Guide to

Developing Naturally

in North Central Texas

A companion guidebook to the DEVELOP-NATURALLY! brochure

DEVELOP -

NATURALLY!

Produced by the North Central Texas Council of Governments in cooperation with Regional Storm Water Management Program participants

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The *Guide to Developing Naturally* is the companion guidebook to the *Develop – Naturally!* brochure. The brochure and guide were produced by the North Central Texas Council of Governments in cooperation with Regional Storm Water Management Program participants.

The documents are available at no charge from most North Texas cities and counties or from the North Central Texas Council of Governments. They can be downloaded from the NCTCOG Storm Water web site at www.dfwstormwater.com, or you can request copies by calling 817-695-9210.

North Central Texas Council of Governments
March 2001

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Why develop naturally?
Over the last several years, a number of issues have arisen concerning where and how we develop. Many of these issues have grown out of a dissatisfaction with the predominant pattern of development that has occurred over the last fifty or so years. Nearly total dependence on the automobile for travel has resulted in traffic jams and air pollution. Universal designs for discount stores and fast food restaurants have eliminated local or regional character. Neighborhoods lack a sense of community. Open spaces vanish as suburbs spread farther out into fields and woodlands. Natural streams are channelized when increased runoff from development exceeds the capacity of the natural drainage features. Pollutants from parking lots, roads, and lawns are washed into streams and lakes by storm water runoff.

Who's concerned about the problems?
Increasingly, residents and regulators alike are trying to seek out alternatives to a form of development that has exhibited many shortcomings. Sustainable Development, Smart Growth, New Urbanism, Traditional Neighborhood Development, and Transit-Oriented Development are some of the initiatives that are being promoted nationally in response to what many view as a serious concern. State and federal environmental regulatory agencies are imposing strict requirements to improve air quality and threatening sanctions that include withholding transportation funding in regions that violate Clean Air Standards. Water quality regulations are being expanded to include storm water runoff from small and medium sized cities in urbanized areas in addition to the larger cities, which have been regulated for some time. Phase I and Phase II storm water regulations require cities and counties to modify development practices in their jurisdictions to reduce pollution in runoff from developed areas.

What changes need to be made?
Principles associated with the various progressive development initiatives and regulations differ somewhat, but most share a number of guidelines, either as central components or peripheral elements. Land and infrastructure should be used efficiently and provide for alternatives to automobile travel. This generally entails building at higher density (on average) within or adjacent to areas with existing infrastructure. Shops, offices, residences, and schools should be located near to each other to promote walking, biking, or transit usage. Developments should be designed and oriented to pedestrians, rather than the automobile. Narrower streets, windows or porches facing the street, sidewalk amenities, landscaping, and detailed building designs all serve to create an inviting, human-scale atmosphere.

What about neighborhoods?
Residential developments should include amenities such as open space, parks, natural areas and be designed to promote walking or biking. Environmentally sensitive or valuable features such as streams and wetlands should be protected and a natural buffer maintained. Removal of mature trees should be minimized and they should be adequately protected during construction. Neighborhoods should be designed at a human scale with reduced setbacks and narrower streets to encourage interaction between neighbors and make the street pedestrian-friendly. Small, community-oriented commercial areas that provide services such as groceries, dry cleaning, boutiques, and restaurants should be located within walking or biking distance.

What does the consumer want?
Surveys of homebuyer preferences demonstrate widespread support for many of the features outlined. A recent national survey exploring the values of homebuyers determined that a majority rated the following amenities as "extremely important:" [1]

Natural, open space	77%	Clustered retail stores	55%
Walking and biking paths	74%	Wilderness areas	52%
Gardens with native plants	56%	Interesting little parks	50%

In the commercial arena, new town centers and "lifestyle shopping centers" that feature mixed uses such as hotel, office, entertainment, retail, and housing are becoming increasingly popular. Addison Circle in Addison, Legacy Town Center in Plano, and North Richland Hills Town Center in North Richland Hills are local examples of this new trend in development.

Are there advantages for developers?
Fortunately, these design techniques offer benefits to developers as well as to residents and the environment. Developments that incorporate these features will command premium prices and attract buyers. One study found that residents are willing to pay an average premium of 11% to live in neighborhoods that are designed to be walkable and compact, with high quality public spaces and a mix of uses.[2] In addition, many of the most popular amenities are relatively inexpensive for the developer to provide.

Density bonuses offered by cities in return for land set aside as open space can offset the reduction in area that would have otherwise been built upon, resulting in no net loss or only minimal loss of building lots. In addition, by constructing more compact neighborhoods with narrower streets and by incorporating other design features, costs for roads and storm drain systems can be reduced substantially.

Take a serious look at the ***Ten Keys to Developing Naturally*** and see how they can help you meet your objectives and improve our environment. Naturally North Central Texas is going to develop -- so let's do it *naturally!*

[1] *1999 Community Preferences: What the Buyers Really Want in Design, Features, and Amenities*, Intercommunications, Inc., 1999.
[2] *Valuing the New Urbanism: The Impact of the New Urbanism on Prices of Single-Family Homes*, Urban Land Institute, 1999.

Ten Keys to Developing Naturally

Key 1: Maintain existing terrain

By maintaining the existing terrain of the land to the greatest extent practical, rather than regrading the property, many objectives are achieved. More of the native vegetation, including stands of mature trees can be preserved. The capacity of the soil to infiltrate storm water is maintained if it is not compacted by construction traffic. Minimizing the area disturbed during construction results in less soil erosion and less sediment entering streams. Natural drainage systems can be utilized and integrated into the comprehensive storm water management system, helping to maintain predevelopment runoff conditions.

Recommendations

- Limit clearing and grading to the minimum required to install the infrastructure and buildings
- Clear individual building lots immediately prior to building construction
- Maintain existing natural topography and drainage patterns
- Preserve and protect as many trees as possible
- Avoid clearing and grading of areas with permeable soils

Key 2: Minimize impervious surfaces

Impervious surfaces include roads, parking lots, driveways, and rooftops. These surfaces do not allow any infiltration of storm water into the soil. All rainfall that lands on impervious surfaces becomes runoff, which can pick up pollutants on the way to the nearest stream or lake. The extra quantity of water that runs off of impervious surfaces causes streambank erosion and habitat degradation and may also result in downstream flooding.

Excessively wide roads and oversized parking lots also detract from the aesthetic value of neighborhoods and commercial centers. Wide residential streets result in higher traffic speeds, creating dangerous conflicts between cars and residents, particularly children. Cul-de-sacs with their large turn around circles generate lots of storm water and reduce the connectivity of the street network.

Recommendations

- Based on traffic volume, design streets for the minimum required pavement width needed to support travel lanes, on-street parking, and emergency vehicle access
- Incorporate sunken landscaped islands in the middle of cul-de-sac turnarounds
- Minimize street length by concentrating development in the least sensitive areas
- Reduce parking lot size by lowering the number of parking spaces and by sharing parking among adjacent businesses
- Use pavers or porous pavement in parking overflow areas
- Reduce the rooftop area of buildings by constructing multiple level structures where feasible

Key 3: Build in the least sensitive areas

By building in the least sensitive areas, direct impacts from construction activities on ecologically valuable features are avoided. Locating buildings and infrastructure away from streams or lakes also provides an opportunity to control storm water runoff from the completed development and thereby minimize impacts, both in terms of the amount of runoff and the pollutants carried by the runoff. Areas that should be preserved include wetlands, floodplains, buffer areas adjacent to streams and lakes, native prairies, and stands of mature trees. In addition, areas with highly permeable soils should be considered for preservation to allow for infiltration of storm water.

Concentrating development in the least environmentally sensitive areas of the property allows natural areas to be maintained as open space. Building at higher density in the portion that is developed can result in minimal loss of building lots compared to conventional subdivision layouts. Consumers are accepting of smaller lot sizes if the development is well designed and open space and recreation amenities (walking and biking trails, small parks) are provided. The commonly held areas essentially become an extension of the individual lot, beyond what would

be affordable by individual homeowners, and without the headache of maintaining a large lot. Studies indicate that homebuyers will pay a premium for lots adjacent to natural open space, and that such properties appreciate at higher rates than those in typical subdivisions.

Recommendations

- Conduct an inventory of the property's natural features including streams, wetlands, wooded areas, and soils
- Locate homes, buildings, and parking lots away from streams, floodplains, and other ecologically and aesthetically valuable areas
- Build at higher density in suitable areas, while preserving sensitive or valuable features as permanent open space

Key 4: Provide open space/parks

Natural open space is extremely valuable as wildlife habitat, storm water infiltration areas, and as protective buffers for ecologically sensitive areas. Open space serves as an extension of the individual residential lot. Natural open space is visually appealing, as it breaks up the endlessly monotonous pattern of rows and rows of houses. Open space and "pocket" parks provide opportunities for recreation including walking, biking, bird watching, and play.

Common open space and pocket parks within neighborhoods are particularly appealing to families with children. Younger children can play in playgrounds with other children under the supervision of parents. Parents may allow older children more freedom to play and explore without direct supervision since trails and open spaces are generally located away from traffic and the frequent presence of neighbors provides a measure of security.

Open space sells. Homebuyer preference surveys show that people want open space and recreation facilities within their neighborhoods. Studies also indicate that homebuyers will pay a premium for lots adjacent to natural open space, and that such properties appreciate at higher rates than those in typical subdivisions. Clearly, providing open space in neighborhoods is a win-win proposition.

Open space must be protected from further development in the future by placing a permanent conservation easement on the land. Conservation easements run with the deed to the property and are held by the city (or county) or a nonprofit organization. The conservation easement must specify that the property is to remain undeveloped and must also list what activities are permitted. Ownership of open space and parks should be transferred to a homeowner association, a land trust, or the city. The city will also require that a management plan outlining maintenance activities and responsibilities be submitted and approved as part of the plat approval process.

Recommendations

- Set aside ecologically sensitive or aesthetically valuable areas as open space
- Design the development to provide direct access to the open space areas by residents
- Protect open space areas through conservation easements or by transferring ownership to the jurisdiction or conservation organization
- Incorporate recreation facilities including walking and biking trails and playground equipment

Key 5: Preserve streams and floodplains

Natural streams, floodplains, and riparian buffers are vital to the success of natural systems. Buffered with trees and vegetation, natural streams provide extremely important aesthetic value to neighborhoods and communities. Natural, undeveloped floodplains provide storage for storm flows, minimizing downstream flooding impacts. Streams, whether they are natural, tree-lined watercourses or concrete drainage ditches, are a very visible indicator of the character of a community.

Maintaining streams and floodplains in their natural condition should be a guiding principle for high quality development projects, which will in turn influence many of the design decisions that follow. In order to maintain viable natural streams, runoff from developments must be controlled. Stream channels can be severely degraded by erosion if post-development storm water flows are significantly higher than pre-development flows. Many of *the Keys to Developing Naturally*, including limiting impervious surfaces, providing open space and buffers for infiltration of storm water runoff, maintaining existing terrain, and others must be implemented to some extent if natural streams are to be capable of handling storm flows from developed areas.

<u>Recommendations</u>

- Conduct hydraulic analyses of streams to determine flow capacity
- Maintain vegetated and wooded riparian buffers along streams (50 feet or more recommended)
- Incorporate other *Keys to Developing Naturally* into project designs to attenuate storm water flows
- Locate all structures out of the "full build-out" 100-year floodplain
- Do not place any fill material in the 100-year floodplain

Key 6: Direct runoff over vegetated areas

Discharging runoff from roofs, roads, and parking lots into vegetated areas, rather than directly into storm drains offers an opportunity for infiltration of storm water runoff into the ground. Infiltration of storm water runoff reduces both the quantity of water and the amount of pollutants that would otherwise reach a stream or lake. When there is too much runoff for the soil to absorb it all, the vegetation through which the storm water runoff flows can trap and remove suspended pollutants before the flow reaches a water body.

There are several ways in which this can be accomplished. For rooftops, downspouts should be directed onto grassed areas rather than onto driveways or parking lots (or plumbed to a storm drain or the street gutter). Runoff from parking lots should be also discharged to grassed areas, which are referred to as vegetated filter strips. Filter strips function well when runoff enters and flows across as a "sheet" of water, rather than as a deeper, fast moving channel of water. Vegetated swales, which are engineered to accomplish both infiltration and filtration of concentrated runoff, can be used in lieu of underground piping for conveyance of storm water runoff once it collects into a concentrated flow of water.

Landscaped and vegetated areas, particularly in commercial and multi-family residential settings, also provide an attractive visual buffer to break up the monotonous pattern of buildings and parking lots. Significant areas of grass, trees, and shrubs also serve to reduce

temperatures compared to vast expanses of asphalt and concrete under the hot Texas sun. With proper design, and accompanied by other design considerations such as reducing overall impervious surface, vegetated filter strips and vegetated swales can reduce storm drain infrastructure costs as well.

Recommendations

- Direct roof drains onto vegetated areas (rather than driveways and parking lots, or plumbing to storm drains)
- Discharge runoff from parking lots as sheet flow into vegetated filter strips bordering the lot
- Incorporate depressed, vegetated areas (bioretention) within parking lots, rather than raised landscaped areas to allow runoff to infiltrate
- Use open drainage (vegetated swales) where feasible instead of underground storm drain systems

Key 7: Use *Texas SmartScape* plants

Landscaped areas, with all of their benefits, can also contribute to the pollution of streams and lakes if they are not managed properly. The use of plants that are not well suited to the climate and conditions in North Texas can result in the need for frequent use of pesticides and fertilizer to maintain the plants in a healthy condition. What's good for the plants, however, can be damaging to the environment and to human health as well.

The application of pesticides ends up killing not only the "bad" insects, but also the beneficial ones, such as bees, butterflies, and earthworms. Anything eating the poisoned insects such as amphibians, lizards, birds, and mammals will also ingest these toxins. In addition, pesticides applied to landscape plants and lawns can be washed into water bodies by storm water runoff, where impacts to aquatic life can occur. Pesticides also present a possible health risk to humans, particularly to children who might play on recently treated lawns.

Fertilizer causes problems when it runs off of lawns and landscaped areas into local waterways. The extra nutrients may cause aquatic plants (including algae) to experience rapid growth. Under the right conditions, these plant and algae "blooms" can reduce oxygen levels in the water and kill fish.

The use of native plants, and those that have been adapted to the local climate and conditions, saves money by reducing the amount of water, pesticides, and fertilizer that must be applied to keep the plants healthy. *Texas SmartScape* is an interactive multimedia program on compact disk that can be used to select plants that are appropriate for North Texas. The software is available from the North Central Texas Council of Governments (see reference information) or from most cities or counties in the Dallas-Fort Worth area.

Recommendations

- Use native and adapted plants for their natural resistance to pests and drought tolerance
- Reduce the use of pesticides, fertilizer, and water for irrigation
- Maintain vegetated areas in good condition to reduce soil erosion

Key 8: Consider ways to reduce car travel

Automobiles impact the environment in a number of ways, both directly and indirectly. Most people are aware that automobiles are a major source of air pollution. In the DFW region, car exhaust accounts for almost one-half of the chemicals that contribute to the creation of ozone in the lower atmosphere. Ozone pollution causes a number of health problems including respiratory system irritation, inflammation and damage to the lining of the lungs, and increased asthma attacks. As population in the region increases, more cars on the road, more congestion, and longer commutes will lead to more air pollution and more health problems as a result.

Many are unaware however, that cars are a significant contributor of pollutants that can negatively impact water quality. Petroleum products including gasoline, oil, and grease drip from cars onto roads and parking lots and are then carried into waterways by storm water runoff. Metals such as zinc, lead, copper, cadmium, copper, chromium, and nickel are also used in various car parts and are deposited on roads and parking lots as the parts wear.

Indirectly, automobiles damage the environment because of the magnitude of impervious surfaces that are required for the operation and parking of vehicles. Roads, parking lots, and driveways generate a tremendous amount of runoff that threatens the equilibrium of natural streams. If runoff from impervious surfaces is not managed properly, natural channels will be overloaded by storm water runoff, resulting is stream bank erosion and flooding.

The most effective option for reducing the impact on streams is to minimize impervious surfaces, rather than relying on the use of expensive control measures such as retention or detention ponds. In order to reduce the need for more highways, wider streets, and expansive parking lots, alternatives to automobile travel must become more feasible for travelers. Designing developments with walking and biking trails that feed into a broader network of bicycle and pedestrian transportation (or transit) facilities is one way to provide alternatives to car use.

Other design options are also effective in reducing automobile travel. Locating concentrated developments near transit facilities gives residents the option to use public transportation rather than their personal vehicle for trips to work or shopping. Designing mixed-use developments in which residences, shops, and schools are in close proximity promotes walking to the nearby corner store, restaurant or school. In addition to the water quality benefits, alternatives that reduce automobile travel will result in less vehicle emissions.

All of these options serve to reduce the vast and expensive infrastructure required to support automobile travel and will result in improvements in air and water quality and corresponding benefits for human health. As noted earlier, homebuyer preference surveys demonstrate there is a strong desire among consumers for walking and biking trails and clustered retail stores in neighborhoods. Everyone wins when developments and transportation systems are designed to meet the needs of people first and automobiles are given secondary consideration.

<u>Recommendations</u>

- Provide walking and biking trails in neighborhoods
- Design and build mixed-use developments that incorporate residential and commercial areas that are within walking or biking distance of each other
- Develop near transit lines/facilities
- Develop at sufficient density to support practical transit usage

Key 9: Incorporate storm water treatment controls

There have been a number of changes in the way in which storm water runoff from developed areas is managed. The traditional approach has been to develop with little regard for storm water other than to construct drainage systems that move the water off the site as quickly as possible. More recently, devices have been used (to varying degrees in different parts of the country) for controlling the rate of flow and timing of storm water leaving the site, and in some cases to reduce the amount of pollutants in the runoff as well. These controls generally work by capturing and holding a portion of the runoff and then releasing it slowly over a sufficient period of time to reduce the "peak" flow from the site. Extended release times promote settling out of pollutants, resulting in improved water quality.

Detention controls, or dry detention ponds, fill up during storms but they discharge completely and are dry during the periods between storms. With proper design and maintenance, dry ponds can be used for recreation when they are dry. Retention controls are known as wet ponds since they maintain a permanent pool of water between storms. The banks and outlet of a wet pond are constructed to provide for storage and subsequent slow release of storm water runoff. Wet ponds look much like any other pond, and with careful attention to design and maintenance, they can serve as an attractive water feature in residential and commercial developments. Infiltration basins also collect storm water runoff, but rather than release the water gradually, they are designed to hold the water and allow it (and any pollutants) to infiltrate into the soil.

Detention and retention ponds and infiltration basins should be considered only after all other *Keys to Developing Naturally* have been explored and implemented to the greatest extent possible. In many cases, the need for these "treatment" or "structural" controls, as they are sometimes referred to, can be avoided (or they can be reduced in size) if the amount of runoff and entrained pollutants are minimized by the design of the project. Generally, it is cheaper and more effective to implement design elements that prevent or reduce the generation of storm water runoff and/or pollutants at the source. However, should factors beyond the control of the developer preclude the full use of other *Keys,* these controls should be incorporated into the project.

Oil and grit separators fall into a different category of treatment device and are designed specifically to trap oil, grease, and grit, which are common pollutants generated by automobile use. Oil and grit separators should be considered for use to treat the runoff from high volume parking lots and businesses such as gas stations, car washes, or automobile service garages. Unlike the other treatment devices discussed above, oil and grit separators offer no benefits for reduction in storm water runoff volume.

<u>Recommendations</u>

- Incorporate the other *Keys to Developing Naturally* to the greatest extent possible
- Evaluate the need for retention/detention ponds or infiltration basins based on inclusion of other design elements for reducing storm water impacts
- Integrate treatment controls in a manner that they function as amenities
- Use oil and grit separators in areas where large amounts of oil and grit can be expected (parking lots with heavy automobile traffic, gas stations, service stations)

Key 10: Use site controls to manage litter

Litter that ends up in streams and lakes is more than an eyesore, it can affect water utilities, residents, and wildlife. Removal of litter and debris is time consuming and expensive once it is in the waterway. Prevention is the preferable approach to litter control.

In commercial areas, inlet controls can be very effective in preventing litter and debris from entering the storm drain system and being discharged into streams and lakes. Wind breaks such as a row of shrubs or a fence can be effective to capture windblown litter before it is blown into a nearby waterway. Generally, inlet controls are not appropriate for use in residential areas (except perhaps apartments) because of the lack of an on-site maintenance staff.

Recommendations

- Use inlet controls in commercial areas to capture litter in storm water runoff
- Use wind breaks in commercial areas to capture windblown litter and debris
- Ensure that the facility owner is aware of maintenance requirements

Reference Information

Additional information, including design manuals and reference books, is available from the organizations listed below. Many of the organizations have other resources available, either in the form of additional publications or information on their web sites. Please notify the Environmental Resources Department of the North Central Texas Council of Government at erinfo@dfwinfo.com of any changes to Internet addresses or other information.

Organization	**Internet Address**	
North Central Texas Council of Governments	www.dfwstormwater.com	
Publications	**Availability**	**Keys**
Storm Water Quality Best Management Practices for Residential and Commercial Land Uses in North Central Texas, July 1993	Ordering information at http://dfwstormwater.com	6, 9, 10
Texas SmartScape CD	(Same as above)	7

Organization	**Internet Address**	
Low-Impact Development Center	http://lowimpactdevelopment.org	
Publications	**Availability**	**Keys**
Low-Impact Development Design Strategies: An Integrated Design Approach, Prince George's County, Maryland, June 1999	Downloadable in pdf format	1, 2, 5, 6, 9

Organization	**Internet Address**	
Center for Watershed Protection	www.cwp.org	
Publications	**Availability**	**Keys**
Better Site Design: A Handbook for Changing Development Rules in Your Community, August 1998	Ordering information at organization web site	1, 2, 3, 4, 5, 6, 8, 9
Nutrient Loading from Conventional and Innovative Site Development, July 1998	Ordering information at organization web site	2, 3, 4, 5, 6, 9

Organization	Internet Address	
Urban Land Institute	www.uli.org	
Publications	**Availability**	**Keys**
The Practice of Sustainable Development, Douglas R. Porter et al., 2000	Ordering information at organization web site	1, 2, 3, 4, 5, 8

Organization	Internet Address	
Maryland Department of the Environment	www.mde.state.md.us	
Publications	**Availability**	**Keys**
2000 Maryland Stormwater Design Manual Volumes I & II	Downloadable in pdf format	1, 2, 3, 4, 5, 6, 8, 9

Organization	Internet Address	
New Urban News	www.newurbannews.com	
Publications	**Availability**	**Keys**
The New Urbanism and Traditional Neighborhood Development: Comprehensive Report and Best Practices Guide	Ordering information at organization web site	2, 3, 4, 5, 8
New Urban News Magazine	Ordering information at organization web site	2, 3, 4, 5, 8

Organization	Internet Address	
Smart Growth America	www.smartgrowthamerica.com	
Publications	**Availability**	**Keys**
Greetings from Smart Growth America	Downloadable in pdf format	1, 2, 3, 4, 5, 8

Organization	Internet Address	
American Planning Association	www.planning.org	
Publications	**Availability**	**Keys**
Best Development Practices, Reid Ewing, 1996	Ordering information at www.planning.org/bookstore	1, 2, 3, 4, 5, 8
The Principles of Smart Development, 1998	Ordering information at www.planning.org/bookstore	1, 2, 3, 4, 5, 6, 8, 9
Growing Greener, Randall Arendt, 1999	Ordering information at www.planning.org/bookstore	1, 2, 3, 4, 5, 6, 8, 9
Green Development, Alex Wilson et al., 1998	Ordering information at www.planning.org/bookstore	1, 2, 3, 4, 5, 6, 8

Web Document	Internet Address	Keys
Texas Nonpoint Source Book	www.txnpsbook.org	2, 4, 6, 9

Organization	Internet Address	
Atlanta Regional Commission	www.atlantaregional.com/design manual	
Publications	**Availability**	**Keys**
Georgia Stormwater Management Design Manual, Draft, May 2000	Downloadable in pdf format	1, 2, 3, 4, 5, 6, 8, 9