### **CITY OF KELOWNA**

### **MEMORANDUM**

**Date:** July 19, 2001 **File No.:** 6660-00

To: City Manager

From: Director of Planning and Development Services

Subject: Hillside Development Guidelines and Proposed Bylaw Amendments

#### 1.0 <u>RECOMMENDATION</u>

THAT the report from the Planning and Development Services Department dated July 19, 2001 containing : <u>Kelowna Hillside Development Guidelines</u> (Schedule A), Amendments Proposed to the Official Community Plan (Schedule B), Amendments Proposed to Zoning Bylaw No. 8000 (Schedule C), and Amendments proposed to the Subdivision, Development and Servicing Bylaw No. 7900 (Schedule D), be received as information,

AND THAT the above noted report from the Planning and Development Services Department dated July 19, 2001 be circulated to the list of interested parties noted in Section 2.0 of the report, as well as being placed on the City's website for the information of the general public.

#### 2.0 BACKGROUND

Through work completed in preparing the Official Community Plan (OCP), which was adopted in 1995, the City of Kelowna began examining alternative Hillside Development Standards. The existing OCP (Section 2.11) contains Hillside Development Objectives and Policies to be followed in the subdivision, development and building on hillside lands. These Objectives and Policies outline the City's philosophy of environmental protection and sensitive hillside development, however as the City has gained more experience in the evaluation and approval of actual developments, the need for more specific regulations and standards has become apparent.

Urban Systems Limited was hired in 1995, to prepare Hillside Development Guidelines that would be specific to the Kelowna experience and context. A series of stakeholder meetings that included City staff, utility representatives, residents associations and other parties was held to outline and prioritize issues to be considered in the preparation of the Guidelines. One thing that became apparent in the early discussions was that alternative standards for Hillside Development involved evaluating the costs and benefits of public convenience and safety, ease of maintenance, and construction costs relative to the less tangible aesthetics of reduced impacts on the hillside environment.

Partway through this process, Ekistics Town Planning Inc., acting for Blenk Developments with regard to the Glenmore Highlands Area Structure Plan prepared more specific alternative engineering standards for the design of roads within hillsides, relative to the Glenmore Highlands. Ekistics made a presentation to Council in September 2000, introducing their philosophy for Hillside Development, which was in large measure congruent with the Hillside Development Guidelines already in draft form.

Following this meeting, both documents were circulated for comment to:

- Key personnel in City departments
- Utility companies
- Irrigation Districts
- Neighbourhood associations
- The Urban Development Institute
- CORD Environmental Advisory Committee
- Consulting Engineers of British Columbia Liaison Chairman
- Southern Interior Construction Association
- Canadian Home Builders

The most recent circulation took place in October 2000, and comments received were assessed and the documents revised in the spring of 2001.

The revised Hillside Development Guidelines document is attached to this report (Schedule A), while the Ekistics work has formed the basis of the attached amendments to the Zoning Bylaw (Schedule C) and Subdivision, Development and Services Bylaw (Schedule D).

#### 3.0 DISCUSSION AND POLICY FRAMEWORK

Sensitive development of Hillside areas requires flexibility, as site conditions may vary widely. At the same time, early criticisms of the Guidelines were that they lacked specifics, and were too vague. It is proposed to address this dichotomy through the Development Permit process, as well as with specific Hillside Zones and corresponding engineering standards.

Pursuant to the OCP, any area over 30% slope is a Natural Environment /Hazardous Condition Development Permit Area. Development Permits are applicable over an entire legal title where portions of the property are in excess of 30% slope. This process was established in the OCP in 1995 and is proposed to continue in the revised OCP. The Kelowna Hillside Development Guidelines will provide an additional tool to be used to guide and assess development permits in these circumstances where Natural Environment and Hazardous Conditions are a consideration.

Through the proposed definition of Hillside Areas in the Zoning Bylaw, which includes lands with slopes of 10% and greater, properties may be considered for the new "hillside" zones ("h" zones). The proposed h-zones will have modifications in siting, and associated engineering standards denoted as schedules to the Subdivision, Development and Services Bylaw intended to reduce the impacts of development on hillsides.

The evaluation and approval of a Hillside Development is proposed to proceed as follows:

- the OCP policy will outline where Hillside Development will be considered (this will be outlined in the new OCP),
- the Natural Environment/Hazardous Condition Development Permit process will continue to identify and evaluate slopes and environmentally sensitive features and identify developable and no-disturb areas,
- the Zoning Bylaw will apply the appropriate Hillside (h) Zone to the developable areas,

- the subdivision process will apply the appropriate covenants, and take the necessary securities for off-site and on-site improvements, landscaping and/or mitigation,
- the Subdivision, Development and Services Bylaw will provide the specific engineering standards (cross sections, grades) on a site specific, comprehensive basis as outlined through the Development Permit for each h-zone.

Running concurrently, these processes will not add to the timelines of development, but will allow the balance of flexibility and control necessary to address development in some of the most environmentally sensitive and complex development areas of the city. Prior to bringing a recommendation to Council for consideration of a zone amending bylaw to an "h" zone, staff will have reviewed the application relative to the criteria contained in the proposed OCP amendments:

The intent is to minimize the effects of development on the natural environment of the hillside areas, including road cuts and fills, tree cutting, regrading and the visual impact in general of urban development on hillsides, while preserving areas with slopes of 10 % and greater;

#### 4.0 Conclusion

Although the City's work on alternative hillside standards began several years ago, the experience gained in dealing with specific development proposals in Glenmore Highlands, Southwest Mission, and other areas of the city having slopes greater than 30% has allowed the development of specific regulations and standards still within the framework of the original guidelines document. It is recommended that the City of Kelowna move forward with this Hillside Development package of guidelines and bylaw amendments, and that the process continue to be monitored and fine tuned as additional experience is gained in this area.

Hazel Christy, MBA, MCIP Special Projects Planning Manager

Steve Muenz P. Eng. Development Engineering Manager

Approved for inclusion

R.L. (Ron) Mattiussi, ACP, MCIP Director of Planning and Development Services

HC/hb Attach.

# Kelowna Hillside

## **Development Guidelines**







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### **1.0 Introduction**

### 1.1 OVERVIEW

Kelowna residents want to see their city develop in a way that enhances liveability, respects and protects the environment, maintains housing and taxes at a reasonable cost, and ensures the high quality lifestyle that the Okanagan Valley has to offer. With the ever-dwindling supply of flat valley bottom property for residential use, the City of Kelowna and the development industry are exploring new and innovative ways to meet these needs on the adjacent hillsides.

Development on the slopes that surround Kelowna will create opportunities for increasing the land base available for housing. However, current development standards and issues such as natural hazards, visual quality and serviceability remain obstacles to progress in this area.

The City of Kelowna's Official Community Plan (OCP) objectives and polices outline a clear course of direction for hillside development. The following is a summary of hillside objectives as stated in the OCP:

- Protect the natural characteristics of the hillsides which contribute to the positive image of Kelowna.
- Maintain and enhance the quality of hillside flora and fauna habitat.
- Support development in appropriate hillside locations which respects and protects the natural topography and which maximizes the retention of existing landforms, vegetation, and soils.
- Encourage cluster housing options which respond to the natural environment on appropriate sites where cluster housing will reduce required grading and site disturbance.
- Encourage the creation of private and public green spaces between development nodes which leave more of the development site undisturbed while maintaining the same or greater densities as conventional single family residential.
- Minimize site disturbance by allowing the sharing of driveways, parking and open space amenities.
- Encourage flexibility and innovation on the part of both the City and developer in order to permit projects which result in a reduced impact on the natural environment.

The intent of the objectives in the OCP is to encourage environmentally responsible development practices that achieve broad social and economic goals.

#### WHY HILLSIDE GUIDELINES ARE REQUIRED

In order to meet the objectives of the OCP relative to sensitive hillside development, it will be necessary to address issues related to subdivision design, construction, maintenance and





public safety and access. The hillsides surrounding Kelowna are visually more prominent than the valley bottom, have a high aesthetic value and often contain unique environments and natural features. The value that residents place on these qualities result in significant public scrutiny when development occurs on hillsides.

The issues that directly relate to developing communities on hillsides include:

#### Site Planning and Design

- Land use and site efficiency
- Private and public open space
  preservation/restoration
- View preservation (of hillsides and from 
   hillsides)
   hillsides
   hil
- Use of ridge lines and hilltops
- Aesthetics
- Parks and recreation
- Pedestrian links and bicycle routes
- Liveability
- Grading (cut and fills)

#### Landscape Design

- Landscape preservation through appropriate
  design
- Natural features (open space) 
  protection/treatment
- Slope stabilization and site grading
- Use of retaining walls
- Planting concepts
- Plant materials (appropriateness)
- Site rehabilitation
- Irrigation

#### **Operations/Maintenance**

- Snow clearing and storage
- Emergency access/services
- Lighting
- Storage of building materials during construction
- Access to utilities
- Access to all levels of parks
- Pedestrian links
- Irrigation

#### **Architectural Design**

- Relationship of adjacent uses
- Scale and context
- Setbacks
- Form and character
- Mass and bulk of structures
- Entry ways/driveways/parking
- Integration of accessory buildings
- Other design details including colours and materials

#### Engineering

- Lighting
- Hydrology, drainage, stormwater management
- Roadway access, grades, alignment, profile, cross-sections
- Municipal services sanitary/water systems
- Geotechnical slope stability and rockfall
- Transportation/transit/parking
- Earthworks and site grading
- Erosion

#### **Process/Development Review**

- Procedure/review process
- Responsibility (reviewing authority)
- Requirements for submissions (plans, drawings, guidelines, reports)

- Implementation
- Education
- Relationship to other governmental policies/regulations



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#### **Market Realities**

- Cost implications
- Developer interests (depth of market for product)
- Resident priorities
- House quality/types
- Liveability

#### Environment

- Environment remediation
- Wildfire hazard/control
- Biophysical assessment
- Wildlife habitat zones/corridors
- Forest pests hazard/control
- Environmental preservation
- Creek setbacks
- Stormwater quality/siltation/erosion

#### Other Concerns

- Communal postal service
- School location and access (including school bussing)
- Emergency service on slopes and security
- Utility provision and maintenance

#### Land Use/Subdivision

- Lot configuration
- Residential location/siting
- Clustering versus individual conventional lotting
- Land use and sense of community
- Lot grading (including walls, yards, setbacks) covered elsewhere

There is a need for effective hillside development guidelines in Kelowna to help address some of these issues. The guidelines that follow provide general direction to city planners and engineers, the development industry and related consultants with respect to appropriate planning design and construction on Kelowna's hillside environments. Each development will have site specific opportunities and constraints to be dealt with through the Development Permit process.

#### 1.2 THE KELOWNA CONTEXT

Cities across Canada, United States and elsewhere in the world have been adopting hillside guidelines and regulations for many years. Although some of the issues faced by all communities are common, the geology, topography, vegetation, and even public perception can vary. As such, each community requires unique solutions.

Some of the unique criteria that set the direction for hillside guidelines in Kelowna are the soils and slopes that make up the hillsides. The soil types are dominated by silts, with pockets of sand and gravels as well as bedrock. The topography is generally characterized by gently rolling hills and slopes with a range of slopes.



Another key criteria that sets the direction for hillside guidelines specific to Kelowna, is climate. The fact that the City is subject to both semi-arid (summer) and snow (winter) conditions means that the guidelines have to address both climate extremes. Area specific issues related to these conditions include wildfire protection, water conservation, site rehabilitation using xeriscape landscape principles as well as snow removal, snow storage, winter vehicular mobility/safety, on-street parking, etc.

Kelowna also differs from other hillside communities in relation to:

- vegetation (both natural arid and irrigated agrarian plant species)
- local housing market styles, patterns •
- demographics and the ageing/retirement community •
- public perception and values

The guidelines have been prepared to address the issues that are unique to our community, as well as issues that are more universal in nature.

#### 1.3 SLOPES DEFINED

The steepness of slopes can be described in degrees, as a ratio of horizontal distance to the vertical rise in elevation, or as a percentage of the distance in rise over the horizontal distance.





The steepness of a slope plays a role in determining the relative importance of different guidelines. For example, various studies have generally found that soil slippage, which cause avalanche-like failures, are more common on steeper slopes greater than 33% while degradation of the visual quality of hillsides and serious erosion can occur at much shallower slopes. For this reason, the existing slope of a property should not be the sole determinant for initializing hillside guideline requirements.

The City of Kelowna Official Community Plan defines Hillside as: *lands in their natural state that have a slope angle of 10 % or greater for a minimum horizontal distance of 10 metres.* Due to the potential for impacts on lands adjacent to the more steeply sloped areas, Hazardous Condition Development Permits will be considered for an entire titled area at a minimum, notwithstanding that portions of the site may contain areas of lesser slopes.

#### 1.4 HOW THE GUIDELINES ARE TO BE USED

Kelowna's guidelines for development on hillsides are to be used to supplement the existing Kelowna Zoning Bylaw and the City of Kelowna Subdivision, Development and Servicing Manual. The Guidelines provide additional criteria to ensure that development on hillsides fulfills the expectations of the Official Community Plan through the Development Permit process.

The guidelines indicate a preferred approach for developing on hillsides, while allowing for other equal or better solutions to be put forward and considered. The guidelines are not intended to be quantitative, like fixed zoning standards. They are to be interpreted and applied with flexibility in mind. Repetitive, cookie cutter solutions are not desired. **However, the guidelines shall set forth a threshold of design expectations and shall not be ignored**. While the design criteria contained in this document are guidelines and not regulations, **each proponent of a project has an obligation to demonstrate how each relevant guideline has been addressed**.

The guidelines represent a combination of performance and prescription standards. Guidelines have been prefaced with a statement of intent that clearly outlines the public benefit to be achieved. This represents the performance and rationale for the guidelines. This is followed by prescriptive guidelines that can be used to achieve the intent. Developers may be given the approval to create their own design solutions to meet the intended performance criteria, provided that the solution is thoroughly researched and is clearly demonstrated in a plan or report for evaluation by approving authorities.



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#### 1.5 REFERENCE TO BYLAWS AND POLICIES

The guidelines have been prepared with the expressed intent of aiding the development community and City approving authorities in achieving environmentally sound and liveable hillside neighbourhoods. The guidelines are not intended to supersede the City of Kelowna's bylaws and policies that allow it to regulate all development and land use in accordance to the Local Government Act and other related enabling legislation of the Province of BC. The guidelines are to be used to assist in subdivision design and in the development application and approval processes.

The user of this document is expected to refer to all appropriate bylaws of the City of Kelowna that control building, development and subdivision of land and other regulations that may apply at the time.





### **2.0 Design Principles**

This section documents some of the primary principles upon which the guidelines are based. It is important for anyone considering a development in a hillside context to familiarize themselves with these principles prior to designing their site and prior to entering the approval process with the City of Kelowna.

### 2.1 CITYSCAPE PRINCIPLES

#### **Scenic Quality**

The natural character of Kelowna's hillsides are one of the features that make it a unique place to live and visit. Development on these hillsides must respect and reflect that character.



#### **View Protection**

One of the benefits of living on a hillside are the significant views of Okanagan Lake, valley bottoms and orchards. Views from hillside houses and public open spaces must be protected as well as views to the hillside from lower elevations.





#### **Natural Features**

Hillsides have unique natural features that contribute to Kelowna's heritage and physical character. These must be identified and protected.



#### Environment

The hillsides of Kelowna have a wide range of habitat values that are critical to the ecological sustainability of the community. The retention and function of significant habitats is important, and must be protected.



#### **Development Patterns**

Traditional forms of development are well-suited to flat terrain, but are not appropriate for the topographical and physical features of the hillside setting. Development patterns and roadways are to conform to the unique characteristics of the hillside setting.







#### Clustering

Clustering is the concentration of residential units. Clustering will help to retain open space in hillside settings for conservation, recreation and visual quality.

#### Infrastructure

The provision of roads and utilities has distinct challenges in hillside areas. Public safety, cost-effectiveness and sustainability must be addressed in providing infrastructure to hillside areas.



#### Liveability

Hillsides offer lifestyle choices that include walking, hiking, cycling and alternative commuting choices, nature appreciation and scenery. Access to and preservation of these hillsides must be addressed.



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#### 2.2 NATURAL HAZARDS

#### Wildfire

The forests of the region are prone to wildfire events. The development of residential uses in the hillside areas can place people and their property close to these events. It is necessary to design and manage development on hillsides to minimize the potential impact of wildfire on people and property. Care must also be taken to ensure that development on hillsides will not increase the possibility of wildfire on adjacent lands. This may be done through fuel wood reduction, building material restrictions, etc.



#### **Unstable Soils**

Planning and design for development on hillsides is to include an assessment of soil stability and development should be directed away from unstable or hazardous slopes.

The geology and soils of the hillsides in Kelowna vary, and may include conditions that are susceptible to erosion and instability. An informed understanding of site specific conditions must ensure that appropriate precautions, including no development, be taken when developing on potentially unstable or hazardous slopes.

#### 2.3 BUILDING DESIGN

#### **Terrain Adaptive Architecture**

Traditional housing designs used on flat sites can have negative impacts on hillside sites. On steeply-sloped sites building designs are to minimize visual impacts and complement the sloping terrain.





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Development Guidelines for Kelowna's Hillsides



#### **Use of Complementary Colours and Materials**

Hillsides are highly visible features that are sensitive to the visual impacts that buildings have on them. The exterior materials and colours of buildings must complement the textures and colours of their hillside setting.









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### 3.0 The Guidelines

The guidelines that follow have been organized under six main headings:

- 3.1 Subdivision Planning
- 3.2 Roads and Driveways
- 3.3 Grading and Earthworks
- 3.4 Municipal Services and Utilities
- 3.5 Building Design and Structures
- 3.6 Landscape Character

Although the guidelines follow a logical sequence, the reader is advised that all categories are inter-related. For example, opportunities and the requirements for landscape development is affected by decisions made for subdivision planning (3.1), site grading (3.3), and building design (3.5). For this reason, city staff, developers, and consultants are advised to remain cognizant of the impact that decisions made in any one category can have on other categories.



















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## SUBDIVISION PLANNING

#### Discussion:

3.1

The importance of quality planning must be emphasized because this step in the development process establishes the foundation for appropriate design and implementation.

This section will focus on the need to diligently assess development opportunities and constraints relative to on-site potential within the context of surrounding areas. This will help to ensure that the visual qualities of Kelowna will be preserved and that environmental and natural features are protected.

Responsible planning will also help to address or mitigate possible natural disasters and help to identify efficiencies that will make the development costeffective and sustainable. This should be done by first mapping sensitive features, and identifying no disturb zones and other development constraints. Planning should also ensure that hillside communities offer a high quality of lifestyles and housing options that are affordable.

#### **Site Analysis of Opportunities and Constraints**

#### Intent:

To promote a clear appreciation of the unique hillside qualities of each site with the purpose of identifying and understanding the specific opportunities or constraints that will result in the preparation of responsible development plans.

#### Guidelines:

- □ The City requires a **topographic and feature survey** of the site for re-zoning, subdivision or development permits. This is to be done prior to site planning or design. For development on hillsides, the survey is to include the following minimum information:
  - Property lines, easements, rights-of-way















- Contours (1.0 metre interval) existing and proposed, spot elevations, swales, knolls, ridgelines, bedrock outcrops, cliffs and slope transitions, top of bank, or break lines
- Proposed terrain protection and modifications (cuts and fills)
- Site features (e.g. hazardous areas, watercourses, groundwater springs, heritage and special trees, trees >150mm diameter at breast height, bedrock outcrops, drainage routes, wetlands, roads, curbs, sidewalks, above and below ground utilities, trails, buildings, structures, fences and retaining walls; and
- Slope analysis

Use the survey to plan and design the site in a manner that respects the hillside and the site specific character of the site.

□ Identify and evaluate development **opportunities and constraints** as they relate to on-site considerations and off-site considerations. Some of these considerations might include:

#### **On-Site Considerations:**

- prevailing winds
- significant views and panoramas
- recreational opportunities/interpretative opportunities
- site orientation and sun angles
- internal access roads
- possible pathway and road connections to surrounding areas
- soils, geology, etc.
- wetlands, tree stands, climate
- drainage routes

#### **Off-Site Considerations:**

- noise from roads, airports, railways or industry
- agricultural impacts (noise, chemical use, traffic impact, etc.)
- views onto the site that might affect placement of roads, housing or other structures
- the form and character of surrounding developments
- the type and proximity of development on surrounding sites
- existing features and amenities on surrounding sites
- the wildfire potential on surrounding sites
- drainage routes

















- As required by the Subdivision, Development and Servicing Bylaw, undertake a geotechnical survey and evaluation of all or portions of the site, prior to site planning or design. The survey should include an assessment of existing surface and subsurface conditions, identification of hazards, potential impacts of development and recommendations for safety, site protection, development and mitigation.
- Avoid and/or correct **hazardous areas** as necessary to make the site safe for human use and to maintain environmental quality. Undertake the necessary work to identify and understand potentially hazardous areas and propose appropriate solutions for dealing with them.
- □ Identify and protect the special **natural and cultural features** of a site. These features include:
- Cliffs. knolls and summits
- Ridgelines and ravines
- Bedrock outcrops
- Wildlife corridors and feature trees, shrubs and groundcover
- Water features
- Presence of rate or endangered species
- Heritage sites

Employ planning, design and construction practices that protect the special natural or visual features of a site. For example, set buildings and roads back from or arrange them around features rather than encroaching on or over them.

#### **Planning Principles**

#### Intent:

The principles which follow are intended to respect the physical and environmental character of the hillside setting in which development is proposed:

#### Guidelines:

□ The form and character of roads and structures are to complement the terrain and features associated with the surrounding hillsides.



Development Guidelines for Kelowna's Hillsides













- Encourage cluster housing options that will retain larger amounts of open space, protect the natural environment and reduce grading and overall site disturbance.
- Road layout and lot configuration should respond to the natural features and attributes of the site without compromising public safety. Linear and grid patterns which contrast with the undulating and sloped nature of hillsides will not be supported.

Unique lot configuration and shared driveways may be required to minimize cut and fill or required to access smaller developable areas that can not be accessed by conventional roads.

□ Building setbacks should be varied to complement the character of hillside settings and to protect slopes or special features.

Variances to front yard setbacks outlined in the current City of Kelowna Zoning Bylaw may be permitted if driveways and parking garages are positioned parallel to the roadway and it can be demonstrated that excessive cut or fills would be required otherwise.

- Ridgelines, knolls and summits are the most visually prominent areas of hillsides. Developers must demonstrate that development in these areas does not detract from the visual character and quality of the areas.
- Areas with significant trees and vegetation are to be identified, protected and incorporated into the overall subdivision plan where environmental concerns, soil stability and buffers between development cells will enhance neighbourhood character and sustainability.
- □ Hillside developments are to provide a variety of **recreational open space**, public and private opportunities for activities (hiking, biking, bird watching, etc.). These open spaces should be linked, and provide continuous pedestrian access throughout the development.

When possible, the open space system is to also provide pedestrian and bicycle access to surrounding neighbourhoods and amenities.













Development Guidelines for Kelowna's Hillsides

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#### **Visual Analysis**

Intent:

The Okanagan hillsides contribute significantly to the overall charm and character of Kelowna. The intent of the following guidelines are to preserve the scenic character of hillsides and the viewing opportunities that they provide.

#### Guidelines:

- Retain trees, and, or other vegetation on ridgelines so that the ridgeline is seen predominantly as a continuous line of natural terrain or vegetation. Where there are gaps or interruptions in the ridgeline caused by site development (e.g., building envelopes, road cuts, utility poles or corridors, site clearing, earthworks, etc.) plant trees and vegetation in front of and behind the disturbance to screen and restore a naturally appearing ridgeline. Interruptions that occur in several smaller components rather than one continuous interruption are preferred.
- ❑ When developing on exposed slope areas, it is important that development patterns do not dominate the hillside landscape. Curvilinear roads, irregular lot shapes, retention of vegetation, maximization of open space and significant landscaping should be incorporated in designs to reduce the visual impact of development in exposed slope areas.
- □ Scenic features such as rock outcrops, cliffs, unique vegetation, water bodies, wetlands and streams should be protected. Development around these features should complement the character of the feature rather than compete with it.
- Site planning should emphasize the opportunity to provide views from hillside vantage points. This can be done staggering buildings, articulating roof lines, and by controlling building heights in a manner that will provide views to residences located on the upslope side of streets.
- □ Public access to significant views of the City and Okanagan Lake should be provided as well. Parks and open space should be located where the most significant view opportunities exist.













Development Guidelines for Kelowna's Hillsides

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Development Guidelines for Kelowna's Hillsides

### 3.2

Roads are used to establish the patterns that developments create on the landscape. On flat sites the pattern is less noticeable than on hillsides when the site is sloped. The cuts, fills and retaining walls associated with carving conventional roads into steep terrain can also have a devastating impact on the visual and environmental qualities of development on hillsides. Alternative means for dealing with cuts, fills and retaining walls, should be considered.

However, the significant role that roads play in hillside development goes beyond the visual qualities that they produce. Roads are the skeleton of all developments, providing car and pedestrian access and emergency/security access. They also contain the service and infrastructure (electrical, sewage disposal, water, etc.) that is required to make neighbourhoods run effectively and establish a pattern for lot and housing development. In steeper areas, pedestrian mobility and access became more challenging. Although alternative roadway standards may be considered for special circumstances, public safety, access awareness and maintenance considerations cannot be ignored.

#### 3.2.1 Roadways

#### Intent:

To encourage layout patterns that complement hillside character and to encourage creative and flexible application of existing standards where visual and environmental objectives can be enhanced while maintaining public safety.

#### Guidelines:

- **Public Safety** City of Kelowna public safety, maintenance and operational considerations (including transit) are not compromised.
- **Road alignments** should be designed to complement the terrain on which they are to be placed. Curvilinear roads that respect topography are preferred.















**ROADS AND** 

DRIVEWAYS







- Existing road standards may preclude access to achieving developable sites. Reduction of existing standards may be considered on a site specific basis where:
  - Special features or significant environmental habitat are protected.
  - Significant amounts of earth moving would otherwise be required and where the visual integrity of a hillside can be retained.
  - Continuous pedestrian, bicycle and vehicular movement is provided.
  - Adequate signage is provided to warn motorists of changes in road configurations.
- **Flexible cross sectional design standards** may also be considered where:
  - Full width right-of-way grading will have a negative impact on natural features.
  - Existing requirements for sidewalks on both sides of roadway impacts site grading in a significant way and where the City Engineer is satisfied that pedestrian safety is not compromised by a reduction of one sidewalk.
  - Parking requirements can be met on-site or it is determined by the City Engineer that parking requirements can be relaxed.
  - Provision of utilities is not adversely affected.
  - Where opportunities for snow storage are not compromised within right-ofways, and
  - Where side slopes may be appropriately graded and rehabilitated after construction.
- □ Split roads and one-way roads may be considered on a site specific basis when:
  - All of the conditions listed above apply.
  - Intersection clearance is maintained before the split or one-way system is allowed to occur.
  - Additional signage clearly identifies the direction of traffic flow.
- □ Where a **grading** impact can be significantly reduced or the natural character of a hillside can be preserved, site specific road design criteria may be modified where:
  - The portions of roadway that exceed the geometric standards set out in the City of Kelowna Subdivision, Development and Servicing Manual, do not affect in a negative way the stopping sight distance at intersections, and
  - The City Engineer is satisfied that private and public safety, and cycling and transit considerations are addressed.













Alternative cul-de-sac ends may be proposed to reduce excessive grading and scaring of the hillside environment. Reduced cul-de-sac radii or hammer head configurations must accommodate the functioning of appropriate operations, maintenance, security and emergency vehicles as determined by the City Engineer.

#### 3.2.2 Driveway Access

#### Intent:

Issues related to driveway access on steep slopes can include steep slopes that are difficult to access in winter, short driveways that can cause parked cars to block sidewalks, poor sight lines and visibility, and the need to park on roads, when steep driveways cannot be negotiated during slippery winter conditions.

The intent is to ensure safe and functional access to private or shared driveways, throughout the year.

#### Guidelines:

- ❑ As required by the City of Kelowna Subdivision, Development and Servicing Bylaw, the maximum grade for driveway access is 15%. Where the City Engineer is satisfied that safe and functional access can be maintained in all weather conditions, it may be possible to exceed this grade up to a maximum of 20% if the following conditions are met:
  - There is a 6.0 metre long flat landing area at the top of the driveway and at the bottom, adjacent to the road. (The bottom landing area may be reduced to 3.0 metres if the driveway is 6.0 metres wide and parallel to the roadway).
  - Underslab heating or special traction materials are incorporated into the driveway construction.
- □ Where residences are obscured from the roadway by distance, vegetation or grade, clean, and **legible address signs** must be provided at the entrance to the driveway.
- **Common driveways** are encouraged where:
  - significant regrading of sites can be reduced
  - more efficient lot yields can be achieved

Development Guidelines for Kelowna's Hillsides













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- access to developable lots could otherwise not be achieved
- impervious surfaces and runoff can be minimized
- □ Common driveways require that one on-site **guest parking area** be provided for each dwelling serviced by the driveway. On driveways exceeding 15% the guest parking must be provided in flat areas either adjacent to the roadway or adjacent to each dwelling.
- □ A **reciprocal access agreement** is required for common driveways which must include provision for an area to accommodate collective services such as garbage pick-up.

Residences served by a common driveway must be adequately addressed along the curb at the entrance to the driveway.



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Grading hillside property in preparation for servicing and development has the potential to alter the existing character of an area to a significant degree. The type and amount of grading should not alter this character or increase the likelihood of hazards. Grading in hillside areas must be in accordance with an approved Natural Environment / Hazardous Condition Development Permit in accordance with the City's Official Community Plan.

#### 3.3.1 Preliminary Work

#### Intent:

To avoid or reduce potential hazards and to identify and take advantage of opportunities to a) reduce earthworks, and b) retain the natural character of the site and c) protect natural features.

#### Guidelines:

- □ As required by the City of Kelowna a geotechnical, and / or a hydrogeological survey and evaluation should be undertaken to identify and assess possible **hazard areas.** The evaluation should provide recommendations which include:
  - areas of special features to be protected from development
  - setbacks at the tops and base of slopes where slumping is possible
  - identifying the potential impact of development on possible hazards
  - identifying the potential impact on subsurface water regimes and surface runoff
  - identifying special construction techniques to mitigate potential hazards
  - identifying hazardous areas (slopes, soils, geology)
- □ A preliminary site grading plan must be prepared which clearly demonstrates an attempt to minimize cut and fill and overall disruption of the site. The plan should include both existing and proposed contours at 1.0 m intervals, and should illustrate:



Development Guidelines for Kelowna's Hillsides



**GRADING AND** 

**EARTHWORKS** 













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- the limit of site disturbance including the area of vegetation to be retained at full buildout
- hazardous and special features (rock outcrops, cliffs, streams, etc, to be • retained)
- proposed setbacks and buffers from hazard areas and natural features
- proposed surface drainage of the site
- proposed erosion control (both during and post-construction)
- location and the height of proposed retaining walls that will reduce site disturbance
- the proposed site development including the location of roads, building lots, and structures such as booster stations, reservoirs, etc.

#### 3.3.2 Grading

#### Intent:

To retain the natural form and landscape character of hillside settings by reducing the potential impact of site grading. Site grading to be addressed by rehabilitation and a landscape plan pursuant to a Development Permit

#### Guidelines:

- □ Uniform and sharp geometric forms should be avoided. Finished contours should appear smooth, irregular and natural in appearance.
- □ The tops and toes of slopes should be blended into side slopes without a clear or well defined change in grade.
- A natural looking **transition** should be provided between areas that have been graded and adjacent undisturbed area. Grading that results in a clear demarkation between disturbed and undisturbed areas is not acceptable.
- Large bulk grading of soils and removal of vegetation is not acceptable. **Spot** grading, and the development of smaller pads or terraces, separated by vegetation is preferred.
- Where cut volumes exceed the volume of fill material, the excess material must be removed from the site and disposed of at appropriate approved locations. Berming or side casting of rock or earthwork, solely for the purpose of the disposal of excess material is not acceptable.













- □ An estimate of the **volume of cut and fill** to grade the site is required to assess the general impact on the site.
- Areas of exposed slopes where **revegetation** will help to reduce the visual impact of site disturbance should be identified.

#### 3.3.3 Retaining Walls

#### Intent:

To use retaining walls where they are effective at reducing the steepness of adjacent slopes or where they will reduce the overall amount of site disturbance. However, care must be taken to ensure that retaining walls do not become visually obtrusive.

#### Guidelines:

- Retaining walls are encouraged where they can be used effectively to reduce site disturbances.
- Retaining walls of 2.0 m in height or less may be used within the right-of-way of roadways where the City Engineer is satisfied that:
  - road access could not be achieved otherwise
  - cut and fill and overall site disturbance can be reduced significantly
  - public safety is not compromised
  - pedestrian, bicycle or vehicular access is not compromised
  - access to maintain utilities is not compromised
  - snow storage opportunities are not compromised
  - large masses of retaining walls do not compromise the visual integrity of the site
  - subsequent maintenance of the retaining wall is not beyond the City of Kelowna's standard
- □ Within building lots retaining wall height should not exceed:
  - 1.2 metres height in front yards
  - 2.0 metres in back and side yards
- □ When site grading requires retaining elevation differences greater than the maximum height allowable, a series of smaller and **stepped retaining walls**











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- □ should be utilized to reduce the apparent mass. Landscaping of the terraces that result is required to soften the appearance of the retaining wall.
- □ The form, character, colours and materials used to create the retaining wall should complement the character of adjacent natural or built environments.
- □ Notwithstanding individual manufacturer recommendations, retaining walls in excess of 1.2 metres (4 ft.) in height will require detailed design drawings sealed by a professional structural engineer. Their drawings must indicate adequate granular back fill and subsurface drainage.

#### 3.3.4 Sediment and Erosion Control

#### Intent:

To reduce the potential of natural hazards and to protect the visual and environmental integrity of hillsides both during and after the development of the property.

#### Guidelines:

- An erosion control mitigation plan is required that clearly outlines the measures to be taken to minimize the potential for erosion of and sedimentation of streams, ponds or wetlands. The rehabilitation and planting plan should include temporary measures to be undertaken during the course of construction as well as permanent mitigating measures.
- □ Where possible schedule development around times of the year when soil or wind erosion is less likely to occur.
- □ Minimize earthworks being undertaken at any one time to a rate that allows for immediate restoration and erosion control.
- □ When possible, reduce grades of exposed soil or use the techniques to **divert** and reduce the volume and velocity of runoff.
- □ Where runoff is to be channelled in **swales or ditches**, these facilities should be appropriately stablized or armoured to reduce runoff velocity and prevent scouring or sediment transport.

Development Guidelines for Kelowna's Hillsides











Development Guidelines for Kelowna's Hillsides

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#### To provide utilities and services to hillside communities in a manner that produces the least environmental and visual impact and in a manner that ensures safe and convenient installation and

#### Guidelines:

- □ Utilities and services lines located within right-of-ways with steep side slopes can be hazardous to installation and maintenance crews. Utilities should be located within right-of-ways where slopes do not exceed 20% grade.
- ❑ Access to utility boxes, and other services that require periodic inspection should be located in areas where slopes do not exceed 15% grade and should be clearly visible and accessible from the roadway for service vehicles.

### 3.4

This section of the guidelines will provide direction to the provision of services and utilities on Kelowna's hillsides. Services and utilities should be provided in a manner that:

- Meets maintenance and operational objectives.
- Assures public safety and security.
- Reduces risk of hazards.
- Provides utilities and services in an affordable way.

#### 3.4.1 Services and Utilities

maintenance.

Intent:











**MUNICIPAL SERVICES** 

**AND UTILITIES** 





- U Where possible, **postal delivery boxes** locations should:
  - be at the uphill side of roadways and cross-sections
  - be midway along slopes and where sight stopping distances are adequate (not at the crest of hills)
- Flexible offsets for services and utilities may be considered where the impact of earthwork can be reduced or, to facilitate the grading of a right-of-way to match existing grades. Flexible offsets may also be considered to improve access for maintenance as long as pedestrian or bicycle access is not compromised.
- □ Within road right-of-ways and in service easements, the use of **common trenches** for compatible services is encouraged.

#### 3.4.2 Stormwater Management

Intent:

Development on Kelowna's hillsides will increase the amount of surface run-off and decrease the surface area available for natural percolation. The overall result can affect groundwater regimes, soil erosion and stormwater quality. The intent is to mitigate possible negative effects by firstly applying creative methods of reducing runoff, and secondly, by applying appropriate methods of moving and collecting surface water that will prevent erosion and will improve water quality both on-site and down stream.







Development Guidelines for Kelowna's Hillsides









#### Guidelines:

- □ Plans for all developments on Kelowna's hillsides must indicate how natural stormwater run-off will be impacted by the development and demonstrate how impacts will be mitigated and controlled.
- Dependent on the size of the development, and the complexity of specific site conditions, the Subdivision Approving Officer may require that a master drainage plan be prepared for the entire site and the downstream basin or basins that might be affected. In such cases a Terms of Reference will be prepared by the City of Kelowna that will address the stormwater issues related to each specific site and type of development. Requirements in the Terms of Reference might include requirements to:
  - Define the existing drainage systems in a basin and complete a comprehensive inventory of the existing drainage features and identify all existing minor and major flow routes.
  - Undertake hydrogeological investigations that examine the groundwater • conditions within the basins to determine the recharge/discharge characteristics and the general flow patterns.
  - Undertake geotechnical investigations that determine the soil characteristics and to determine if groundwater recharge is possible and to what extent this could be considered. The assessments should include soil classifications and potential for erosion and specifically bank stability.
  - Review all hydrometeorological data. If any of the basin area includes different hydrometeorological conditions than those established for the City of Kelowna, it may be necessary to adjust storm types or intensity distribution relationships. Analysis of existing stream flow data may also be required.
  - Include a summary of water quality characteristics and suggest the appropriate methods required to deal with any quality concerns.
  - Incorporate Best Management Practices and the Urban Runoff Quality Guidelines for British Columbia, together with Kelowna's Erosion and Sediment Control Guidelines.
  - Develop the most suitable hydrological, hydraulic, environmental, water quality criteria for the specific basin under study. Erosion potential, wildlife and general environmental protection methods, including fisheries and financial implications must be addressed.















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- Make specific recommendations regarding the following:
  - a) Hydrometeorological data to be utilized in the analysis.
  - b) Stormwater routing using the traditional method of piped collection conveys stormwater directly away from a drainage basin which may reduce groundwater infiltration and riparian base flows. Piped systems may also direct flows directly to receiving waters where the natural filtering process, that occurs in ditches of swales or through natural percolation to the ground, is eliminated. Water quality can therefore be significantly impacted. Therefore, recommendations for the most appropriate method of stormwater routing to enhance water quality may also be required.
  - c) Stormwater control techniques shall be determined for the basin. If groundwater recharge is a requirement, the appropriate means to accomplish this shall be recommended. Methods such as ditch / swale seepage systems, infiltration galleries, or basins should be considered. If detention/retention is required, the means to deal with this issue must be explored.
  - d) Should water quality be an issue, the master drainage plan shall summarize the best means to eliminate existing quality problems or maintenance of existing water quality. This may entail development of natural filtration systems to man-made systems.
  - e) Consideration should be given to assess the impacts of irrigation on short and long term stability of any slopes and development area.
  - f) Individual lot drainage may be of concern in steeper areas. Appropriate lot drainage management shall be considered for the condition during construction and after. Drainage swales may need to be established and protected by covenant or rights of way. In some cases it may be necessary to connect roof and or footing drains to storm sewers.
  - g) Foundation and roof drainage discharges can cause significant erosion if uncontrolled. The appropriate means to deal with these flows must be considered.
  - h) The need for silt and erosion control is of significant importance in the hillside areas. The most appropriate method of controlling this issue must be explored. Numerous methods are identified in the Urban Quality Control Guidelines for BC and the City's Erosion and Sediment Control Guidelines.
  - i) Conventional catch basins often have much lower inlet capacity when located on steeper hillsides. It may be appropriate to recommend alternative types of catch basins for hillside conditions. (See Section 7.11 of M.O.E.S.S.).















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Development Guidelines for Kelowna's Hillsides

3.5.1 Building Design

in which they are to be placed.

To encourage creative design techniques that will build a strong complementary relationship between built forms and the natural character of unique hillside settings.

with manufactured elements. They are also more likely to be prominently displayed on slopes or ridgelines. The Building and Structure Design section of the guidelines will address the need to minimize negative visual impacts by encouraging complementary relationships to be built between the design and massing and character of structures and the intrinsic gualities of the natural setting

#### Guidelines:

Intent:

3.5

- □ The landscape character of the hillsides surrounding Kelowna varies dramatically from fields of bunchgrass and sage to open Ponderosa Pine forests. The architectural style of structures on hillsides should vary to complement and integrate buildings into specific visual and physical qualities of unique hillside settings.
- Treat building exteriors with materials that reflect the natural qualities of the hillside setting (e.g., wood, rock, etc.). Select exterior materials that have a colour and texture that is compatible with the hillside setting.
- Avoid the use of shiny materials or highly reflective surfaces on the building exterior that will draw undue attention to a structure.
- □ The **predominant colour** of a building extension should be of a value similar to that of the natural setting and vegetation.











**BUILDING DESIGN** 









- □ The use of **multi-colour schemes** should be considered where such a scheme will help to reduce the perception of mass, add interest, and help to integrate structures into their surroundings.
- Avoid the use of colours that have a **sharp contrast** with the surrounding landscape.
- Provide a building texture takes its cue from the texture of the natural hillside setting, complementing the natural setting rather than contrasting with it.
- Design rooftops to complement surrounding land forms and avoid blocking views from uphill dwellings. Specific consideration should be given to the following:
  - For both sloped and flat roof buildings, avoid single roof units and roofs with long unbroken peak lines or large uniform expanses. Break roof forms into a number of smaller components that reflect the forms and patterns of the surrounding natural landscape.
  - Relate roof forms to the form and massing of the building. That is, eave heights and alignments should correspond to similar transitions in the main building components.
  - For sloped roof buildings, design roof pitches that are similar to the slope of the natural terrain (i.e. within 15%). Align roof pitches so that the plane of the roof on the downhill side is approximately the same as the natural slope.
  - Locate and treat supplementary roof elements (e.g., chimneys, vents, skylights, roof-top patios, HVAC equipment, satellite dishes, etc.) with visual considerations in mind, particularly considering views from other buildings and public open spaces.
- □ The use of **decks and raised patios** are encouraged if they reduce the appearance of building mass. However, attention should be given to the following design considerations:
  - Deck forms that appear to be cantilevered off of main structures or appear to be platforms supported by posts or columns should be avoided.
  - Upper storey decks should be treated to appear like raised patios over an enclosure.
  - Smaller, stepped and staggered deck systems are preferred over large deck areas on one level.
  - Decks that extend more than 2/3 the overall length of the front or rear facade are not acceptable.

















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- Deck colours, materials, form and design must complement those of the main structure.
- □ To reduce the perceived **massing of structures** and to help visually integrate buildings into the natural setting the following considerations should be observed:
  - Use stepped foundations and stories to help the structure conform to the natural slope of the hillside. Where practical, cut buildings into hillsides to help reduce apparent bulk and integrate it with the natural landform.
  - On downhill elevations, avoid the use of single plane walls that exceed one story. To more appropriately accommodate multi-storey buildings, step upper levels back from the facade of the level below.
  - Avoid large unbroken expanses of wall and long continuous building masses. Design buildings that are comprised of a number of smaller or less massive building components which reflect the sloped character of the site.
  - Apply architectural design treatments that provide three-dimensional relief and shadows (e.g., overhangs, corners, minor projections, reveals, recesses and varied offsets, etc.).











Development Guidelines for Kelowna's Hillside





This section provides guidelines that will help to minimize the visual and environmental impact that development may have on Kelowna's hillsides.

#### 3.6.1 Vegetation Retention

#### Intent:

To retain natural hillside landscapes for aesthetic and environmental purposes.

#### Guidelines:

- A landscape management plan must be prepared for all development on hillsides that will clearly indicate the existing limits of tree cover to be removed, and where landscape restoration is to take place. When hillside vegetation is predominantly grassland, the level of site disturbance must be indicated. The plan shall specify how tree and vegetation retention is to be implemented and managed. Show removals and new plantings.
- Clear cut removal of trees from proposed individual building lots is discouraged.
- Selected removal of trees from individual building sites should be co-ordinated with site planning and architectural designs to ensure maximum retention of vegetation.
- **Selected removal of trees** within areas proposed for vegetation retention is permitted if the objective is to:
  - Remove or prune dead, diseased or damaged trees
  - Address wild fire mitigation measures











**AND** 



**OPEN SPACE** 

LANDSCAPE

**CHARACTER** 









- Ensure public safety or reduce potential damage to personal property
- □ As a requirement of the City of Kelowna Tree Protection Bylaw No. 8041, no tree removal is permitted on hillsides with slope of 30% or greater or within a stream corridor Leave Strips without the issuance of a **Tree Cutting Permit**.

#### 3.6.2 Site Restoration

#### Intent:

To reduce the visual and environmental impacts and to reduce the risk of personal injury or property damage resulting from site disturbances.

#### Guidelines:

- Restore disturbed areas of the site, that are not part of a roadway or formal yard landscaping, to a natural condition as soon as possible after disturbance. Undertake restoration as soon as practical after disturbance to minimize the potential for impacts to the environment and reduce risks to people and property.
- Replace trees in a manner that helps to restore the natural character of the hillside site. Specifically, plant trees and shrubs to screen undesirable views and buffer incompatible uses. Arrange trees in natural groupings or clusters rather than in lines of formal arrangements.
- □ Employ restoration practices specifically tailored to address the type and degree of disturbance and the specific conditions of the site. **Restoration** planning and implementation should consider:
  - Regrading of disturbed areas to complement existing and adjacent contours
  - Where artificial applications of slope stabilization and erosion control are required (geo-textiles, rock armour, retaining walls, etc.), an integrated landscape plan is required that will reduce visual impacts
  - Alleviating soil compaction
  - Soil preparation and soil amendment to meet revegetation needs
  - Temporary irrigation measures to ensure adequate plant establishment
  - Landscape establishment and maintenance requirements













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- □ For forested and grassland sites, plant material should establish a **transition** between hard edge urban forms and open spaces that will eventually restore the character of a natural condition.
- □ Utilize plant material for site restoration that is native to the site. Where the use of only **native plant material** is not possible or desirable, select plant material that is similar in appearance, growth habit, colour and texture to native plants and that will not act as a weed in the natural environment (i.e., it will not displace native plants, provide habitat for undesirable wildlife or act as a host for insect pests) or create fire hazards.
- □ Plant shrubs and trees in masses and patterns characteristic of a natural setting and with the intent of encouraging **biodiversity**.
- □ For restoration or development of **habitat areas** (e.g., riparian areas, ravines, greenways, etc.) use plant species that have value as food or cover.

#### 3.6.3 Residences and Streetscapes

#### Intent:

To balance opportunities to meet market needs and personal tastes with the need to create landscapes that complement the natural hillside environments.

#### Guidelines:

- □ Where possible, landscape design, plant selection and the use of hard landscape materials in streetscape and residential applications should **complement the landscape character** of surrounding hillsides.
- □ **Flexibility** will be applied to front yard lawns, foundation plantings, sideyard planting and feature areas in residential lots or streetscapes as long as the resulting landscape does not detract from the natural hillside character.
- Avoid the construction of solid **fences** that impose highly visible and artificial lines on the hillside. Construct fences that are semi-solid/semi-transparent instead. Select fence material and colour according to the same requirements as those for houses (e.g., complementary colour, low reflectivity, etc.).

Development Guidelines for Kelowna's Hillsides













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- □ Employ water-conserving principles and practices in the irrigation design, plant selection, soil amendment and mulching of residential and public landscapes.
- □ Limit over-spray and run-off due to watering. Do not irrigate **undisturbed natural areas**. Prevent the spread of irrigation run-off onto natural areas of the hillside.
- Provide automatic shut-off valves for irrigation systems to reduce the risk of accidental erosion in the event that a head or pipe breaks.

















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#### SCHEDULE B AMENDMENTS PROPOSED TO THE OFFICIAL COMMUNITY PLAN

- **2.13.24** Alternative Hillside Standards. Consider, within the context of a Hazardous Condition Development Permit, alternative hillside development standards within Zoning Bylaw 8000 and the Subdivision, Development and Servicing Bylaw 7900. The intent is to minimize the effects of development on the natural environment of the hillside areas, including road cuts and fills, tree cutting, regrading and the visual impact in general of urban development on hillsides, while preserving areas with slopes of 10 % and greater;
- 2.13.25 Application of Alternative Hillside Development Standards. Consider alternative hillside development standards for hillside areas, and adjacent areas, proposed to be on urban services and having no through roads or larger areas planned on a comprehensive neighbourhood basis. Due to the potential for impacts on lands adjacent to the more steeply sloped areas, Hazardous Condition Development Permits will be considered for an entire titled area, notwithstanding that portions of the site may contain areas of lesser slopes. Hillside areas are defined as lands in their natural state that have a slope angle of 10 % and greater for a minimum horizontal distance of 10 metres.

#### SCHEDULE C: AMENDMENTS PROPOSED TO ZONING BYLAW No. 8000

To be inserted in Zoning Bylaw 8000 after the following sections (Proposed amendments denoted in bold type):

- 1.3.4. Schedule A may contain zone sub-classes as denoted by the following:
  - (a) An "S" notation shown on Schedule "A" as part of the identified zone classification indicates that a secondary use in the form of a secondary dwelling unit is permitted on the properties so designated, subject to meeting the conditions of use of the zone. An "s" zoning classification on a property shall be established by rezoning the subject property to the "s" version of the parent zone.
  - (b) An "h" notation shown on Schedule "A" as part of the identified zone classification indicates that alternative development regulations will be applied in Hillside Development Areas. An "h" zoning classification on a property shall be established by rezoning the subject property to the "h" version of the parent zone.
  - (c) Zones may be subject to more than one sub-class and denoted as "h/s". A lot in an "h/s" zone will be subject to regulations in the appropriate "h" zone.
- 2.3.3. (General Definitions, insert alphabetically)

HILLSIDE AREA means land in its natural state having a slope angle of 10% and greater for a distance of 10 metres or more.

#### SECTION 13 – URBAN RESIDENTIAL ZONES

#### RU1 – Urban Residential Large Lot Zone

(proposed amendments shown in bold)

- 13.1. RU1 Large Lot Housing RU1s-Large Lot Housing with Secondary Suite **RU1h-Large Lot Housing (Hillside Area)**
- 13.1.5.c. In RU1 and RU1s zones, the minimum front yard is 4.5m. except it is 6.0m from a garage or carport having vehicular entry from the front. In RU1h zones the minimum front yard is 3.0m except it is 4.5m from a garage or carport having vehicular entry from the front.
- 13.1.5.d. The minimum side yard is 2.0m for a 1 or 1 ½ storey portion of a building and 2.3m for a 2 or 2 ½ storey portion of a building, except that it is 4.5m from a flanking street or when required by Section 13.1.5.(e). In RU1h zones the minimum setback from a flanking

### street shall be 3.0m, except that it is 4.5m from a garage or carport having vehicular entry from the flanking street.

- 13.1.5.f. For RU1h zones, the maximum height of any vertical wall element facing a front, flanking or rear yard (including walkout basements) is the lesser of 6.5m or 2 storeys, above which the building must be stepped back at least 1.2m.
- 13.1.5.g. For RU1h zones, all decks, supporting posts or columns shall not exceed the lesser of 4.5m or 1 storey in height, such measurements to include the height of any support structure or retaining wall.
- 13.1.6.e. An "h" notation shown on Schedule "A" as part of the identified zone classification indicates that the zoned area may be developed in accordance with Hillside Development Standards contained in the Subdivision, and Development Services Bylaw.

Renumber following section.

#### RU2 – Urban Residential Medium Lot zone

(proposed amendments shown in bold)

- 13.2 RU2 Medium Lot Housing RU2s- Medium Lot Housing with Secondary Suite **RU2h-Medium Lot Housing (Hillside Area)**
- 13.2.5.c. In RU2 and RU2s zones, the minimum front yard is 4.5m, except it is 6.0m from a garage or carport having vehicular entry from the front. In RU2h zones, the minimum front yard is 3.0m except it is 4.5m from a garage or carport having vehicular entry from the front.
- 13.2.5.d. The minimum side yard is 1.5m for a 1 or 1 ½ storey portion of a building and 1.8m for a 2 or 2 ½ storey portion of a building, except that it is 4.5m from a flanking street or when required by Section 13.2.5.(e). In RU2h zones the minimum setback from a flanking street shall be 3.0m except that it is 4.5m from a garage or carport having vehicular entry from the flanking street.
- 13.2.5.f. For RU2h zones, the maximum height of any vertical wall element facing a front, flanking or rear yard (including walkout basements) is the lesser of 6.5m or 2 storeys, above which the building must be stepped back at least 1.2m.
- 13.2.5.g. For RU2h zones, all decks, supporting posts or columns shall not exceed the lesser of 4.5m or 1 storey in height, such measurements to include the height of any support structure or retaining wall.

13.2.6.e. An "h" notation shown on Schedule "A" as part of the identified zone classification indicates that the zoned area may be developed in accordance with Hillside Development Standards contained in the Subdivision, and Development Services Bylaw.

Renumber following section.

#### RU3 – Urban Residential Small Lot Housing

(proposed amendments shown in bold) (Note that access in the RU3 zone is by lane only / Sec. 13.3.6.(b))

- 13.3 RU3-Small Lot Housing RU3s- Small Lot Housing with Secondary Suite RU3h-Small Lot Housing (Hillside Area)
- 13.3.3. Secondary Uses

The secondary uses in this zone are:

- (a) care centres, minor
- (b) group homes, minor
- (c) home based businesses, minor
- (d) secondary suites (RU3s only)
- 13.3.5.c The maximum height is the lesser of 9.5m or 2 ½ storeys, except it is 4.5m for accessory buildings and accessory structures **and a maximum of 6.0m for an accessory building containing a suite.**
- 13.3.5.d **The minimum front yard is 3.0m.**
- 13.3.5.e The minimum side yard is 1.2m for a 1 ½ storey portion of a building and 1.5m for a 2 or 2 ½ storey portion of a building except that it is **3.0m** from a flanking street or when required by Section 13.3.5.g.
- 13.3.5.g The minimum rear yard is 6.0m for a 1 or 1 ½ storey building and 7.5m for a 2 or 2 ½ storey building, but it is 1.5m for accessory buildings. Where the lot width exceeds the lot depth, the minimum rear yard is **3.0m** provided that one side yard shall have a minimum width of **3.0m**.
- 13.3.5.h For RU3h zones, the maximum height of any vertical wall element facing a front, flanking or rear yard (including walkout basements) is the lesser of 6.5m or 2 storeys, above which the building must be stepped back at least 1.2m.
- 13.3.5.i For RU3h zones, all decks, supporting posts or columns shall not exceed the lesser of 4.5m or 1 storey in height, such measurements to include the height of any support structure or retaining wall.

- 13.3.6.d An "s" notation shown on Schedule "A" as part of the identified zone classification indicates that a secondary use in the form of a secondary suite is permitted on the properties do designated, subject to meeting the conditions of use of the zone. An "s" zoning classification on a property shall be established by rezoning the subject property to the "s" version of the parent zone.
- 13.3.6.e A secondary suite, in accordance with Section 9.5, may only be located within a single detached dwelling or an accessory building to a single detached dwelling which is no closer than 5.0m to the principal building.
- 13.3.6.f An "h" notation shown on Schedule "A" as part of the identified zone classification indicates that the zoned area may be developed in accordance with Hillside Development Standards contained in the Subdivision, and Development Services Bylaw.

Renumber following sections.

Schedule 4 7. Hillside Street Standards Page 1 of 5

#### SCHEDULE D

#### **DESIGN STANDARDS**

#### 7. HILLSIDE STREET STANDARDS

- 7.1 General
- 7.2 Street Trees
- 7.3 Arterial Streets
- 7.4 Village Collector Streets ("Main Street")
- 7.5 Collector Streets
- 7.6 Minor Collector Streets
- 7.7 Village Local Streets
- 7.8 Local Streets
- 7.9 Minor Local Streets
- 7.10 Public Lanes
- 7.11 Cul-de-Sac Streets and Hillside Emergency Accesses

#### 3.1.1.1 LIST OF TABLES (located at back of section)

- NO. <u>TITLE</u>
- Table 1Hillside Street StandardsTable 2Alignment Design Criteria

#### 3.1.1.1.1 7. HILLSIDE STREET STANDARDS

#### 7.1 General

Where development lands receive hillside ("h") zoning, these standards may be utilized in place of the specific sections in the HIGHWAY DESIGN STANDARDS (Section 4 of this Schedule). The Hillside Street Standard drawings are included in Schedule 5, section 2 (Drawings) of this Bylaw.

The hillside standards have been designed for environmental sensitivity with reduced physical impacts in mind. Generally, the street standards proposed herein have been drawn from the following principles:

- The public interest requires safe, livable and attractive streets that contribute to the urban fabric;
- Streets should be designed to suit their function. Many streets, especially local ones, have purposes other than vehicular traffic;
- A hierarchical street network should have a rich variety of types, including bicycle, pedestrian and transit routes;
- Standards should be developed to enhance local streets' contributions to urban design. Issues such as sense of enclosure, landscaping, parking, building setbacks, surface materials, street furniture, signs and street lighting are vital determinants of livability in neighbourhoods.

These street standards have largely been designed for application under specific traffic volumes and development densities. Traffic volume determines which general street type (Arterial, Collector, Minor Collector, Local, etc.) is required to service an area and, in most cases, density of fronting development determines which specific street condition ("Condition A", "Condition B", "Condition C", etc.) will be applied. In the case of Collector Streets, whether or not the street acts as a village centre "main street" is also a factor. For Arterial Streets, proximity to a village centre and local environmental conditions are the determinants of "condition" application.

Development that has direct public street access is defined as "fronting" the street. In other words, only those units that are oriented to the street are considered to "front" on it. This will most often occur in areas of fee-simple single family, mixed-use, or apartment development. Circumstances where strata units "front" onto a public street may also arise; however, strata and bareland strata developments will primarily be serviced by Private Streets. Standards for Public Lanes, Cul-de-sac Streets and Hillside Emergency Accesses are also included.

#### 7.2 Street Trees

Many livable streets include street trees. Trees on the street provide dappled light to walk and ride through, they rustle in the wind and they display the passing of the seasons. Trees modify the microclimate—on hot sunny days the street is cool and on rainy days there is a relatively dry place to walk. Trees also foster a sense of comfort and safety for drivers and pedestrians by creating an edge between the sidewalk and the moving traffic. Street trees contribute to the livability of a street.

Street trees also create a distinctly urban feel in a neighbourhood—boulevards lined with trees create a very strong linear pattern. In hillside areas it is desired that the natural landscape be more prominent. While in some instances, such as along Arterials and Collectors and in a village centre, street trees are thought to be appropriate, even necessary, in other areas a more natural approach is desired.

Therefore, those hillside street standards that will be applied to areas that will have a tighter "fit" to the natural landscape will not be required to incorporate street trees. For Minor Collector Streets, Local Streets, Minor Local Streets and Private Streets, street trees are considered optional. The planting of stands of native trees and vegetation is encouraged in these areas to contribute some of the elements of livability that would otherwise be missed with the elimination of formal street tree plantings. Street trees and landscaping are to be to the satisfaction of the Parks Department.

A discussion of each class of street follows.

#### 7.3 Arterial Streets

Arterial streets provide a continuos drive path for inter- community through traffic. The Arterial corridors of hillside areas will be different in that, while they will continue to provide a throughway for automobiles, the experience will take on qualities of a scenic drive.

#### 7.4 Village Collector Streets ("Main Street")

Collector streets perform the dual function of land access and traffic movement between arterial and local roads. In the village centre the unique and very social function of this more localized type of street will be reflected in a more urban feel than will be found on collectors elsewhere throughout the site.

#### 7.5 Collector Streets

Collector streets perform the dual function of land access and traffic movement between arterial and local roads; however, this more localized type of street plays a social as well as a functional role in the neighbourhood. Street design, therefore, must balance all objectives including, but not limited to, the need to provide a driving path for automobiles to access the neighbourhood.

#### 7.6 Minor Collector Streets

There is the potential for some portions of Collector streets to experience lower traffic volumes. In these instances, Minor Collector streets will be utilized. Toward reducing the street section, a sidewalk will be provided on only one side of the street for all Minor Collectors.

#### 7.7 Village Local Streets

The residential areas of the village centre will be more urban than those that will be found elsewhere within the Hillside areas. Narrow local streets with on-street parking and framed by street trees and sidewalks on one or both sides will provide a comfortable environment for all users in the neighbourhood. This condition is for use where development greater than ten units per hectare fronts at least one side of the street.

#### 7.8 Local Streets

Local streets serve a multitude of functions that are important in the day-to-day lives of residents: residents walk their dogs on the street, they wash their cars on the street and they meet and talk to their neighbours on the street. Children play on the street, they learn to ride their bicycles on the street; they treat the street as an extension of the local neighbourhood park system. At this level, the street plays a very social role. Local street design, therefore, should continue to be sensitive to the needs of non-vehicle street users as well as seeking the best fit between street and landscape.

#### 7.9 Minor Local Streets

For use where the street provides direct land access for a limited number of units and is not intended to carry through traffic. Minor Local Streets may be used in areas where no

development fronts the street, or development of five units per hectare or less fronts one or both sides of the street. Low traffic volumes will allow even more use of the street by residents and pedestrians, therefore, no sidewalk is included in the section.

#### 7.10 Public Lanes

Public Lanes are also used by the residents of a community as a venue for social interaction and play and they can contribute greatly to the fabric of a livable community. One opportunity for their use, however, is in areas of density greater than ten units per hectare, such as the village centre. Such higher density development is generally located in more gently sloping areas where steeply sloping terrain is not an issue. The inclusion of Public Lanes in these neighbourhoods will contribute to the more urban feel envisioned as well as provide an alternate route for bikes and pedestrians.

#### 7.11 Cul-de-Sac Streets and Hillside Emergency Accesses

Some of the Local streets within complex topographic areas will take the form of a culde-sac. Generally, cul-de-sac streets are used where street connectivity is not possible (i.e. steep terrain) or not warranted (i.e. serves very few homes). Although the appropriate Local street standard will also apply to cul-de-sac streets, there are two additional street specifications unique to this street form that must be addressed in relation to livability: permitted length and the design of the street turnaround.

In complex topographic areas long streets may be required to access developable pockets within areas of steep terrain. Due to the complex topography it will often not be advisable, or even possible, for connectivity to be achieved at both ends of a street.

Longer cul-de-sac streets will result and systems of branching cul-de-sacs will be established to access some areas of extremely difficult terrain. In response to public safety issues, it is desirable that emergency access routes to such areas are available – Hillside Emergency Access standards are included below. This is considered more acceptable from a livability stance than requiring street connectivity in all situations as the lower standards required for an emergency access will result in a lesser impact to the hillside. Maintaining street connectivity wherever possible will remain a priority.

The radius of a cul-de-sac also plays a role in the livability of a street. Laying a cul-desac requires a relatively large flat area. The larger this area is, the greater the impact to the landscape, particularly in complex topographic areas. Large cul-de-sacs can also decrease the social quality of a street by terminating the public corridor with a large, barren paved surface. A reduction of the cul-de-sac radius is feasible if parking is restricted in the cul-de-sac, which will ensure a large enough circumference for car turning. It is noted that provision must be made on a case by case basis for emergency vehicle turning.

#### Cul-de-sac

- ROW: min 13.0m radius;
- Radius to edge of paved surface: min 12.0m radius;
- Alternative types of street turnarounds will be considered for use based on site specific topographic conditions. In certain circumstances reduced cul-de-sac radii or hammer head type turnarounds will be permitted.
- Cul-de-sac streets may exceed the maximum length as specified by the City of Kelowna mid-block turnarounds should be considered in this situation;
- A secondary emergency access must be provided for all public cul-de-sac streets that are in excess of the maximum length as specified by the City of Kelowna;

#### Hillside Emergency Access

- Maximum grade: 15%;
- 4.5m ROW; 4.5m roadway;
- Restrict non-emergency vehicles access through the use of removable bollards or gates.
- Shared use with pedestrian trails.

# TABLE 1Hillside Street Standards

Street Conditions				Street Section Specifications						
Street Typ (Std Draw	be and Condition ing number)	Max. Units Served	Design Speed <sup>1</sup> (km/h)	Max. Grade (%)	ROW (m)	Street Width 2 (m)	Parking	Curb & Gutter	Sidewalk 3	Street Trees
Arterial St	reets	>600								
Condition A (median) (SS-H1)	within village centre where environmental conditi permit	ions	60 (50) <sup>4</sup>	8 (10) <sup>11</sup>	23.0	16.0 <sup>5</sup>	none permitted	barrier curb required	required both sides <sup>6</sup>	required both sides and in median
Condition B (SS-H2)	within 10-minute walking distance <sup>7</sup> of village cen within village centre where environmental condit not permit the use of Condition A	ntre; or, tions do	60 (50) <sup>4</sup>	8 (10) <sup>11</sup>	17.0 <sup>8</sup>	10.0 <sup>8</sup>	none permitted	barrier curb required	required both sides <sup>6</sup>	required both sides
Condition C (SS-H3)	greater than a 10-minute walking distance' from centre.	village	60 (50) <sup>4</sup>	8 (10) <sup>11</sup>	15.5 <sup>8</sup>	10.0 <sup>8</sup>	none permitted	barrier curb required	required one side <sup>6</sup>	required both sides
Village Co	llector Streets (main street)	600								
Condition A (SS-H4)	where commercial development fronts stree	et	50	10	20.8	12.8	required on-street both sides	barrier curb required	required both sides	required both sides
Condition B (SS-H5)	where no commercial development fronts state	treet	50	10	20.8	12.8	required on-street both sides	barrier curb required	required both sides	required both sides
Collector	Streets	600		-		_				
Condition A (SS-H6)	<ul> <li>development<sup>9</sup> &gt;5 gross uph fronts both side</li> </ul>	S	50 (40) <sup>4</sup>	10 (12) <sup>11</sup>	18.6 <sup>8</sup>	8.6 <sup>8</sup>	required above curb both sides	rollover curb required	required both sides <sup>6</sup>	required both sides
Condition B (SS-H7)	<ul> <li>development &gt;5 gross uph fronts one side v development or ≤5 gross uph fronting opposition</li> </ul>	vith no site side	50 (40) <sup>4</sup>	10 (12) <sup>11</sup>	15.1 <sup>8</sup>	8.6 <sup>8</sup>	required above curb one side	rollover curb required <sup>12</sup>	required one side <sup>6</sup>	required both sides
Condition C (SS-H8)	<ul> <li>no development fronts street or ≤5 gross up one or both sides</li> </ul>	h fronts	50 (40) <sup>4</sup>	10 (12) <sup>11</sup>	14.1 <sup>8</sup>	8.6 <sup>8</sup>	none permitted <sup>10</sup>	rollover curb required <sup>12</sup>	required one side <sup>6</sup>	required both sides
Minor Collector Streets 300										
Condition A (SS-H9)	<ul> <li>development &gt;5 gross uph fronts both sides</li> <li>development &gt;5 gross uph fronts one side v development or ≤5 gross uph fronting opposition</li> </ul>	s; or, vith no site side	50 (40) <sup>4</sup>	10 (12) <sup>11</sup>	13.5 <sup>8</sup>	7.0 <sup>8</sup>	required above curb one side	rollover curb required	required one side <sup>6</sup>	optional
Condition B (SS-H10)	<ul> <li>no development fronts street or ≤5 gross up one or both sides</li> </ul>	h fronts	50 (40) <sup>4</sup>	10 (12) <sup>11</sup>	12.5 <sup>8</sup>	7.0 <sup>8</sup>	none permitted <sup>10</sup>	rollover curb required	required one side <sup>6</sup>	optional

TABLE 1 (continued)										
Hillside Street Standards										
	Street Conditions					Street	Section Sp	ecifications	;	
Street Type and ConditionMax.(Std Drawing number)Served		Design Speed <sup>1</sup> (km/h)	Max. Grade (%)	ROW (m)	Street Width 2 (m)	Parking	Curb & Gutter	Sidewalk <sup>3</sup>	Street Trees	
Village Lo	cal Streets	100								
Village Local (SS-H11)	<ul> <li>development &gt;10 gross uph fronts at least of</li> </ul>	on side	40 (30) <sup>4</sup>	12	16.7	8.7	required on-street both sides	barrier curb required	required minimum one side <sup>6</sup>	required both sides
Local Stre	ets	100								
Condition A (SS-H12)	Condition A (SS-H12) • development of >5 and ≤10 gross uph fronts both sides		40 (30) <sup>4</sup>	12	14.5	6.0	required above curb both sides	rollover curb required	optional one side <sup>6</sup>	optional
Condition B (SS-H13)	Condition B (SS-H13) • development of >5 and ≤10 gross uph fronts one side with no development or ≤5 gross uph fronting opposite side		40 (30) <sup>4</sup>	12	12.5	6.0	required above curb one side	rollover curb required	optional one side <sup>6</sup>	optional
Condition C (SS-H14) • no development fronts street or ≤5 gross uph fronts one or both sides		40 (30) <sup>4</sup>	12	10.5	6.0	none permitted <sup>10</sup>	rollover curb required	optional one side <sup>6</sup>	optional	
Minor Local Streets 15										
Minor Local (SS-H15)	<ul> <li>no development fronts street or ≤5 gross up one or both sides</li> </ul>	oh fronts	30 (20) <sup>4</sup>	12	9.5	5.0	on gravel boulevard	rollover curb required	none	optional
Public La	ne									
Condition A (SS-H16) • multi-family development backs onto at least one side		20	12 (15) <sup>11</sup>	6.0	5.7	on edge of paved surface	rollover curb required	none		
Condition B (SS-H17)	<ul> <li>single-family development backs onto both</li> <li>single-family development backs onto one s</li> <li>no development backing onto opposite side</li> </ul>	sides; or, side with	20	12 (15) <sup>11</sup>	6.0	4.5	on gravel boulevard	rollover curb required	none	
Hillside E	mergency Vehicle Access									
<ul> <li>provide exceed Kelowr</li> </ul>	e a secondary access route, if possible, where a cu Is maximum street length as specified by the City o a	ul-de-sac of		15	4.5	4.5				

#### Schedule 4 7. Hillside Street Standards – TABLE 1 Page 3 of 3

#### Footnotes:

- 1. See Table 2 for alignment design criteria for each design speed.
- 2. Street width measured from curb face (gutterline).
- 3. For all conditions, sidewalks should terminate at a destination or connect with another sidewalk or trailhead.
- 4. Minimum permitted design speed reduction, where necessary due to topographic constraints, and approved by the City.
- 5. Separate left turn lanes to be provided in the medians.
- 6. Where issues of livability warrant, (eg. extreme topographic conditions) sidewalk(s) may be located in a separate dedicated corridor and street ROW width reduced accordingly.
- 7. For this purpose, the 10-minute walking distance is considered to be ½ mile (0.8 km).
- 8. Where required, ROW and street widths will be increased at major intersections to provide for separate turning lanes.
- 9. "Development" includes all residential, mixed-use, commercial, institutional and park uses.
- 10. All parking shall be managed on-site or within small parking pullouts, as required.
- 11. Maximum grade permitted where necessary due to topographic constraints and as approved by the City.
- 12. Where no fronting development (driveway access not required), barrier curbs to be considered to restrict illegal parking on sidewalks.

Schedule 4 7. Hillside Street Standards – TABLE 2 Page 1 of 2

## Table 2Alignment Design Criteria

#### 1. Horizontal Curve Radii Criteria 60 km/h 50 km/h 40 km/h 30 km/h Roadway Crossfall normal crown (-2%) 260m 165m 90m 45m 205m 120m 65m 30m 2% superelevation 4% superelevation 150m 80m 45m 22m 6% superelevation 120m ---**Through Intersections** 200m 120m 70m 40m

#### 2. Superelevation

Criteria	60 km/h	60 km/h 50 km/h		30 km/h
Maximum Superelevation	6%	4%	4%	4%
Maximum Superelevation at Intersections	4%	4%	4%	4%

#### 3. Superelevation Transition Lengths

Criteria	60 km/h	50 km/h	40 km/h	30 km/h			
Transition Lengths (2 / 4-lane roadways)							
normal crown to +2%	24m / 36m	22m / 34m	20m	20m			
normal crown to +4%	38m / 54m	33m / 50m	30m	30m			
normal crown to +6%	48m / 72m	-	-	-			
Min Tangent Length between reversing							
2% superelevation (2 / 4-lane	15m / 22m	13m / 20m	12m	12m			
4% superelevation	28m / 42m	26m / 40m	24m	22m			
6% superelevation	42m / 64m	-	-	-			
Values for transition lengths include tongent rungut applied at the same rate assumed levels rungff							

1 Values for transition lengths include tangent runout applied at the same rate as superelevation runoff.

2 60% of superelevation runoff occurs on the tangent approach and 40% on the curve, resulting in a minimum length of tangent between reversing curves of 120% of the superelevation runoff length.

### Table 2 (continued) **Alignment Design Criteria**

4. Gradients						
Criteria	60 km/h	60 km/h 50 km/h		30 km/h		
Minimum Grade	0.5%	0.5%	0.5%	0.5%		
Maximum Grades						
on horizontal tangents	8% <sup>1</sup>	10% <sup>2</sup>	12%	12%		
on minimum radius horizontal curves <sup>3</sup>	8%	9%	10%	10%		
Grades Through Intersections						
with design speed on major road	8%	8%	8%	-		
approach distance for major road <sup>4</sup>	15 / 5m <sup>5</sup>	5m	0m	-		
with design speed on minor road	5% <sup>6</sup>	5%	6%	6%		
approach distance for minor road <sup>7</sup>	20m	15m	5m	5m		

Under special circumstances, grades up to 10% may be permitted. 1

2 Under special circumstances, grades up to 12% may be permitted.

Applies where radius is less than 1.5 times minimum allowable radius.
Minimum distance back from the gutter line of the minor road that the s

Minimum distance back from the gutter line of the minor road that the specified grade may not be exceeded.

5 Distances for design road approach to intersection with collector road / local road.

6. 4% desirable.

7 Minimum distance back from the gutter line of the major road that the specified grade may not be exceeded.

#### 5. Vertical Curve K Values

Criteria	60 km/h	50 km/h	40 km/h	30 km/h
Minimum Crest	15	8	4	2
Minimum Sag	10	7	4	2
Crest / Sag on approach to stop	4	3	2	2

K values listed assume that new roadways will be illuminated

#### 6. Stopping Sight Distances

Criteria		60 km/h	50 km/h	40 km/h	30 km/h
Down grades:	12%	109	78	52	34
	9%	101	73	50	32
	6%	94	69	48	31
	3%	89	66	46	30
	0%	85	63	45	30
Up grades:	3%	81	61	44	29
	6%	78	59	42	29
	9%	76	57	41	28
	12%	73	56	40	28

#### 7. Decision Sight Distance

Minimum decision sight distance for 60 km/h: 175m - 235m.

1. Note that decision sight distance applies only to multi-lane roads at intersections.

2. The range of values recognizes the variation in complexity that occurs at various sites. For less complex situations, values towards the lower end of the range are appropriate and for more complexity, values at the upper end are used.
































