

## APPENDIX D - CONSERVATION DESIGN TEMPLATES

The land use templates are described in this appendix. The templates are presented in a way that compares and contrasts the differences between the conservation and conventional versions of each land use. Each set contains a side-by-side comparison of the templates, including the principles involved in designing the templates and the evaluation modeling results. The booklets include graphic representations of the templates, basic statistics regarding lot size and other site details, and the results of the stormwater modeling used to evaluate the difference in runoff response between the templates.

The seven template categories are:

- Commercial/Industrial
- Moderate Density Residential
- Rural Residential
- Estate Residential
- Agriculture
- Stream Corridors
- Depressional Wetlands

# COMMERCIAL/INDUSTRIAL TEMPLATES



Town Square - Wheaton, Illinois

Commercial & Industrial Lands: Retail, light industrial and office development, including various scales of development from large scale “big box” retail stores and light industrial and office park development, to smaller scale restaurants, shops, and individual offices.

This booklet has been prepared as part of the Blackberry Creek Watershed Alternative Futures Analysis project funded by a grant from USEPA to IDNR and Kane County. Under this project, two “visions” for the watershed have been developed and evaluated. One vision is composed of “Conservation” template land uses that conserve a high level of watershed integrity. The other vision is composed of “Conventional” template land uses that generally will have a negative impact on watershed hydrology and biology.

This booklet presents descriptions and evaluation results of the Conservation and Conventional versions of the Commercial/Industrial Templates. Watershed scale results are presented in the Alternative Futures Analysis Report.

# ~ CONVENTIONAL ~

## Commercial/Industrial Guidelines and Conceptual Images

### Conventional Template Description

Conventional commercial/industrial development typical of what is represented in this template is single-story, automobile accessed, commercial big box or strip mall development. These sites typically have a large amount of surface parking, often exceeding the needs of the businesses during the majority of the year.

Landscaping is typically limited to raised islands at the ends of parking isles. Turf grass is typically planted around detention basins and within the strip between the access roads and the parking lot and the buildings.

On some sites, the outlying or roadside lots are developed for fast food, banks, and other businesses. These outlots generally have their own parking, and are accessible only by cars. Sidewalks are provided sometimes along main roads and in front of the mall entrances, but generally not between the main mall and the outlots.

Commercial and industrial developments typically use flat roofs on buildings and standard asphalt paving with impervious percentages of 80% to 90% and higher. Stormwater is conveyed via storm sewer inlets to large detention basins. Because of the large amount of impervious cover, water level fluctuations in the detention basins are often large and frequent, leading to the use of rip rap to protect the shoreline from erosion. As with many detention basins, geese frequent the turf covered shorelines, contributing significant nutrient and bacteria loadings.



Disconnected yet adjacent commercial properties require the use of an automobile for convenience and safety. Minimal landscaping is provided except to meet code.



Outlot development adjacent to major commercial parking lot and facility with access from only one side of the road.



Conventional commercial sites have a high percentage of impervious surface, and can require significant amounts of storm sewer and detention.



Detention ponds with rip rap edges provide no water quality benefits and have limited aesthetic quality.

# ~ CONSERVATION ~

## Commercial/Industrial Guidelines and Conceptual Images

### Conservation Template Description

Conservation commercial and industrial development includes mixed-use commercial, office and light industrial development designed to minimize negative impacts to hydrology and water quality.

Sustainable technologies and designs are incorporated into conservation commercial developments to minimize the impact of impervious surfaces. These systems encourage infiltration and retention and discourage stormwater discharge directly to natural surface waterbodies for most storm events. Accessible green roofs can be designed into new conservation commercial buildings to intercept and absorb a portion of the rainfall, and provide additional insulation and outdoor leisure space for second story offices or residences.

Parking lots can be constructed of porous paving materials for infiltration, and include large canopy trees for cooling and wind-breaks. Parking lots built with bioswales and underground infiltration beds help to reduce runoff, eliminate the need for storm inlets, and contribute to groundwater recharge.

Conservation commercial development may include residential or office development on upper floors. Interconnected street systems with pedestrian and bicycle connections and infrastructure throughout make the public accessible to a variety of modes of transportation. Conservation commercial developments can be designed to fit any scale, and mix uses to encourage trip linking, day and night activity and reduced peak parking demands.



Main Street-like commercial development with second stories allowing office or residential uses.



Neighborhood commercial center within a new residential development.



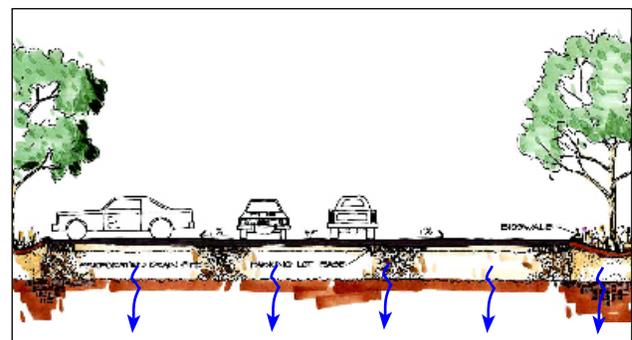
Chicago City Hall green roof insulates the building, provides wildlife habitat, and reduces roof runoff.



Porous paving systems encourage infiltration and retention or runoff.

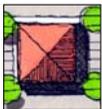


Parking lot with bioswale to filter and absorb runoff. Shade trees reduce heat gain.



Parking lot with bioswale & under parking infiltration system.

~ CONVENTIONAL ~  
Commercial/Industrial Template



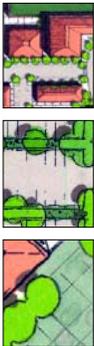
Commercial Building



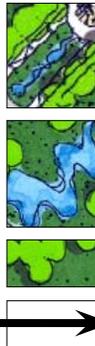
Impervious Parking/Driving Lane

# ~ CONSERVATION ~

## Commercial/Industrial Template



Commercial Building  
 Porous Pavement Parking Lot with Bioswales  
 Paved Patio



Bioswale Infiltration  
 Naturalized Detention  
 Stormwater Flow Direction

# Commercial/Industrial Template Standards

	<i>Conventional</i>	<i>Conservation</i>
<i>Retail Space</i>	<i>332,500 sf (7.6 acres or 19% of site)</i>	<i>332,500 sf (7.6 acres or 19% of site)</i>
<i>Open Space<sup>a</sup> / Landscaping</i>	<i>8.7 acres (22% of site)</i>	<i>14.5 acres (36% of site)</i>
<i>Parcel Size</i>	<i>40 acres</i>	
<i>Zoning</i>	<i>F – District (B1 District - Business)</i>	
<i>Parking Spaces</i>	<i>1,108 (1 space per 300 sf)</i>	
<i>Parking Setback</i>	<i>20 feet from ROW</i>	
<i>Access Roads</i>	<i>24 feet wide</i>	<i>24 – 30 feet wide</i>
<i>Road/Parking Area</i>	<i>23.7 acres (59% of site)</i>	<i>17.9 acres (45% of site)</i>
<i>Trees</i>	<i>2 Trees/23 Parking Spaces</i>	<i>2 Trees/10 Parking Spaces</i>
<i>Floor Area Ratio</i>	<i>0.19</i>	<i>0.23<sup>b</sup></i>
<i>Detention Area</i>	<i>2 acres (5% of site)</i>	<i>2.9 acres (7% of site)</i>
<i>Allowable Detention Release Rate</i>	<i>0.10 cfs/acre</i>	
<i>Required Permanent Pool Storage</i>	<i>0.75 inches/impervious acre</i>	
<i>Development Bonus</i>	<i>None</i>	<i>62,100 sf (additional retail, office, residential space)<sup>b</sup></i>

<sup>a</sup> Includes detention areas and excludes green roofs.

<sup>b</sup> Due to this figure being potential bonus additional square footage, and not defined as either office, retail or residential, parking requirements could not be calculated and added to the total. Shared parking could address most of the additional parking requirement, minimizing the need for additional spaces. Also, there is room to fit additional and/or temporary parking that could be reserved for periods of peak parking demand.

# MODERATE DENSITY RESIDENTIAL TEMPLATES



Mill Creek Subdivision - Geneva, Illinois

Moderate Density Residential Development: Residential development with lots ranging from 6,000 to 15,000 square feet, a gross density of around 2 units per acre, and municipal water and sewer service. Typically, these developments are under municipal jurisdiction, but may occur in unincorporated areas as part of planned unit developments (PUDs).

This booklet has been prepared as part of the Blackberry Creek Watershed Alternative Futures Analysis project funded by a grant from USEPA to IDNR and Kane County. Under this project, two “visions” for the watershed have been developed and evaluated. One vision is composed of “Conservation” template land uses that conserve a high level of watershed integrity. The other vision is composed of “Conventional” template land uses that generally will have a negative impact on watershed hydrology and biology.

This booklet presents descriptions and evaluation results of the Conservation and Conventional versions of the Moderate Density Residential template. Watershed scale results are presented in the Alternative Futures Analysis Report.

# ~ CONVENTIONAL ~

## Moderate Density Residential Guidelines and Conceptual Images

### Conventional Template Description

Conventional moderate density residential development is designed to drain runoff from streets, driveways, and lawns as quickly as possible and then to temporarily hold the runoff in detention basins at the end of the storm sewer system before releasing it offsite. While detention is quite effective at controlling the rate of runoff, it does little to address the increased volume of runoff, and hence its effectiveness decreases with increasing watershed size.

Due to the impervious surfaces and hardened drainage systems, there is a shift from groundwater dominated hydrology to surface water dominated hydrology. As a result, stream discharge becomes “flashier” with higher high flows and lower low flows, which, in turn has significant impacts on downstream aquatic ecosystems adapted to more stable hydrology characterized by variations in flow related to season much more than to individual rainfall events.

Parking areas for residences are required to be paved and usually include both interior and exterior parking space, with room for at least four cars per single family housing unit. Driveways are typically paved with impervious materials, which increase ambient air temperatures and create additional stormwater runoff.

Detention basins are typically either dry or wet and ringed with rip rap, have little or no natural habitat value for plants, animals or other wildlife, and do not enhance the aesthetics of the neighborhood.

Public open space is often limited to road rights-of-way and small, isolated park lands. Lot sizes are standardized as much as possible, with little variety. Street trees may be required on each lot or every 50 feet or so, depending upon the particular subdivision code. Other landscaping within the site is generally limited to turf grass.



Reliance on conventional detention as a sole stormwater management technique leads to unaesthetic conditions and decreases quality of life.



Conventional residential developments have large setbacks increasing driveway and front yard turf area.



Wide roads in conventional residential development developments increase runoff and air temperature and encourage higher speed traffic.

# ~ CONSERVATION ~

## Moderate Density Residential Guidelines and Conceptual Images

### Conservation Template Description

Conservation moderate density residential developments cluster housing at the same gross density as conventional development to preserve and/or create ecological, stormwater and cultural corridors. Clustering also creates opportunities to develop neighborhood amenities, including parks and recreation facilities. Lot sizes are intentionally varied to provide a richer diversity of housing opportunities for potential residents.

Clustering and decreased lot sizes allow for every lot to front or back onto naturalized open space and/or park land that is also part of the drainage system. Restored native landscaping in these areas increases habitat potential for wildlife as well. Parks and naturalized open space are designed in an interwoven pattern across the entire development to connect habitats, provide stormwater infiltration and conveyance, and provide recreational and transportation opportunities to residents.

The stormwater system is designed to replicate or preserve the site's natural hydrology. No stormwater discharge occurs directly to streams or wetlands or even to the site detention area. Instead, much of the landscape is used to filter and retain runoff. Driveways, parking areas and streets can use porous paving materials. Detention areas are naturalized and designed to mimic natural wetlands and are part of a network of open space within and outside the development.

Streets are narrowed to reduce traffic speeds and decrease impervious cover. Shallow street parkway bioswales retain street and front yard runoff. Excess runoff is directed along curbs to rear yard swales to provide filtration and infiltration opportunities.

Conservation developments are connected to the local community through various alternative transportation systems (e.g., handicapped accessible trails, sidewalks, streets, bicycle paths and mass transit). Sidewalks are constructed on both sides of the street with crosswalks at intersections to encourage and allow the safe use of alternative modes of transportation.



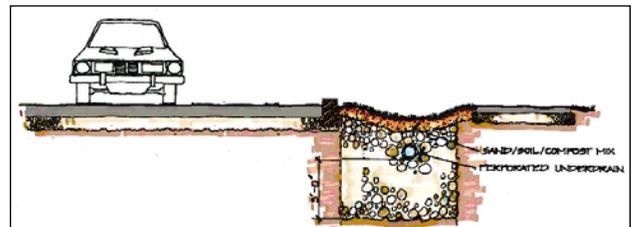
Clustering of houses and lots allows for open space that can be used for neighborhood connectivity, community activity areas, parks, naturalized stormwater systems and wildlife habitat areas. (Prairie Crossing, Greyslake, Illinois)



Conservation residential developments have reduced setbacks and narrow streets to minimize the overall amount of impervious surface, while at the same time creating a safe, friendly and walkable streetscape. (Prairie Crossing, Greyslake, Illinois)



Conservation residential developments may use porous pavers for driveways and off-street parking areas. (However, the evaluation modeling assumed no porous paving.)



Street parkway bioswales filter and infiltrate street and front yard runoff.

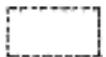


Naturalized back yard drainage swales provide public open space, habitat and stormwater retention. (Village Homes, Davis, CA)

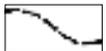
# ~ CONVENTIONAL ~ Moderate Density Residential Template



Housing



Development Lot Line



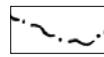
Contour Lines



Stormwater Infrastructure



Stormwater Flow Direction



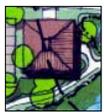
Detention Pond Boundary

# ~ CONSERVATION ~

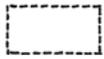
## Moderate Density Residential Template



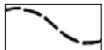
Housing



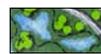
Community/Commercial Center



Development Lot Line



Contour Lines



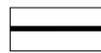
Vegetated Swales



Roadside Bioswales



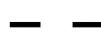
Canopy Trees



Stormwater Infrastructure



Stormwater Flow Direction



Stormwater Level Spreader

# Moderate Density Residential Template Standards

	<i>Conventional</i>	<i>Conservation</i>
<i>Number of Lots</i>	89 (25.5 acres or 63.8% of site)	89 (15.7 acres or 39.2% of site): 45 @ 6,000 sf; 35 @ 8,000 sf; 9 @ 15,000 sf
<i>Open Space</i>	3.6 acres, including stormwater treatment (9.0% of site)	15.1 acres, including stormwater treatment (37.8% of site)
<i>Parcel Size</i>	40 Acres	
<i>Gross Density</i>	2.23 units/acre	
<i>Zoning</i>	F - District	
<i>Lot Width</i>	80 feet	60, 80, 100 feet
<i>Lot Depth</i>	125 feet	100, 150 feet
<i>Setbacks</i>	Front – 35 ft; Rear/Side – 10 ft; Corner – 35 ft	Front – 20 ft, 50 ft; Rear – 10 ft, 25 ft; Side – 3 ft, 10 ft; Corner – 20 ft
<i>Lot Area</i>	10,000 sf (ranging up to 33,000 sf)	6,000 sf, 8,000 sf, 15,000 sf
<i>Roadway</i>	32 feet minimum	28 ft and 32 ft
<i>Roadway Area</i>	4.8 acres (12.0% of site)	4.3 acres (10.8% of site)
<i>ROW</i>	66 feet minimum	50 feet minimum
<i>ROW Area</i>	10.9 acres (27.2% of site)	9.2 acres (23% of site)
<i>Waste Water</i>	Development served by City	
<i>Potable Water</i>	Development served by City	
<i>Allowable Release Rate</i>	0.10 cfs/acre	
<i>Required Permanent Pool Storage</i>	0.75 inches/impervious acre	

# RURAL RESIDENTIAL TEMPLATES



Prairie Crossing, Greyslake, Illinois

Rural Residential Development: Residential development with lots averaging approximately 1.25 acres, a gross density of 0.55 units per acre, served by private wells and septic systems. Typically, rural residential development is limited to unincorporated areas. However, more recently, many developments of this density have come under municipal jurisdiction, and would often be served by municipal water and sewer.

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This booklet presents descriptions and evaluation results of the Conservation and Conventional versions of the Rural Residential template. Watershed scale results are presented in the Alternative Futures Analysis Report.

# ~ CONVENTIONAL ~

## Rural Residential Guidelines and Conceptual Images

### Conventional Template Description

Conventional rural residential developments are designed like moderate density developments, but have a density of around 0.55 units per acre.

While many developments at this density have open drainage systems, these developments increasingly use curb and gutter drainage with storm sewers. This is particularly true of large lot developments occurring within municipalities. While swales provide a level of infiltration, hydrology is still dominated by surface runoff.

Detention basins at the edge of the development are used to temporarily store runoff and release it at the allowable rate. Detention basins include permanent pool storage as required by code to provide water quality benefits. However, many are lined with rip rap or have turf down to the shoreline and provide very little habitat benefit. Wet detention surrounded by turf quickly becomes permanent Canada goose habitat. The majority of non-paved areas are typically planted in turf grass as well.

Setbacks are large, necessitating long paved driveways, increasing impervious cover. Roads are generally wider than necessary for the traffic they support, increasing stormwater runoff, while at the same time heating runoff water well above naturally occurring temperatures. Wide streets also encourage higher speeds than may be safe for a residential neighborhood.

Although sometimes sidewalks are included in conventional large lot developments, typically they are not, unless required by code. This establishes the automobile as the primary mode of transportation. Culs-de-sacs are commonly used, creating disjointed neighborhoods that can make navigation confusing.



Turf grass stormwater drainage systems often lead to dead grass and bare ground due to wet conditions and subsequent erosion.



Turf lined stormwater detention typical of conventional development leads to shoreline erosion and supports excessive goose populations that cause water quality problems and reduces recreational use.



Large setbacks increase total pavement and imperviousness. Street "eyebrows" and curb radii increase impervious surface area and encourage inappropriately high automobile speeds.

# ~ CONSERVATION ~

## Rural Residential Guidelines and Conceptual Images

### Conservation Template Description

Conservation rural residential developments have the same gross density as conventional developments. However, reduced lot sizes and clustering allow for shared common open space and conservation easements to protect natural areas and preserve or create habitat and stormwater infiltration corridors. Individual home sites may use low-impact design techniques to reduce runoff from each lot, including rain-barrels, porous pavement, and ecologically sensitive native landscaping.

The objective of the stormwater system is to utilize significant common open space to filter and absorb runoff and replicate the natural site hydrology. There is no concentrated direct discharge of stormwater into streams or wetlands. Wastewater systems could include individual septic tanks that lead to a common on-site but municipally managed treatment system and drainage field rather than individual leach fields. Detention areas are naturalized, enhancing overall ecological integrity, while at the same time improving the aesthetic quality and rural character of the site.

Wildlife habitat and native landscaping occur in large areas on the front and back sides of home sites. Because less area of the site is needed for septic fields, remnant woodland, prairie and wetland landscapes can be preserved. All lots feature naturalized open space on at least one side. Turf grass is limited to lawn areas immediately surrounding each home and developed public recreation areas.

Roads in conservation large lot developments are narrower on average, and are designed at a human scale as well as for slower, more appropriate speeds for neighborhoods. Roads and streets have naturalized swales for immediate cooling and retention of stormwater.

Trail systems connect all parcels to each other, by using the natural areas and roadways. Trail systems also connect the site to adjacent residential developments and other nearby amenities. Both permeable and conventional pavement can be used for pedestrian and bicycle amenities found throughout the site, creating a low-impact, multi-modal network of transportation options for all residents.



Clustering large lot residences allows for accessible connected open space, which is preferable for recreation, stormwater retention and native habitat.

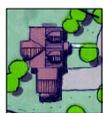
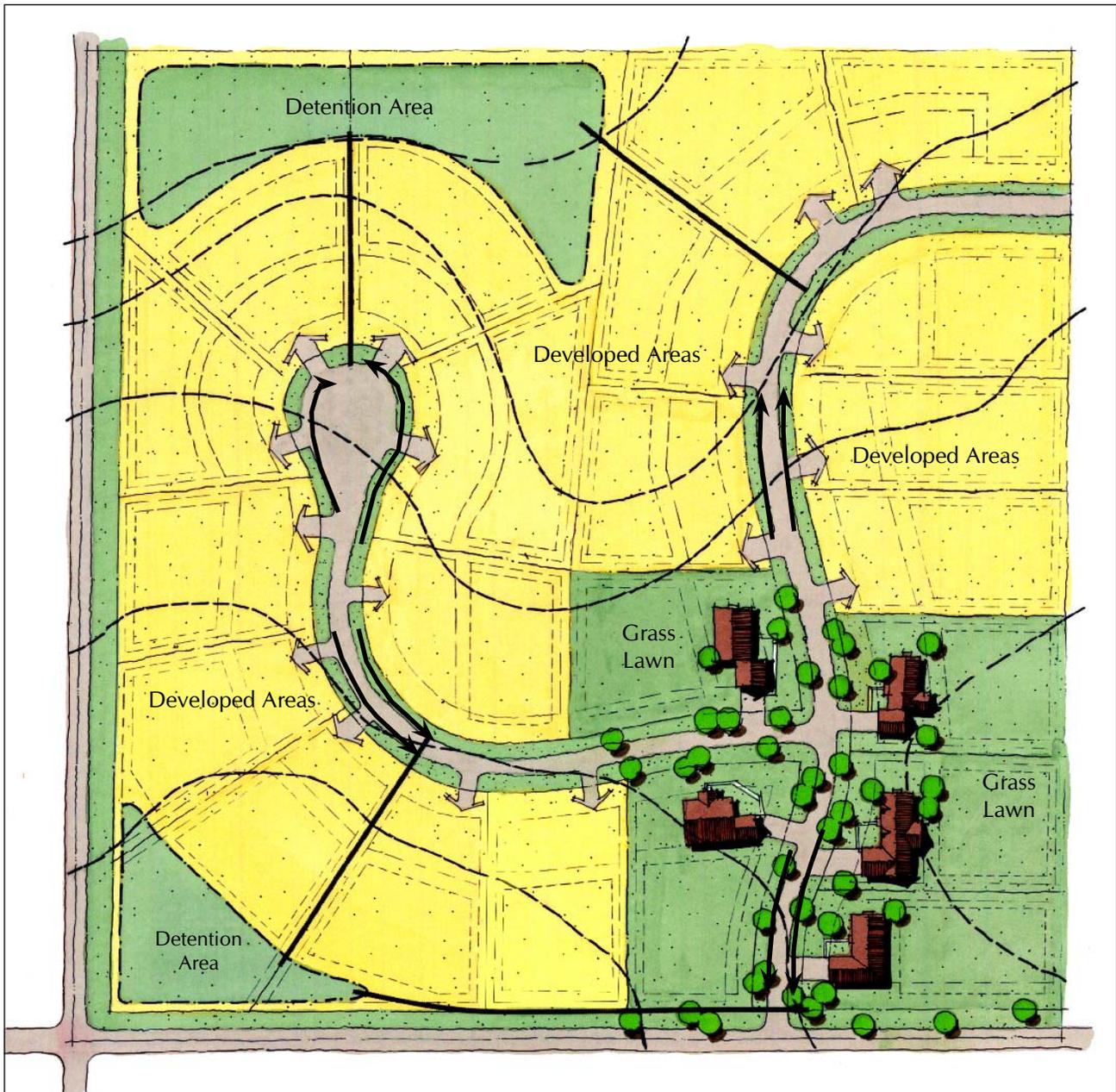


Naturalized detention provides desirable stormwater treatment and wildlife habitat while discouraging geese and enhancing rural character.

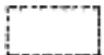


Swales with native plantings retain and cleanse stormwater runoff. Narrow lanes reduce pavement area and travel speed.

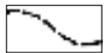
# ~ CONVENTIONAL ~ Rural Residential Template



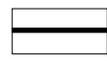
Housing



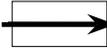
Development Lot Line



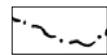
Contour Lines



Stormwater Infrastructure



Stormwater Flow Direction



Detention Pond Boundary

# ~ CONSERVATION ~

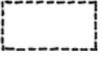
## Rural Residential Template



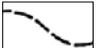
Housing



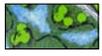
Recreational Shelter



Development Lot Line



Contour Lines



Vegetated Swales



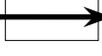
Roadside Swales



Canopy Trees



Stormwater Infrastructure



Stormwater Flow Direction



Stormwater Level Spreader

# Rural Residential Template Standards

	<i>Conventional</i>	<i>Conservation</i>
<i>Number of Lots</i>	22 (29.4 acres or 73.5% of site)	22 (10.8 acres or 27.0% of site)
<i>Open Space</i>	3.8 acres, including stormwater treatment area (9.5% of site)	21.6 acres, including storm water and wastewater treatment area (54.0% of site)
<i>Parcel Size</i>	40 acres	
<i>Gross Density</i>	0.55 units/acre	
<i>Zoning</i>	E3-PUD	
<i>Lot Width</i>	200 feet	100 feet
<i>Lot Depth</i>	300 feet	150 feet
<i>Lot Area</i>	60,000 square feet	15,000 square feet
<i>Setbacks</i>	Front – 35 ft; Rear/Side – 10 ft; Corner – 35 ft	
<i>Roadway</i>	24 ft, 28 ft	20 ft, 24 ft
<i>Roadway Area</i>	2.6 acres (6.5% of site)	2.5 acres (6.2% of site)
<i>ROW</i>	66 feet minimum.	
<i>ROW Area</i>	6.8 acres (17.0% of site)	7.6 acres (19.0% of site)
<i>Wastewater</i>	Private septic tank with individual leach field.	Private septic tank with common treatment and leach field system.
<i>Water Supply</i>	Individual well.	
<i>Allowable Detention Release Rate</i>	0.10 cfs/acre	
<i>Required Permanent Pool Storage</i>	0.75 inches/impervious acre	

# ESTATE RESIDENTIAL TEMPLATES



Estate Residential Development: Residential development, with lots averaging approximately 2.5 acres in size, a gross density of approximately 0.2 units per acre, served by private well and septic. Estate residential developments occur almost exclusively in unincorporated areas.

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This booklet presents descriptions and evaluation results of the Conservation and Conventional versions of the Estate Residential Template. Watershed scale results are presented in the Alternative Futures Analysis Report.

# ~ CONVENTIONAL ~

## Estate Residential Guidelines and Conceptual Images

### Conventional Template Description

Conventional estate residential development consists of 2.5 acre or greater lots, and often a single access road culminating in a cul-de-sac.

Requirements for stormwater detention are met through the provision of turf grass depressions, or occasionally with constructed ponds. Stormwater is conveyed via roadside swales and culverts, which are also typically planted in turf grass.

Driveways in conventional estate residential developments tend to be long and paved with standard impermeable asphalt and may include a dropoff area and several outdoor parking spaces, increasing the per household imperviousness.

Environmentally speaking, even though there is generally less runoff in an estate residential development due to the low density and low relative amount of impervious surface, conventional residential developments pose several other problems to the local ecology. Grass lawns require a great deal of fertilizer, pesticides, and herbicides, as well as irrigation, to maintain them in the desired condition. Added chemicals run off and work their way slowly into local streams and wetlands. Turf lawns, especially in the magnitude seen in conventional estate residential developments, not only require mowing, but allocate more underutilized mown acres per person than other more dense or more naturally landscaped developments. Turf lawns also have very little habitat value and produce more runoff than virtually any other non-impervious surface.

Conventional estate residential developments offer few safe and convenient alternatives to driving, and thus pose challenges to networked road systems. Day to day trips, either to and from work, or to and from shopping, school and other destinations typically can only be achieved by driving a car.



Stormwater detention in some cases is designed as a naturalized system. However, “flashy” hydrology and excessive nutrient loading can lead to dominance by invasive and non-native plant species.



Although producing less runoff than curb and gutter systems, turf swales subject to wet conditions may lead to bare ground and subsequent erosion as well as reduced aesthetics.



Turf grass lawns make up a majority of estate residential landscapes, requiring fertilization and mowing and providing little wildlife habitat value.