



Trail Standard Guidelines

November 2014

Village of Pemberton Trail Standard Guidelines

Introduction

The purpose of this report is to provide recommendations for trail standards for the construction of future trails in Pemberton.

First, there is a discussion of the Pemberton context and current conditions, including an inventory of existing trails. Next there are summaries of trail standards that are used by the RMOW, the District of Squamish and the SLRD. There is an example of another jurisdiction's standards, and finally there are recommendations for standards that would be suitable for Pemberton.

Pemberton Context

Currently within the Village of Pemberton there are many trails, and a number of different trail types. These range from double track gravel surface trails such as those along the dyke tops, to crushed surface double track such as the Sea to Sky trail, and all the way to narrow, steep single track with jumps and technical features.

The Pemberton Valley Trails Association (PVTA) map provides an excellent overview of the local trails, as well as specific information such as level of difficulty and recommended users. An excerpted portion of the trail list from the PVTA map is attached to this document as Appendix A.

The diversity of trail types reflects the diversity of trail users that are found in Pemberton. Users include hikers, bikers, walkers, dog-walkers, runners, horseback riders, and tourists. Most of the trails are multi-use, meaning that several different user groups may be enjoying the trail at the same time. According to the PVTA trail map, there are eighty seven (87) trails in the greater Pemberton area, most of which are at least partially within the Village of Pemberton. Of those 87, 83 are recommended for biking, 48 for hiking and 29 for horseback riding.



Summary of Standards from Adjacent Jurisdictions

Resort Municipality of Whistler (RMOW) Trail Standards

The stated objective of RMOW trail standards is to “establish a trail hierarchy and environmental standards to ensure the type of trail and its maintenance is appropriate to the setting” and minimize trail placement in environmentally sensitive areas.

The document provides a chart showing the matrix of trails types and landform types (sensitivity ratings) developed by the municipality. It is used to easily determine which types of trails are appropriate in any given landform. For example, a Type I trail, which is wide, relatively easy, and will likely see the most users, is not appropriate in an environmentally sensitive area.

This approach required that land be classified according to sensitivity, and that trails also be classified in terms of width, surface type, grades, presence of mandatory elements, and amount of vegetation clearing on sides and above trail.

In addition to the trail type/land use compatibility, the RMOW standard classifies trail types by degree of difficulty using a system similar to downhill skiing, where green circle is easiest, blue square is intermediate, and black diamond is expert. There are specific measurable characteristics for each trail type. Within the rating system is a sub-rating system as well that describes Technical Trail Features (TTFs). TTFs include jumps, drops, bridges, teeter-totters and other similar elements of mountain biking. The RMOW

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standard sets specific, measurable parameters for TTFs that are considered appropriate for each Trail Type. For example, a large jump is not appropriate on a beginner trail.

The RMOW also sets out standards with respect to the placement of trails, the construction of TTFs, signage, fall zones, and trail maintenance.

District of Squamish (DOS) Trail Standards

The stated intent of the DOS standards is to provide consistent guidelines and standards for trail development and maintenance. The belief is that effective trail standards will provide a foundation for good trail design, construction and maintenance, and thus provide a safe and enjoyable experience for users. The cooperation, communication and courtesy of all users is highlighted as the key to its success, and the underlining philosophy of the document is that all public access trails are a shared resource and a shared use.

The DOS standards set out requirements for inventory and mapping of all existing and new/proposed trails.

The types of trails in the DOS standard are primarily divided according to the type of access they provide, using categories such as Corridor, Collector and Neighbourhood. This classification system takes a broader view of trails, and deliberately includes the widest range of users and types. To address the specific uses such as mountain biking and horseback riding they used a category called 'Specified Use', which served as a place holder of sorts. Under specified use, each use was described separately and had its own set of specific standards, regulations, etc.

This standard is a lengthy and very detailed resource that includes policy with respect to several other factors related to the trail experience user behavior (i.e. user code of conduct), regulations regarding dogs on trails, how to behave in bear country, rock climbing etiquette, horse etiquette, motorized use regulations, trials bike regulations, and mountain bike etiquette. It also outlines a process for obtaining municipal approval for special use of the trails, such as race events.

Squamish Lillooet Regional District (SLRD) Trail Standards

The SLRD Parks and Trails Coordinator oversees the construction and maintenance of the Sea to Sky Trail. To establish standards for construction and maintenance they use a combination of the Whistler standard and the IMBA (International Mountain Biking Association) guide for trail building.

In addition, the Village of Pemberton is a key partner in the SLRD's Pemberton and Area C Trails Master Plan. The Plan, adopted by the SLRD in 2009, includes a detailed overview and action plan for future trail development within the Village of Pemberton and Area C. The plan identifies recommended trail locations, specific to commuter routes or front country users (Valley Loop), as well as single track and alpine access trails. Each of the trails' status is identified and mapped.

Example of Standards from Other Jurisdictions

Portland, Oregon Trail Standards

The design philosophy of the Portland Trail Design Guidelines is that every trail requires four main goals to be considered: safety, connectivity, response to location, and diversity of users.

The range of trail types described includes everything from fully accessible, multi-use trails that are constructed to double as access routes for emergency vehicles such as fire trucks, to on street bike lanes, and technical single track mountain bike trails.

This is a very detailed set of standards that is an excellent resource for planning trails.

Recommendations for Pemberton

Given the range of trail types that already exist in Pemberton, and the similar challenges being faced in Pemberton as some of the other jurisdictions in terms of the variety of users, environmental constraints, safety and connectivity, it is recommended that Pemberton adopt a guideline for trail building standards, and that the Pemberton standard be a blend of the other standards discussed above. Developing appropriate standards will allow trail designers and builders to ensure that future trail work meets the needs of the community in a safe and consistent manner. It will also help planners and decision makers assess new proposed trails to determine their appropriateness.

The following section includes a 'Pemberton Matrix' that outlines the recommended classification system for trails, and provides general construction information such as tread widths, cleared widths and heights, and grades, and also suggests appropriate levels of amenities, lighting, and signage. The section also includes simple cross sections of each trail type as well as photos and examples from the local network and neighbouring trail networks.

General Guidelines

It is intended that the standards described in the following section will provide enough detail for planning purposes and general construction direction. They are not intended to be specific requirements for the actual construction of trails. Specific engineering or design requirement should be determined specifically for any proposed trail, and prepared by an appropriate, qualified professional.

When new trails are designed it is recommended that consideration be given to the different user groups that may use the trail, and that restrictions (such as one travel direction, or restricting use to specific user groups) be considered in certain cases where safety or trail erosion may be a concern. Examples of trail restrictions that could be considered on certain trails in Pemberton would include a downhill mountain bike trail where riders may be travelling at high speed and would have difficulty yielding to uphill users. For specific mountain bike trails it is recommended that trails be designed and constructed to the Whistler and IMBA standards with respect to specific construction details, Technical Trail Features (TTFs), and other elements as appropriate.

When new downhill mountain bike trails are constructed it is recommended that consideration be given to designing and building trails in a manner that minimizes erosion. The IMBA is an important resource when it comes to designing trails on hillsides. According to their website, *"in order to reduce or limit erosion caused by water, downhill mountain bike trails should be constructed in a sustainable manner according to the standards endorsed by IMBA for building sustainable contour trails. A contour trail is a path that gently traverses a hill or side slope. It is characterized by a gentle grade, undulations called grade reversals, and a tread that usually tilts or out-slopes slightly toward the outer edge. These features minimize tread erosion by allowing water to drain in a gentle, non-erosive manner called sheet flow. When water drains in thin, dispersed sheets, dirt stays where it belongs - on the trail. Basically, when designing downhill trails "do everything you can to keep the water off the tread, and users on it. Build on the contour and use frequent grade reversals - surf the hillside."*¹

Tips to Minimize Erosion (adapted from <http://www.imbacanada.com/resources/trail-building/designing-and-building-sustainable-trails>)

- **Avoid the Fall Line**
Fall-line trails typically follow the shortest route down a hill, which is unfortunately the same route that water flows. The problem with building trails on a fall-line is that they funnel water down their entire length. The rushing water strips the trail of soil, exposing roots, creating ruts, and damaging the environment.
- **Avoid Flat Areas**
Many trail builders are attracted to flat terrain given the initial ease of trail construction. However, if a trail is not located on a slope, there is potential for the trail to collect water. The trail bed must always be slightly higher than the ground on at least one side so that water can drain properly.

¹ IMBA, retrieved November 20, 2014 from <http://www.imbacanada.com/resources/trail-building/designing-and-building-sustainable-trails>

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Other resources that should be consulted for greater detail include the District of Squamish Trail Standards document and the Portland Trail Design Guidelines. The Squamish and Portland documents also include design guidelines for equestrian trails as well as trials motorcycles and cyclocross. All of these documents are valuable resources for trail design and construction.

Regarding wheelchair accessibility, Type 1 trails could be accessible provided the tread materials, grades and width meet provincial the appropriate provincial standards for accessibility. Other trail types may limit access due to varied tread materials, inadequate widths and steeper grades. On street bike lanes could be considered for one-way wheelchair use, in accordance with Ministry of Transportation standards and other provincial regulations.

All of the trail types could potentially be used as four season trails. Types I and II could be cleared of snow to provide year round access for walkers, joggers, strollers, etc. Alternatively, Types I and II may also be suitable for track setting cross country ski trails. Types III, IV and V would likely be better used as snow-shoe trails given their grades and narrower widths.

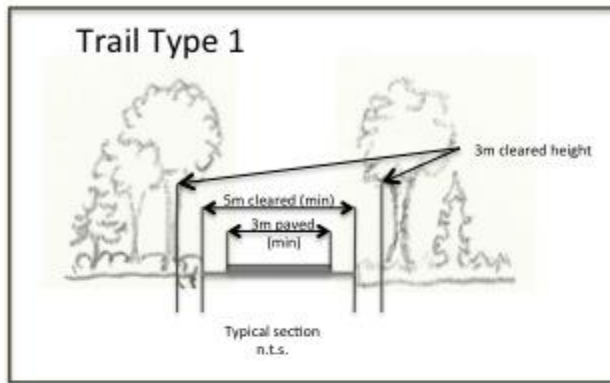
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The Pemberton Matrix

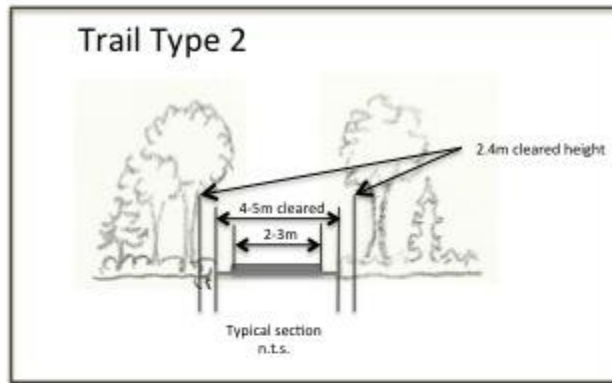
| | Type 1 | Type 2 | Type 3 | Type 4 | Type 5 | Type 6 |
|----------------------------------|--|--|---|--|---|--|
| General Use / Description | Multi-user, commuter trail | Multi-user, dyke top trails, Sea to Sky trail | Multi-user, neighbourhood trails | Single-user, or multi-user, recreational trails | Light, low impact users, recreational trails | On-street bike lane |
| Tread surface | Paved asphalt or chip-seal coat | Crushed limestone with fine well compacted gravel, or existing old roadbeds. Embedded obstacles removed from trail. Machine built. | Unsurfaced single track. May be machine built. Tread on native soil. | Unsurfaced single track, hand built. | Unsurfaced hand built. Low impact nature trail, wilderness trail | Asphalt |
| Tread width | Minimum 3m | 2-3m for double tracks, 1m for single track | 50 – 70cm | 30 – 50cm | 30 – 50cm | 1.5m each way |
| Clear width | Tread plus minimum 1m each side | 5m for double track, 1.6m for single track | 1.0 – 1.5m | 1.0m | Clear tread only. Avoid tread grubbing. | As per road construction standards |
| Clear height | 3m | 2.4m | 2.4m | 2.4m | 2.4m | As above |
| Maximum grade | 0-3% preferred, up to 5% as necessary for short sections | 0-3% preferred, up to 8% as necessary for short sections. | 0-15%, preferred up to 30 as necessary | As per specific use | As per terrain and specific use | As above |
| Lighting | pedestrian level lighting for evening commuting and night use | If appropriate | Not applicable | Not applicable | Not applicable | As above |
| Signage /Amenities | Trailhead signs, directional signs at intersections, map kiosks, benches, viewing areas, bear-proof garbage containers | Trailhead signs, directional signs at intersections. Map kiosks, benches, bear-proof garbage containers if appropriate | Trailhead signs, directional signs at intersections. Map Kiosk and bear-proof garbage container at trailhead if appropriate | Trailhead signs, directional signs at intersections. Map kiosk and bear-proof garbage containers at trailhead if appropriate | Trailhead signs. Minimal directional signs. Bear-proof garbage containers at trail head if appropriate. | Markers on surface in lane to indicate bike lane |

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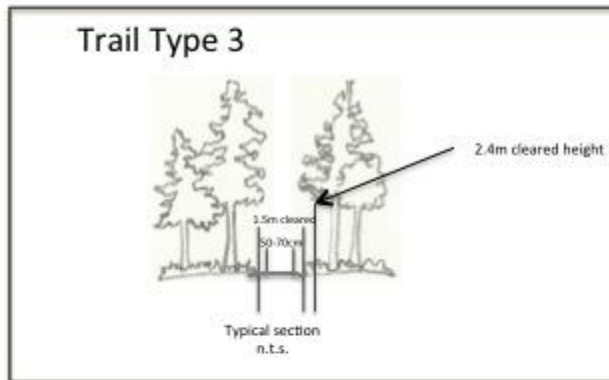


- Paved asphalt or chip-seal coat
- Minimum 3m tread width
- Minimum 1m clear on either side
- Prefer 0-3% grade
- Include pedestrian level lighting
- Directional signage and other amenities along route
- Should consider ensuring trail meets minimum provincial standards for manual or motorized wheelchairs
- Example: Valley Trail in Whistler

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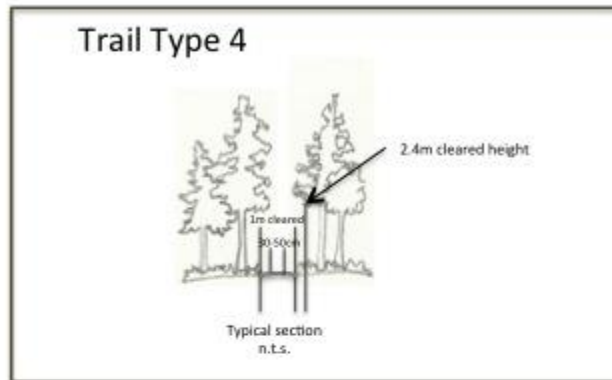
- Crushed limestone with fines, well compacted gravel or old road bed
- 2-3m tread width for double track, 1m for single track
- 1m clear on either side of tread
- vegetation cleared to 2.4m height
- 0-3% grade, up to 8% in limited sections
- pedestrian lighting if appropriate
- trailhead signs, directional signs
- examples: Nairn Falls Trail, Dyke-top trails



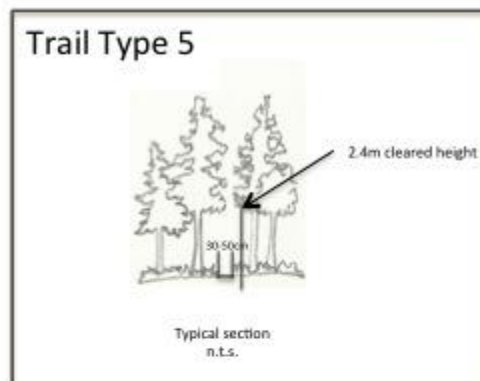
- Unsurfaced single track
- 50-70cm tread width
- 1.0-1.5m cleared
- vegetation cleared to 2.4m height
- 0-15% grade, up to 30% in limited sections
- no lighting
- trailhead signs, directional signs as required
- example: Rainbow Trail in Whistler



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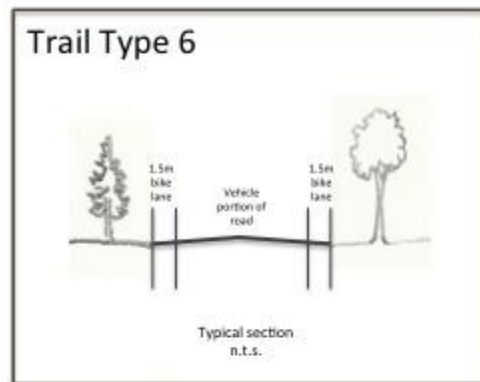


- Unsurfaced single track, hand built
- 30-50cm tread width
- 1m cleared
- vegetation cleared to 2.4m height
- grading as per specific use
- no lighting
- trailhead signs, directional signs as required
- Biking examples: Happy Trail, Dog Beach, Lumpy's Epic



- Unsurfaced single track, hand built
- 30-50cm tread width
- clear tread only, avoid tread grubbing
- vegetation cleared to 2.4m height
- grading as per specific use
- no lighting
- trailhead signs, directional signs if necessary
- examples: Waterfall trail, Tenquille Lake trail

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- On-street bike lane
- Asphalt surfacing
- 1.5m lane width each way
- Painted line separating vehicle portion of road from bicycle lane
- Markers painted in lane
- As per Ministry of Transportation standards and other provincial regulations



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Appendix A – Trail Inventory

| Area | Trail No. | Trail Name | Trail difficulty |
|-----------------|------------------|------------------------|-------------------------|
| Mosquito Lake | 1 | Econoline | blue |
| Mosquito Lake | 2 | Cream Puff | black |
| Mosquito Lake | 2a | Main Vein | black |
| Mosquito Lake | 3 | Grumpy Grouse | black |
| Mosquito Lake | 4 | Freak Boy | black |
| Mosquito Lake | 5 | Rock and Roll | blue |
| Mosquito Lake | 6 | Slingshot | black |
| Mosquito Lake | 7 | Strawberry Fields | blue |
| Mosquito Lake | 8 | Ramble On | blue |
| Mosquito Lake | 9 | Moby Dick | black |
| Mosquito Lake | 10 | Smell the Glove | blue |
| Mosquito Lake | 11 | Dark Forest | blue |
| Mosquito Lake | 12 | Mr. Rogers | blue |
| Mosquito Lake | 13 | Radio Tower | blue |
| Mosquito Lake | 14 | Mission Impossible | black |
| Mosquito Lake | 14a / 14b | Moosejah | black |
| Mosquito Lake | 15 | No Err | blue |
| Mosquito Lake | 16 | Meat Grinder | black |
| Mosquito Lake | 17 | Walker's End | blue |
| Mosquito Lake | 18 | Sadie's | green |
| Mosquito Lake | 19 | Lake Loop | blue |
| Mosquito Lake | 20 | Jim-Jam | blue |
| Mosquito Lake | 20a | Wolf's Trail | blue |
| Mosquito Lake | 21 | JK Traverse | blue |
| Mosquito Lake | 22 | Hand Job | blue |
| Mosquito Lake | 23 | Dead Birch | green |
| Mosquito Lake | 24 | Battery Park | black |
| Mosquito Lake | 25 | Log and Rock | blue |
| Mosquito Lake | 26 | Chair Traverse | blue |
| Mosquito Lake | 27 | Sphincter Rock | blue |
| Mosquito Lake | 28 | Scruffy's Bypass | blue |
| Mosquito Lake | 29 | Waterfall | blue |
| Mosquito Lake | 30 | Crosstown Traffic | blue |
| Mackenzie Basin | 31 | Bathtub Trail | green |
| Mackenzie Basin | 32 | TeePee Trail | green |
| Mackenzie Basin | 33 | Lower Happy Trail | blue |
| Mackenzie Basin | 34 | Waco Connector | blue |
| Mackenzie Basin | 35 | Nimby | blue |
| Mackenzie Basin | 36 | Blood, Sweat and Fear | black |
| Mackenzie Basin | 37 | Psychopath | black |
| Mackenzie Basin | 38 | Eight Seconds | double black |
| Mackenzie Basin | 39 | High Indy | black |
| Mackenzie Basin | 40 | Indy 500 | black |
| Mackenzie Basin | 41 | Hawaii | double black |
| Mackenzie Basin | 42a | Upper Mackenzie Cruise | double black |
| Mackenzie Basin | 42b | Lower Mackenzie Cruise | blue |
| Mackenzie Basin | 43 | Bob Gnarly | double black |
| Mackenzie Basin | 44 | Overnight Sensation | black |
| Mackenzie Basin | 44a | Hydro Cut | blue |
| Mackenzie Basin | 45 | Cop Killer | black |

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Appendix A – Trail Inventory

| Area | Trail No. | Trail Name | Trail difficulty |
|---------------------------|------------------|------------------------|-------------------------|
| Mackenzie Basin | 46 | Let It Go | black |
| Mackenzie Basin | 47 | Stimulus | black |
| Mackenzie Basin | 48 | Mackenzie Basin Loop | green |
| Mackenzie Basin | 49 | Middle Earth | blue |
| Mackenzie Basin | 50 | Gravitron | double black |
| Mackenzie Basin | 50a | Gravitrout | double black |
| Mackenzie Basin | 51 | Owl Connector | double black |
| Mackenzie Basin | 52 | Jack the Ripper | double black |
| Mackenzie Basin | 53 | Rusty Trombone | double black |
| Mackenzie Basin | 54 | Fifty | blue |
| Mackenzie Basin | 55 | Back Pains | blue |
| Mackenzie Basin | 56 | Shama | blue |
| Mackenzie Basin | 57 | Smoke-A-Howie | green |
| Pemberton Town and Valley | 60 | Valley Loop | green |
| Pemberton Town and Valley | 61 | Pemberton Creek Trail | green |
| Pemberton Town and Valley | 62 | Pemberton Creek Falls | black |
| Pemberton Town and Valley | 63 | Naylor's Trail | green |
| Pemberton Town and Valley | 64 | Log House Trail | green |
| Pemberton Town and Valley | 65 | Bob's Loop Horse Trail | green |
| Pemberton Town and Valley | 66 | Green River Horse Loop | green |
| One Mile Lake Area | 70 | One Mile Lake Loop | green |
| One Mile Lake Area | 71 | Sea to Sky Trail | green |
| One Mile Lake Area | 72 | Overhill | blue |
| One Mile Lake Area | 73 | Nairn/One Mile | blue |
| One Mile Lake Area | 74 | Lumpy's Epic | black |
| One Mile Lake Area | 75 | K2 | black |
| One Mile Lake Area | 76 | Tower of Power | black |
| One Mile Lake Area | 77 | Brake-away | blue |
| One Mile Lake Area | 78 | News Flash | blue |
| One Mile Lake Area | 79 | Fizzy Pop | blue |
| One Mile Lake Area | 80 | Dog Beach | black |
| One Mile Lake Area | 81 | Special K | black |
| One Mile Lake Area | 82 | Pioneer | black |
| One Mile Lake Area | 83 | Pickle Surprise | blue |
| One Mile Lake Area | 84 | 306 | double black |
| One Mile Lake Area | 86 | Tour do Soo | blue |
| One Mile Lake Area | 87 | Pacific | black |