

# CLIMATE, WATER & GLACIERS

## *Essential Facts*

### GLOBAL WARMING AND CLIMATE CHANGE

- Global warming is a reality that is upon us, even though we do not know how severe it will be. It is a compelling reason to build Jumbo Glacier Resort (JGR). If the worst predictions regarding global warming are true, many existing low-elevation ski resorts in B.C. will not be able to operate. **Because of its high elevations, JGR will continue to receive natural snow and operate long after other resorts are inoperable.**
- While the affects of climate change have more to do with mankind's activities on a global scale, rather than the activities of skiers and snowboarders, skiers and boarders are amongst the first to notice the impact of climate change. This results in a strong motivation to embrace “green” practices and design. **JGR is a compact, pedestrian-oriented resort incorporating comprehensive environmental management plans, a “green” design, and a staffed, year-round environmental monitoring centre.** It is the most comprehensively planned resort in the Kootenays.
- JGR is the **only tourism project in the Kootenays to have received certification** under B.C.’s comprehensive Environmental Assessment Act.
- **In B.C., the consensus is that climate change will result in increased precipitation.** It is estimated that precipitation will increase by 10 to 20 percent by 2090.<sup>1</sup> At lower elevations, B.C. will see more rain as the climate changes. At higher elevations, especially in the interior, B.C. will see more snow. It is therefore likely that the coastal ranges will see more rainfall, while the interior ranges such as the Purcells will see significantly more snowfall.
- “Low-elevation ski resorts may experience a shorter ski season or no snow at all, due to warmer winter temperatures,”<sup>2</sup> but “where winter precipitation falls as snow – in the interior of B.C, for example – an increase in

### *Quick Reference*

- Global warming is real, and is a compelling reason to build JGR – a high elevation resort.
- JGR has comprehensive **environmental management plans and a “green” design**; it is the most comprehensively planned resort in the Kootenays.
- JGR is the **only tourism project in the Kootenays to receive certification** under the Environmental Assessment Act of B.C.
- JGR will get **all of its water from wells**; no surface water will be utilized.
- JGR will **not require any snowmaking** – a major ecological benefit in terms of energy and water usage.
- JGR is the only resort in the Kootenays with a **comprehensive Water Conservation Plan.**
- JGR will utilize a tertiary treatment to return treated water to the ground.
- JGR’s high elevation glaciers are not expected to disappear in the foreseeable future, even if they did, **JGR would be the only skiable resort left** in B.C.
- Global warming is expected to cause increased precipitation in B.C. – this **may cause high elevation glaciers such as Jumbo Glacier to grow in the future.**

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<sup>1</sup> BC Ministry of Water, Land and Air Protection, Indicators of Climate Change for British Columbia 2002; page 16.

<sup>2</sup> BC Ministry of Water, Land and Air Protection, Weather, Climate and The Future: B.C.’s Plan; (December, 2004) page 7

precipitation may help local economies based on skiing and other winter recreation activities.”<sup>3</sup>

## WATER

- Water Source – the resort will **get all its water from wells**. No surface water of any kind will be utilized and all riparian areas will be protected by minimum 30 metre setbacks. Careful attention has been given to ensure that there will be no impacts on Jumbo Creek or its tributaries.
- Snowmaking – JGR will be the highest resort in B.C. and will be one of the very few resorts in B.C. (planned or existing) **that will not require any snowmaking** – this results in huge savings in the amount of water the resort will require. Many snowmaking systems utilize millions of litres of water/hour. Panorama’s system can pump 10,600 litres/minute or 638,000 litres/hour. The fact that JGR receives plentiful natural snow means that **no salt or fertilizers will be used** to “firm up” a scant snow base.
- Water Conservation – the resort is **the only tourism project in the Kootenays with a comprehensive Water Conservation Plan** that will significantly reduce its water usage and needs.
- Invermere’s Water Supply: Invermere’s water supply system has been described as being “antiquated.” This has nothing to do with the amount of meltwater or runoff coming off the nearby mountains. According to Mayor Shmigelsky, Invermere’s water reservoir was full this summer<sup>4</sup>. The town, however, has seen significant growth in the past decade with no improvements to its water supply infrastructure. The recently approved Castle Rock subdivision in Invermere will be **almost exactly as large** (5,100 bed units<sup>5</sup> vs. 5,500 bed units) as Jumbo Glacier Resort at buildout. Castle Rock’s water supply will be from the District of Invermere while JGR will supply its own water. JGR will not affect Invermere’s water or wastewater issues.
- Invermere will reportedly receive about \$1.4 million funding from the Canada-BC Infrastructure Program for groundwater well development, construction of a 500,000 imperial gallon water reservoir, installation of about 1,000 metres transmission mains and a booster pump station.<sup>6</sup> **JGR will not require tax dollars for its water supply or any other part of its infrastructure.** The resort will provide its own water and will not impact Invermere’s water supply.

## WASTEWATER

- The resort will use a **tertiary treatment plant** to treat sewer and will return treated water to the ground in areas (identified by engineers and scientists) where groundwater or surface

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<sup>3</sup> BC Ministry of Water, Land and Air Protection, Indicators of Climate Change for British Columbia 2002; page 15

<sup>4</sup> [http://www.watertiger.net/articles/water\\_shortage.htm](http://www.watertiger.net/articles/water_shortage.htm)

<sup>5</sup> Based on projected 550 single family homes (3,300 bed-units) and 450 townhomes/condos (1,800 bed-units).

<sup>6</sup> [http://www.infrastructure.gc.ca/icp/publication/new\\_release/bc/2003/20030522vancouver\\_e.shtml](http://www.infrastructure.gc.ca/icp/publication/new_release/bc/2003/20030522vancouver_e.shtml)

water contamination will be impossible. Tertiary treatment plants are the most advanced sewer treatment systems available and the treated water that they output is potable.

## GLACIERS

- Glaciers are formed in locations where heavy snowfalls occur and where the snow never melts. Snowfalls accumulate year-over-year for centuries, to the point where they become compacted into ice.

The upper part of a glacier that receives most of the snowfall is called the *accumulation zone*. As a rule of thumb, the accumulation zone accounts for 60-70% of the glacier's surface area. The depth of ice in the accumulation zone exerts a downward force sufficient to cause deep erosion of the rock in this area.

On the lower end -- the foot of the glacier, is the *ablation zone*, where more ice is lost through melting than gained from snowfall and sediment is deposited.

The "health" of a glacier is defined by the area of the accumulation zone compared to the ablation zone. Healthy glaciers have large accumulation zones. In summer, skiers ski on the snow that is on top of the accumulation zone of a glacier, not the ablation zone.



Jumbo Glacier, for example, is almost entirely an "accumulation zone". It has almost no ablation zone because it flows (calves) over a huge cliff into the Lake of the Hanging Glacier. Jumbo is the "hanging glacier".

- **Not all glaciers behave the same way.** Worldwide, while the majority of glaciers are retracting, around 30% of them are advancing. Glaciers have been advancing recently in Norway, New Zealand and South America. This is often attributed to increased precipitation in specific microclimates. For example, the biggest glacier of South America, Chile's Pio XI Glacier has been growing at an unprecedented rate. Only 50 kilometres away, however, there are glaciers that are shrinking.
- In New Zealand, the famous Franz Josef Glacier has been **advancing rapidly** since 1984. The glacier is 12 kilometres long and stretches down to a mere 200 metres above sea level. Its expansion is due to increasing precipitation falling as snow at higher elevations.
- **The glaciers at JGR are high.** They stretch from a height of 3,400 metres (top of Jumbo) to a low of 2,450 metres (bottom of Farnham). By comparison, Athabasca Glacier, the (well-studied glacier in the Columbia Icefields) stretches from a height of 2,800 metres to a low of 1,900 metres. Jumbo Glacier itself stretches from 3,400 metres to 2,700 metres. **Almost all of Jumbo Glacier is higher than Athabasca Glacier.**
- The toe of Athabasca Glacier is receding relatively rapidly; Jumbo Glacier is not.
- "In BC, whether glaciers advance, remain stable, or retreat will depend on their geographic location and elevation. Most glaciers in southern BC are likely to continue to retreat.

**Glaciers with a high proportion of their surface area at high elevations are likely to remain stable.** In northwestern BC, increases in precipitation associated with climate change may offset higher temperatures and contribute to the ongoing advance of glaciers.”<sup>7</sup>

- Due to increased precipitation caused by climate change, Jumbo Glacier (which is situated at a high elevation) **may in fact grow** in the future.
- **Skiers ski on snow that is on top of a glacier. They don’t ski on glacier ice.** No part of the resort will be “built” on a glacier. T-bars will “float” on the snow that is on top of the glacier. They never touch the glacier.
- There are an estimated **100,000 glaciers in Canada**. Only one of them (a very small one) is lift-accessible for skiing (Blackcomb Glacier). It is reasonable to provide access to high elevation glaciers in ONE location in Canada. In other parts of the world, high elevation glaciers are readily accessible to the public via ski lifts, gondolas and trains.
- Glaciers hold “most of the world’s fresh water”, however 90% of the world’s glacier mass is locked up in the world’s ice caps and is not where we get our fresh water from. We do not get most of our freshwater from glacier melt. We get it from snowmelt, watersheds and aquifers.
- Even if JGR’s glaciers were to completely disappear, the moraines that the glaciers leave behind are perfect for skiing when it snows in winter.

### MELTWATER

- Glacier Dome, Jumbo Glacier, Commander Glacier and Farnham Glacier (JGR’s glaciers) all drain into the Horsethief Creek drainage. NONE of the project’s glaciers actually drain into the Jumbo/Toby Creek drainages.
- Jumbo Creek is primarily fed by snowmelt. The resort will not affect snowfall or snowmelt in any way.
- Glacier (ice) melt accounts for a tiny percentage of a glacier’s runoff. Most of the runoff is melting snow.

### Background Facts

- The resort will average a maximum of 2,000 to 3,000 visitors at one time during high season. This is about the same as Panorama. It is much smaller than Banff or Whistler. Whistler, for example can see 20,000 – 30,000 visitors during peak periods.
- A “bed-unit” is a measurement of development size. It is not a person count. JGR will have 5,500 tourist bed-units at buildout. Panorama will have 7,000 bed-units at buildout, Sun Peaks will have 26,000 and Whistler has 52,000. Castle Rock estates in Invermere will have approximately 5,100 bed-units.
- The access road is a dead end road that will see roughly 900 vehicles per day during peak periods at buildout. It is one of the easiest mountain access roads in Canada. It will not connect to the West Kootenays.

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<sup>7</sup> BC Ministry of Water, Land and Air Protection, Indicators of Climate Change for British Columbia 2002; page 21