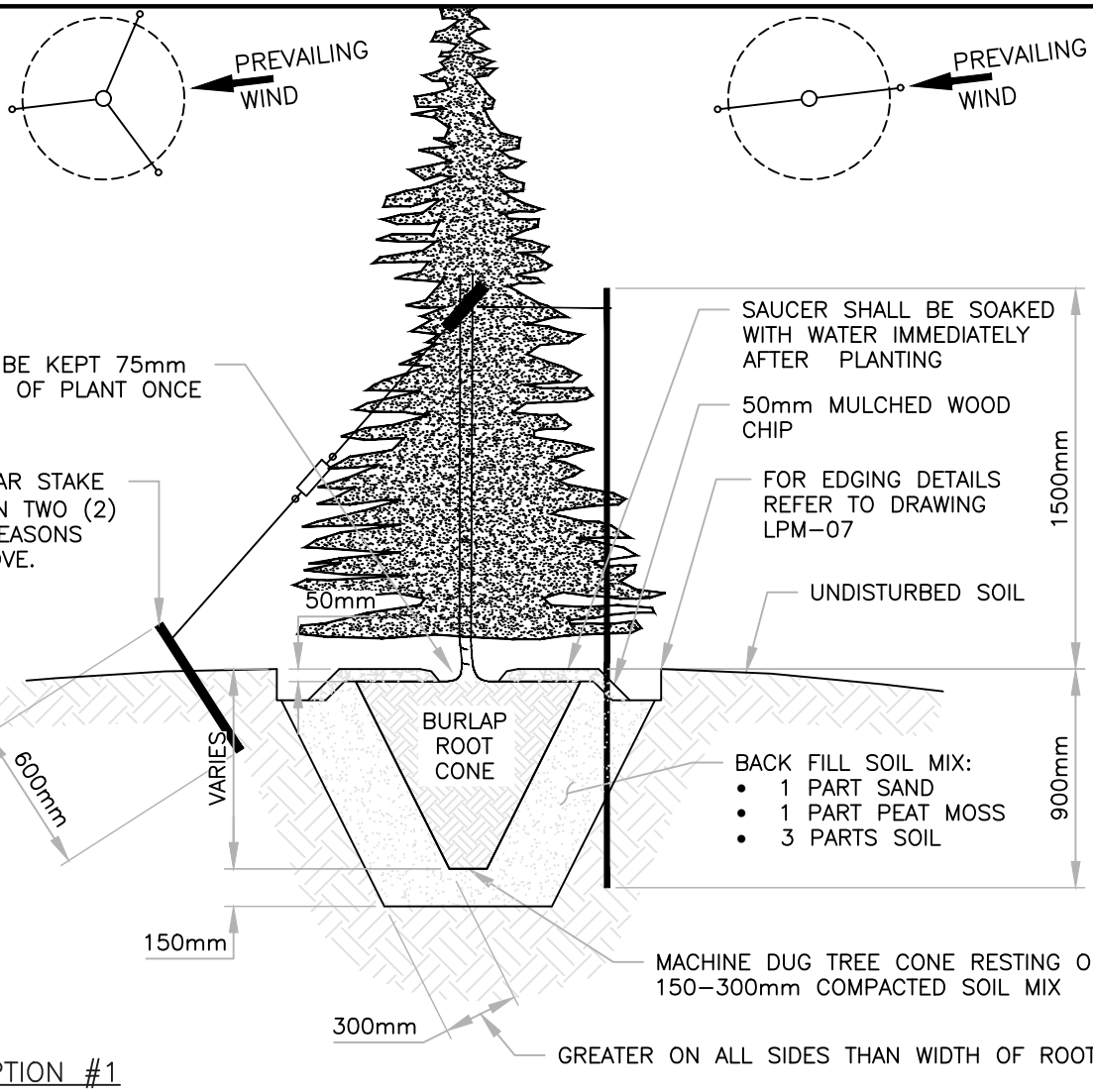
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

TREE PLANTING IN SOD CONIFEROUS/DECIDUOUS

SCALE: 1:30
FIGURE NO.: LSC 10.5



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3–4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS T–BAR POST WHEN PLANTING IS IN NEW SOD, GUY STAKE SYSTEM IN PRE–EXISTING ESTABLISHED CONDITIONS.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in Metric meters unless otherwise noted

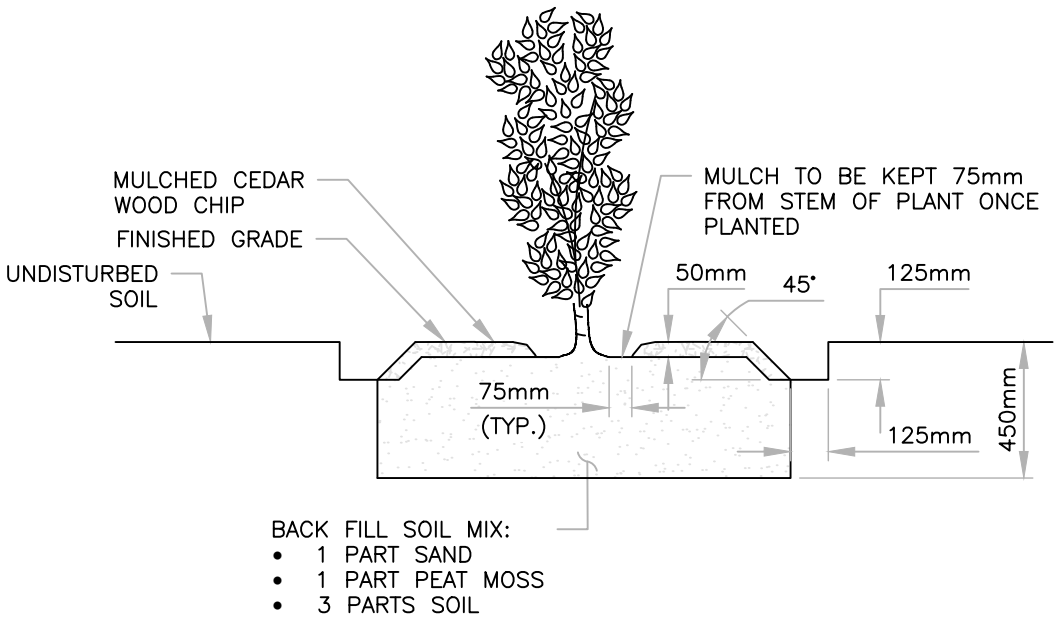
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

CONIFEROUS PLANTING MACHINE DUG

SCALE: 1:30
FIGURE NO.: LSC 10.6



NOTES

1. THIS DESIGN CAN BE USED WITH OR WITHOUT LANDSCAPING FABRIC.
2. IF LANDSCAPING FABRIC IS USED, IT NEEDS TO BE ATTACHED TO THE GROUND NEATLY AT THE BOTTOM OF THE GUTTER SLOPED (BED) SIDE.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

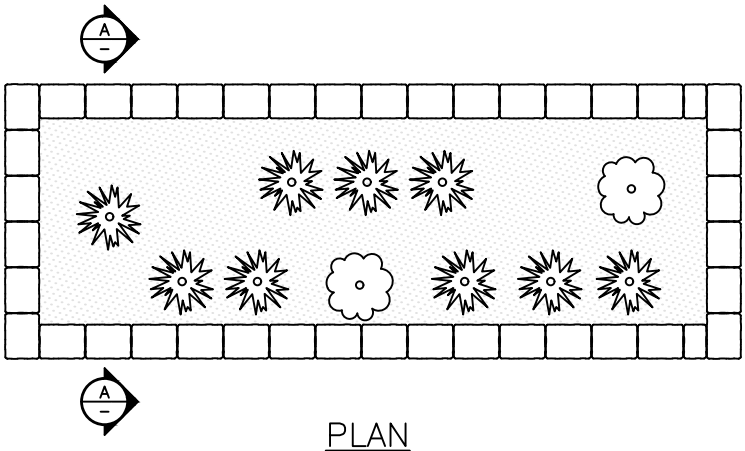
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	TR	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

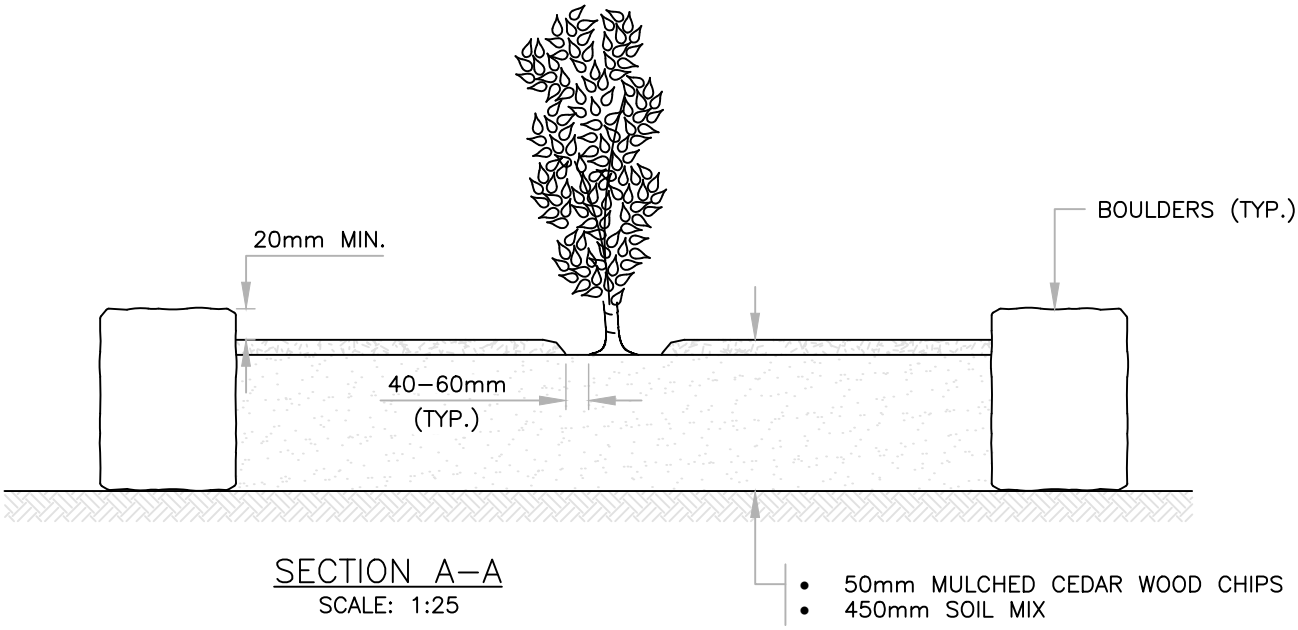
Town of CANMORE

SHRUB PLANTING GROUND BED

SCALE: 1:25
FIGURE NO.: LSC 10.7



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:25

NOTES

1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

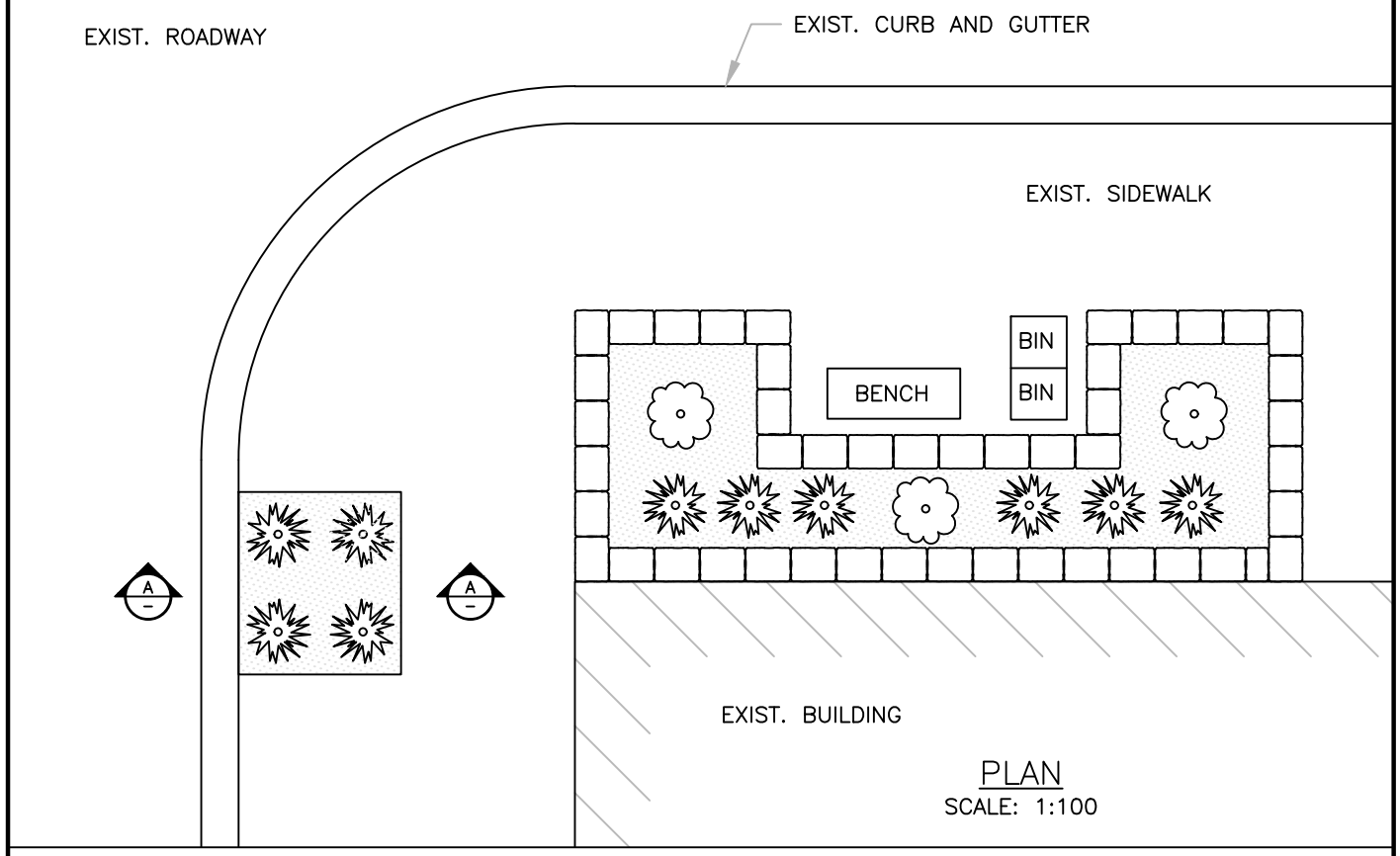
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

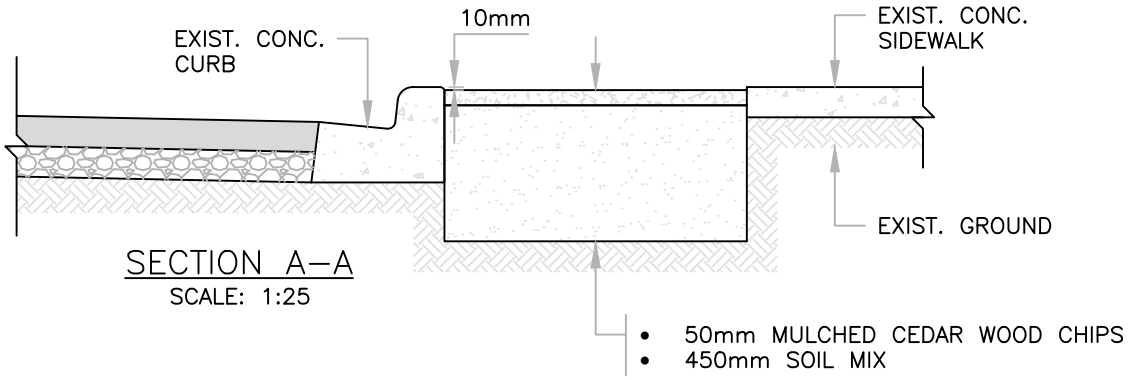
Town of CANMORE

MULCH BED BORDERED BY ROCK SCAPING

SCALE: AS NOTED
FIGURE NO.: LSC 10.8



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:25

NOTES
1. NO LANDSCAPING FABRIC.
2. IF LANDSCAPING FABRIC IS USED, IT MUST BE ATTACHED DOWN EVERY 300mm AND AT EACH CORNER.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
4. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

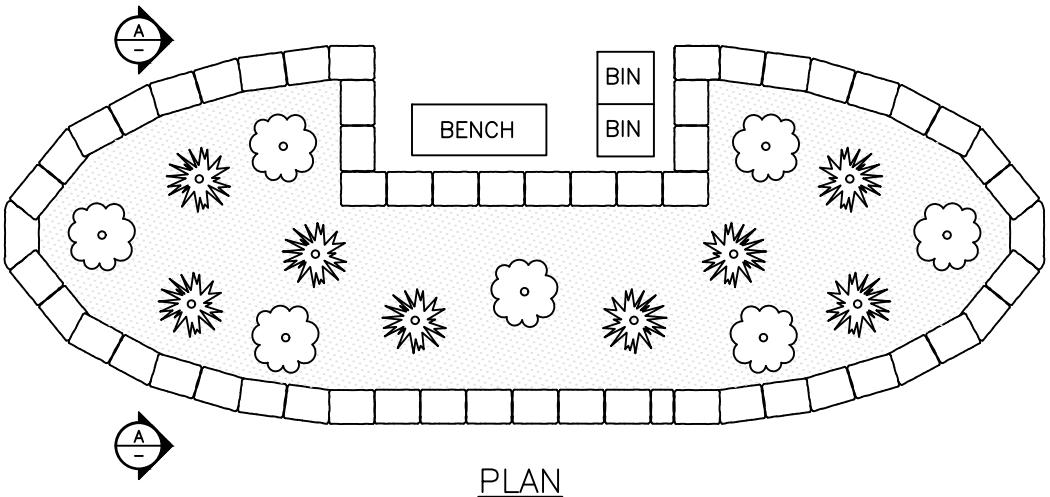
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

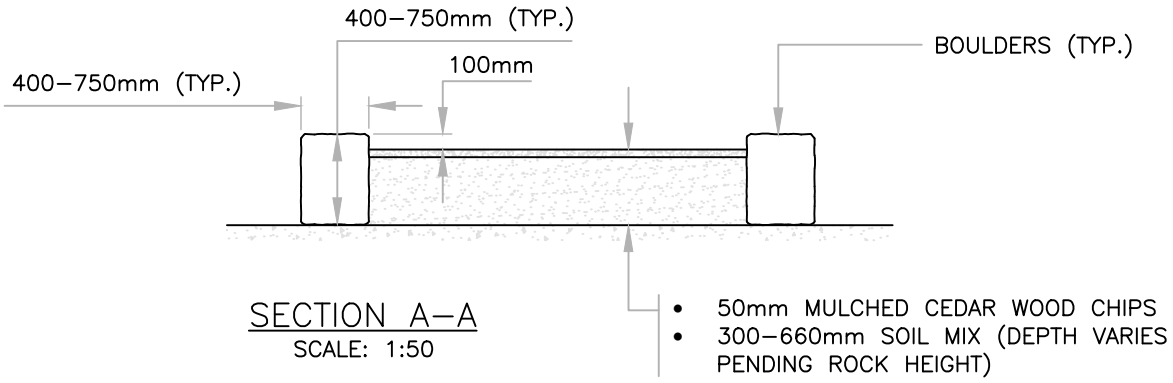
Town of CANMORE

MULCH BED WITHIN A CONCRETE SIDEWALK
BED NEXT TO ROADWAY

SCALE: AS NOTED
FIGURE NO.: LSC 10.9



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:50

NOTES
1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

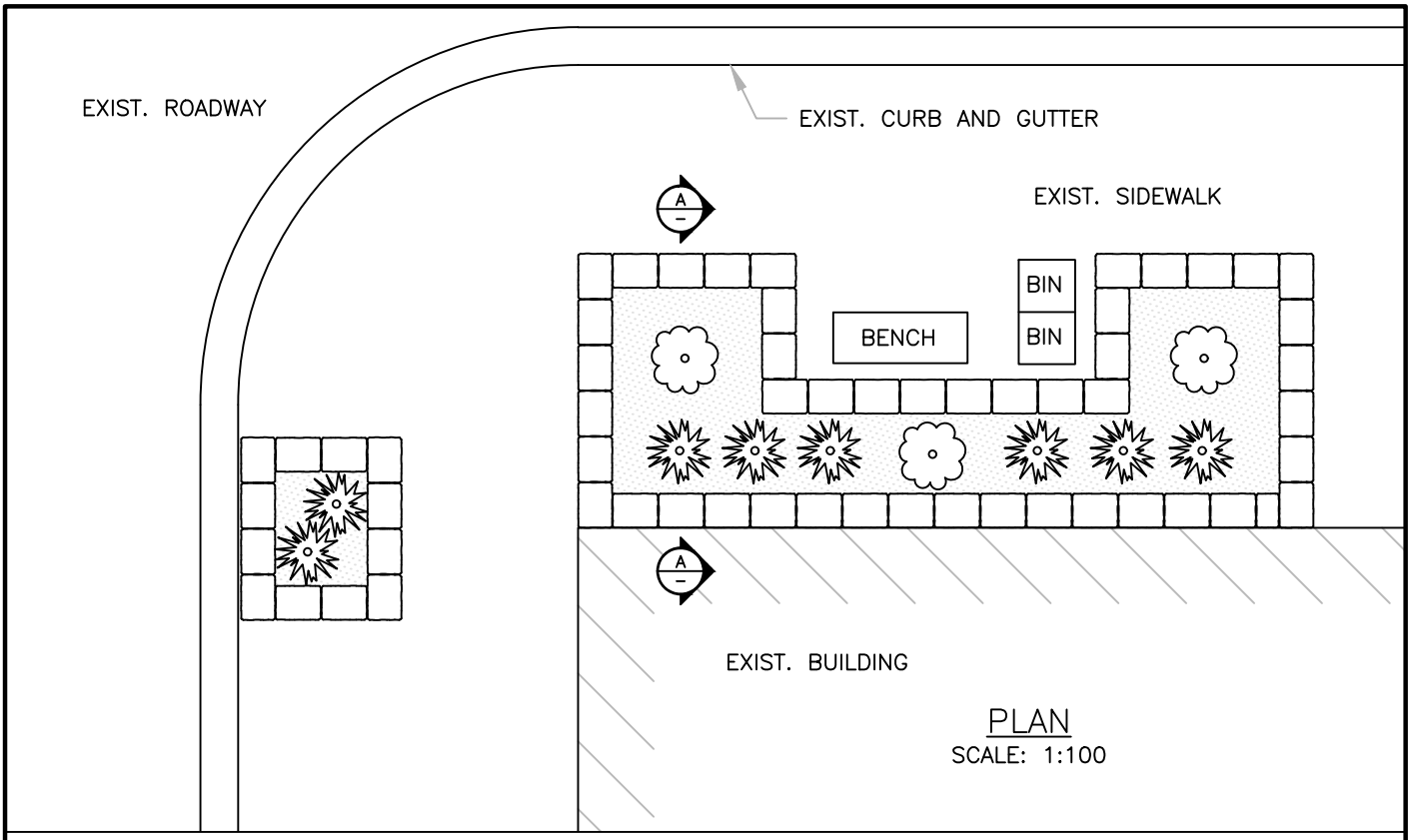
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

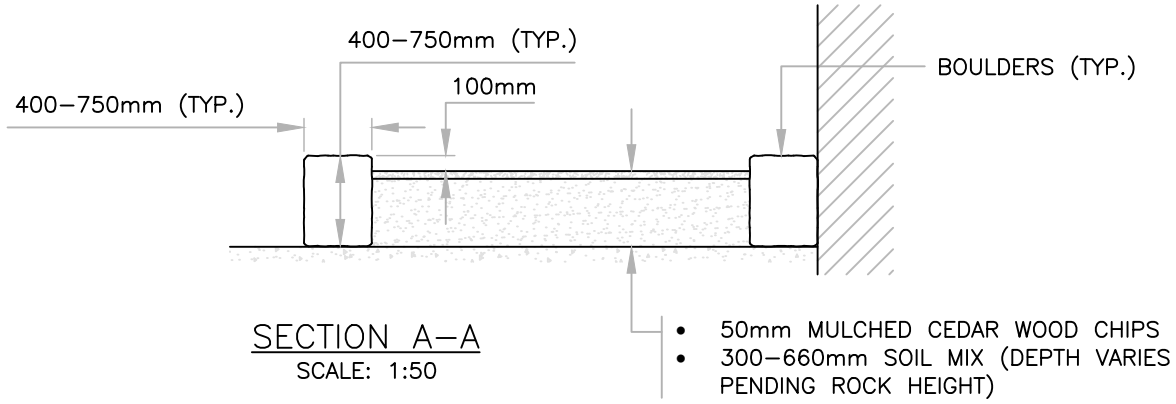
Town of CANMORE

PLAZA RAISED ROCK FEATURE BED

SCALE: AS NOTED
FIGURE NO.: LSC 10.10



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:50

- 50mm MULCHED CEDAR WOOD CHIPS
- 300–660mm SOIL MIX (DEPTH VARIES PENDING ROCK HEIGHT)

NOTES

1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

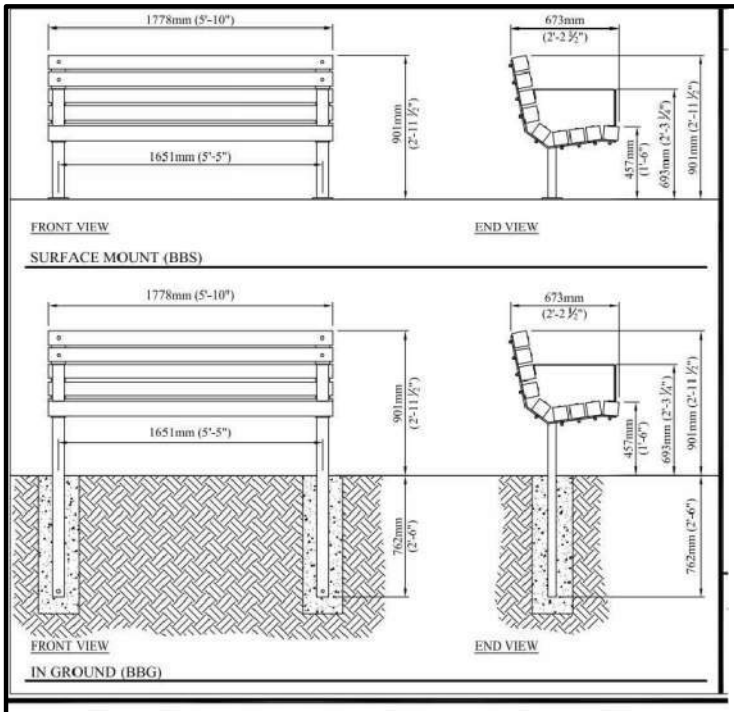
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

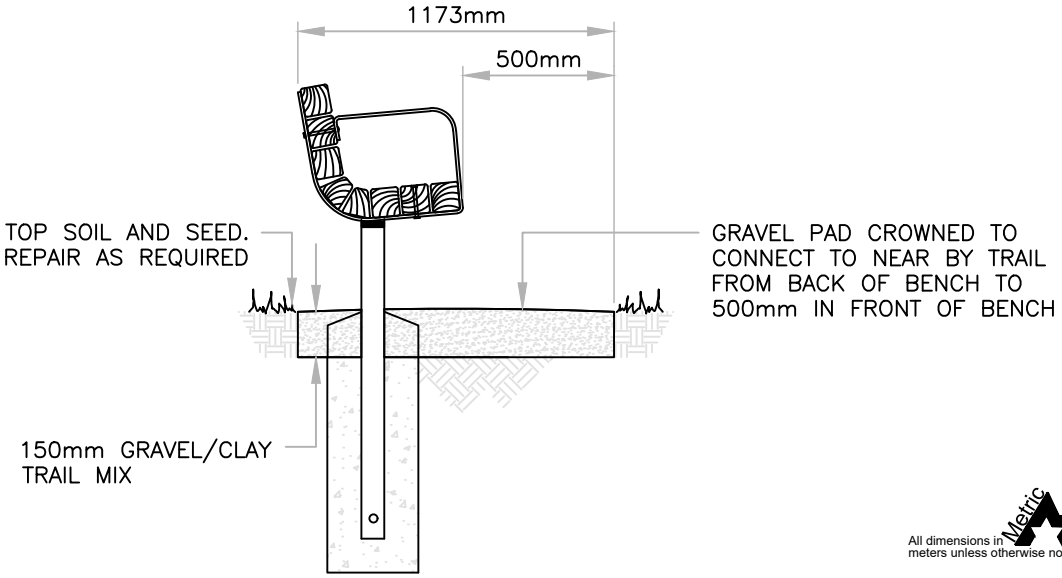
DRAWN: B. MORVAN
DATE: AUG 2018
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

SIDEWALK RAISED ROCK FEATURE BED

SCALE: AS NOTED
FIGURE NO.: LSC 10.11





All dimensions in Metric meters unless otherwise noted

PARK BENCH	WOOD	STEEL FINISH	FASTNERS	TYPE	MOUNT
SERIES "B" PARK BENCH BY CUSTOM PARK & LEISURE OR APPROVED EQUIVALENT	88.9 x 88.9 x 1178.0mm (3–1/2" x 3–1/2" x 70") #1 GRADE CLEAR CEDAR	3 STEP POWDER COAT PROCESS 1–SURFACE PREP(SANDBLAST) 2– PRIME COAT (ZINCPRIMER) 3– TOP POWDER COAT COLOUR: CHESTNUT BROWN	9.5mm PLATED CARRIAGE BOLTS. COLOUR MATCHED TO STEEL FRAME	1778mm IN LENGTH WITH BACK AND ARM RESTS	BOLT DOWN MOUNT IN–GROUND MOUNT FREE STANDING MOUNT

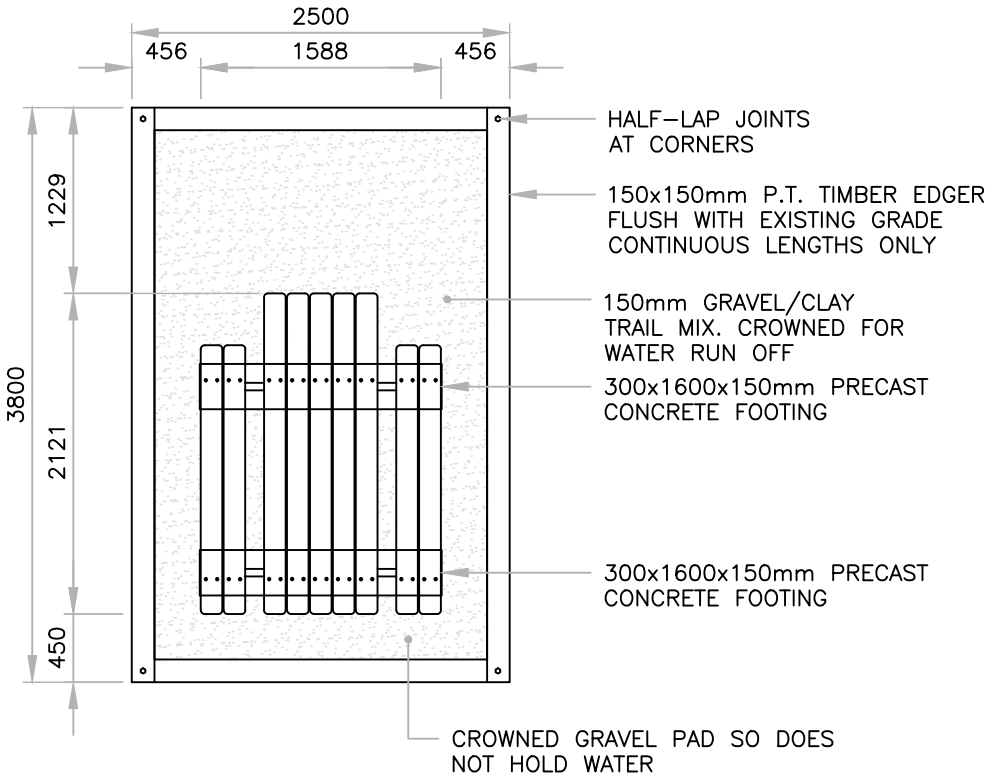
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

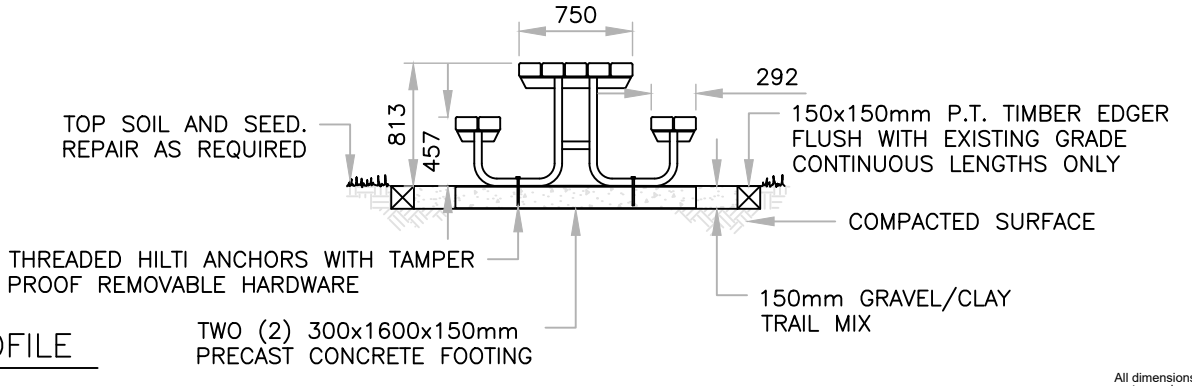
PARK BENCH TYPE AND INSTALLATION DETAILS

SCALE: NTS
FIGURE NO.: LSC 10.12



PLAN

1:50



PROFILE

1:50

All dimensions in meters unless otherwise noted

PICNIC TABLE	WOOD	STEEL TYPE	FASTNERS	STEEL FINISH	WOOD FINISH
SERIES "B" SURFACE MOUNT (PBS) BY CUSTOM PARK & LEISURE OR APPROVED EQUIVALENT	88.9 x 139.7 x 1778.0mm (3 1/2" x 5 1/2" x 70") # 1 GRADE SELECT CEDAR	101.6 x 76.2mm (4" X 3") ANGLE IRON WOOD SUPPORTS 50.8 x 50.8mm (2" x 2") SQUARE TUBE FRAME	9.5mm (3/8) PLATED CARRIAGE BOLTS COLOUR MATCHED TO STEEL FRAME	3 STEP POWDER COAT PROCESS 1–SURFACE PREP (SANDBLAST) 2– PRIME COAT (ZINC PRIMER) 3– TOP POWDER COAT COLOUR: CHESTNUT BROWN	OPTIONAL SIKKENS STAIN

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN

DATE: AUG 2019

CHECKED BY: L. GUEST

APPROVED:

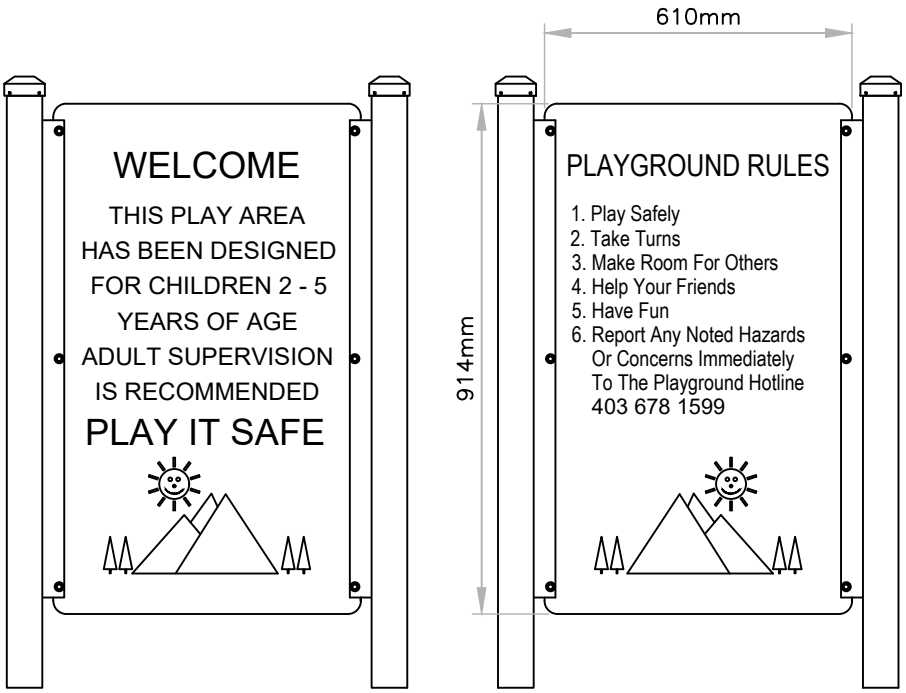
MANAGER OF ENGINEERING
TOWN OF CANMORE

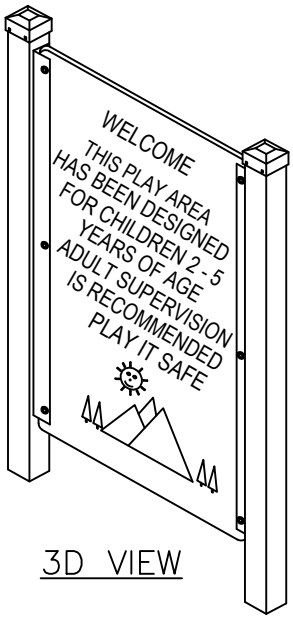
Town of CANMORE

PICNIC TABLE TYPE AND INSTALLATION DETAILS

SCALE: NTS

FIGURE NO.: LSC 10.13





3D VIEW

All dimensions in Metric meters unless otherwise noted

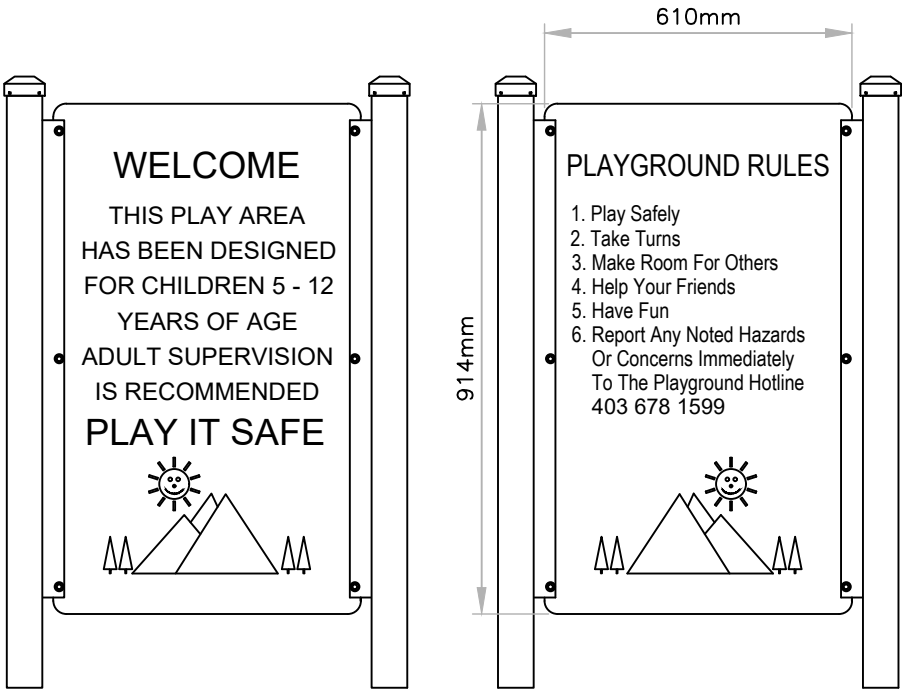
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

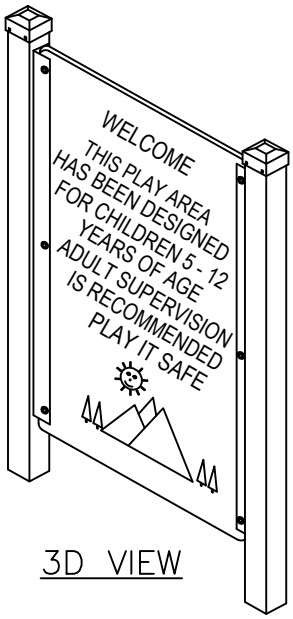
PLAYGROUND SIGN AGE 2 - 5 YEARS

SCALE: NTS
FIGURE NO.: LSC 10.14



FRONT VIEW

BACK VIEW



3D VIEW

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

PLAYGROUND SIGN AGE 5 - 12 YEARS

SCALE: NTS
FIGURE NO.: LSC 10.15

All dimensions in Metric meters unless otherwise noted

TRAIL SIGNAGE TABLE

ALL SIGNAGE INDICATED ON PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

TRAIL SIGNAGE TYPE (TOWN OF CANMORE DESIGNATION)	STOCK NUMBER (ATSL)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
"A"	CUSTOM	TRAIL c/w T.O.C. SYMBOL	AL1	RECTANGULAR	30 x 45 cm	W/BR	VIN	TO IDENTIFY PUBLIC TRAILS

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

TYPE "A" TRAIL SIGNAGE

SCALE: NTS
FIGURE NO.: LSC 10.16

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–01 T.O.C. DESIGNATION	CUSTOM	PARK CLOSURE SIGN WITH DESIGNATED HOURS c/w T.O.C. LOGO	AL–.081	RECTANGLE c/w ROUNDED CORNERS	76.2cm X 60.96cm	WHITE BACKGROUND, BLACK LETTERS AND BLACK BORDER LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THE TIME THE PARK IS CLOSED TO THE PUBLIC

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

THIS PARK IS CLOSED TO THE PUBLIC

SCALE: NTS | FIGURE NO.: LSC 10.18

All dimensions in meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-03	CUSTOM	NO PETS c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	DESIGNATES A NO PETS ALLOWED LOCATION/AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

NO PETS

SCALE: NTS | FIGURE NO.: LSC 10.19

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-04	CUSTOM	NO PETS WITHIN 20m OF PLAY APPARATUS c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	NO PETS WITHIN 20m OF PLAY APPARATUS. DESIGNATES NO PETS ALLOWED IN AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

NO PETS WITHIN 20 METRES OF PLAY APPARATUS

SCALE: NTS
FIGURE NO.: LSC 10.20

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–04 T.O.C. DESIGNATION	CUSTOM	PETS ON LEASH SYMBOL c/w T.O.C. LOGO & BYLAW TEXT	AL–.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOL GREEN CIRCLE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES A PETS ON LEASH ALLOWED LOCATION/AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

PETS ON LEASH

SCALE: NTS | FIGURE NO.: LSC 10.21

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-02	CUSTOM	NO BICYCLES c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	DESIGNATES A NO BICYCLES ALLOWED IN THAT AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

NO BICYCLES

SCALE: NTS | FIGURE NO.: LSC 10.22

All dimensions in meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–07 T.O.C. DESIGNATION	CUSTOM	DAY USE ONLY c/w T.O.C. LOGO	AL–.081	RECTANGLE c/w ROUNDED CORNERS	81.28cm X 45.72cm	TOP RED BACKGROUND w/ WHITE LETTERS. BOTTOM WHITE BACKGROUND w/ BLACK & RED LETTERS BLACK TRIM LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THAT A PARKING LOT IS FOR DAY USE ONLY

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

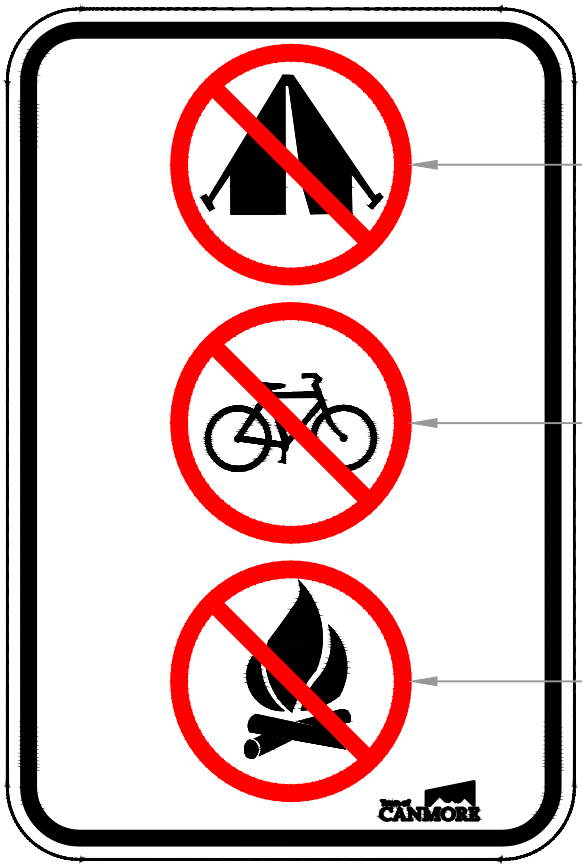
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

DAY USE ONLY
PARKING LOT SIGNAGE

SCALE: NTS
FIGURE NO.: LSC 10.23

All dimensions in Metric meters unless otherwise noted



REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–06 T.O.C. DESIGNATION	CUSTOM	NO CAMPING, BICYCLES OR FIRES SYMBOLS c/w T.O.C. LOGO & BYLAW TEXT	AL–.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK SYMBOLS, RED CIRCLES & BLACK TRIM LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THAT THE NOTED ACTIVITIES ARE NOT ALLOWED IN THAT LOCATION

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

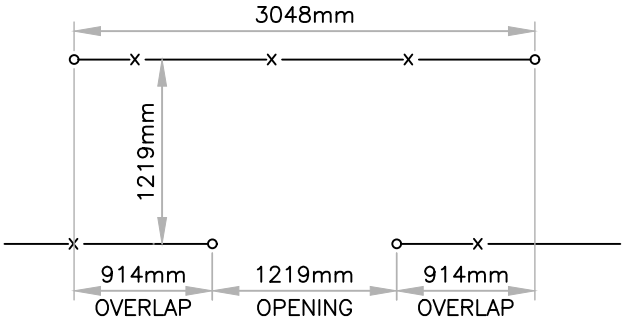
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

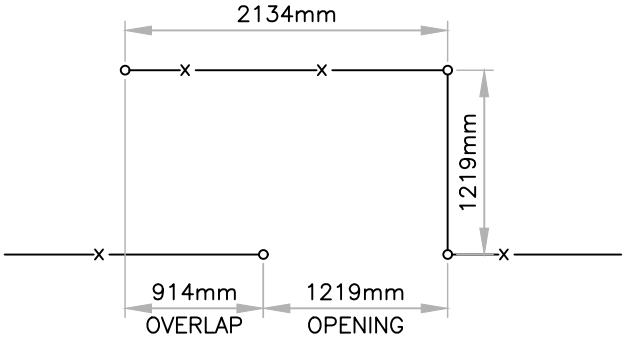
NO CAMPING
NO BICYCLING
NO CAMP FIRES

SCALE: NTS
FIGURE NO.: LSC 10.24

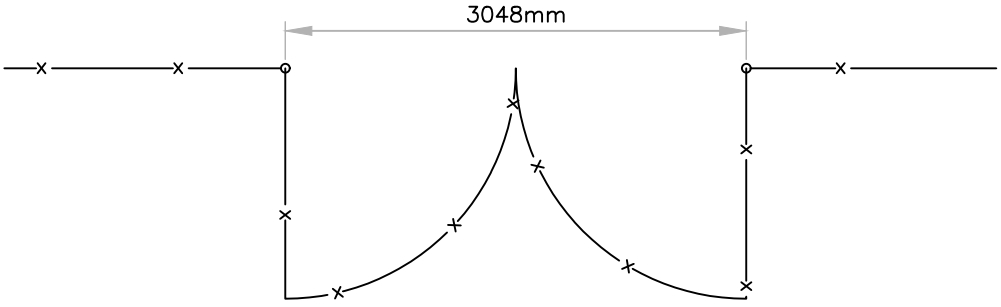
PEDESTRIAN ACCESS – OPTION A



PEDESTRIAN ACCESS – OPTION B



MAINTENANCE ACCESS



All dimensions in Metric meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

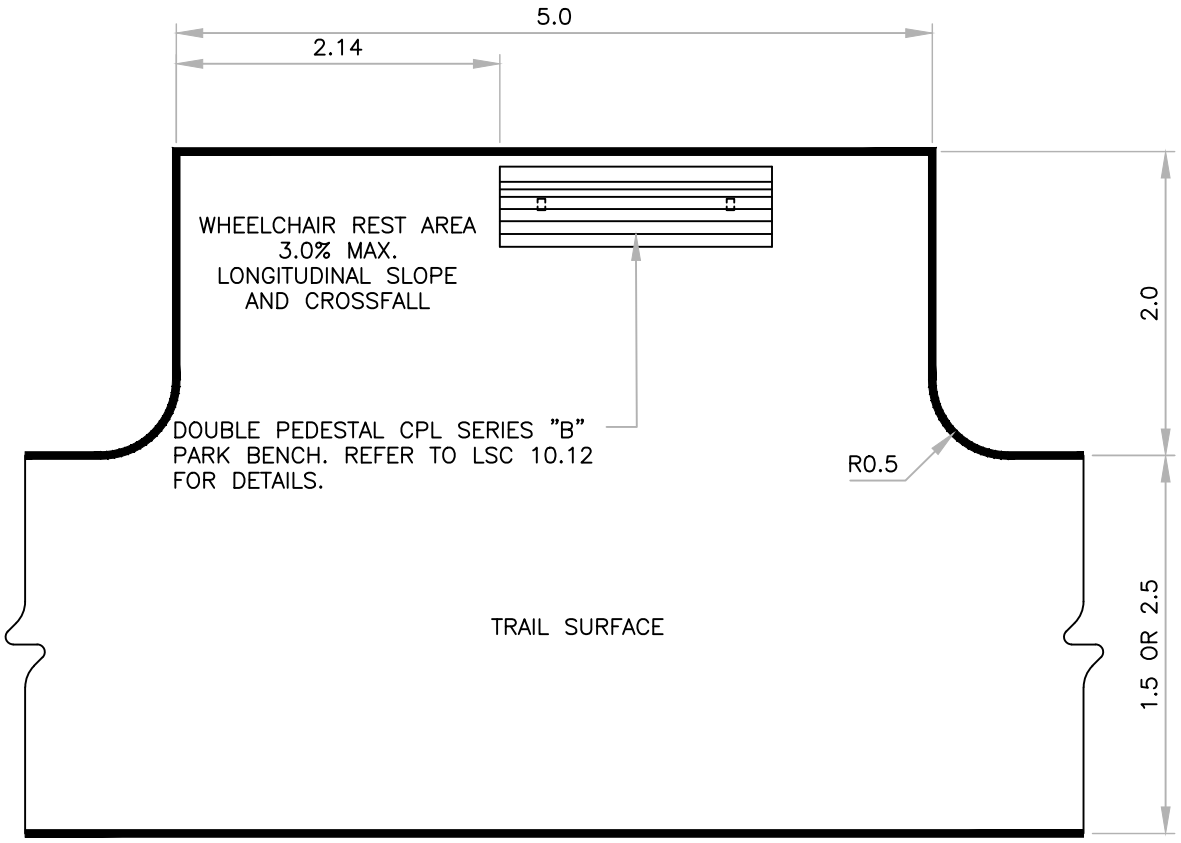
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

PEDESTRIAN AND MAINTENANCE ACCESS GATES

SCALE: 1:50
FIGURE NO.: LSC 10.25



NOTES

1. 1.0m CLEARING WIDTH AT BACK AND SIDES OF REST AREA.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	12/09/19	2019 EDCG	BWM	LG	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: DEC 2019

CHECKED BY: L. GUEST

APPROVED:

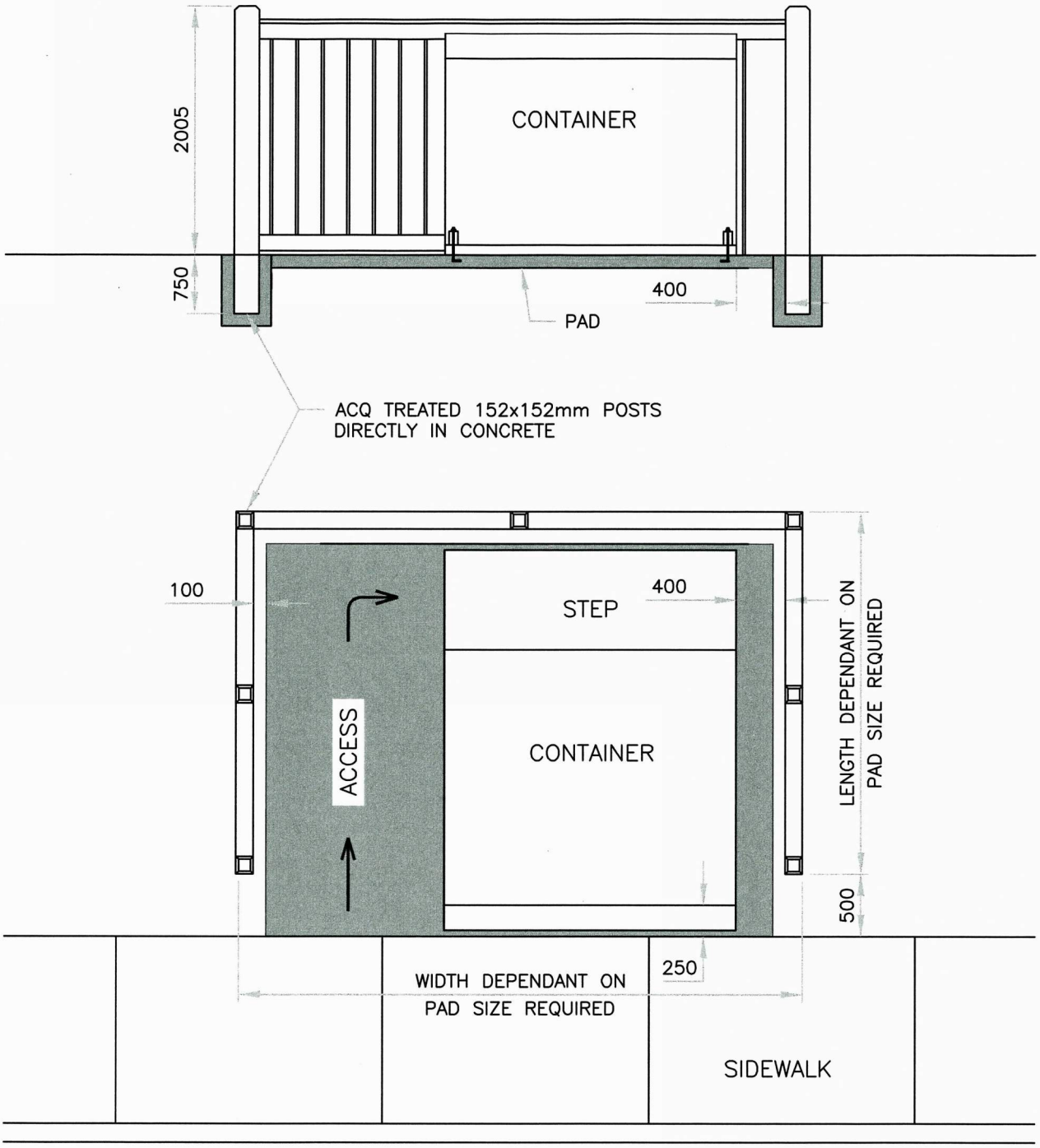
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

TRAIL SIDE REST AREA

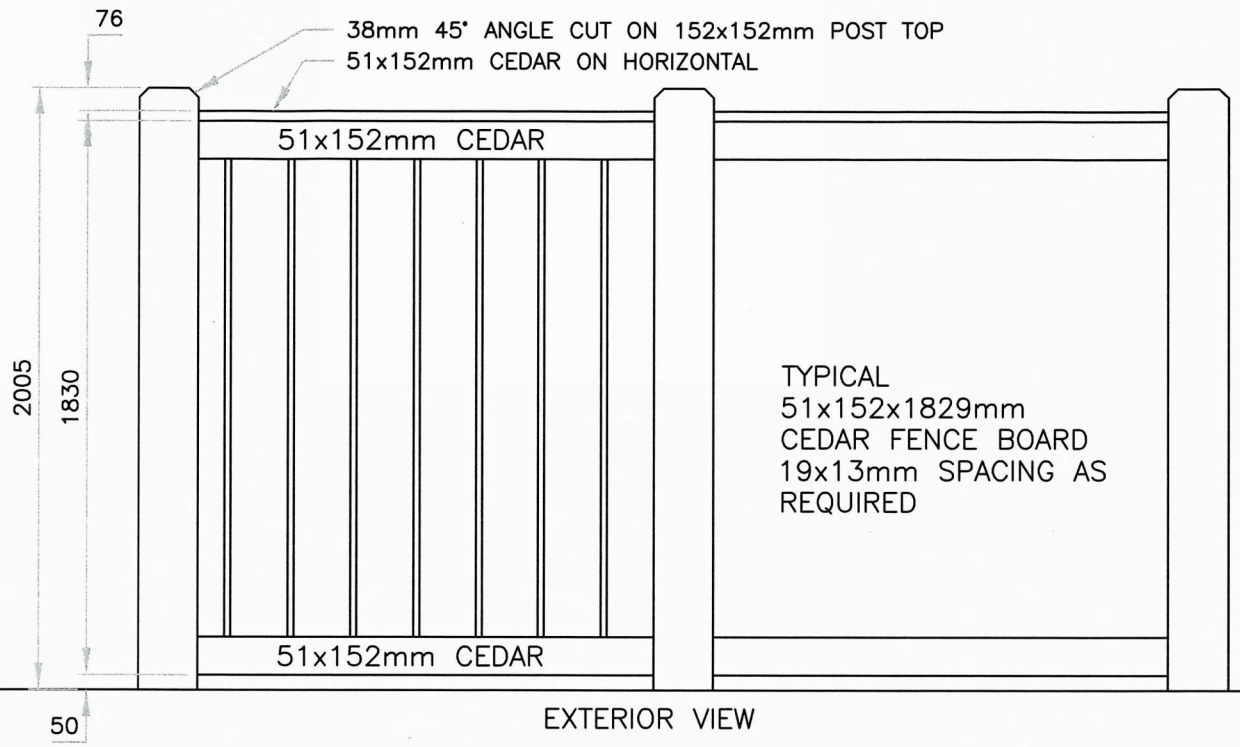
SCALE: 1:50

FIGURE NO.: LSC 10.26



All dimensions in Metric meters unless otherwise noted

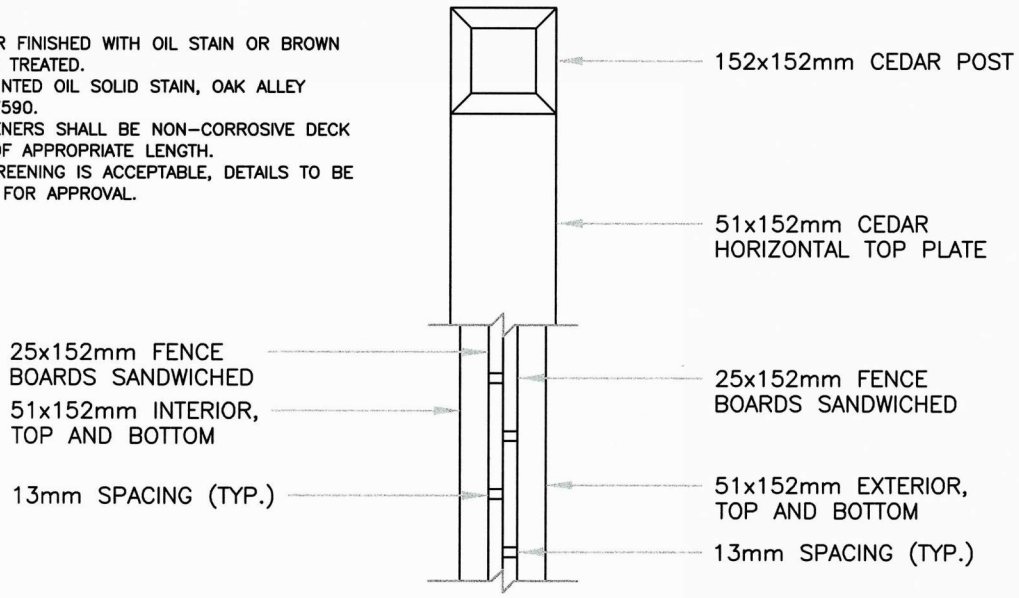
SCALE: NTS		FIGURE NO.: SWS 11.1	ANIMAL PROOF WASTE CONTAINER - ARTIFICAL SCREEN DIMENSIONS				
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	10/30/2023	2023 EDCG	BWM	SR	BK		
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		



EXTERIOR VIEW

NOTES

1. ALL CEDAR FINISHED WITH OIL STAIN OR BROWN PRESSURE TREATED.
2. POSTS PAINTED OIL SOLID STAIN, OAK ALLEY COLOUR 7590.
3. ALL FASTENERS SHALL BE NON-CORROSIVE DECK SCREWS OF APPROPRIATE LENGTH.
4. METAL SCREENING IS ACCEPTABLE, DETAILS TO BE PROVIDED FOR APPROVAL.



TOP PANEL DETAIL

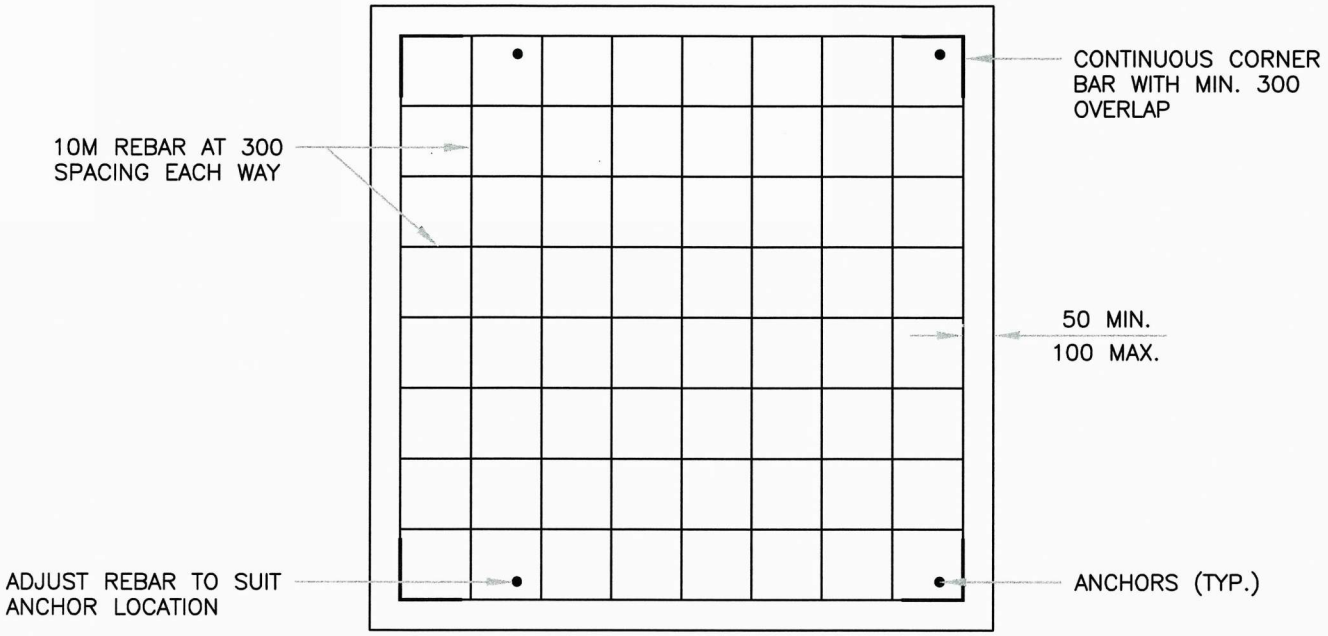
All dimensions in Metric meters unless otherwise noted

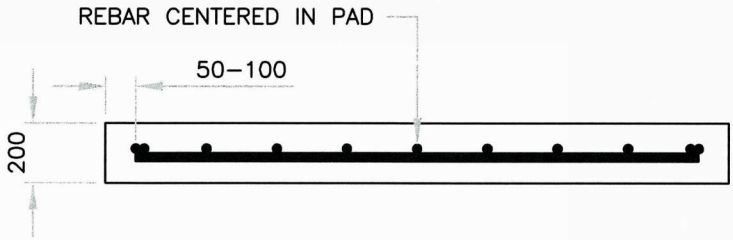
SCALE: NTS		FIGURE NO.: SWS 11.2	ANIMAL PROOF WASTE CONTAINER - ARTIFICAL SCREEN DETAIL				
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT	SEAL
2	10/30/23	2023 EDCG	BWM	SR	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

FEB. 28, 2025

REINFORCING



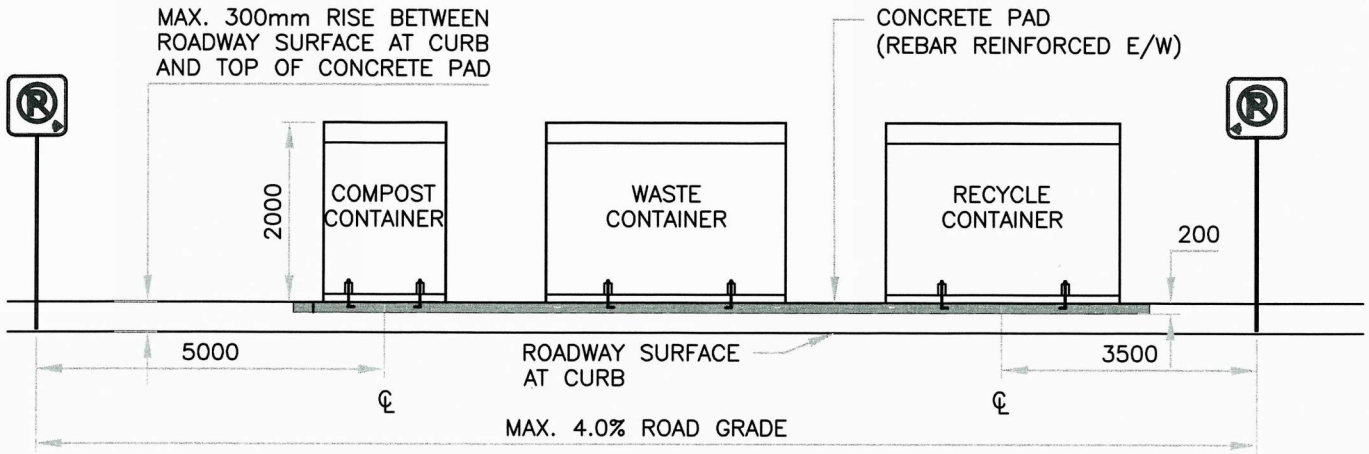


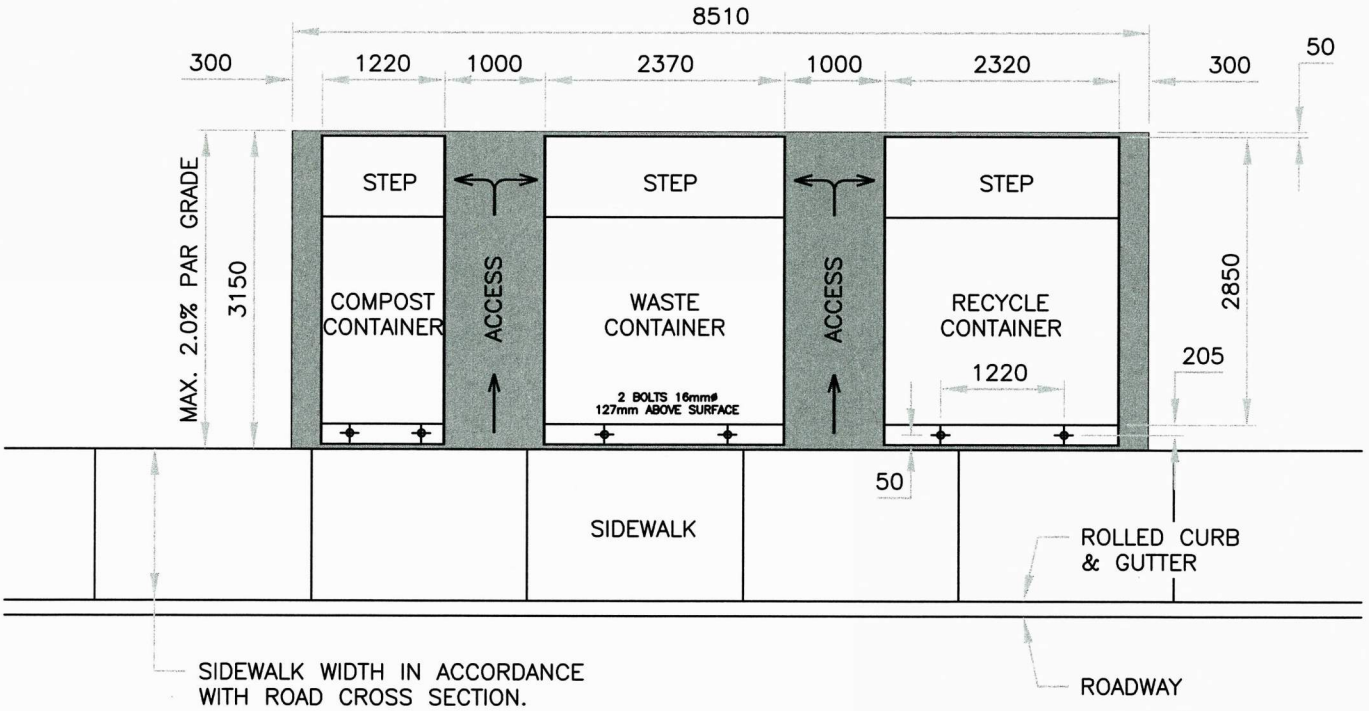
ANCHOR NOTES

1. CONCRETE 75MM STAINLESS STEEL ANCHOR BOLTS SET IN TWO PART EPOXY OR ACRYLIC BONDING AGENT.
2. ANCHORS TO BE HILTI, RED HEAD OR APPROVED EQUAL.
3. ANCHORS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
4. MINIMUM TEMPERATURE FOR INSTALLATION IS 4° C. CONCRETE SHALL BE HEATED FOR
5. BONDING AGENT CURING TIME IF TEMPERATURES ARE LESS THAN 4°C.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: SWS 11.3	ANIMAL PROOF WASTE CONTAINER - PAD CONSTRUCTION AND ANCHOR				
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	01/28/25	2025 EDCG	BWM	SR	BK		
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		





NOTES

1. CONCRETE PAD TO BE REINFORCED AS PER DRAWING SWS 11.3.
2. SIDEWALK ALIGNMENT AND WIDTH TO BE REVIEWED WITH ENGINEERING AT TIME OF DEVELOPMENT PERMIT APPLICATION.
3. CONSULT WITH ENGINEERING FOR PLACEMENT OF BINS ON COLLECTOR AND ARTERIAL ROADS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: SWS 11.5				ANIMAL PROOF WASTE CONTAINER - TRIPLE PAD (LARGE)		
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT	SEAL	
2	10/31/23	2023 EDCG	BWM	SR	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95879 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	08/14/19	2019 EDCG	BWM	SR	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			