

## Chapter 10 – Trail System Management



Trails play an integral role within the park and open space system. Trails are the most widely used recreational facility managed by the Parks and Community Services Department. They are used and supported by nearly 90% of Bellevue citizens. Trails provide non-motorized and recreational opportunities for walkers, bicyclists, joggers, hikers and birdwatchers. They are the string that physically connects parklands, neighborhoods, schools and businesses. Trails also provide staff access for maintenance and management of the parks and open space system. Bellevue's trails are designed and constructed in an environmentally sensitive manner to reduce soil compaction, erosion and runoff to protect sensitive areas from degradation.

Notes:

### 10.2 Definitions

**Compaction** – An increase in the density of something, through the act of crushing or compressing.

**Geotextile fabric** – A synthetic woven fabric used to reinforce and support surface materials and enhance drainage.

**Grade** – The degree of inclination of the trail surface, measured from ground/base level. Grade also relates to the degree of trail side slope.

**Trail** – Refers to a marked or beaten path, going through or connecting destinations.

Notes:

## 10.3 Background

Bellevue's trail program oversees trail planning and development, project management, development mitigation, workload planning and maintenance of over 80 miles of pedestrian, equestrian and multi-purpose trails located on park property and public easements. Attention to trail planning and design has resulted in a system of pathways which provides a spectrum of opportunities for different users.

Bellevue's trail system provides a physical link for citizens to value and appreciate the natural attributes of our open space and greenway system. Trails are constructed in a manner that minimizes the impact of human traffic in park natural areas and protects sensitive wildlife habitat while at the same time enhancing the visitor experience. Human contact with nature fosters citizen support for the overall goals and objectives of the City's park and open space plan and the natural resource management program.

### Trail Design and Construction

Trail construction is guided by park development standards that consider drainage, slope, width, clearing limits, surface material and habitat value. The use of geotextiles on trail surfaces and water diversion BMPs provides effective drainage, soil stabilization and weed control. Stair and boardwalk construction provides access through narrow corridors, over wet ground and on steep slopes with less impact than traditional trail structures. The following considerations are reviewed based on site conditions and constraints.

### Design Elements in Wetlands

Design and implementation of trails in a wetland environment requires consideration of certain risks associated with this type of sensitive area, such as:

- Water-quality impacts
- Sedimentation
- Introduction of toxins
- Increase in nutrient load
- Changes in pH, salinity and oxygen balance
- Increases in suspended and dissolved solids and turbidity

- Impediment of movement of storm waters (including soil compaction)
- Habitat impacts
- Fish and wildlife disturbances
- Aesthetic impacts
- Illicit access off developed trails (social trails)

Notes:

In order to minimize impacts from trails in a wetland:

- When possible, higher ground shall be chosen for trail location.
- Stream crossings shall be at a minimal, but if necessary, shall be done at 90 degree angles.
- Culverts or bridges, if necessary, shall be used in such a way that the existing drainage will not be altered and passage for fish and will not be affected.
- Culvert size is based upon maximum stream flow and site conditions.
- Streambanks and other sensitive areas will be minimally impacted, if at all.
- Geotextile fabric may be used in construction to increase the bearing strength of the trail, minimize fill requirements, disturbance and maintenance costs.
- Trail grades should range from 0 to 6% with a 3% or less side slope to ensure adequate drainage, minimize surface-water velocities and discourage rutting and erosion. Based on site conditions and site constraints, trails may be constructed with grades ranging from 15 to 20%. Steeper grades may require stairs to avoid erosion and other site impacts.

### Design Elements in Upland Park Sites

- Consideration shall be given regarding impact on neighboring properties, drainage, slope, width, clearing limits and surface materials for each individual park.
- If narrow corridors are present, stairs shall be considered.
- Steep slopes and wet areas shall be avoided, if possible, for trail development. If necessary, stairs and/or cantilevered boardwalks shall be utilized to decrease surface impact.
- Trail width shall be a minimum of 4 feet.
- Trails should follow slope contours to decrease disturbance as much as possible.
- Trail slope shall be based on site conditions and decided upon by site managers.

Notes:

- Trail grades should range from 0 to 6% with a 3% or less side slope to ensure adequate drainage, minimize surface-water velocities and discourage rutting and erosion. Based on site conditions and site constraints, trails may be constructed with grades ranging from 15 to 20%. Steeper grades may require stairs to avoid erosion and other site impacts.

### 10.4 Best Management Practices

#### Design Elements/Trail Surface - Bark Trails

- Prior to surfacing, trail shall be manually grubbed out taking care not to disturb surrounding vegetation. Any areas adjacent to trail where vegetation was removed or damaged shall be replanted with native species.
- Surface drainage techniques shall be utilized, such as:
  - Crowning
  - In-sloping and out-sloping at 3% or less grade
  - Culvert installation
  - Slope exposed gutters
  - Turn pike/ French drain systems
- Trails shall maintain a 2 foot minimum horizontal clearance to any obstruction.
- Trails shall maintain a 7 foot minimum vertical clearance from trail surface, across the horizontal clearance width.
- Side-slope shall be graded no greater than a 3:1 slope, and covered with Jute fabric and stapled. Grading shall be done so that accumulation of run-off does not collect at bottom of slope. A 2 ft. wide transition edge is required prior to start of side-slope. Where required, toe of slope exposed gutters are used to route trail water runoff to culverts.
- Geotextile fabric shall be laid between sub-grade and base course prior to surfacing, where needed. This is applicable to wetland sites and sites that have a soft base.
- Sub-grade shall consist of undisturbed native soil. Sub-grade shall never be compacted.
- Surface shall be grubbed to level trail grade to 3% or less to ensure trail drainage.
- Trail surfacing shall consist of medium fine bark applied to a depth of 4 inches and raked out smooth.

- If necessary, area adjacent to trail shall be re-planted, or properly landscaped with native shrub/tree/groundcover species.
- Trailheads will have developed signage, and if necessary, post and rail fence detail, and a native shrub/tree palette (see appendices for specific specs).

Notes:

## Design Elements/Trail Surface - Crushed Rock/Gravel Trails

- Prior to surfacing, trail shall be manually grubbed out taking care not to disturb surrounding vegetation. Any areas adjacent to trail where vegetation was removed or damaged shall be re-planted with native species.
- Surface drainage techniques shall be utilized, such as:
  - Crowning
  - In-sloping and out-sloping at a 2% grade
  - Culvert installation
  - Slope exposed gutters
  - Turn pike/ French drain systems
- Trails shall maintain a 2 foot minimum horizontal clearance to any obstruction.
- Trails shall maintain a 7 foot minimum vertical clearance from trail surface, across the horizontal clearance width.
- Side-slope shall be graded to a 3:1 slope when possible. Grading shall be done so that accumulation of run-off does not collect at bottom of slope.
- Geotextile fabric is not usually used in park rock/gravel trails.
- Sub-grade shall be 5/8 inch crushed rock, compacted to 95% density. Disturbed native soil subgrade should be compacted to 95% density.
- Surfacing base shall be 4 inches of 5/8 minus crushed rock. Trail surface shall be 2 inches of compacted 3/8 minus crushed rock.
- If necessary, area adjacent to trail shall be re-planted, or properly landscaped with native tree/shrub/groundcover species.
- Trailheads will have developed signage, and if necessary, post and rail fence detail, and a native shrub/tree palette (see appendices for specific specs).

Notes:

### **Design Elements/Trail Surface - Asphalt Trails**

- Prior to surfacing, trail shall be grubbed out by mechanical or manual means. Any areas adjacent to trail where vegetation was removed or damaged shall be replanted with native species.
- All hazard tree and tree limbs shall be removed from trail site.
- Subgrade shall consist of undisturbed native soil. If soil is disturbed, soil shall be compacted to 95% density.
- Geotextile fabric shall be laid between sub-grade and base course.
- Root barrier, if necessary, shall be installed prior to installation of asphalt. Root pruning, when necessary, shall be done by a certified arborist.
- Side-slope shall be graded to a 3:1 slope, when possible. Bottom of side-slope shall be graded to prevent accumulation of run-off.
- Trail surface slope shall be a maximum of 3%. Edges shall be thickened to 6 inches deep by 10 inches wide for erosion protection.
- Trees shall be maintained for a 7 foot vertical clearance from trail surface, across the horizontal clearance width. Equestrian trails shall be maintained for a vertical clearance of 10 feet.
- Asphalt top course shall be class "B" asphalt with a minimum of 2.5 inches, and a maximum of 4 inches thick.
- Base course shall be 5/8 inch minus crushed rock, compacted to 95% density, and a minimum of 4 inches thick.
- Trail width shall be between 4-14 feet, depending on site conditions and designed functionality. Wider trails are not usually installed in Bellevue parks, but consideration will be made if necessary.
- If necessary, area adjacent to trail shall be re-planted with native tree/shrub/groundcover species. If trail crosses a turf area, disturbed turf shall be replaced.
- Trailheads will have developed signage, and if necessary, treated post and rail fence detail, and a native shrub/tree palette (see appendices for specific specs).

### **Design Elements/Trail Structures - Stairs**

- Wood materials will be used that are shown not to leach hazardous materials, and will be ACQ/CBA pressure treated.
- All wood shall be of HEM-FIR #2 grade or better.

- Stair planks shall be ACQ/CBA pressure treated wood, 4" wide and 8" thick. Length is determined by site conditions.
- #4 Rebar- 3 ft. - will be used for stability and placement.
- Overlap of stairs shall be 4 inches, making each step 1 foot wide, consisting of 2 planks.
- Stairs shall be placed on stable subgrade.
- Landings shall be composed of fill with 3/8" minus crushed rock, compacted by hand. Railings will be used if edge is 30 inches or greater from grade, or is deemed necessary. Railings shall be installed on right hand side heading upstairs.

Notes:

## 10.5 Integrated Pest Management

### Weed Control

- Weeds are generally tolerated on park trails, until they interfere with trail function. Mechanical methods such as mowing, hula hoeing or resurfacing shall be employed first.
- Approved herbicides shall be used to remove weed species from trail surfaces that cannot be controlled through cultural or mechanical methods.
- On wetland trails, herbicides will only be considered as a last resort.

### Insect Control

- Insects are tolerated on trail areas. Only insects that cause a health risk will be controlled, and shall be done so by the Department of Health.
- Approved insecticides will be used to remove pests such as hornets and wasps, and only individual nests will be treated.

## 10.6 Training

All maintenance crew members are trained in proper trail planning, design, construction and maintenance. Crew members and staff are also trained certified pesticide applicators and certified arborists.

