# SOUTH KELOWNA SLOPES GEOGRAPHICAL INDICATION

April 2020

## Technical Documentation

Documentation in support of a formal application to the BC Wine Authority for the creation of a new Geographical Indication named South Kelowna Slopes a sub-division of the Okanagan Valley Geographical Indication.

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Cover photo: Vineyards of Cedar Creek Estate Winery looking westward over Okanagan Lake.

# South Kelowna Slopes Geographical Indication

TECHNICAL DOCUMENTATION

## EXECUTIVE SUMMARY

The primary concept of the South Kelowna Slopes GI encompasses the mixed glacial sediments along the slopes overlooking Okanagan Lake in the South Mission area of Kelowna. The proposed GI covers an area of approximately 800 ha. This extent excludes the large residential neighbourhoods of South Mission and Upper Mission, although some residential pockets do exist within the boundaries of the GI.

The surficial geological materials in the landscape today are the result of the most recent glaciation ending some 12,000 years ago when over 2 km of ice covered the landscape. Wind, water and gravity continue to shape surficial materials today. As a result, slopes of the GI are dominated by a mixture of glacial sediments particularly those deposited by glacial meltwater (glaciofluvial).

These surficial geologic deposits act as what are termed “soil parent materials”. Parent materials weather over time to form soil horizons, layers of soil with differing colours and properties such as amount of organic matter and water holding capacity. Most common are soils formed on glaciofluvial parent materials, these have gravelly subsoils with surface cover of sandy or loamy sand of various thickness. Their coarse texture and low water holding capacity enables control of vine vigour through careful irrigation to achieve optimum cluster exposure and a balance between vigour and fruit yield. This ability to manipulate vine vigour and fruit microclimate allows for adjustment of fruit temperature and the timing of maturation to achieve high fruit quality for premium wine production.

The climate of the South Kelowna Slopes GI is affected by the moderating influence of Okanagan Lake. Elevation, landscape position, local topography, and regional weather all affect temperatures. The regional climate, moderated by the lake, creates a long but cool growing season conducive to producing premium Pinot Noir which accounts for most of red wine cultivar acreage. Gamay Noir is also grown but planted to a lesser extent. White wines produced in the GI are known for their flavor, aroma, body and acidity which are enhanced during fruit development by the GI’s climate. Riesling, Chardonnay, Pinot Gris and Gewurztraminer comprise most of the white grape acreage in the GI.

# BACKGROUND

This work was initiated in response to the release of recommendations prepared by industry representative to the BC Wine Authority and the BC Ministry of Agriculture (Appellation Task Force 2015). Following an initial meeting in April 2019 hosted by Summerhill Winery and chaired by Ezra Cipes, Scott Smith was retained by Tantalus Vineyards on behalf of a group of neighboring wineries to help define the extent of a proposed South Kelowna Slopes Geographical Indication (GI) in the central Okanagan Valley and to compile technical (biophysical) information to describe and define its nature.

This technical document describes the extent and rationale for a GI boundary. It follows the southern lakeshore portion of the concept originally put forward by Andy Gebert of St. Hubertus Estate Winery but does not extend into the domain of SE Kelowna which will proceed with a separate application and designation.

The intent of this report is to provide the required technical documentation for the formal application to the BC Wine Authority for GI status.

# GEOGRAPHIC EXTENT AND BOUNDARY

## The Concept

The primary concept of the South Kelowna Slopes GI encompasses the mixed glacial sediments along the slopes overlooking Okanagan Lake in the South Mission area of Kelowna. The extent of the proposed GI covers an area of approximately 800 ha (Figure 1).

As with the delineation of other GIs in the Okanagan Valley, we have used wherever possible natural features to place boundaries. For South Kelowna Slopes, several different natural features are used, as well as the extent of arable land are used to define the GI. The upper boundary was largely set based on the extent of land suitable or potentially suitable for agriculture. The elevation of the upper boundary runs between 500 and 6000 m elevation depending on local topography and bedrock exposure. Vineyards all slope to the northwest and west. Their climate is strongly influenced by their slope and immediate proximity to Okanagan Lake.


Figure 1. Overview of the boundary configuration for the proposed GI. The boundary placement, shown in red, is described in more detail in Figures 2-3. The edge of the adjacent East Kelowna Slopes GI is seen at the upper right corner of the image.

One of the additional guiding principles of boundary placement is to avoid cutting across or dividing individual property lots. The boundary as proposed adheres to this principle as far as we are aware. The details of the boundary placement and the ground features used are described in more detail below.

## Boundary Rationalization


Figure 2. The boundary configuration (red line) for the western portion of the GI. Green lines outline the extent of the Agricultural Land Reserve which captures most of the arable land in the area. Okanagan Mountain Park occupies a proportion of the western-most extent of the GI.

The GI northern extent is defined by the shore of Okanagan Lake while the southern boundary is set by various natural and urban features (Figure 2). The proposed GI boundary excludes the extensive residential developments of South Mission but includes the older residential area of Braeloch and the rural residential area off Rimrock and Timberline Roads just east of Okanagan Mountain Park. The park is included within the GI even though this landscape is mostly exposed bedrock and does not support agriculture. This was done to accommodate a small parcel of arable land lying immediately to the west of the park that is included within the ALR and the GI with some potential for viticulture. At its western limit, the southern boundary is placed along the border of Okanagan Mountain Park and follows that border for 3.6 km at an elevation of approximately 600m. The boundary crosses Bertram Creek and then follows the height of land above the Cedar Creek Winery vineyards at an elevation between 575 and 615 m before dropping down to Lebanon

Creek below the South Mission residential area then along the ALR boundary that runs along the top of the St. Hubertus vineyards.

Figure 3 outlines the boundary in the easterly portion of the GI. This portion of the GI is constrained by the lakeshore to the northwest, residential neighbourhoods to the south and east and by Bellevue Creek to the north. This 'island' of agricultural land (all within the bounds of the ALR) supports a mixture of horticultural crops about half of this area is in viticulture.


Figure 3. The boundary placement in the eastern portion of the GI. For the most part, the boundary is constrained by the presence of extensive residential development.

# SURFICIAL GEOLOGY AND LANDFORMS

Surficial materials, also called surficial geology, are the loose materials on top of bedrock. They are the parent materials for soils and form the terraces, fans, blankets and veneers that underlie the GI. The surficial geology of the area was first mapped and described as part of a regional study of the late glacial history of the Okanagan Valley by Nasmith (1962). Surficial materials were mapped for regional planning at a 1:20 000 scale for the South Slopes (Iverson et al. 2004) and Kelowna areas (Iverson and Uunila 2008). More recently, a surficial geology map of the Kelowna area was published by the Geological Survey of Canada at a scale of 1:50 000 (Paradis 2009). These studies form a good overview of the materials and landforms in the area (Figure 4).

The Okanagan Valley has been subject to multiple glaciations during the Pleistocene epoch (2.6 million years). Most surficial materials in the landscape today are the result of the most recent glaciation when over 2 km of ice covered the landscape. Ice scoured the uplands and blanketed the plateau and mid-slopes. Melt waters deposited sorted material in the valley bottoms as the ice receded. Wind, water, and gravity continue to shape surficial materials today.

Deglaciation occurred by down wasting in the interior plateau of BC around 10 000 years ago. Large masses of ice melted in place as they were cut off from ice receding into the mountains to the east and west. Valley ice remained in the bottom of the Okanagan Valley after the surrounding plateau was relatively ice free. During the late stages of deglaciation, lower elevations of the valley were inundated when meltwater accumulated behind and around valley ice, resulting in the formation of Glacial Lake Penticton. This large impounded body of water had a surface approximately 150m above the present level of Okanagan Lake and extended south to OK Falls. In deeper lake waters, layers of sand, silt and clay accumulated as finer sediments fell out of suspension. Pockets of these glaciolacustrine sediments can be found between 360-400m. Bellevue Creek, and other local creeks, originating in the uplands to the east of the GI, deposited sand and gravel creating a series of fans and terraces corresponding to the elevation of Glacial Lake Penticton (400-520m). Above this elevation glacial deposits are dominated by discontinuous blanket of glacial till. Additionally, more till is present moving south west away from Bellevue Creek.

Postglacially, the ongoing forces of water, gravity and wind have reworked the glacial landscape. Modern day creeks have dissected glacial deposits creating gullies and scarp slopes in thick surficial materials. Fans have formed below 360m where Bellevue, Lebanon and Bertram Creeks meet Okanagan Lake. In the upper elevations of the GI, rockfall deposits and bedrock derived colluvial veneers are intermixed with exposed bedrock and glacial till. Wind deposited, stone free eolian silt and sand form a discontinuous surface layer on gentle slopes and terraces. Cliff top dunes are present along the crest of south west facing escarpments such as in Lebanon Creek Linear Park.

As a result, slopes are dominated by a mixture of glacial sediments including those deposited by glacial meltwater (glaciofluvial) (Figure 4). Nasmith (1962) simply mapped the sediments on the lower slopes of the GI as “mixed”, a condition verified by field work conducted for this study. Paradis (2009) mapped the northwestern extent of the GI as mixed glaciofluvial sediments and the eastern extent as largely glacial till.

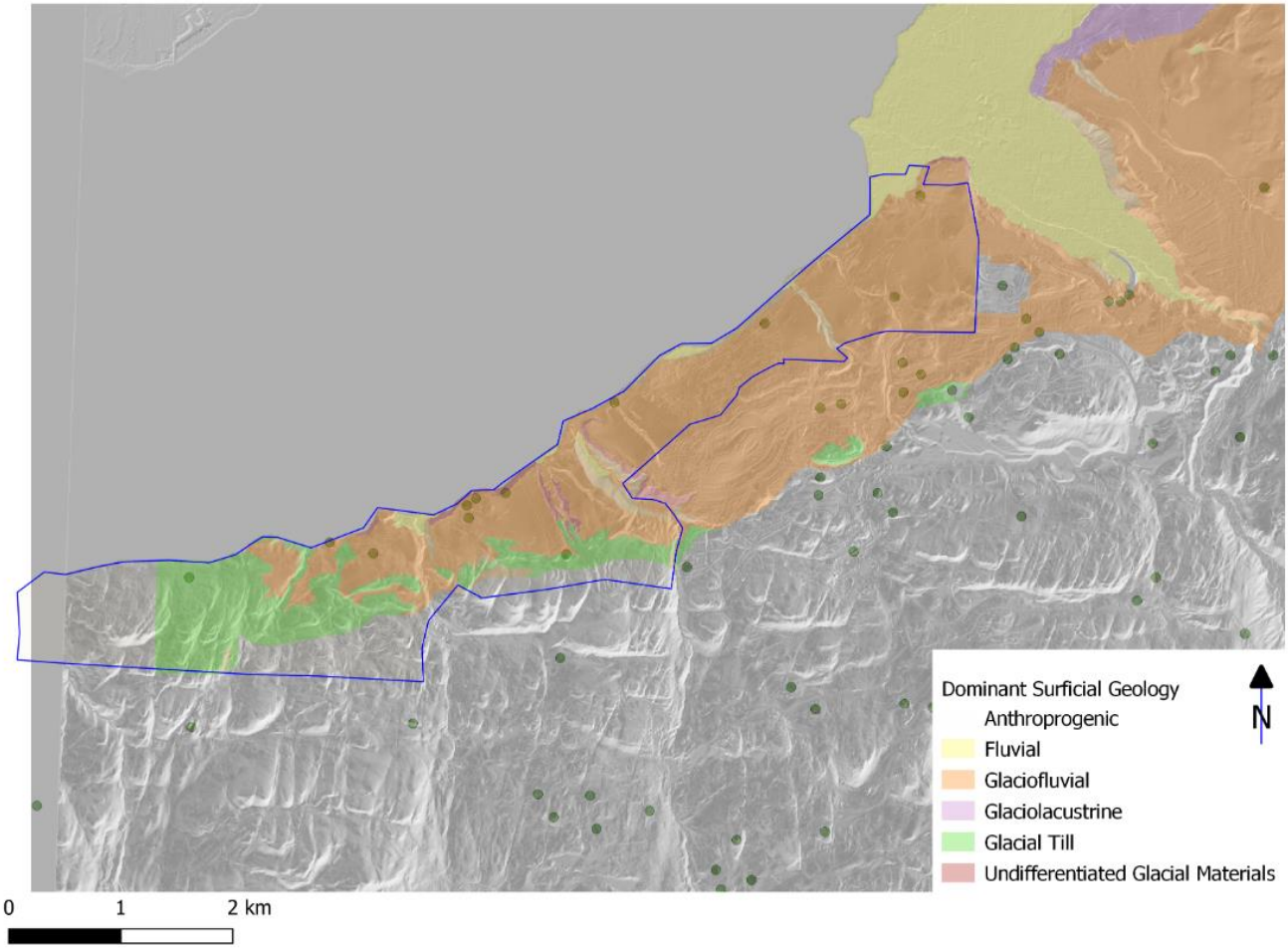


Figure 4. Generalized surficial geology. Slopes are predominantly covered by glaciofluvial sediments (orange) which are dissected by recent stream activity. Glacial till (green) is found at higher elevation and covering the rocky landscapes of the western-most extent of the GI.

Field work for this study revealed remnant glaciolacustrine terraces in a few locations (Figure 5). The glaciolacustrine sediments exhibit distinctly different character being composed of primarily silts and clays rather than the sands and gravels that are typical of glaciofluvial sediments. The geologic materials form the parent materials for the soils that exist in the GI. Parent materials determine the water holding capacity of the vineyard soils and so are important setting vineyard irrigation management.

Figure 5. Winter scene of the South Kelowna Slopes taken at St. Hubertus Winery. These moderate slopes typify the GI. However, a small level terrace (black arrow) which is composed of clayey glaciolacustrine sediments provides for a very different soil type at this location. Photo credit: St. Hubertus and Oak Bay Estate Winery.

## SOIL DEVELOPMENT AND SOIL PROPERTIES

In the report *Soils of the Okanagan and Similkameen Valleys*, Wittneben (1986) mapped a half dozen or so common soil series on the landscapes within the extent of the South Kelowna Slopes GI. Soil series are soil mapping units defined by the nature of the soil profile and the type of surficial material within which the soil has formed. Unconsolidated surficial geologic deposits act as what are termed “soil parent materials”. Parent materials weather over time to form soil horizons, layers of soil with differing colours and properties such as amount of organic matter and water holding capacity. Almost all the soils utilized for viticulture are formed from the glacial sediments described in the Surficial Geology section. The soils formed over thousands of years under dominantly open pine forest with grass dominated understory resulting in a mix of forest and grassland soils. The soil textures vary considerable from clayey to gravelly. The soils formed under pine forest share the properties of originally having had a leached grayish topsoil and brownish subsoil layer prior to cultivation. These soils belong to the Brunisolic taxonomic order according to the Canadian system of soil classification (Soil Classification Working Group 1998).

Soils formed under grass have dark topsoil layers and belong the Chernozemic taxonomic order in the Canadian system of soil classification.

The most common soils used for wine grape production in the GI are presented in Table 1. The soil series are organized according to the nature of the surficial geological sediments that make up the parent materials for soil formation. These belong to two broad groups. Most commonly are soils formed on glaciofluvial parent materials, these always have gravelly subsoils with surface cover of sandy or loamy sand of various thickness. The second group, and less common in the GI are those soils formed on glaciolacustrine materials, these always have clayey or loamy clay subsoils and can have a variety of surface textures.

Table 1. Common soil series and their characteristics found underlying the vineyards of the South Kelowna Slopes GI.

| Soil Series Name | Location | Profile Characteristics | Viticultural Use |
|---|---|---|---|
| | | ***Soils formed on sloping glaciofluvial parent materials*** | |
| Gammil | Widespread occurrence | Sandy surface horizon overlying gravelly loamy sand at <25 cm depth | Commonly used for viticulture in the GI. Somewhat droughty and often stony when cultivated, but suitable for irrigation |
| Paradise | Sporadic occurrence | Sandy surface horizon overlying gravelly loamy sand at 25 to 60 cm depth | While less common, use is similar to Gammil soil. |
| Parkill | Found along linear ridges often associated with gullies | Largely stone-free sands and loamy sands | Very droughty, limited use in the GI. |
| Trout Creek | Sporadic occurrence | Loamy sands over gravel at >60 cm depth | Limited distribution but well suited to irrigation. |
| | | ***Soils formed on glaciolacustrine parent materials*** | |
| Boucherie | Lower elevations close to lakeshore | Clay loam, few stones | High moisture retention, soft when wet. |
| Greata | Sporadic occurrence, often discontinuous coverage | Sandy gravel overlying clayey subsoil | Well suited for irrigated viticulture |
| Kalamoir | Lower elevations close to lakeshore | Fine sands overlying loamy to clayey subsoil | Not a common soil but well suited for irrigated viticulture. |

The most common soil used for viticulture is the Gammil soil series (Figure 6a). This soil series is characterized by a thin cover <25 cm thick of sandy material over gravel. The soil occurs on a range of slopes at mid to upper elevations within the GI. Gammil soils and the similar Paradise soil which has a slightly thicker surface cover of sandy loam (typically 25 to 60 cm) underlie an estimated 50% of the vineyard area within the GI based on soil survey mapping (Wettneben 1986).

The Parkhill soil (Figure 6b) is found in concentrated areas, often associated with the edge of large gullies is composed entirely of sand. While suited for viticulture, this discontinuous occurrence means Parkhill soil has limited use for viticultural production in the GI.


Figure 6. Two soils formed in parent materials of glaciofluvial origin. The Gammil soil series is gravelly with a thin veneer (<25 cm) of sandy loam cover as denoted by the dashed line (a). The Parkhill soil is formed entirely in sands without stones (b). The light gray colour of the Parkhill soil is the result of weathering (leaching) of the sandy parent material, the dark surface layer is the result of cultivation.

The second group of soils are less common than the glaciofluvial soils but are important to production. These are soils formed on glaciolacustrine sediments. These sediments are fine-textured, meaning they are composed primarily of silt and clay and are generally stone-free. Soils composed entirely of these fine-textured parent materials are classed as Boucherie soils (Figure 7a). As the name implies, these soils are more common on the west side of Okanagan Lake but

also occur sporadically in the South Kelowna Slopes GI generally at lower elevations adjacent to the present lake shore. These fine-textured materials are sediments deposited at the time when impounded water filled much of the valley during deglaciation. They are often composed of layered bands of sediment representing different periods of sedimentation into the lake. Often however, these sediments have been partially buried by other materials. When they are buried by gravelly material, these are classed as Greata soils (Figure 7b), when buried by sands, they are classed as Kalamoir soils. This condition of highly contrasting texture within the profile of vineyard soils has irrigation implications. The underlying glaciolacustrine parent materials have high moisture holding capacity compared to the coarse-textured surface materials which have much less water holding capacity.

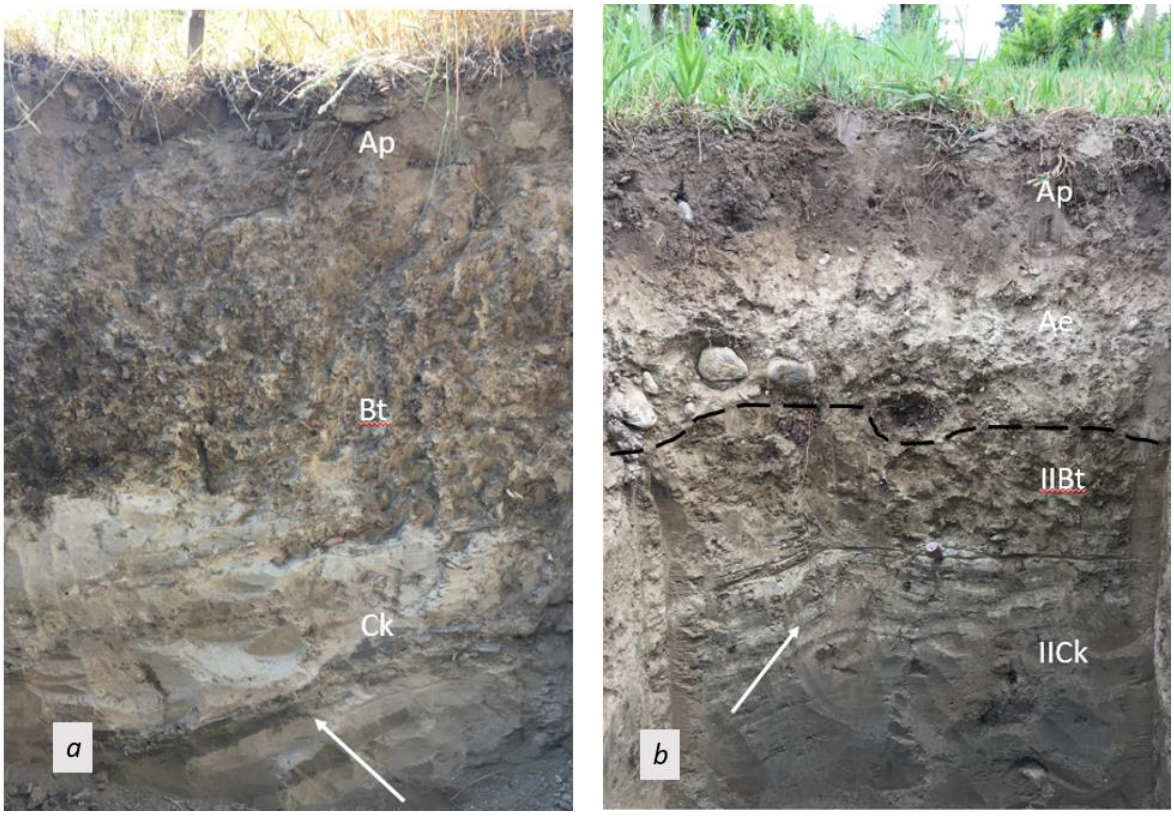


Figure 7. Soils formed in glaciolacustrine materials. When the entire soil is formed within these fine-textured materials they are classed as Boucherie soil series (a). When the glaciolacustrine materials are buried by gravelly sediments they are classed as Greata soil series (b). The lettering on the soil profiles refer to the type of soil horizon, leached layers are designated as Ae horizons, layers with accumulated clay are designated as Bt horizons, surface cultivated horizons as Ap horizons and the unweather glaciolacustrine parent material seen at the base of each profile as Ck horizons. The white arrows point to the sedimentation layering (referred to as varves) within the parent materials indicative of annual variations in glacial lake sedimentation.

## CLIMATE

The climate of the South Kelowna Slopes GI is affected by the moderating influence of Okanagan Lake. This influence impacts the growing season climate in two ways: temperatures are moderated to be slightly cooler in the day and slightly warmer at night; and the length of the growing season is increased due to the reduced risk of frost in late spring and early fall. Two agroclimatic indices often used to characterize the growing conditions of an area are presented in Table 2 for two sites within the GI. Growing degree days base 10 (GDD) is used in viticulture as a measure of effective growing season heat. The frost free period (FFP) defines the length of the growing season from the last frost in the spring until the first frost in the fall.

Table 2. Agroclimatic indices, GDD and FPP, for two years at two vineyard sites within the GI. Data provided by Taylor Whelan, Cedar Creek Estate Winery

| Vineyard | Elevation (m) | 2017 | | 2018 | |
|---|---|---|---|---|---|
| | | GDD | FFP (days) | GDD | FFP (days) |
| Simes (SF22) | 455 | 1368 | 209 | 1280 | >210 |
| Cedar Creek (SF29) | 400 | 1471 | 209 | 1376 | 220 |

The two sites have similar slope (5 to 15%) and aspect (NW-facing) but the Simes vineyard weather station is about 50 m higher in elevation at about 100 m above the level of Okanagan Lake (Figure 8). The topography of the GI also influences its climate. The dominantly west and northwest facing slopes facilitate excellent air drainage that is assisted by the creek valleys that dissect the GI. At night, cold air originating from high-elevation areas east of the GI drains from vineyard sites, increasing the GDD and frost-free period of vineyards.

Elevation, landscape position, local topography, and regional weather all affect temperatures. Data from the two exemplary sites in Table 2 illustrate the range of temperature conditions that can exist on these vineyard slopes. The range of GDD values (*ca.*1200 to 1500) reflects a climatic condition well suited to production of premium aromatic white wines and cool climate reds, such as Pinot Noir and Gamay.


Figure 8. Oblique images of the GI showing locations of major wineries and the locations of the two weather stations used to summarize agroclimatic conditions in Table 2.

The close proximity of South Kelowna Slopes vineyards to Okanagan Lake also influences winter temperatures. As is typical for much of the landscape adjacent to the lake throughout the valley, winter minimums are less extreme than those experienced farther away from this large water body. During the fall and winter of 2017-2018 three cold temperature events were recorded: an early November event which terminated the growing season; a lengthy period of sub-freezing temperatures in late December; and another cold event in early February (Figure 9). The lowest temperatures recorded in each event were not cold enough to cause damage to the vines at the time of the events. The winter of 2017-18 was not a typical winter based on long-term

measurements at the Summerland CS weather station. December and February were colder than normal while January was warmer than normal, but the episodic nature of freezing events is typical for the Okanagan Valley.

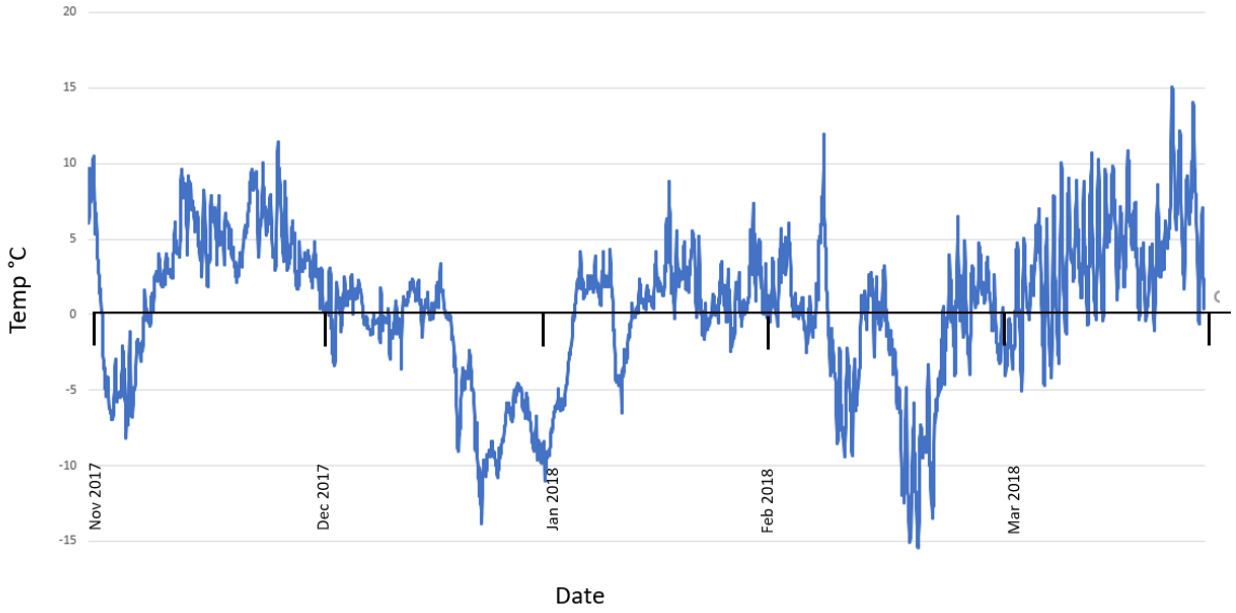


Figure 9. Temperature plot from Cedar Creek Estate vineyard for the period Nov 2017 to March 2018. Data provided by Taylor Whelan, Cedar Creek Estate Winery.

## Viticultural Characterization

There are 120 ha of vineyards reporting within the extent of the proposed South Kelowna Slopes GI. Somewhat more of the growing area is devoted to white wine grape cultivars than to red (Table 3).

The elevated and gently sloped vineyard sites, characteristic of the GI, are well suited for production of premium cool-climate cultivars. The cool regional climate, moderated by the lake, creates a long but cool growing season conducive to producing premium Pinot Noir which accounts for most of red wine cultivar acreage. Gamay Noir is also grown but planted to a lesser extent. White wines produced in the GI are known for their flavor, aroma, body and acidity which are enhanced during fruit development by the GI's climate. Riesling, Chardonnay, Pinot Gris and Gewurztraminer comprise most of the white grape acreage in the GI.

Table 3. Major red and white cultivars grown in the proposed GI expressed as % of reported growing area. Data supplied by the BC Wine Authority.

| Cultivar | % Growing area |
|---|---|
| ***Reds*** | |
| Pinot Noir | 33.2 |
| Gamay Noir | 6.7 |
| Foch | 1.5 |
| Pinot Meunier | 1.5 |
| Baco Noir | 1.2 |
| other | 0.9 |
| total | 45.0 |
| ***Whites*** | |
| Riesling | 18.1 |
| Chardonnay | 9.1 |
| Pinot Gris | 6.8 |
| Gewurztraminer | 6.1 |
| Pinot Blanc | 4.5 |
| Auxerrois | 2.4 |
| Ehrenfelser | 1.8 |
| Chasselas | 1.6 |
| Muscat | 1.6 |
| other | 3.1 |
| total | 55.0 |

Loamy sands and gravelly loamy sands are the most common soils in the GI and are well suited to irrigated viticulture. Their coarse texture and low water holding capacity enables control of vine vigour through careful irrigation to achieve optimum cluster exposure and a balance between vigour and fruit yield. This ability to manipulate vine vigour and fruit microclimate allows for adjustment of fruit temperature and the timing of maturation to achieve high fruit quality for premium wine production.

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