

PHYSICAL FEATURES

Physical features ó soils, topography, and floodplains ó play a significant role in land use planning. Virtually every development which takes place is affected by the natural environment, which in turn affects our social and economic environments. Planning with these elements in mind is essential to the orderly and best use of the land. If one pays little heed to the characteristics of the community's physical make-up, unwise land uses may cause physical, social and economic hardships.

Geology and Soils

Pipestone County lies on the western slope of the Coteau des Prairies, a stretch of elevated prairie country nearly 200 miles in length. The western slope of the Coteau is about fifty miles in width and comprises all of Pipestone County. The contour of the surface of Pipestone County is the result of glacial activity. The major material at the surface is glacial till, a non-stratified sediment deposited by the Wisconsin glacier 10,000 years ago. Most of this till has been covered by loess, fine particles of glacial outwash sediments that were blown off the flood plains and stream terraces along the valley of the Big Sioux River. This material has a silty clay loam texture and does not have the stones and pebbles that are common in glacial till. The deposition of loess tended to smooth and fill in valleys in the surface of the glacial ground moraine.

The elevation of Pipestone County is among the highest in Minnesota. The highest area in the County is approximately 1950 feet above sea level. This area is found along the Bemis moraine, a ridge that crosses the northeastern part of the County from northwest to southeast. From the top of the Bemis moraine to the southwestern corner of the County, the elevation drops approximately 325 feet in about 25 miles. The gradual descent is due to the elevation of the underlying Sioux quartzite bedrock. The crest of the Bemis moraine forms the divide between the Mississippi and Missouri River basins.

The *Soil Survey of Pipestone County* conducted by the United States Department of Agriculture Soil Conservation Service (1971) contains an index to suitability of soils for selected land uses. The "Engineering Interpretations of the Soils" indicated suitability in degrees of hazards or limitations ó Slight, Moderate or Severe, and one or more of the limiting soil characteristics or qualities are cited. A severe limitation does not mean that the soil is excluded from a specific land use. It does indicate that these limitations require more inputs or modifications to overcome hazards for some land uses.

In selecting a site for a particular use, the soil limitation rating given a kind of soil, while important, is only one of the criteria a user considers. Location, land values, aesthetic values etc., are examples of other criteria. In some circumstances, soil limitations can be modified or removed so that the soil can be used safely for the desired use. For this reason, some soil types rated as severe should not be regarded as entirely unusable. This is especially important when ideal soils are scarce.

The Pipestone County Soils Table contains selected information useful for planning the construction of local roads, streets, foundations, excavations, sanitary landfills, sewage lagoons, and sewage systems. Detrimental or undesirable features are emphasized. The ratings and other interpretations in this table are based on estimated engineering properties of the soils, on available test data, and on field experience. The information is reasonably reliable to depths of about 5 feet.

More detailed information on the Engineering tables can be found in the *Pipestone County Soil Survey*.

Soils identified in the Survey as "Severe 6 Dwellings with Basement" refers to foundations for single family dwellings and other buildings with similar foundation requirements. While the main emphasis is on evaluation for foundations, other features affecting these sites are also considered. These include slope gradients, flooding and seasonal wetness, and depth to bedrock and gravel. The properties affecting foundation include sheer strength, bearing capacity, shrink-swell, plasticity and density. The areas marked in red are areas that should be avoided if possible for residential type construction activity. If construction in these areas occur due to various social and utility oriented factors, then special efforts must be made to overcome problems with these soils. Such efforts would be heavily reinforced basement walls, gravel backfill around basements, sump pump drainage tile, etc. The importance of sensitivity to soils cannot be overlooked due to the effect the soils will have over time on structures.

Soils labeled "Severe 6 Dwellings with Septic Tanks" indicated the problems for individual sewage disposal using a subsurface treatment system. Predominant features affecting the rate and uniformity of distribution of effluent are permeability of soil, depth of bedrock, seasonal flooding and annual high ground water, and soil slopes. Most of the problems experienced in our study area involve permeability of the heavy clay loam soils, and the seasonal high water table. Both of these will affect septic tank systems, and there is little that can be done to alter these limitations. Therefore, these areas should be avoided for residential development that would require septic tank sewage disposal.

Soils labeled "Severe 6 High Water Table" indicated those soils that possess seasonal and annual ground water level problems. These areas possess the greatest difficulty for residential dwellings with basements. Also combined with this is the problems experienced with wetness of yards, poor drainage, and inflow into utilities such as sanitary sewer. These areas should be looked at closely due to the amount of modification to construction structures, etc., necessary to overcome water problems.

Topography

The topography of an area has particular implications for site development; the topography itself sometimes determines a plan. The gradient of paths, the flow of utilities, the use of areas, disposition of buildings, and the visual aspect are all affected by topography.

The form of an area is critical to how it may be used. Ground slope is one of the more aspects of the topography, since land use and service maintenance are dependent on it. This relationship will vary according to the pattern of activity, but the following is a general classification worth remembering. Slopes under 4 percent seem flat and are usable for all kinds of intense activity. Slopes between 4 and 10 percent appear as easy grades, suitable for informal movement and activity. Slopes over 10 percent seem steep and can be actively used only for hill sports or free play. Pipestone possesses topography between 2 and 5 percent, relatively flat and useful for nearly all land uses.

Slope also has a bearing on drainage, erosion, and maintenance. Slopes under 1 percent do not drain well unless they are paved and carefully finished. The steeper the land and the more impervious its soil, the more the rain will run off its surface instead of seeping into the ground. This means a liability to erosion and the flooding of surface channels.

As mentioned in the earlier section on Geology and Soils, Pipestone possesses tight soils, and penetration of soils by moisture is limited in certain places in the study area. There are several surface drainage channels, Pipestone Creek, and the intermittent stream South Branch Pipestone Creek in the west section of the City. These channels become flooded easily due to the flat terrain and lack of slope in the creek bed. These areas will be discussed later in the land use section.

Another critical aspect of a ground form is the way in which it limits circulation by means of roads and gravity-powered utilities such as sewers. Here, concern is not only with local slopes but with the way in which the total system of slopes allows continuous lines of suitable grade to be connected.

The topography of the Pipestone area indicated several areas as being flood prone or experiencing standing water during heavy precipitation. The flood prone areas have been so designated from hydrology studies, previous flood records and topography, as areas having flood waters or high water at various flood stage periods. Conditions of water runoff, septic tank drainage and soil stability are areas that must be observed if potential development seeks to locate in such areas.

Floodplains

Floodplains provide a buffer between waterways and other land uses. Development within floodplains is known to be disastrous during times of rapid snow melt and heavy rains. Generally, development within floodplains should be limited to uses that would receive the least amount of damage during periods of flooding.

Typically, frozen and saturated ground, rapid snow melt, and heavy rain, lead to seasonal and flash flooding in this region. Principle flood hazards are related to ice accumulations at bridges and overbank flow, where velocities are relatively low. Flooding in the City of Pipestone is primarily caused by snow melt and intense rainfall. The flat topography of the areas east and north of the City makes them flood prone. Generally, some flooding will occur each spring.

Many areas experience flooding as a result of trapped drainage and backup of floodwater along small drainage-ways.

According to the Federal Emergency Management Agency (FEMA) , flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. FEMA maps floodways and flood plainsö to help determine risk of flood events. The City of Pipestone participates in FEMA's National Flood Insurance Program (NFIP). The current Flood Insurance Rate Map (FIRM) went into effect in 1991.

FEMA's term "100-year floodplain" represents the long-term average floods of a specific magnitude. It is possible that rare floods could occur at shorter intervals or even within the same year. A 100-year flood has a 1% chance of being equaled or exceeded during any year. A 500-year flood has a 0.2% chance of being equaled or exceeded in any given year. FEMA is currently undertaking a national multi-year effort to update Flood Insurance Rate Maps (FIRMs) in digital format; however, no update activity is scheduled for Pipestone currently.

Current land use found within the 100- and 500-year floodplain boundaries include agriculture, single and multi family residential, mobile home residential, and highway business districts. The City's adopted Floodplain Ordinance was reviewed in 2007. Flooding is a severe hazard to the public that can be prevented, or at least mitigated. This can be accomplished by eliminating or reducing the hazard, removing or decreasing population and property threatened by the hazard, or a combination of both.

No further development should be allowed in floodplains, and measures should be taken to reduce the incidence of flooding within the mapped floodplains and other areas which experience flooding.