Bend Area General Plan

Chapter 10: Natural Forces

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Amended February 6, 2002 – Ordinance NS-1819

PREAMBLE

The natural forces that have formed the physical environment of the Bend Urban Area continue to provide the area with many benefits: a moderate climate, clean air and water, plentiful stream flows and ground water, and natural energy resources from the sun, water, and geothermal energy. The Plan and related ordinances shall reflect the interest of the community to retain and enhance the quality and availability of these resources.

GOALS

Natural forces such as the quality of the air, the energy of the sun, and the power smoldering deep under the lava flows are characteristic of Central Oregon. The local governments and community residents must work together to ensure these natural forces are not diminished. In support of this effort the Plan has the following goals:

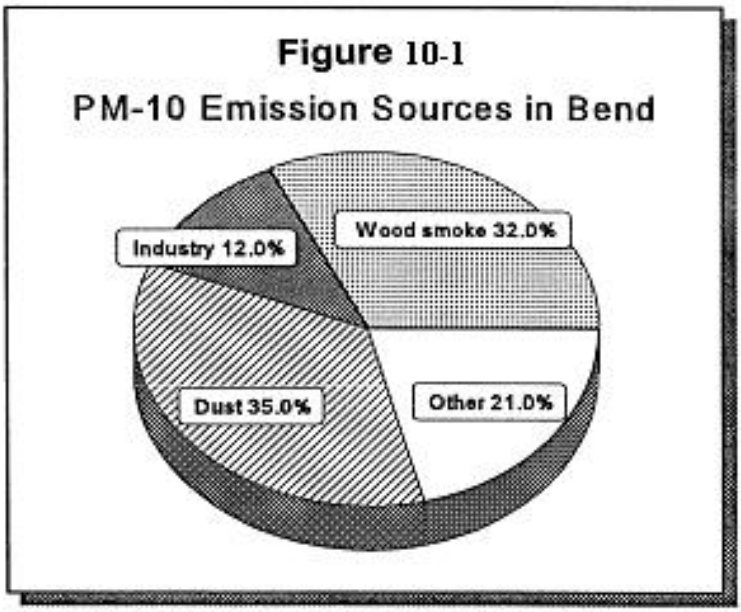
- to maintain or improve the air quality for a healthful and desirable urban environment;
- to encourage energy conservation and the development of energy producing facilities that use renewable resources; and
- to work with state and federal agencies to develop new, more accurate mapping data on flood plains, faults, and other local natural hazards within the urban areas.

OVERVIEW

This final chapter in the Bend Area General Plan provides discussion and data on natural forces — air quality, energy sources and conservation, and potential hazards such as flooding and land faults. Land use planning can have some influence on how future development impacts these natural forces. However, the effect of these forces on the growth and livability of the urban area is equally likely to be driven by factors that are beyond the physical and political control of the city or county.

AIR QUALITY

Maintaining and improving the air quality in the area is an important part of keeping Bend a desirable place to live. Bend is fortunate that local governments, citizens' groups, and the Oregon Department of Environmental Quality are working together to ensure that Central Oregon's sky remains blue and clear, and our citizens remain healthy without concerns of air pollution. Policies at the end of this chapter provide direction for local actions to reduce air pollution.



Source: Oregon Department of Environmental Quality

Both the federal and state government establish air quality standards for various pollutants, and may impose strict and costly control measures for communities that exceed the standards. In Bend, the two air pollutants that are of concern and monitored on a regular basis are carbon monoxide (CO) and very small particulate matter (PM10). Automobile exhaust and other incomplete combustion are typical sources of CO production. Bend has exceeded the CO standards twice since 1987, and both occurrences were in 1987.

A variety of materials such as wind-blown dust, field and slash burning, wood stove smoke, and road cinders used for winter sanding can produce fine particles that fall into the PM10 air pollution category. Figure 43 shows PM10 emission sources measured during the winter of 1994-5. The PM10 air quality standard has been exceeded twice since 1987, most recently in the winter of 1996. A new particular matter standard is being established by the Federal Environmental Protection Agency. The impact of this new standard on Bend is unknown at this time.

Although the few occurrences of exceeding these two air quality standards have *not* been of sufficient frequency to have Bend designated as an air quality "non-attainment area," the forecast of significant population and economic growth for Bend and Deschutes County increases concerns about Bend's ability to maintain compliance with the air quality standards.

In 1989, a group of citizens sharing a concern for Bend's air quality started a true "grass-roots" effort to ensure that Bend's air would remain clean and healthy. This group, known as the Bend

Clean Air Committee, consists of individuals that represent local, state, and federal government agencies, the scientific community, the medical community, industry, environmental groups, and concerned citizens. Since its beginning, the Bend Clean Air Committee has been very proactive and its efforts have included:

- conducting several surveys to gauge public awareness of air quality issues;
- sponsoring city ordinances restricting open burning and requiring replacement of non-certified wood stoves upon sale of homes;
- conducting educational campaigns;
- maintaining a wood stove burning advisory program during the winter using billboards, banners, public service announcements, and telephone hotlines; and
- giving an annual clean air award recognizing individuals and groups whose actions contribute to preserving and improving air quality.

The existence of the Bend Clean Air Committee was a factor in the federal government's $100,000 grant in 1994 to the Oregon Department of Environmental Quality, the City of Bend, and the Bend Clean Air Committee. The grant paid for monitoring carbon monoxide and particulate pollutant levels in Bend and for developing strategies to maintain compliance with the national air quality standards. Additional information on meteorological conditions in Bend and air quality standards is in two General Plan resource documents titled *Goal 6: Air, Water, and Land Resources Quality* and the *Bend Air Quality Project Phase II Work Plan*.

NOISE RELATED ISSUES

Noise emissions come from many different sources. Many noises are inherent within different areas of a community. However, excessive noise can be detrimental to the health, safety and welfare of Bend's citizens. Excessive noise can also cause deterioration of the quality of life within a given area of a community.

The State sets forth rules and policy for regulating noise. These rules quantify acceptable types and thresholds of noise. However, the State no longer enforces these rules and relies on the local governments for enforcement. Section 5.385 of the Bend Code; was adopted by the City of Bend pursuant to the provisions of State statute ORS 467.100. This code specifically identifies and defines different noises that are considered to be loud and raucous. These noises are prohibited within the City. For other noise emissions not identified by the Bend Code, the City coordinates with the local DEQ staff and the ORS as a resource. The City Police Services Department assists in the actual enforcement of noise complaints.

[Added by Ord NS-1819, adopted 2/6/02]

ENERGY CONSERVATION

The efficient use of energy saves the consumer money, and reduces the need for developing new (and often more expensive) sources of energy. This element addresses energy conservation through a variety of land use planning and construction practices.

While no known sites that have a potential for oil, gas or geothermal resource development exist in the area, there are two hydroelectric sites within Bend. As early as 1910, a small hydroelectric dam was constructed on the Deschutes near downtown to generate power for the growing community. This facility is still in use today. In 1985 the Central Oregon

Irrigation District built a hydroelectric facility using water from its irrigation flume along the river to power a small generating plant that is tucked into the hillside opposite Mt. Bachelor Village. In addition, there is still potential for heating and power from locally generated wood wastes, such as slash and mill trimmings. As noted earlier in the Air Quality section, Bend has an active program to upgrade wood stoves for more efficient use of the resource and to maintain air quality in the area.

The large number of sunny days makes this area particularly suitable for solar power, both passive and active systems. During the summer, 300-350 British Thermal Units (BTUs) of sunlight energy are delivered to each square foot of land in the area, but this level declines to 175-200 BTUs during the winter. Bend was one of the first cities in the state to adopt “solar access” ordinances to provide good solar access during the winter solar heating hours so that homeowners can incorporate passive or active solar systems into their homes.

The Bend area is fortunate to have some potential energy sources. However, the expanding population will continue to test the ability of energy suppliers to meet increasing demand. All available resources will have to be evaluated, used, and made compatible with the economic, social, and environmental goals of the local and regional population. No single answer exists, but a reasonable combination will have to be found. In the meantime, local planning efforts must be aimed at promoting greater efficiency in the use of existing energy resources, and in protecting and developing those resources we will need in the future.

NATURAL HAZARDS

Official flood hazard maps for the Bend area and Deschutes County are published by the Federal Emergency Management Agency (FEMA). The flood hazard area within Bend is within or adjacent to the banks of the Deschutes River. During the winter of 1996-97 the high water level in some parts of the urban area exceeded the 100-year flood boundary as mapped by FEMA. The city has requested that FEMA re-evaluate the 100-year flood plain within the

urban

area and adjust their maps as necessary.

The Oregon Department of Geology and Mineral Industries has mapped some faults within the urban area. More information is needed on the type and extent of these faults.

STEEP SLOPES

Development on hillsides demands special considerations for site preparation, access, and utility placement. In planning and engineering, slopes are typically described as a percentage figure, which is a measurement of the change in elevation divided by distance. For example, if a lot has a 15 foot change in elevation over a 100-foot distance, the slope would be 15 percent (15/100). As a comparison, the maximum slope or grade on interstate freeways is 6 percent.

Several factors such as rainfall levels, vegetation cover, soil depth and base material affect the stability of slopes. However, it is generally true that as slopes increase in steepness, there is a corresponding increase in the impacts on the natural conditions on the slopes and in the difficulty of construction. A typical or general range describing slopes and the corresponding level of concern are:

Percent Slope	Level of Impact on Environment / Design and Construction Concern
0 - 10%	Slight
11%-25%	Moderate
26%-35%	Severe
35% and above	Extreme

Although the Bend urban area is generally on a plateau at the base of the Cascade Mountains, there are a few areas that have moderate to steep slopes. Awbrey Butte, Pilot Butte, Overturf Butte, areas along fault scarps, and some areas along the river canyon in the south and north part of the urban area have slopes of 15 percent and more.

There are several possible impacts associated with construction and road building on slopes:

- **Disruption of natural landform and drainage patterns**. Even when a road follows the contour around a hill there is a need to cut into the hill on the high side and fill on the down slope side to create a level surface. As the slope percent increases, more cutting of the hill on the high side and more filling on the low side to is needed to create a level travel way or building site.

Most high desert soils are loose and powdery, and only a few inches thick. A major side effect of the cut and fill activity needed for road and building construction is the increased possibility of soil erosion. The impacts here are twofold. First, when native grasses, shrubs, trees and other vegetation that hold the soils on steep slopes are removed, there is greater exposure of soil and rock that is subject to wind and water erosion. In addition to erosion, slopes without vegetation are more likely to suffer slumping and sliding. Second, the amount of cut and fill areas, and the modifications to drainage patterns created by streets, driveways, sidewalks, and utility routes, can all create erosion problems and/or the degradation of the exposed rock through winter freeze and thaw cycles.

- **Public safety**. If a road, sidewalk, or other transportation route goes up the hill across the contours, then the steepness of the route can make it difficult for emergency vehicle access any time, and especially hazardous for any type of vehicle or pedestrian movement during winter conditions. Also, the increased impact on drainage and soil movement concerns with steeper slopes can create slumps, breaks or other problems with streets, sidewalks, trails, water and sewer lines, and other utilities.

- **Visual impact**. Because the buttes and other sites with steep slopes can be seen from many parts of the urban area, there is interest in designing developments that minimize the amount disruption to the natural conditions. The Awbrey Butte Master Plan, which covers several hundred acres of steep slopes on the most prominent butte in town, includes street and site development standards to reduce the visual impact of development.

  There are several construction and subdivision design measures that can be applied to steep slopes to reduce the potential adverse impacts from development. Such measures include, but are not limited to:
  - larger lots to reduce the number of building sites and corresponding disruption of the natural contour and vegetation;
  - using narrower right-of-way, pavement widths, and “hammer-head” street ends rather than cul-de-sac bulbs to reduce road cut and fills;
  - taking access off alleys on the uphill side of a street to reduce driveway cuts into the hillside;
  - placing sidewalks at the curb, or having only one sidewalk along the street to reduce the cross-slope cut and fills;
  - adjusting the building setback from property lines to minimize building site cuts and fills;
  - regulating the amount of vegetation cleared off a hillside lot;
  - requiring temporary use of hay bales, diversion dams, or other physical changes to control storm runoff during road and site construction; and
  - setting maximum grade or slopes on public streets and pedestrian corridors.

Additional information, measures, and policies on street construction on steep slopes are included in Chapter 7, *Transportation Systems*.

POLICIES

Air quality

1. The city shall encourage DEQ to perform more thorough monitoring of the air quality of the Bend Area, and shall work with DEQ to ensure that state and federal ambient air quality standards shall not be exceeded.

2. The city, county and state shall continue to work towards improving circulation and traffic flow through the city in order to reduce carbon monoxide levels.

3. The city shall regulate open burning, wood stove installations, and consider other measures to improve air quality within the urban area.

4. The city will cooperate with DEQ in continuing to monitor industrial emissions.

5. The city shall review land-use development in the Bend Urban Area as to its potential air quality impact on Class I areas within a 20-mile radius.

6. The city and county shall develop a plan and program to mitigate any air quality problems, before the city gets out of compliance with air quality standards.

7. The city shall support local citizen organizations in their efforts to improve the air quality in Bend.

8. The city and county shall develop a plan to mitigate the adverse air impacts of sanding roadways during winter weather.

9. The City, in cooperation with State and local agencies and volunteer special interest groups, shall consider a long range strategy for improving air quality to address issues such as the reduction of air toxins, haze, and air particulate. At a minimum, the strategy shall include:
   - ❑ Provide prior notice to DEQ of pending land use development that might be a new source of air pollution.
   - ❑ Require that all new development comply with any applicable state or federal air quality standards as part of the land use application process.
   - ❑ Develop a “covered load” ordinance for construction, development, sand & gravel and debris hauling within the city limits.

Noise Control

1. The city shall coordinate with the DEQ as a resource regarding noise related issues and will require any applicable state or federal noise standards to be met as part of individual land use applications

Energy conservation

1. The use of alternative energy sources should be encouraged.

2. Any energy producing projects shall be consistent with the community's wildlife, recreation, open space, and scenic resource values.

Natural hazards

1. The city shall continue to apply their Flood Plain zoning regulations along the Deschutes River and Tumalo Creek based on the best available data.

2. The city shall encourage the Oregon Department of Geology and Mineral Industries to complete an assessment of faults in the Bend area.

3. The city shall review the construction plans for buildings that are proposed to be built across or along identified fault lines.

Steep slopes

1. The city shall require development on slopes in excess of 10 percent to employ measures to minimize the hillside cuts and fills for streets and driveways.

2. The location and design of streets, structures and other development features on slopes in excess of 10 percent shall give full consideration to the natural contours, drainage patterns, and vegetative features of the site to protect against temporary and long-term erosion.

3. In areas where the natural slope exceeds 20 percent, the city may reduce the minimum residential density (allow larger lots) or alternatively, may require cluster development through the PUD process to preserve the natural topography and vegetation, and improve fire protection.