SOURLAND MOUNTAIN
COMPREHENSIVE MANAGEMENT PLAN

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FINAL DRAFT

Prepared for the Sourland Planning Council
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1. Executive Summary

The Sourland mountaintop and its agricultural foothills possess incredible natural beauty, despite its location among communities that continually fight sprawling development. The tools in this fight against sprawl include municipal land use policies and regulations, along with a variety of permanent preservation efforts. This central location, amid advancing waves of suburban growth from the north, east and south that have reached into the foothills, has long made preserving the mountain's resources a local and regional priority. Seven New Jersey municipalities and three counties share jurisdiction over this biological and geographic region of unique and diverse habitats, culture and people (Figures 1 and 2).

The Sourland Mountain Region spans the Townships of East Amwell, Hillsborough, Hopewell, Montgomery and West Amwell and extends into Lambertville and Hopewell Borough. The vision for this Sourland Mountain region (Region) in this Comprehensive Management Plan has considered the local municipal master plans, which share a desire to carefully manage the fragile environmental resources of the mountain. All five townships have taken bold policy and regulatory initiatives to protect the extremely limited water supply that is a lifeline for the people, plants, animals and natural systems that occupy the mountain.

In like fashion, local master plans and zoning have made the agricultural foothills less susceptible to sprawl by rewarding compact development that preserves farmland at no cost to the public This report includes options for local land stewards to come together to explore ways that they can collectively exercise their home rule powers in a more coordinated fashion to protect the Sourlands.

The future health of the Region will rely heavily on municipal collaboration and citizen participation if it is to succeed. As work to protect the Region moves forward, the success of the program will relate directly to how well the citizenry can be informed and municipal actions can be coordinated. Toward this end, a collective vision will be best served by a collaborative municipal effort that utilizes the full scope of municipal authority to produce a coordinated series of land management tools.

Recognizing that density and lot size standards alone will not protect sensitive lands and critical resources, the Comprehensive Management Plan calls on local policymakers to join hands across municipal boundaries, in order to advance a series of shared goals. Through a "Sourland Alliance", modeled after successful inter-municipal agreements designed for similar purposes, these communities can align their efforts toward what is best for the region, as well as their backyards.

Properly managed growth must be directed toward the necessary supporting infrastructure, and away from areas that merit preserving and protecting. The relatively flat, forested top of the mountain and its agricultural side slopes have been identified as areas to be conserved or preserved by local master plans. The Sourland Alliance (SA) hopes to bring municipal planning and regulatory agencies together to explore the variety of ways their efforts can be combined. These efforts include regulatory strategies and innovative planning opportunities to protect the Region's resources and its residents. The SA recognizes that the local governing bodies are directly accountable to the local community regarding the eventual scope of the recommendations in this document.

2. Results of Public Meetings

After conducting a series of workshops during 2007 and hearing from audience members and residents, residents of the five Sourland communities were encouraged to visit the CMP project website as a means of offering further comments on the information that was presented. The Public Participatory GIS (PPGIS) website, which includes an interactive map and database capable of storing photos and other images, text, pdf's, YouTube videos and other data, enables the public to submit comments that are site specific or general about the project. Comments were submitted by residents and non-residents of the area, alike. Those who visit the various Sourland Mountain parks offered comments about the wildlife and natural beauty of the area, as well as their desires to see it remain in an undeveloped state. They appreciate the opportunity to experience the area as it currently exists and suggest that proper stewardship and maintenance of the mountain will preserve that experience for future generations.

The majority of comments focused on preserving the area as is. However, there were a few comments that suggested additional recreation might be appropriate. For example, one suggestion was for "bouldering" or low-impact rock climbing. More research would need to be done in order to develop a plan for that kind of activity; but in essence, it might be something appropriate for an area that is already significantly altered from its natural state – i.e. Gibraltar Rock of Belle Mead.

In addition to recreation and wildlife, many comments referred to the history of the area. There are many families living, or owning property in the Sourlands today that have been here for generations. The Sourland area boasts its own folklore of people and places of the past and much of it is already preserved in the books written about the area. As one comment suggested, while a lot has changed in the Sourlands, much has also stayed the same. In order to preserve what has stayed the same, the project team was encouraged to develop tools and options for keeping that history alive.

Perhaps the greatest number of comments focused on the development of the land that occurs throughout the region. Each community within the Sourlands faces its own challenges, but the overall concern was largely the same: *no new development within the Sourland boundaries*. Residents and visitors feel that development that has already occurred on the mountain has made significant impacts to wildlife, the quality of the waterways, the wooded areas, the open areas, the historic and cultural landmarks, and the farmland.

Specific comments were made about the following places within the Sourlands:

- A large, partly wooded tract on Washington Street in Lambertville. It is the former Lambertville High School property and is now a haven for various hawks and pileated woodpeckers. Large mature oak and hickory trees are also located on this property. It would make a nice companion piece to the trails and preserved wooded slopes across Route 179.
- The Lambertville Wing Dam is noted as a popular whitewater play area, although it may not be widely recognized as such. At this point, the Delaware River exposes and sculpts the Sourland diabase and offers a shallow, rippling play area in the river.
- The Boulder Fields in the Sourland Preserve provided hours of play time and wonderment for our children as they explored the woods and the caves. We would walk through the forest and get lost, which provided ample time to learn about the trees in the area.
- The mountain roads in the Sourlands were a beautiful place to ride my horse.

- I recently spotted an American Woodcock on Mountain Road near the Northern Stony Brook Preserve, aka McBurney Woods. I also saw a pileated woodpecker in the same area.
- The Sourland Mountain is an essential water recharge area, as well as a wildlife habitat.
- Farms and the preservation of the land and livelihood are helped by the sale of development rights. Preserved lands should be working lands which produce agricultural commodities or serve as pasture for domestic animals.

Specific suggestions for moving forward in this process included:

- Creating an extensive new NJ State park designated strictly for passive recreation. The goal should be to acquire as much of the contiguous undeveloped forestland as possible from Bald Pate in the West to East Mountain Road in the East.
- Replanting five native trees for every tree cut in the Sourlands. The mountain is already carrying as much development as it can bear, so if more trees are removed, they should be chosen for replacement by someone who understands the ecosystem and planted by someone who knows how to plant sensitively.
- Preserving the Sourlands, as is, for children and families to grow and learn from.
- Keeping the area for passive recreation and not for dangerous activities such as hunting. NJ has almost 9 million people living within its confines and hunting, which is indulged in by less than ½ of one percent of all NJ citizens, should not take over the use of this land from late August through early May, as it does in many other areas in NJ. The people of NJ want safe land to walk on, to hike on, to take pictures on, and to bike on and they want to be safe from the numerous hunting accidents that endanger every citizen.
- Farming without the use of pesticides and herbicides. Chemicals on the land that runoff into waterways and seep into groundwater cause illness and are not detected in testing as thoroughly as they could be. In addition to reducing or eliminating the use of harmful chemicals, a suggestion would be to test for mercury in the soil to monitor its effect on vegetation growth.
- Continuing to halt development to protect water resources, among other natural and unique cultural resources.

The comments summarized above represent a variety of voices from the seven municipalities in the Sourlands and the five communities where we held visioning sessions.

3. 2020 Vision Statement

We envision for the Sourlands a place where a series of cooperative efforts by municipalities will produce increasing collaboration toward the protection of the Sourland Mountain Region and its myriad rare and threatened resources.

A shared purpose - seeking the highest level of protection for the mountain - will encourage collaborating conservation partners to fill in the “blanks” in the mosaic of preserved lands that are important to supporting a sustainable future on the Sourland Mountain. Strategic “branding” of the region as a place for active as well as casual recreation and cross-cutting alliances, will bring alive the culture and history of the Region, and will attract the attention of birders, hikers, cyclists and others who seek a respite from the nearby hustle and bustle.

Eco-cultural tourists will be drawn to the region by the international intrigue surrounding the Lindbergh homestead and curiosity about how our fledgling Continental Army managed to defeat the better-equipped British troops, with cunning and courage. Likewise, the preserved open spaces, parks, scenic corridors, and fishing streams will hold sporting allure and offer a wide range of hiking opportunities across a well-connected trail system that spans the mountain. And as aging Baby Boomers fully embrace heritage tourism and eco-tourism close to home, travel dollars will fuel New Jersey's economy as never before. The rising cost of travel will make nearby destinations increasingly attractive and reveal the mountain as a place where history unfolds and an authentic sense of place will remain. Of course, as more visitors come to tour the wineries and farms that dot the countryside, managing their impacts on the landscape will be an increasing concern.

The flourishing populations of neo-tropical birds that make the round-trip every year from Mexico to Canada stop along the Atlantic Flyway to rest in the Sourland Mountains. This will increasingly capture the attention of birders, researchers and other outdoor enthusiasts. Diverse and effective protection and forest management strategies will ensure a healthy future for this spectacular forest and the biodiversity it supports. Here all wildlife will co-exist in balance.

The stewardship goals for the Sourland Mountain will be reflected in a coherent land management ethic for the Region that is taught in local schools, shared by homeowners and businesses alike and aided by the coordinated actions of municipal and county governing entities. Field observations and nature exploration will lead to more coordinated monitoring of the health of the forest and the streams it protects, and allow the near-term consequences of our actions to be better understood. Internet usage will also be harnessed to stimulate collective knowledge and appreciation for the mountain's authentic character, which will become ever more special in the face of the ordinary.

4. Goals and Objectives

A priority goal of this plan is for the Sourland mountain communities to form a partnership. For the purposes of this plan, we refer to this partnership as the "Sourland Alliance". This newly created Sourland Alliance (SA) will be a support network for each of the municipalities in order to advance the following goals:

- Expand and regenerate forests, and protect wetlands, wildlife habitats, and scenic vistas;
- Maintain the rural character of the communities including the preservation of farmland and shifting farmland practices to those more harmonious with the environment;
- Identify environmentally sensitive natural areas and protect them from development;
- Protect, defend and manage the region's scarce water resources;
- Develop a series of model environmental ordinances;
- Become leaders and educators in the effort to build awareness of the biodiversity of the Sourlands as a "living classroom";
- Work to identify and preserve scenic corridors, byways and vistas, recognizing their importance in helping to create the special quality of the Sourlands;
- Strengthen our commitment to identify and preserve historic resources;
- Seek agreement among stakeholders on matters such as road widths, allowable speed limits, and clearing and removal of brush along roads;

- Strengthen commitment to "dark skies";
- Develop rational consensus on treatment of undersized lots in light of water and other resource limits;
- Work towards creating an extensive new NJ State park designated strictly for passive recreation - The goal should be to acquire as much of the contiguous undeveloped forestland as possible from Bald Pate in the West to East Mountain Road in the East.

5. Natural Resources of the Sourland Mountain Region

The first phase of the Sourland Mountain Smart Growth Planning and Management Project examined land use capability based on ecological "carrying capacity". The Phase I studies included a Natural Resource Inventory, an evaluation of groundwater for the region, a build-out analysis and a comparison of all state, county and municipal planning documents and ordinances. These detailed background studies combined to form the Conservation and Open Space Plan for the Sourland Mountain[1]. The following sections briefly outline the critical environmental features of the Sourland Mountains as identified in the previous studies of the region and provide recommendations for future land use planning in the Sourland region.

5.1 Groundwater

A detailed assessment of the water-bearing capabilities of bedrock in the Sourland Mountain Region are contained in a report prepared by Matthew Mulhall, P.G., and Peter Demicco, P.G., titled "Evaluation of Groundwater Resources of the Sourland Mountain Region of Central New Jersey" (November 2004). The report highlighted the very limited yields from the underlying formations of dense hard rocks due to the very low water bearing capacities of the bedrock formations. The region's low water yield and the competition for this supply between anthropogenic activities (wells, irrigation) and natural systems (stream flow, plant growth, animals) has already challenged the limited Sourland Mountain water supply.

The recent trend toward "teardowns" where a (small) house is demolished and a (very big) house replaces it, is a unique threat to the water supply of mountain residents, since water-dependent lifestyles increase with the size of the buildings and "landscape management" areas, such as lawns. Thus, even the low densities required by the townships for new development will not assure that existing homesites, some in beautiful natural settings, will not be increasingly attractive candidates for "facelifts" or replacement. Municipal regulations governing floor area ratio, the extent of building coverage and other impervious surfaces are critical elements in the protection of the scarce Sourland Mountain water supply.

The low infiltration potential of the dense rocks of the mountain's forested core make them poor aquifers, highly susceptible to contamination and threatened by overuse. As demands on this supply continue to increase, local and regional water deficits reduce the amount of groundwater close to the land surface. When this happens, critical habitat features like vernal pools and wetlands are threatened and stream flow, which relies on groundwater for the base flow that keeps the stream flowing during

[1] "Smart Growth Planning and Management Project for the Sourland Mountain". November 2005

drought periods, can slow to a trickle or worse, with deleterious effects on the flora and fauna that rely on these resources.

5.2 Riparian Areas

Riparian areas, found along the streams that drain the mountain, are a diverse and important part of the ecosystem that protect water quality by buffering the impacts of surrounding land uses (Figure 3). A forested riparian area reduces water temperature, stabilizes the stream bank, filters pollutants and sediment from runoff, and provides critical nutrients and woody debris, which provide habitat for in-stream organisms. Stream monitoring shows a correlation between upstream development and impairment of benthic communities, an early indication of declining water quality.

5.3 Wetlands and Vernal Pools

Wetland habitats characteristically include swamps, bogs, marshes, artesian seeps, springs, and bottomland areas between well-drained upland areas and low-lying, permanently flooded areas, lakes or streams, although they may occur on slopes with groundwater seeps or in perched water table areas, as is typical on the Sourland Mountain. Wetlands account for twelve percent (over 6,500 acres) of the study area and are primarily forested. Wetlands serve as aquifer recharge areas and trap and filter nonpoint source pollutants through natural bio-chemical processes, helping to improve stream quality (Figure 4).

Wetlands play a particularly valuable role on the Sourland Mountain, filtering clean water into headwaters streams and capturing and retaining precipitation to recharge water-poor aquifers, a critical function on the mountain, where recharge is extremely low.

Vernal pools, a rare and important landscape feature in the Sourland Mountain, are isolated depressions that contain water in the early spring. Most vernal pools dry up and do not contain water all year round. NJDEP says, "Vernal pools are confined wetland depressions, either natural or man-made, that hold water for at least two consecutive months out of the year and are devoid of breeding fish populations." http://www.state.nj.us/dep/fgw/ensp/vernalpool.htm Before the high seasonal water levels are drawn down, these temporary ponds host breeding, egg laying and early life stages for a variety of reptiles and amphibians. Vernal pools occupy a fragile place in the landscape, and one that is highly susceptible to hydrologic changes in landscape ecology. Lowering the seasonal water table will have serious and potentially irreversible impacts on regional biodiversity.

5.4 Steep Slopes

The Sourland Mountain has a peak elevation of 567' above mean sea level. The bulk of the mountain is distinguished by an elevated plateau which stretches over three miles wide and fifteen miles long. The areas of steep slope in the Sourland Mountain region are found in the transitional areas, mainly on the western side, where Baldpate Mountain, Pennington Mountain and Pheasant Hill are located (Figure 5).

5.5 Forest

Among the 23,000 acres of forest on the Sourland Mountain, the 12,000-acre mixed oak forest is the largest remaining contiguous woodland in central New Jersey and the most significant remnant of the

vast Piedmont forest that once covered much of New Jersey (Figure 6). The expansive mature deciduous forest in the Sourlands, with its many important habitat types, is a unique ecological treasure. The size, shape and composition of the relatively unfragmented forest and adjacent land use make the Sourlands a haven for scores of woodland bird species. Biological diversity increases with the area of contiguous forest as habitat is better protected from intrusion of invasive species and disturbance. However, it is not just the acreage of a patch that makes it suitable habitat, but also its shape. Thus, maintaining wide unbroken patches of forest has more habitat value than the same patch size in a linear arrangement, where the "edge effect" is heightened. Land that is at the edge of a forest is different from land that is deep in the middle of a forest - more light penetrates, and there is a different collection of species that prefer the edge of a forest to the core of a forest.

Forest edges are also more accessible to predators and parasites that may occur in adjacent fields or developed areas. For example, house cats that kill small birds are often more common in forest edges adjacent to residential developments. Cowbirds, which are nest parasites, are also more common in forests adjacent to the open fields where they feed.

Some species of birds, known as "forest interior species", are not tolerant of the dryer conditions or the predators and parasites that occur at the forest edge. These species only occur in the core habitat of forest patches

5.6 Grasslands

Grasslands in New Jersey, other than marshes, are typically agricultural fields, either maintained as pasture or mowed regularly for hay. In modern times, the woodlands of the lower flanks and foothills of the Sourland region were cleared when the area was settled and farming was widespread (Figure 7). Grassland bird species readily took advantage of the open fields, particularly when warm season native grasses flourished. The grasslands that flank the Sourland ridge in the Amwell and Hopewell valleys continue to provide critical habitat for a number of bird species. According New Jersey's Landscape Project, the Piedmont region of the state, which includes the Sourlands, is home to imperiled and rare species including grassland birds such as the endangered upland sandpiper and woodland raptors such as the barred owl and Cooper's hawk.[2]

5.7 Critical Habitat for Threatened and Endangered Species

The Sourland Mountain region is rich in habitat suitable to support populations of threatened and endangered species and includes forest, grassland, emergent and forested wetland areas (Figure 8). Grassland habitat in the Sourland Mountain region supports a variety of endangered and threatened bird species, as well as offering necessary areas for migratory birds. Grassland habitats that support State threatened species are located along the study area boundary in Hopewell Township and northeast of Hopewell Borough straddling the Montgomery/Hopewell Township border. Typically, grassland habitat and agricultural hay fields exhibit similar characteristics. Hay fields tend to be conducive to bird habitat. In order to protect grassland habitat and its nesting bird population, farming practices that are friendly to grassland birds should be encouraged - e.g. delayed mowing or growing of warm season grasses, etc.

[2] http://www.state.nj.us/dep/fgw/ensp/landscape/lp_report_2_1.pdf p.7

According to the Raritan Piedmont Wildlife Habitat Partnership, the largest swath of grasslands (The Grasslands) lies within East Amwell Township. The East Amwell Grasslands, in the southern portion of Hunterdon County, abut the northern border of the Sourland Mountains. The Grasslands occupy portions of four municipalities, with significant portions also lying in Raritan and Delaware Townships, outside the Sourland Mountain Region. The Neshanic River, a major tributary of the Raritan River, flows through the center of the site.[3]

Emergent wetlands habitat, or areas of unique wetlands and vernal pools, are critical to the reproductive cycles of many amphibian species. Emergent wetlands have a wetlands vegetation pattern in which persistent and non-persistent grasses, rushes, sedges, forbs and other herbaceous or grass-like plants are the dominant vegetation.[4] The study area contains critical emergent and forested wetland habitat (south and west of Hopewell Borough), supporting State species of special concern. Areas of emergent habitat are also found east and west of County Route 601 in West Amwell and Hopewell Townships and in Hillsborough Township along Long Hill and Montgomery Roads. State regulations adopted in 2001 afford some protection for emergent and vernal habitats, where none previously existed, but these features merit increased protection.

The combination of unique environmental features amid such widespread regional development is a testimonial to the limitations on development in the Sourlands. However, the task of preserving and effectively managing critical resources in order to safeguard one of the last unbroken habitat areas in the State relies on the actions of government and landowner. This plan lays out a variety of tools to achieve its goals, such as private and public land stewardship principles, preservation and conservation of public lands and regulatory policies that minimize the impact of land development and developed land uses on the ecosystem.

6. Conservation Plan

The 2005 Conservation and Open Space Plan highlighted the importance of identifying and protecting the natural systems found in the Sourland Region. The goals of this Comprehensive Management Plan focus on stewardship, sustainability and regeneration. As new land development and existing developed uses place increasing demands on water resources, water quality and quantity are challenged. Demands can include increased water withdrawals that reduce base flow in streams that rely on groundwater during droughts. In recent years, weather patterns have shown increasing drought periods for the region, with rainfall periods becoming more infrequent and severe. The result of this has heightened need to determine the sustainable water yield and the contaminant effects of non point runoff and improperly functioning septic systems.

Protecting the quality and quantity of water will have a direct impact on the biodiversity in the Sourland Region. Often the first indictors of potential long-term problems are seen in vernal pools, where reptiles and amphibians find a springtime breeding ground and rely upon these areas for their continuing existence. Fragmentation of forests, reduction in grasslands, and loss of threatened and endangered

[3] Ettel, Troy. "Grassland Conservation Plan: Effective Stewardship of Public and Private Lands and Targeted Preservation of Critical Habitat". Raritan Piedmont Wildlife Habitat Partnership. 2006
[4] NJ DEP, Freshwater Wetlands Protection Act Rules (as amended through 11/2/2009) http://www.nj.gov/dep/rules/rules/njac7_7a.pdf

habitat are all critical concerns within the Sourlands. Collaborative land stewardship that makes a concerted effort to preserve and protect important lands will contribute to the long-term sustainability of the Region.

This Plan also recommends strategies to help the Region become more regenerative in its various functions. Enhancing natural features through a whole systems approach can reduce the need for structural technologies. For example, constructed and naturally-occurring wetlands systems can provide stormwater management functions, if they are protected and operate properly. Similarly, the dense forest habitat that offers cover to many species within the region also sequesters (captures) carbon that would otherwise be released into the atmosphere and contribute to climate change. Studies by the International Panel on Climate Change (IPCC) have found that carbon sequestration in densely forested areas is the most significant mitigation factor to climate change, provided the forest is managed properly and is not subject to frequent fire[5].

6.1 Stewardship Goals and Strategies

Implementing and encouraging long-term stewardship practices are key to achieving the goals and objectives of this Plan. While much of the Sourland Mountain Region is privately owned, encouragement of sustainable practices and educational efforts regarding proper land use can help to contribute to overall ecosystem health. The 2005 Conservation and Open Space Plan identified the following strategies that will work towards a sustainable future, including:

- Maximize the permanent preservation and stewardship of critical resource lands.
- Maintain the quantity and quality of surface waters and groundwater to protect the ecological health of the region.
- Conserve large contiguous areas of interior forest, grasslands, wetlands and other critical habitat by carefully managing man-made activities and encouraging open space acquisitions.
- Manage *limited* growth to respect the region's limited carrying capacity and be compatible with ecological constraints.
- Promote restoration of degraded landscape features.

During this planning process, the concept of sustainability has been expanding. As a result, a refined understanding of "sustainable" practices is required that goes beyond "holding the line" on pollution or mere restoration of previous degradation and embraces "regeneration" as a standard. Through regenerative practices the competition for scarce water resources can be directed away from an endgame where insufficient water for human needs also spells ecological disaster.

A regenerative relationship with a place goes beyond simple performance standards. A whole system understanding and vision is needed so that integrated solutions can be fashioned to address interrelated ecological systems, and the health of the living "infrastructure" is addressed along with green building issues. This living infrastructure consists of the waterways, groundwater, soil health, plants, animals, geology, and human communities.

[5] IPCC Assessment Report 4 (AR4). http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter9.pdf

Another factor of this living infrastructure is the awareness and understanding of the human connection to the unique ecology of the Mountain region. Checklists and generalized concepts, alone, will not convey an understanding of living systems. Observing the patterns of life over time in this place we will be able to design a positive, healing ecological footprint that will achieve long-term health and true sustainability.

Low Impact Development (LID) is an element of smart growth that achieves improved protection of environmental resources. It is an environmentally sensitive approach to land use planning that uses a variety of landscape and design techniques which manage development activities in order to mitigate potential adverse impacts on the natural environment. LID encompasses a broad array of development and management techniques and can be implemented in resource management practices, stormwater management methods, and low impact "green" construction activities. LID for natural resource management is applied through Best Management Practices and is geared toward protection and conservation of the resources. LID for stormwater management is aimed at capturing rainfall onsite, filtering it through vegetation and allowing it to recharge ground water. LID treats stormwater as a resource. LID for site design includes stormwater management techniques as well as other measures designed to reduce site disturbance, limit impervious coverage and utilize the natural features of a site to guide site development. Similar LID techniques may be applied for each of these purposes with the overall goal of minimizing adverse impacts of the activity.

In the Sourlands, where water resources are already stressed and unprotected habitat is increasingly threatened, LID standards are particularly important. Given the shared municipal goals of protecting the forest, avoiding disturbance, minimizing impacts, and mitigating adverse modifications to critical habitat, LID strategies can be meaningfully applied by Sourland Mountain municipalities both on the mountain and in the valleys beyond.

LID standards useful to protecting the Sourland Mountain environment and which can enhance the level of protection in critical resource areas include:

- Implementation of on-site stormwater management features that maintain, restore and enhance the pre-existing natural drainage patterns of the site.
- Limitations on the amount of impervious cover allowed on a site as a means to protect habitat and increase stormwater infiltration and reduce stormwater runoff.
- Minimum requirements for site-specific hydrologic studies during local development review and Sourlands Project Review which identify the velocity, volume and pattern of water flow into, through, and off of the parcel proposed for development.
- Minimum requirements for use of grass channels, dry swales, wet swales, infiltration basins, bio-swales and water gardens, green roofs, and other low impact approaches to attenuate and control stormwater and provide multiple environmental benefits.
- Municipal and county master plans and development regulations which permit the establishment of innovative technologies that promote compact design, native species landscaping, Low Impact Development, energy efficiency and resource conservation in support of the Sourland CMP goals.

- Minimizing soil disturbance during any type of development or redevelopment using on-site maintenance of sediment and erosion control practices such as silt fencing, rock check dams, and inlet protection.
- Discouraging clear-cutting of land and vegetation to prohibit compaction of soil and loss of the land's natural filtering system.

LID standards may also prove useful to protecting the mountain through their application outside the Sourland Mountain zones. These include the essential smart growth approach of locating development adjacent to existing water and wastewater infrastructure as well as transportation infrastructure such as roads and sidewalks. Such standards could provide opportunities to retire development rights from water-starved portions of the Sourlands through non-contiguous clustering. Such an approach would calculate the development potential from the mountain tract and provide for a commensurate increase in density on the valley tract in locations where natural or man-made infrastructure can support smaller residential lots in order to incorporate community open space and existing natural resources into the design.

For the purposes of developing a regenerative approach to this plan, the planning, management, regulatory and educational activities identified in the Phase I Sourland Mountain Plan are no less relevant today, and should be use as building blocks to form a firm foundation for long term sustainability.

Many of those activities were identified in the Phase I plan as follows:

Planning

- Develop a Sourland Alliance modeled on the Ten Towns Great Swamp Watershed Management Committee. This approach recognizes that municipal home rule will continue to shape landscape changes on the Mountain, and relies on intermunicipal cooperation in the exercise of municipal planning and regulatory powers. The highly successful Ten Towns Committee has been copied for other regional watershed applications, and its focus on public education and incentives, in tandem with plans and regulations, makes it a worthy model for a Sourland Alliance.

- Identify the forest core and corridors for preservation. This should include the forest core area where little or no development can be tolerated without significant environmental damage, along with linkage corridors where restoration efforts should be directed. This area should be targeted for acquisition or other preservation efforts and future management of existing land uses should seek to minimize detrimental impacts and phase out inconsistent or deleterious land uses, through a variety of techniques.

- Identify an agricultural retention area, where continuing agricultural activity, using best management practices, is to be supported. The Sourland Mountain region identified in this plan includes areas well suited to farming as well as those where farming is not appropriate. A coherent regional planning approach will acknowledge the importance of supporting agriculture on prime farmland where water is relatively abundant, while also discouraging or preventing agriculture where it would damage a fragile ecosystem or

overstress limited water supplies. Failure to clearly define such areas will create unnecessary adversaries among those with competing visions for the varied landscapes of the Sourland Mountain region.

- Prepare a comprehensive Forest Management Plan for the region, including detailed forest stand delineation, to actively manage impacts to the forest from development, timber harvests, farming and other activities. Change is inevitable, so change should be harnessed wherever possible to improve the future forest's ability to protect local water supplies, while also protecting and enhancing habitat value and biological diversity. Aesthetic considerations should be appropriately weighted in developing forest management strategies.

- Prepare a comprehensive cultural resource management plan for the region incorporating local historic preservation plans.

- Prioritize open space acquisitions to mirror the level of environmental sensitivity of the resource to be protected.

- Develop a greenway plan for headwater riparian corridors and other conservation areas.

- Promote diverse partnerships among governments, non-profit entities and private landowners to assure enhanced stewardship.

- Develop a coordinated indicators program to measure and monitor the ecological health of the region, including surveys of stream flow and surface water quality (chemical, physical, biological), regional water levels and groundwater quality (from well records), breeding birds, amphibians and other flora and fauna, including invasive and rare species.

Management

- Promote aggressive deer management strategies at the local, county and State level and conduct studies of the effect of deer harvest on the forest.

- Promote the eradication of invasive non native plant species and promote the restoration of native species.

- Promote use of best management practices to conserve critical woodland, grassland and wetland habitat, including trail maintenance.

- Protect surface and groundwater quality and quantity to maintain the ecological integrity of natural ecosystems and human health using best management practices and effective land use management.

- Prepare a comprehensive cultural resource management plan.

Regulation

- Explore enhanced environmental protection standards. Since DEP requirements generally applicable throughout the State may fail to adequately protect stressed water resources, native vegetation and wildlife within the Sourland Mountain region, municipalities should adopt more protective standards through local ordinances.

- Manage limited growth to be compatible with ecological constraints. This would involve a "zero tolerance" approach to pollution, destruction and degradation and would require a "custom fit" for new development within the Sourland Mountain environment. Require all new development to include remediation strategies to limit or obviate its attendant environmental impacts.

- Continue to explore the option of a Transfer of Development Rights (TDR) program for vacant undersized lots to relocate development from the Sourland Mountain core area to less environmentally constrained areas.

- Limit anthropogenic demands on the environment through land acquisition and land use policy that minimizes the footprint of future development and the water demands of new development.

- Develop equitable strategies to phase out and prevent new incompatible agricultural activities within the water-poor forested core area.

- Minimize impervious coverage in aquifer recharge areas and limit water use by new development and agriculture.

- Establish protective and regenerative environmental protection strategies, ordinances and design and performance standards for new development and redevelopment.

- Require each buildable lot to have a primary and a reserve septic field.

Education

- Catalog and disseminate sound habitat management policies that prevent habitat fragmentation and degradation including conservation site designs and coordinated management of upland forest and grassland habitat.

- Develop land stewardship programs for farmers, woodland owners and homeowners and discourage the planting of invasive vegetation especially where private property adjoins public open space.

- Provide public education about resource conservation to guide those who will live, work and play on the Sourland Mountain Those who wish broad lawns and ornamental landscapes can find suitable locales outside the Sourland region, where these

superimposed landscape changes damage the natural environment and their cumulative external impacts destroy important resources.

6.2 Best Management Practices and Policies for Resource Protection

Best management practices (BMPs) relate to the most appropriate and efficient uses of land that will, at the very least, minimize the overall impact on natural resources. BMPs relate to a wide variety of land uses from agricultural resources to residential development and commercial and industrial activities. For example, stream buffers, flood retention areas, carbon sequestration, and environmental contaminants are habitat protection measures and are effective at the regional, town and site planning levels. The recommendations that follow regarding Groundwater, Stormwater, Wetlands and Vernal Pools, Grassland Habitat, Forest Management, and Riparian Areas, offer both Regulatory and Non-regulatory protection, where appropriate.

Regulatory strategies can be designed to accomplish a variety of objectives that include: reducing forest penetration and fragmentation and development disturbance to protect areas with high resource values; protecting and expanding uninterrupted forest areas; adjusting zoning designations to appropriately reflect existing sparse development patterns; shifting development from areas with high resource value to areas more suited to growth; and clustering development in a compact form to limit the effects of sprawl and increase open space opportunities.

Non-Regulatory Strategies generally fall into three major categories: Land acquisition; Inventory needs; and Land stewardship. These strategies, in addition to zoning and other regulatory measures, are necessary for the SA to employ in order to achieve the overall goals of this response protection plan and implement a successful conservation / preservation program.

6.2.1 Ground Water

The water that lands as rainfall does not know political boundaries. Waters of the five Sourland Townships eventually make their way to the Stony Brook, Millstone and Delaware Rivers. This plan encourages the five municipalities to work across their political boundaries. Whether it originates on or below the surface, when water comes out of the tap in the Sourlands, it likely traveled under the surface from higher points of the watershed through cracks and faults until it was pumped up from a well.

Ground water is a resource often forgotten until the well runs dry. Our typical relationship to water involves turning on the faucet to fill a glass, brush our teeth, or wash the dishes. In the Sourlands our efforts to conserve water and promote infiltration of rain into the ground help to keep clean water flowing through our faucets. Ground water conservation is a primary goal within the Sourlands Region, and while efficient utilization of Sourlands water resources is one way to extend the available water supply, the CMP's policies on low impact development will support maximum infiltration of water into the ground over the long run. Consuming less water overall and only using fresh water for potable uses are strategies for effective water conservation. Low flow plumbing fixtures, re-using water, and proper maintenance of water delivery systems contribute to conservation efforts.

Development and redevelopment projects should incorporate water conservation and aquifer recharge protection strategies wherever possible. Potable water should not be utilized for non-potable uses, e.g., landscape irrigation. Any new landscape irrigation system should utilize rain gauges or moisture sensors

to limit watering of lawns. The US EPA's Water Sense program has more detailed information on these strategies[6]. The Sourland Alliance should promote the following benefits of water efficiency:

- Fewer sewage system failures caused from water overwhelming the system.
- Healthier natural pollution filters such as downstream wetlands.
- Reduced water contamination caused by polluted runoff from over-irrigating yards and agricultural lands.
- Reduced need to construct additional dams and reservoirs or otherwise regulate the natural flow of streams, thus preserving their free flow and retaining the value of stream and river systems as wildlife habitats and recreational areas.
- Reduced need to construct additional water and wastewater treatment facilities.
- Reduced surface water withdrawals that degrade habitat both in streams and on land close to streams and lakes.
- Enhanced water well yield.

Ground water quality can be impacted by pollution in a number of ways. Mines, pits and quarries; schools and hospitals; potable water treatment plants; large corporate office buildings; industrial manufacturing facilities; campgrounds and mobile home parks; food processors; and sewage treatment plants and other discharges of wastewater can all impact the quality of ground water. The SA should promote policies that provide for clean drinking water.

6.2.2 Stormwater

Stormwater management shall be designed to employ a "design with nature" approach, as defined in the New Jersey Stormwater Best Management Practices Manual, prepared by the NJDEP – Division of Watershed Management. Stormwater shall, to the greatest extent possible, be managed in a decentralized manner and shall utilize low impact mechanisms wherever feasible. Development and redevelopment projects shall be required, where appropriate, to at least meet the performance standard of 80% on-site stormwater capture for average annual precipitation (N.J.S.A. 7:8-5.5).

In order to promote best management practices, municipalities should be encouraged to strengthen their stormwater ordinances to be more protective than the general state model ordinance. For example, municipalities can require stormwater to be managed to the "maximum extent possible" and can reduce the threshold size of development or disturbance that triggers the need to comply with the stormwater ordinance. The SA should also encourage municipalities to require that any new development or redevelopment within the Region to:

- Maintain natural hydrology of the site.
- Limit land disturbance and vegetation removal.
- Maintain peak flows.
- Increase infiltration.
- Treat and recycle stormwater on-site.
- Reduce the need for structural and optimize use of nonstructural and living BMPs.
- Include buffers of thick native vegetation surrounding water resources (wetlands, lakes, ponds, streams).

[6] US EPA WaterSense Program, Water Efficiency
http://www.epa.gov/watersense/water_efficiency/benefits_of_water_efficiency.html

The SA should encourage the retrofitting of existing detention basins and other non structural vegetative practices.

Additional recommendations from the NJ DEP's Best Management Practices manual for promoting water conservation and infiltration of ground water include:

- Natural Landscaping - The average house or office building sits on a lot that is maintained as a lawn, and campus style office parks are situated within acres of manicured lawn. These lawn areas are compacted surfaces, limiting recharge to ground water, and for residential lawns often receive regular pesticide and nutrient applications. Natural areas of meadow or forest facilitate recharge, decrease stormwater runoff, and do not contribute chemicals to the environment. Replanting lawn areas with natural vegetation increases ground water recharge, and reduces runoff and the flow of pollutants across the landscape. Converting lawn areas to natural landscaping may help mitigate existing stormwater runoff problems as well as reducing maintenance costs.

  Local planning and development programs should require that new development and redevelopment incorporate natural landscaping into their landscape plans wherever feasible.

  The Sourlands Alliance should develop an educational program to encourage property owners to retrofit existing lawns, potentially including an annual awards program recognizing the best new landscaping and the best restoration landscaping of existing property to enhance the program.

- Pervious Pavement - Most pavement surfaces are designed to be impervious, serving to block the infiltration of precipitation to the ground below. Pervious pavement is designed to maintain or increase infiltration without damage to the transportation surface or to public safety. Pervious pavements range from pervious asphalt and concrete to gravel drive surfaces with a retainer to hold the gravel in place and prevent compaction that would reduce infiltration. The use of pervious asphalt and concrete on low-volume roads and parking areas may assist in reducing the impact of development. For individual home paving, pervious pavers of various types and gravel driveways may reduce the imperviousness of buildings and parking.

  Paving systems that permit grass to grow within the paved area or require little underlying engineering are generally suitable for residential drives or infrequently used parking areas. Pervious pavement techniques have been proven to work in climates with winter freezes, such as New Jersey. Local site plan and subdivision regulations should be reviewed to determine whether it is appropriate to allow and/or encourage the use of pervious paving materials.

6.2.3 Wetlands and Vernal Pools

Wetlands and adjacent uplands provide essential habitat for wildlife, including food, cover and travel, if connected to other habitat. Vernal pools, the small seasonal surface water pools from temporary flooding, are the breeding habitat for amphibian species that live in upland areas most of the year. Wetlands and vernal pools provide benefits such as protecting the water quality of lakes and streams; removing excess nitrogen; reducing flooding (wetlands act like a sponge); keeping streams flowing in dry periods.

The Sourland Alliance should work to ensure that adequate buffer areas are in place to protect wetlands and vernal pools, in addition to the regulated transition areas. Buffer areas not only provide protection as described above, they also:

- Stabilize soil and prevent erosion.
- Filter suspended solids, nutrients, and harmful or toxic substances.
- Moderate impacts of stormwater runoff.
- Moderate system microclimates. .
- Provide habitat and protect wetland wildlife habitat from adverse impacts. .
- Maintain and enhance habitat diversity and / or integrity.
- Support and protect wetland plant and animal species and biotic communities.
- Reduce disturbances to wetland resources caused by intrusion of humans and domestic animals.

Wetlands buffer widths are required and determined by state rules, and municipalities are preempted from adopting stricter requirements. Municipalities, however, should find ways to encourage landowners to identify and certify vernal pools on their properties with the NJDEP. Only certified vernal pools are provided with some protection at the state level.

6.2.4 Steep Slopes

Protecting steep slopes, hillsides, and ridgelines helps preserve unique qualities of a landscape that might otherwise be lost to development. In addition to protecting the natural landscape, steep slope regulations should be enforced as a precaution for public health, safety and environmental protection in a manner that allows a landowner use of the land, while avoiding drainage and stormwater problems. One example is to link density limitation to the grade of a slope. This allows for development, but limits it for safety, erosion control, and aesthetics.

The SA should develop guidelines that classify hillsides and grading regulations into three potential categories:

1. Slope/Density Provisions, which reduce allowable densities on hillsides (the steeper the slope, the less density permitted).
2. Soil overlays, which use maps by the NRCS to restrict development based on soil type.
3. Guiding Principles Approach, which tailors development to the characteristics of each site using innovative development approaches.

In addition, the SA should develop regulations that take the following areas of steep slope and hillside protection into account:

- Topography will define steep slope and determine what percentage of slope is permissible for development.
- Slope Stability identifies to what extent grading would affect the stability of the soils on site.
- Drainage & Erosion identifies areas that experience flooding, the location of facilities and structures downstream of hillside drainage, and the extent of all highly erodible soils in each watershed and subwatershed.
- Infrastructure intended to extend into sloped areas may be difficult and expensive to construct on hillsides and septic systems on slopes tend to have high failure rates. Regulations should identify

the slope grade at which septic systems, roads, power lines, and data lines are prohibited (eg. 15% or greater).

- Access to sloped areas should be regulated as a threshold for development of roads and driveways on slopes.
- Aesthetics to extend views to hillsides should be regulated by identifying peaks and hillsides of special symbolic value to the community. A survey of community values of hillsides and ridgelines and a map of these aesthetic resources would guide the boundaries of regulated areas.
- Natural Qualities such as vegetation communities and wildlife habitats should be identified and mapped along with any threats to these resources.
- Fire Hazards can be identified by assessing location, typical response times, and access requirements for Fire Departments to sloped areas.
- Recreational Values can be identified as area-wide needs and opportunities such as possible trails, viewing / look-out locations, and access to these sites.
- Preservation of Open Space on slopes should be considered for the creation of greenways, wildlife habitat preservation and conservation areas, and areas for regenerative practices.

Slopes provide many functions that contribute to a unique character of a landscape and should be protected for these reasons as well as to avoid negative impacts to downstream features. The SA should develop regulations controlling lot sizes on slopes, regulating access and infrastructure development on slopes, and/or promoting open spaces, greenways, and scenic overlooks. The viewshed discussion in the Open Space Plan provides additional recommendations on ridgeline protection.

6.2.5 Grassland Habitat Management

Grassland habitat will require the most intensive management, since valuable grassland habitat in the Sourland Mountain Region is found in active agricultural areas. Former hayfields, or meadows left to go fallow, may need to be supplemented with native cool and warm season grasses and herbs combined with a strict mowing regimen. This will allow for areas left fallow to maintain high quality habitat areas, especially for grassland birds, insect and flora. These areas also require monitoring for invasive plants such as Canada thistle and crown vetch, which reduce native species and diminish high quality nesting areas. Invasive species, if found, would have to be eliminated.

Habitat management has advanced to a point where long-standing land management practices by public agencies (mowing, clearing, fertilizing, etc) have been reconsidered, due to their impacts on wildlife. As a result, improved management approaches are being advanced by Federal, State, County agencies and non-profit conservation organizations that will aid habitat and resource conservation in the Sourland Mountain.

6.2.6 Grassland Management Recommendations

Grassland species, especially migratory birds and native species, have been on the decline partly due to successional processes and/or the development of agricultural lands and changes in agricultural practices. Due to increased mechanization of agricultural production, farmers have been able to increase production of hay and field crops from one (1) cutting per season to two (2) or three (3) per season. In addition, increased use of pesticides and herbicides, and reduction in field rotation, has also impacted grassland species.

Non-Regulatory Strategies
A variety of practices could be employed to alleviate these impacts and provide beneficial results for wildlife and farmers, including:

- Implement a delayed mowing program. Hay producers should conduct their first harvest no earlier than July 15 to permit one brood of grassland birds to fledge. Private landowners and public land stewards mowing fallow fields for aesthetics or to maintain early succession should mow no earlier than August 15 to permit grassland birds to fledge two broods.
- Restore agricultural/hayfields using native warm season grasses which may require herbicide treatment for establishment and management but do not require annual fertilizer or insecticide applications.
- Utilizing different portions of fields each season to improve the quality of the soil as land remains fallow and has an opportunity to return to natural state.
- Planting warm season grasses which are more resistant to drought and pests.
- Restoring meadows with native warm season grasses, which naturally bunch, leaving open areas for wildlife to nest, feed, forage, etc.
- Restoring meadows with native warm season grasses to allow for wildflowers and other plants to grow in the open areas, attracting insects for nesting grassland species to feed on.
- Encouraging landowners, planners, and/or stewards developing restoration plans or conducting plantings to consult with experts (i.e. Natural Resources Conservation Service) for technical assistance including seed mix and seeding rates to ensure native planting will benefit wildlife and is appropriate for the location. Programs such as EQIP (Environmental Quality Incentives Program) offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. WHIP (Wildlife Habitat Incentives Program) is a voluntary USDA program for improving or developing fish and wildlife habitat on private lands. The program provides both technical and financial assistance to establish and enhance habitat for priority species and habitat types.
- Requiring land managers/stewards of public lands and requesting private landowners to mow fields with blades at 6-8" high to minimize injuries and deaths to native turtles and snakes. In addition, encourage hay producers to harvest the field from the inside outward rather than the outside inward. This will allow some ground nesting birds to escape injury or death from haying activities.

In addition, the SA will work to attract agencies and programs to protect grasslands. Work is needed to prioritize grasslands. The SA will work with consulting agencies to prioritize grasslands for active management or purchase based on the NJ Habitat Incentive Team analysis as used by the Raritan Piedmont Wildlife Habitat Partnership (RPWHP). The variables for prioritizing grasslands are as follows:

- 202 hectare (ha) patches
- ¼ mile to protected open space
- ½ mile to preserved farmland
- Presence of endangered and threatened species

NOTE: Grassland species' restoration targets could be extracted from (or guided by) the RPWHP Conservation Goals since this region overlaps with the RPWHP focus area, and targets may be applied or revised where appropriate.

6.2.7 Forest Management for Habitat Improvement

The species diversity and abundance of intact habitat on the Sourland Mountain fits the definition of a priority habitat site. Because of the quality of available habitat, including the availability of fresh water, shelter, and food, the neo-tropical migratory bird stopover occurs in the Sourlands during the spring and summer months.

To determine the appropriate management techniques to improve habitat, the SA must assess the types of wildlife, their specific habitat needs, and the dates they thrive in this habitat. Most migratory birds arrive in New Jersey between mid-April and late-May and can include species such as the Cape May warbler, Blackburnian warbler, Wood thrush, and the Red-eyed vireo. Habitat value can be determined by quantity (e.g., acreage), quality (e.g., core forest vs. edge forest), type (e.g., scrub-shrub), and function (e.g., winter hibernacula). As the SA explores mitigation requirements such as no net loss of habitat value, these four elements should be accounted for and included in any mitigation design, in order to meet the habitat and life-cycle requirements of the impacted species.

The USDA Natural Resources Conservation Service (NRCS) publication *Conservation Corridor Planning at the Landscape Level: Managing for Wildlife Habitat*[7] identifies three levels of protection in a forest that can assist in the preservation of habitat. A "Core Reserve" manages specifically for wildlife species diversity and is what this plan seeks most to preserve. This is where the habitat is most protected from edge disturbances and has the ability to thrive on its own, without much "management". The "Buffer Zone" is the outer ring of the core forest area and manages for desirable edge species and low intensity recreation. This area of the forest could host multiple uses without disturbing the interior. The third level of protection involves Linking Corridors, which manages habitat for species migration and dispersal. Linking open spaces to create a corridor assists wildlife habitat to expand as the species move.

Where corridors are planned for improvement or management, the SA should consider the patterns of contiguous forest "patches" over time. The NRCS suggests that forest patches have become fragmented and that comparing historical patterns with existing patterns will help to determine areas of desirable, and feasible, connectivity in order to reconnect the landscape to benefit wildlife.

The dense wooded areas of the Sourlands provide numerous benefits to the wildlife of the region, including:

- Protective cover from adverse weather.
- Escape cover.
- Foraging and loafing sites.
- Reproductive / nesting habitat.
- Travel corridors for dispersing juveniles, travel between home range resources, and movement between larger natural habitats.
- Temporary seasonal habitat for migrating birds.

[7] Conservation Corridor Planning at the Landscape Level: Managing for Wildlife Habitat. USDA, NRCS., Part 190 National Biology Handbook. August 1999.

- A great variety of native plants.
- Groundwater and aquifer recharge.

They also provide numerous other environmental services:

- Reduce wind erosion.
- Provide shelter for structures and livestock.
- Provide tree or shrub products.
- Provide living screens.
- Improve aesthetics.
- Reduce flooding.

6.2.8 Forest Management Recommendations

In the Sourland Mountain region, forest management for purposes of preferential property tax treatment is currently undertaken by individual property owners with little clear coordination toward a common goal. The future health of the forest would be enhanced if these individual harvesting decisions were coordinated through a centralized oversight process, where the long-term resource management goals for the region could be advanced. The Forest Stewardship Law passed in early 2010, when implemented, will provide for required specific stewardship activities without the necessity of cutting down trees unless the plan so requires.

Identifying forest subwatershed integrity within the Sourland Mountain region should remain a component in determining levels of protection for each type of forest subwatershed. Figure 9 identifies core forested areas, which are defined as forest areas with a canopy closure greater than 50% outside of a 300 foot buffer of roadways and contain one or more valuable natural resources which include threatened or endangered species habitat and vernal pools. The combination of these features highlight areas in the Sourlands that may require additional protection strategies. Further analysis of could include determination of forest integrity by degree and location in subwatersheds. These core forest areas are identified below:

High Integrity Forest Subwatersheds. High Integrity Forest Subwatersheds are predominantly forested and characterized by a high proportion of native forest cover consisting of high value core area, large patch sizes and short distances between patches.

Moderate Integrity Forest Subwatersheds. Moderate Integrity Forest Subwatersheds are predominantly forested, but do not exhibit a high proportion of high value core as large patch sizes or proximity between patches.

Low Integrity Forest Subwatersheds. Low Integrity Forest Subwatersheds are predominantly non-forested or include low values for proportion of forest cover and patch size, or exhibit high distance to nearest patch.

An analysis of the species of wildlife present, as well as the times of year, duration of time they inhabit the area and their pattern of movement is needed to better understand the diversity of wildlife in the Sourlands, and appropriate levels of protection / management. This can be done by following the NRCS' GAP Analysis Process which will produce a "Species Richness Map". Note: GAP refers to the Gap Analysis Program, a US Geological Survey program. The goal of Gap Analysis is to keep common

species common by identifying those species and plant communities that are not adequately represented on existing conservation lands. Common species are those not threatened with extinction. By identifying their habitats, Gap Analysis gives land managers, planners, scientists, and policy makers the information they need to make better-informed decisions when identifying priority areas for conservation.

Outline for GAP Analysis Process

1. Determine those species that occur in the region that are of concern or interest.
2. Collect and compile habitat relationship and occurrence data for those species.
3. Create a map of where the habitats occur in the region based on existing vegetation.
4. Overlay the wildlife habitat data with the habitat map to determine areas of rich species diversity.
5. The result of items 1-4 will be a *Species Richness Map***.**

Once the Species Richness Map is created, forest management strategies for preserving forest core, creating buffers and linking corridors can be applied as necessary, as identified in the forest integrity map. An accompanying general land ownership map will classify lands into public and private ownership. The two maps together, the GAP Map, will reveal habitats that are offered the least protection in the region. The SA can then assign management status for these areas through special regulating language to ensure the proper management for wildlife habitat.

Non-Regulatory Strategies

An effective woodland conservation program should place emphasis on the structure of each stand, edge effects, dead trees and snags, appearance, crown cover, invasive plants, tree density, basal area, micro environments, water movement, potential plant diseases and noxious insects, and stand disturbance.[8]

Following the guidelines of Hagan *et al*. 1997, King *et al*. 2001 and Keller *et al*. 2003, an effective long-term coordinated forest management strategy for New Jersey would be to:

1. Encourage and provide incentives for implementing "no management" and "infrequently harvested" strategies on privately-held land, wetland, and wetland buffer easements. Figure 10: Interior Forest Areas and Preserved Open Space, which identifies preserved open space and interior forest blocks within the Sourland Mountain region, can aid in identifying and prioritizing interstitial areas that would be valuable to add as additional core areas or connecting corridors.
2. Provide for regional-scale review of individual harvest plans by an agency to be identified, for the purpose of maximizing the long term health and regeneration of the forest. An intermunicipal cooperative agreement could advance this objective, which can be significantly advanced using municipal regulatory authority.
3. Review harvest plans as they are submitted in order to consolidate proposed cutting into shelterwood cuts up to 10 acres and located, whenever possible, away from forest patches and clustered in such a way to preserve the maximum amount of core forest and reduce edge.[9]
4. Consider shelterwood or seed tree cuts where the retention of some canopy trees (e.g., Williamson 1970), especially in small (3-4 trees), scattered, open clusters, increases heterogeneity of the stand, provides habitat for additional types of birds during succession (Keller *et al*. 2003). Plans should be prepared by an approved forester with oversight from the NJ Bureau of Forest Management.

[8] "Forest Sustainability is the Long Term Goal", Mannix Porterfield, Register-Herald, WV. Jan. 13, 2009.
[9] Comment made by NJ Division of Fish and Wildlife via email December 2008.

5. Harvest boles and the largest limbs only. Leave some trunks (e.g., beech) and all slash on the ground. Minimize the number and size of logging trails and lay them out in a way that does not aggravate soil erosion and runoff.
6. Retain screens of mature forest between cuts and adjacent private lands and public roads where aesthetics are of concern.
7. Educate the public on the value of these techniques and provide outreach and education materials and signage for cut areas on publicly-held lands.
8. Explore opportunities for establishing a Sourlands branded signage program for commitments to recommended "forest friendly" land management approaches.

In addition, the SA should consider:

1. The mortal threat the deer overpopulation crisis poses to the continued existence of the Sourlands forest needs to be addressed through community-based deer management, widespread hunting on private lands, and perhaps even professional deer management.
2. The management of invasive plant species, especially those near the Core Forest, should be prioritized. Early detection/rapid response programs to emerging species/populations of invasives should be put in place throughout the region. These management activities should be important features of any forest management/stewardship plans adopted in the region, as well as priorities for public, non-profit land trust, and private landowners.
3. Special attention should be paid to safeguarding the numerous rare and declining plants which currently live in the Sourlands, especially deep-forest herbs. Utilizing the Plant Stewardship Index (developed by nearby Bowman's Hill Wildflower Preserve) to assess the ecological conservatism of areas prior to approval of any development in the region would be an appropriate metric to safeguard these plants.
4. A management plan should be developed to protect plants native to the Sourland region and to control and reduce non-indigenous plants.
5. Areas of Core Forest (contiguous closed canopy) should be expanded, buffered and connected through available land acquisition and protection tools. This will have the net benefit of protecting wildlife and flora alike.

Regulatory Strategies

1. The Core Forest (continually forested area which has never experienced soil disturbance from agriculture) should be precisely delineated utilizing GIS and searching through the oldest possible records to determine its extent.
2. Require publicly-held land, wetland, and wetland buffer easements to remain undisturbed, especially in core areas of mature forest.
3. Prohibit within any portion of the Sourland Mountain Region, any forest disturbance that by definition constitutes deforestation.
4. Forest disturbance within the Sourland Mountain Region should be permitted only upon a finding by the reviewing board or other applicable municipal authority that the following requirements have been satisfactorily addressed:
    a. Demonstration that the proposed disturbance can neither be avoided nor reduced in extent, while adequately providing for a proposed use that otherwise meets the requirements of the municipality's regulating language;

   b. Demonstration that the proposed disturbance will not diminish the forest integrity class (as indicated in the map of Forest Subwatersheds, Figure 9) of any forested areas adjacent or proximate to the location of the proposed activity;
   c. Incorporation of Low Impact Development techniques appropriate to the activity or development project proposed;
   d. For any proposed disturbance other than that associated with the maintenance of a legally pre-existing use or structure (expressly excluding the expansion of any such use or structure), submission, approval and implementation of a Forest Mitigation Plan designed to minimize the extent of such disturbance, protect forest areas adjacent to or proximate to the disturbance area, and mitigate for loss of tree or other forest vegetation removed during the course of such disturbance; and
   e. Notwithstanding the preceding provisions, in the case of any proposed disturbance that by definition constitutes deforestation, submission, approval and implementation of a Forest Mitigation Plan designed to minimize the extent of deforestation, protect forest areas to remain, and restore or mitigate for forest area loss.
5. Adopt a woodlands and tree protection ordinance such as the model that is provided in this plan.
6. Tree harvesting or any other forms of disturbance or clearing should be minimized in this area. If timber harvesting must be pursued (i.e. by a private landowner), it should be an extremely selective harvest (high-grading), which minimizes canopy gaps that could destroy the structure, soil interdependencies, and herbaceous layers of the soil, and also threaten deep forest birds and other wildlife. Clear-cuts, seed tree cuts, shelterwood cuts etc. do not preserve the integrity of the ancient forest. Selective harvests must be accompanied by effective deer management (hunting or fencing) in order to insure regeneration.
7. Management, when it must take place at all (for example in situations where landowners are compelled to manage in order to obtain farmland tax assessment) should manage for regeneration of the disappearing understory: native shrubs, understory trees and forest herbs. Techniques for this type of management will need to be developed or honed because few foresters currently possess the expertise or inclination to manage in this fashion.

6.2.9 Forest Mitigation Plans

Sourland Mountain forest resources are vitally important to every element of the Sourlands Region, including the natural and the built environment. Forests provide essential ecosystem functions, including the recharge of aquifers, the protection of stream water quality, protective cover from adverse weather and escape cover, foraging and loafing sites, reproductive / nesting habitat, travel corridors for dispersing juveniles, travel between home range resources, and movement between larger natural habitats. Forests also provide temporary seasonal habitat for migrating birds, a great variety of native plants, groundwater and aquifer recharge, sequestering atmospheric carbon and contributing to the fight against global warming. Forests also reduce wind erosion, provide shelter for structures and livestock, provide tree or shrub products, provide living screens, improve aesthetics and reduce flooding.

Forests serve as habitat for plants and animals, and as forests contain critical habitat, they are critically important to the maintenance of biodiversity in this part of the state. The Sourlands also offer recreational resources and contribute to the Region's unique scenic value. When managed for sustainable use, forests can also be a source of renewable wood products. The Sourland forests are a defining visible and functional feature of Central Jersey and constitute a majority of critical habitat of the immediate Region.

In order to ensure the protection of these important and unique resources, a Forest Mitigation Plan should be prepared for the Region. This plan, prepared by a New Jersey-Approved Forester or other qualified professional, should include each of the components listed herein.

A. ***Mitigation Priority Map***. Priority Areas are forested locations within the site having the highest ecological value to be targeted for conservation, restoration, or mitigation, including such areas as:
   i. Open Waters and Buffers
   ii. Riparian Area, including Floodplains and Floodprone Areas
   iii. Critical Habitat
   iv. Steep Slopes and Ridgelines
   v. Core Forests and Contiguous Forest Patches
B. ***Forest Protection Plan.*** A plan providing the proposed methodology appropriate to, and by which the applicable mitigation priority areas will be protected throughout the period of forest disturbance and thereafter.
C. ***Proposed Site Plan.*** A plan incorporating pre-construction and construction best management practices to ensure the well-being of forest areas adjacent or proximate to the disturbance area. Such plans shall include prescribed limits of disturbance to be mapped, field marked, and provided with protective fencing prior to the start of any construction activity. Plans shall indicate installation of tree protection fencing along the drip line of trees to be protects, with instructions barring encroachment by machinery or heavy equipment of any kind, and requiring regular inspection and maintenance of fencing throughout the construction period.
D. ***Mitigation Description.*** A description of the proposed forest restoration, tree planting plan or other mitigation initiative proposed to provide equivalent or enhanced forest ecosystem benefit in consideration of the extent and type of disturbance or deforestation that would result if the use or activity is approved.
E. ***Planting Plan.*** A detailed plan indicating the specific plantings proposed for restoration, reforestation or mitigation, including size, species, quantity, location, separation distances, planting details, deer and pest management protections and maintenance plans.
F. ***Maintenance Agreement.*** A minimum 3-year maintenance agreement that outlines care-taking responsibilities of the applicant once the proposed planting has been completed. The maintenance agreement must include monitoring of newly planted stands, provide for protection devices in working order for three (3) years, and ensure at least a 75% survival rate after three (3) years.

6.2.10 Riparian Area Habitat Management

A riparian corridor is an area encompassing a stream, its banks, and any additional critical features identified by a governing body. The features can include any associated wetlands, steep slopes, and floodplains adjacent to a stream channel. A riparian corridor should include a vegetated buffer so that the stream may be maintained in its natural condition, with minimum disturbance. When a riparian area is protected, it functions as a filter, removing sediment, nutrients, and pollutants by providing opportunities for filtration, absorption, and decomposition. It reduces stream bank erosion by slowing stormwater velocity, which aids in allowing stormwater to be absorbed in the soil and taken up by vegetation. In addition, a properly functioning riparian buffer prevents flood-related damage by storing

stormwater and releasing it slowly; provides shade to maintain cool water temperatures needed to provide a suitable habitat and nutrients for terrestrial and aquatic species; helps to maintain biological diversity and adequate flows of water to underground aquifers; and provides greenway corridors for wildlife.

Riparian areas are a diverse and important part of the ecosystem storing and transferring nutrients among the habitat areas throughout the landscape. The scenic character of many riparian areas makes them appear desirable for development or use, making them vulnerable to harmful activities.

The municipalities should consider enacting additional support for the protection of streams as local resources and treasures.

6.2.11 Riparian Area Management Recommendations

Effective protection of riparian areas requires the careful delineation of stream corridors and identification of riparian area species.

Non-Regulatory Strategies

- Maintenance of forest areas to prevent streambank erosion and non-point source pollution and to reduce sediment entering the waterway.
- Locate parking areas, loading areas and golf courses outside of the stream corridor.
- Maintenance and restoration of the streambank vegetation with native species trees, shrubs and grasses and a “no-mow” policy.
- Swimming pool discharges to surface water or stormwater systems can also increase loads in the streams. It is recommended that homeowners be advised of Best Management Practices for the proper discharge of pool water.
- The municipalities in the Sourlands should encourage residents and businesses to practice good land stewardship by removing invasive species and choosing native vegetation for plantings on uplands and riparian areas and minimizing the use of pesticides and fertilizers as much as possible.

Regulatory Strategies

- Clear definitions for “flood plain” and “stream corridor.”
- Adopt a stream corridor ordinance, protecting stream corridor areas and prohibiting new structures within 300 ft of all streams, as supported by the following NJDEP rules: Stormwater Management Rules (N.J.A.C. 7:8); Surface Water Quality Standards (SWQS) (N.J.A.C. 7:9B); Flood Hazard Area Control Act rules (FHACA) (N.J.A.C. 7:13).
- Extension of the stream corridor if wetlands, flood plains, steep slopes or critical habitats are adjacent.
- Seek stream protection through enhanced stream classification (i.e. Category One) under Surface Water Quality Standards (SWQS) (N.J.A.C. 7:9B) and Flood Hazard Area Control Act rules (FHACA) (N.J.A.C. 7:13)
- Provide monitoring and penalty provisions.

6.3 Environmental Health Monitoring

Protection of the Sourlands can be enhanced with the development of an indicators program that identifies and measures a variety of indicators of environmental health. Indicators should include:

1. Stream chemical and physical quality - This could include pH, phosphates, nitrate, total dissolved solids (TDS), and temperature of selected area streams and other surface water bodies, and could be expanded to include specific markers of human-caused pollution, e.g. from septic systems, such as caffeine, pharmaceuticals or bacteria. The Stony Brook-Millstone Watershed Association has one of the oldest stream monitoring programs in New Jersey, and regularly collects both biological and chemical data from streams in the Sourlands. The Watershed Association's data indicates that the stream quality in the Sourlands is good (but in many cases, impaired to an extent). The streams sampled by the Watershed Association in the Sourlands meet state standards for nitrate, dissolved oxygen, temperature, pH, and turbidity, although there have been cases where turbidity was too high in Cruser Brook. Biological data shows that stream health has fluctuated between non-impaired (healthy) and moderately impaired, which indicates that stream health is declining.

   This information should coordinate with and augment existing efforts gathered by the DEP, which with the USGS and other organizations, already samples a number of streams for some of the above parameters.

2. Stream biomonitoring - The NJDEP has a well-developed approach to monitoring benthic macroinvertebrates in streams, and to gauging the degree of stream impairment through these results. Additional sampling sites within the Sourland Mountain could be chosen and operated consistent with the NJDEP methodology.

3. Groundwater quantity - Some wells in the area, such as East Amwell, are monitored by the United States Geologic Survey (USGS) for water levels. More detail is needed on the status of groundwater quantities, and more well records are needed. Hydrogeologists can assist in identifying useful locations and setting up routine, electronic monitoring with observation wells.

4. Groundwater quality - Through New Jersey's Private Well Testing Act, much data are now becoming available on groundwater quality in the State. The data for the Region include nitrate, arsenic, fecal coliform, and a variety of other parameters. Some municipalities also collect data. While data are generally available only at relatively broad geographic scale, at least routine reporting of the data relevant to the Sourlands should be considered. Ideally, these data will be augmented with local-scale data.

5. Breeding bird surveys - Such surveys are conducted by the Audubon Society and periodically by NJDEP. The establishment of a routine monitoring program for the Sourlands could augment these efforts and provide important detail on trends of key species that are especially important in the Sourlands (e.g. Ovenbird and others that need relatively large contiguous forests for breeding success). Hannah Suthers, a local licensed avian rehabilitator, has been a valued participant in the Washington Crossing Audubon Society's (WCAS) biological surveys, the NJ Breeding Bird

Atlas, the Christmas Bird Count, the Atlantic Flyway Project, bluebird nest monitoring in the Lawrence/Hopewell area and the NJ Herp Atlas Project. Her data are a critical part of the Sourlands Natural Resources Inventory.

A complementary study to the breeding bird survey is a survey for the presence of threatened and/or alien invasive flora and fauna. The presence of these species threatens the long-term health of the Sourland Mountain region as they could take over the native plants that provide habitat for wildlife in the Sourlands. Identifying the presence of invasive species in the Sourlands would highlight the region as a threatened resource. This could potentially stimulate additional survey efforts to gather as much data as possible for protecting the existing populations of wildlife and native plant species threatened by invasive species. .

6. Land use/land cover – Available interpretations rely on the aerial photos and satellite-based imagery available through the State and from regional and national organizations. Trends in these data, especially any significant changes in extent of impervious cover, could be routinely examined and reported on a Sourland-specific basis to area organizations and municipalities. An ongoing database of land cover alterations, documenting changes between aerial photo interpretations, could be developed to track emergent change.

7. Other land use measurements - Such measures as traffic counts on selected, representative roads, issuance of building permits or septic installation or repair permits, could be routinely tracked in the Sourlands.

8. Plant species inventories and maps.

9. Stream flow – While USGS monitors points at some streams, there is a need for more detailed data, particularly on some of the headwaters streams that are, increasingly, intermittent or ephemeral. Additional monitoring stations could be established in the Sourlands under the guidance of hydrogeologists.

10. Amphibian monitoring - The North American Amphibian Monitoring Program (NAAMP) is a collaborative effort among regional partners (state natural resource agencies, nonprofit organizations and the USGS) to monitor populations of vocal amphibians. Observers are trained to identify their local species by these unique vocalizations or "frog calls". The USGS provides central coordination and database management, while the regional partners recruit and train volunteer observers to collect amphibian population data, following the protocol of the NAAMP. This could be expanded along the same lines with additional sites in the Sourlands, and would likely generate much useful data.

11. Other - Other measures, e.g. location, extent and functioning of detention basins in the region, location and status of easements and various other prohibitions on certain types of land use, e.g. preserved stream corridors, could be routinely monitored in the Sourlands.

12. Future use of the Hillsborough Quarry - In June of 2009, the Silvi Group acquired the 3M quarry property in Hillsborough and Montgomery. Its new name is Gibraltar Rock of Belle Mead. The site is home to approximately 60 acres of quarry rock waste material known as “fines”. The fines

pile has been capped and there is minimal erosion, however the fines pile will not support growth of vegetation indigenous to the Sourlands. This quarry has been a source of polluted stormwater runoff to Sourland streams including Cruser Brook, Roaring Brook, Pike Run, and beyond, for a least a decade. While polluted stormwater runoff from the site has been drastically reduced since active quarrying ceased, the stormwater management facilities on this site need to be carefully designed to ensure cleaner runoff in the future.

7. Open Space and Recreation Opportunities

Open space lands include active and passive recreation areas, gardens, naturalized areas (including stormwater techniques such as naturalized swales), trail systems, and critical environmental areas such as steep slopes, habitat lands, wetlands, water bodies, riparian corridors, and forests. In the Sourlands, the preservation and conservation of unique and scarce resources is key to the long term viability of the Region as critical habitat and home to human population. One of the best methods to achieve the preservation goals is to identify, acquire and preserve important areas that exemplify the Sourlands or are key to its ecological integrity since private ownership prevents assurance of long term protection. The Conservation and Open Space Plan prepared in 2005 for the Sourland Mountain Region highlighted the extent, type and use of open space areas in the region as well as identified areas of importance for preservation and management strategies for proper use and maintenance of open space and recreation areas.

In 2005 there were over 17,000 acres of preserved land in the Sourland region, or 31% of the study area. By 2008 this amount increased by 1,106.54 acres (Figure 11) preserved through private and non-profit initiatives along with municipal, County and State efforts. Non-profit organizations, such as D&R Greenway, New Jersey Conservation Foundation, the Lawrence Township Conservation Foundation, Friends of Hopewell Valley Open Space, Sourland Planning Council, Montgomery Friends of Open Space, Hunterdon Land Trust Alliance and Friends of Princeton Open Space, have made important contributions to the amount of preserved open space in the region.

In addition to the preservation of land, there is also a concerted effort to create a contiguous trail system throughout the region and beyond. The D&R Greenway Land Trust and other nonprofits, including the New Jersey Trails Association, have been working toward identifying and expanding the current trail system. One of the goals of these efforts is to create greenway linkages between the Delaware River and the Sourland Preserve in Somerset County, as well as north-south trails between the agricultural valleys and historic settlements (Figure 12).

An increasingly coordinated strategy for the permanent preservation of open space in the Region will help to achieve a variety of goals. Preserved lands should be slated primarily for passive recreation use that will protect valuable resources, eliminating development permanently and its potential impacts to habitat diversity and water resources. Active recreation uses, such as ball fields, should be located outside of the Sourlands Region. Permanent preservation also allows for public access and education, helping people understand and respect the sensitive ecological resources often overlooked in New Jersey's threatened landscape. The protection of the Sourland Mountain Region will be greatly advanced through finding and preserving appropriate linkages between and among historic sites and districts, farmland, forestlands and other open spaces areas.

7.1 Identifying Potential Open Space Opportunities

Preserving critical environmental features in strategic locations is essential to the long-term viability of the Region. Permanently preserving these areas can help to ensure proper management and conservation of a site. Protecting interconnected systems, such as stream corridors, where forested areas, wetlands, steep slopes and floodplains combine to provide habitat diversity preserves the functional integrity of the evolving landscape. Properties containing multiple critical environmental features, therefore, should be highly valued when evaluating potential purchases, especially when they adjoin other environmentally sensitive areas and contiguous open space areas. Passive recreation should be the end use when environmentally sensitive properties are acquired, since it is most conducive to the preservation of the valued feature(s). The following are examples of evaluative criteria when ranking or considering open space purchases.

7.1.1 Critical Water Resource Areas

The protection of critical water resources is one of the primary objectives in the Sourland Mountain region. One of the most effective ways to achieve water resource protection is through permanent preservation of lands that contribute to high quality and quantity of water. The New Jersey Water Supply Authority (NJWSA) has developed ranking criteria to identify lands by importance to water resources protection factors. These factors include wellhead protection areas, groundwater recharge, riparian areas, forests and wildlife habitat, preserved open space, land cover and known contaminated sites. The ranking can then be used to determine a parcel's level of importance for water resource and distinguishes lands most important and appropriate for preservation. Figure 13 identifies areas of critical importance for water resources, prepared by the NJWSA for the Raritan Basin, which includes the Stony Brook-Millstone Watershed, the Upper Raritan Watershed and the South Branch Watershed.. The ranking values were assigned on a percentage basis, from the most important lands for water quality protection (90% and above), to those which are least important (less than 10%).

As noted in the 2005 Conservation and Recreation Plan for the Sourland Region, and other technical documents, an array of valuable, limited resources that are key to the overall health of the Sourland Mountain make some areas most appropriate for acquisition. The New Jersey Water Supply Authority ranking values (Figure 13), which identify the most important lands for water quality protection, should inform future acquisitions. Water quantity and quality is protected by the contiguous forests, wetlands, floodplains and vernal pools. Preserving large tracts that contain one or several of these features will help to offset future degradation of resources.

7.1.2 Greenways/linkages

Parcels that provide connections to existing or proposed open space and greenways areas contribute greatly to the massing of contiguous habitat areas. A linear or contiguous system of open space that provides access for passive recreation opportunities, such as birding or hiking, and preserves uninterrupted habitat, is important to protect. Open space and/or Greenways maps developed by each of the municipalities were used to create the Greenways Map for this plan. (Figure 14)

7.1.3 Increase contiguous holdings

The contiguity of land to existing or proposed preserved areas should be an influencing factor. Areas that can contribute to contiguous open space will help to achieve goals regarding expanding open space,

preserving habitats and environmental features and maintaining the rural character of the Sourlands. Contiguous areas are extremely valuable for habitat protection and viability.

7.1.4 Develop new linkages

New linkages become possible as preserved land increases over time. New or expanded linear opportunities may become evident with additional preservation efforts, adding new connectivity to the system and should be given priority for purchase.

7.1.5 Cultural/historical lands

The historic and cultural resources of the Sourland region provide a continuing connection to the past and add to the overall appeal of the Region to visitors and residents alike. Protecting historically or culturally significant sites is important when preserving properties and also when private properties are developed.

"Teardown" development threatens historic resources throughout New Jersey and can occur wherever an "underdeveloped" home site is deemed to need a facelift. Municipal initiatives should be linked to preserve the character and historically rich identity of the region.

7.1.6 Scenic viewsheds

Maintaining rural character and scenic vistas offer a perspective on place and should be considered a high priority for land preservation where development threatens to erode or destroy scenic qualities. Montgomery Township has developed an approach to scenic viewshed protection through mapping that identifies the "Areas of Scenic and Recreational Importance". These areas of importance tend to be the ridgelines throughout the Township. Mapping scenic resources provides a starting point for the Township to prepare local regulations preventing the disturbance of scenic views.

7.1.7 Development pressure

The threat of development is frequently the motivator for preservation, and is one that does not always recognize other preservation priorities. When potential development prompts preservation interest, and the parcel meets one or more of the criteria or goals of the Plan, acquisition priority should be given where it can provide a valuable addition for passive or active recreation, for preservation of water quality or for preservation of endangered species habitat. While preservation and enhancement is increasingly important in locations where development density is high and little preserved land exists, expanding existing preserved elements to maximize the size and optimize the shape of the contiguous forest is a key preservation objective.

7.2 Open Space and Recreation Action Plan

The relative abundance of preserved lands in the Sourlands has resulted from the ongoing efforts of municipalities, counties and the State, along with non-profit organizations and private donors. Preservation partnerships are among the most effective methods utilized to preserve and conserve open space and recreation areas in the Sourland Mountain Region.

The D&R Greenway Land Trust, a major strategic partner in the collaboration to protect the mountain, has identified elements of a long-term preservation strategy for the Sourlands to advance the

preservation objectives of county, municipal and nonprofit preservation partnerships. Amongst the recommendations:

- A stable source of preservation funding;
- Volunteers to build trails;
- A coherent vision for the Sourlands as a public/private open space network; and
- A greater State role in teaching stewardship as well as continuing education efforts by the State, counties and municipalities.

No preservation strategy can be more effective than permanent preservation. Once land is preserved, proper land management assures that any potential development is handled so that it does not threaten ecosystem health. Fee ownership of protected open space prevents the loss of forest and other essential habitat.

The acquisition and permanent preservation of open space diminishes the threat of development and the man-made impacts of development, both during construction and after. Open spaces that can limit these impacts are critically important to protecting water resources and the fragile ecosystem of the mountain. As preservation and conservation acquisitions continue into the future, these efforts should focus on better management of public lands as habitat (e.g. delayed mowing of grasslands, avoidance of "clean-up" techniques that remove woody debris, etc.) and expanded linkages among critical habitats that are key to maintaining regional species biodiversity.

The SA recommends that the use of motorized vehicles be prohibited in preserved/protected open space areas. Motorized vehicles degrade the environment, cause serious erosion to the land and to trails and compromise the integrity of buffers and wetlands.

A variety of programs and approaches to advance preservation and conservation goals are outlined below.

New Jersey Trails Association (NJTA)

NJTA is a cooperative project of environmental organizations, dedicated to making free information conveniently available to the public about places to walk. NJTA assembles information on trails open to the public, and posts the information on its website (www.njtrails.org). NJTA works with state, county, local, and non-profit land preservation groups and parks agencies to plan and build more trails.

Crossroads of the American Revolution Project Area

Green Acres, along with the National Park Service, has been undertaking a variety of projects highlighting the rich historical role New Jersey played in the Revolutionary War. A variety of project areas and trail systems are proposed to document significant Revolutionary War sites and events. One such project is the Crossroads of the American Revolution Project Area, which aims to preserve the landscapes and trail corridor system from Morristown National Historic Park to Washington Crossing State Park, including among other sites Old Barracks in Trenton, Princeton Battlefield State Park and Monmouth Battlefield State Park.

A recently preserved property is located in West Amwell Township at the top of Goat Hill; a scenic overlook where Gen. George Washington once stood to view the Delaware River. The 213 acres of open space has been preserved for public use by the NJ DEP's Green Acres program. The acquisition is part of the Green Acres' Crossroads of the American Revolution land preservation initiative. The DEP's Division of Parks and Forestry will manage the area as part of nearby Washington Crossing State Park.

New Jersey Department of Environmental Protection Green Acres Program

In 1999 the State Legislature passed the Garden State Preservation Trust Act, securing stable funding for preservation of open space, farmland and historic resources throughout New Jersey. There are a variety of funding opportunities through Green Acres, the program that manages open space acquisitions and recreational development.

Planning Incentive Grants (PIG)

A method of encouraging municipal and county participation is the Planning Incentive Grant (PIG) process for lands in the Sourland region and finding mutual partnerships to expand on funding opportunities will increase preserved lands in the region. The PIG process enables the State Agricultural Development Committee to provide grants to eligible counties and municipalities to purchase development easements for permanent preservation of farmland in designated project areas.

County Open Space Preservation Program

Hunterdon, Mercer and Somerset Counties all provide assistance programs for the acquisition of open space properties. Through municipal and non-profit initiatives, counties assist non-profits and municipalities in acquiring county-significant projects. Funding preferences for municipal and non-profit initiated projects are often based on their consistency with the goals and criteria of each County. Counties often request that projects demonstrate efforts to leverage other governmental and private funds while providing regionally significant open space.

The Environmental Infrastructure Trust Financing Program

This program provides low interest loans to municipalities, counties and authorities for clean water-related activities, including land acquisition when watershed management and water quality benefits are provided. With funding from both NJDEP and the NJ Environmental Infrastructure Trust, the program utilizes a Federal Priority System developed each year by NJDEP. Loans are made for 20-year terms at a blended interest rate. Local governments receive 0% interest rate for half of the allowable costs and market rate interest rates for the remainder.

National Recreational Trails Program

NJDEP provides financial assistance for developing and maintaining trails and trail facilities for non-motorized and multi-use purposes, such as horseback riding, hiking, and biking. The maximum grant award is $25,000, and projects are funded on an 80% federal share and 20% matching share basis.

Conservation Easements

Recreational land, both passive and active, can be made more accessible with access provided through conservation easements. Conservation easements typically encompass some desirable

environmental resource, such as a stream, floodplain or steep slope area, and provide a measure of protection against development to that resource. Limited access permitted through conservation easements is a means to make certain lands more accessible to the public. Conservation easements should support existing and planned linkages of open space corridors and recreational areas to create, or enhance, a network of open space to be accessed by non-vehicular means. Conservation easements should be encouraged for all properties with habitats that support threatened or endangered species.

8. Land Use and Management Plan

8.1 Existing Land Use/Land Cover

Despite a scattered pattern of low density housing, sloping farm fields and a small complement of commercial uses, the distribution of land cover types in the Sourland region reflects and reinforces the high resource values that are unique to the region.

According to 2007 Land Use/Land Cover data, published by the New Jersey Department of Environmental Protection (NJDEP), not quite half (44%) of the Sourland Mountain region is covered by forest, while 16% is in urban land use (residential, commercial, industrial, government, etc.). Agriculture (25%), wetlands (13%), barren land (1%) and water (1%) account for the remainder (see Figure 15 and Table 1).

The most developed areas of the Sourland Mountain region are found at the base of the plateau, in areas that were traditionally farmland. The more densely settled areas are in and around Hopewell Borough and in the easterly portion of the region in Montgomery, Hillsborough and Hopewell Townships. In addition, linear concentrations of development line the major transportation routes, such as State Route 31, as well as local roads.

Table 1 – 2007 Land Use/Land Cover

Land Cover Type	Acres	%
Forest	22,884	44
Agricultural	13,031	25
Urban	8,211	16
Wetlands	6,563	13
Barren	394	1
Water	441	1
Total	**51,524**	**100**

The 2005 Natural Resource Inventory for the Sourland Mountain Region examined land cover in 1995 and the increase in developed land area in 2002, which has been expanded and updated below to include the 1972, 1986, 1995, 2002 and 2007 land cover data. Between 1995 and 2007, development generally occurred outside of the forested ridge of the Sourlands and was generally located on the fringe of the ridge. Table 2 identifies the change in land cover characteristics over a 30-year period.

Table 2 – Land Use/Land Cover Change (1972 to 2002)

Land Use/Land Cover Type	1972*		1986		1995		2002		2007		Change 1972 to 2007	
	Acres	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*
Agriculture	18,238	35	16,184	31	14,437	28	13,259	26	13,031	25	-5,207	-29
Barren Land	76	0	297	0	264	.5	523	1	394	1	318	418
Forest	25,127	49	22,427	44	23,137	45	23,417	45	22,884	44	-2,243	-9
Urban	557	1	5,957	12	6,655	13	7,302	14	8,211	16	7,654	1374
Water	142	1	329	0	328	.5	397	1	441	1	299	211
Wetlands	7,307	14	6,331	13	6,702	13	6,626	13	6,563	13	-744	-10

*Acreages were approximated by multiplying the number of grids for each land use/land cover category by the grid size of 262'x262'.

The loss of over 5,200 acres of agricultural land (-29%) and over 2,200 acres of forest (-9%) accounted for most of the nearly 7,700-acre increase in urban land cover (1,374%) between 1972 and 2007, highlighting how substantially the region has been impacted by development in recent history. Figure 16 shows the areas where land use changes to urban lands occurred since 1986 and 1995. Reinforcing the pattern of historic development, the lands converted to development are generally outside of the forested mountaintop, along the foothills and in the valleys surrounding the Sourland Mountain.

8.2 Existing Municipal Zoning Regulations

The Phase 1 Smart Growth Planning and Management Project for the Sourland Mountain compared municipal zoning (see Figure 17) and other land use regulations, including board of health and design regulations. The following identifies the current status of zoning and other regulations by municipality, as updated from the Phase 1 findings:

8.2.1 East Amwell Township, Hunterdon County

There are four (4) zoning districts in East Amwell Township that are included in the Sourland Mountain Regional Study Area. The Sourland Mountain District (SM), the Amwell Valley Agricultural District (AVAD), the Residential District (R) and the Highway Office District (HO). The SM and AVAD are residential districts with large lot sizes to accommodate appropriate growth. The two HO parcels, a tiny fragment of southern Ringoes and a lot at the Rte. 31, Rte. 518 intersection, currently a hay field, allow for commercial uses, with a main focus of providing services for local needs. One side of Poplar Road, just south of Ringoes comprises the very small R parcel.

East Amwell identified the Sourland Mountain Region as an area that required special consideration for the protection of its fragile natural resources and limited water supply. The Sourland Mountain District in East Amwell requires a minimum lot size of 15 acres/unit for residential development and 30 acres/unit for farm uses. Expansion of existing farm uses is prohibited. While the Township recognizes the value of smart growth techniques such as clustered development, given the concerns over water supply and poor groundwater recharge, clustering is not permitted in the Sourland Mountain District.

Pre-existing five-acre lots, which conformed to the ordinance prior to the zoning change in 2003, are grandfathered for single-family homes.

The Amwell Valley Agricultural District (AVAD) extends into the Region. The AVAD includes the rural agricultural areas of the Township, where key farming operations have historically occurred. The intent of this zone is to retain and promote agricultural activities, and permitted uses include single-family detached units, agricultural uses and farms and public parks. Much of the AVAD has prime agricultural soil. In the Region it is found in the areas south of Wertsville Rd. and south of Rocktown Rd. in the proximity of Rte. 31. The Amwell Valley Agricultural District requires a minimum lot size of 10 acres and encourages the use of development options such as clustering and lot size averaging, where lots of 1½ acres can be created at a bonus density of 1 unit per 6.7 acres.

8.2.2 Hillsborough Township, Somerset County (2002)

Hillsborough Township has five zoning districts within the Sourland Mountain Region. These include the Agricultural [AG], the Mountain Conservation [MZ], the Residential [R], the Quarry [Q] and the Retail Commercial [C1] Zones.

The Mountain Conservation [MZ] District is found along the trailing end of the Sourland Ridge and consists of the great majority of the land in the Sourland Mountain Comprehensive Management Plan located in Hillsborough. The township instituted the district as a means to protect the fragile resources, critical land, forest habitat and scarce water resources. The Mountain Conservation Zone seeks to provide for capacity based planning and development that does not negatively impact the resources of the Ridge. The minimum lot size is 15 acres with a maximum density of 0.06 units/acre.

The Agricultural [AG] District is a very small percentage of the Sourland Mountain Comprehensive Management Plan and it flanks the Mountain to the north and provides for retention of agricultural practices in the Township. Residential development not affiliated with farming in this district is directed at smart growth principals to deter sprawl. The density for a conventional single-family detached development is one-unit/10 acres. Clustering and lot averaging development options are available in the agricultural District.

The Quarry [Q] District is focused on one specific parcel where quarry activity has occurred. The intent of the district is to allow the continued quarry operations. The regulations in the district allow for a reasonable activity level on site that take into account the natural resources valuable to the environment.

The Residential [R] area is at the edge and a very small insignificant area in the Sourland Mountain Comprehensive Management Plan. The purpose of the R District is to provide for development takes into consideration existing and prospective facilities, a convenient street system, employment areas and reasonable predictability of population growth. The standards under the R District are intended to maximize site design flexibility and offer a balanced housing pattern attractive to all income and age segments. In these districts, development design may follow either standard subdivision requirements for lots, cluster zoning or utilize the planned development provisions. The minimum lot size for the R District is one acre.

The Retail Commercial [C-1] area is also at the edge of the Sourland Mountain Comprehensive Management Plan and is extremely small and insignificant. The C-1 District is intended to provide the

opportunity for commercial services, limited entertainment facilities and employment opportunities. Their geographic distribution is intended for convenient access by the residents of the immediate area and to discourage unnecessary traffic from major streets.

8.2.3 Hopewell Township, Mercer County

The Sourland Mountain Region in Hopewell Township includes the Mountain Resource Conservation District (MRC), the Valley Resource Conservation Districts (VRC), the Neighborhood Retail Commercial District (C-1) and the R-100 Residential District and Q (Quarry)

The Valley Resource Conservation (VRC) and Mountain Resource Conservation (MRC) Districts are by far the largest percentage of the Sourland Mountain Region. They lack public water and sewer infrastructure which limits future development potential. The Districts respond to the goals of conserving the rural and agricultural countryside that embodies much of Hopewell Township. The VRC District permits open lands zoning, provided that a significant remainder (60 to 70 % of the parcel) is permanently deed restricted against future residential use and remains available for agricultural or other resource conservation uses. Minimum lot sizes should be large enough to assure an adequate site for a home, septic system and accessory uses, but small enough so that the open space ratios can be provided.

The Mountain Resource Conservation District also permits open lands zoning at a density of approximately one unit/13 to 14 acres, provided that 75 to 80 percent of the parcel is permanently deed restricted against future residential use and remains available for agricultural or other resource conservation uses. In this District, minimum lot sizes also should be large enough to assure an adequate site for a home, septic system and accessory uses, but small enough so that the open space requirements can be met.

The R-100 District largely encompasses pockets of existing development, many of which were historically developed as subdivisions under prior zoning or strip frontage lots along collector and arterial roads. The R-100 Districts allows for residential development to occur at 1 unit/2 acre density.

The Neighborhood Retail Commercial (C-1) District is intended to recognize patterns of existing, isolated retail uses consisting of single lots or two adjoining uses. The purpose of this district is not to perpetuate strip development, but merely to recognize existing uses. Permitted uses include retail sales and service establishments, offices, banks, restaurants and commercial recreational establishments.

The Quarry District (Q) is the existing quarry at Moore’s Mill.

8.2.4 Montgomery Township, Somerset County

The Mountain Residential (MR) District permits low-density residential uses and passive recreational areas compatible with the prevailing rural atmosphere and natural resource limitations in the area. The minimum lot size for residential construction is 10 acres in the MR District.

The R-5 Single Family Residential District permits low density land uses that retain rural character and protect environmental integrity. The minimum lot size required for residential construction is 5 acres in the R-5 District. The Public, Parks and Education (PPE) district includes parkland and the Montgomery High School. The District permits farms, public parks, conservation areas, open space, public purpose uses and schools, including public and private elementary and/or high school and some single-family

dwelling units. The minimum lot area for the PPE district is 10 Acres for residential development and 5 acres for public developments.

The Mountain Residential/Special Industrial District, where the former 3M quarry produced stone products used in the manufacture of roofing shingles, is rural in nature and contains environmentally sensitive features found primarily in the Sourland Mountain region. The property was sold to the Silvi Group and is operating the quarry under the name Gibraltar Rock. The residual "fines" by-product of the former quarry production is no longer being produced. While permitted uses for this district include single-family detached developments and special processing activities, Gibraltar Rock owns almost the entire district. However, 3M also sold a significant portion of the property to Somerset County to add to the Sourland Mountain Park. Given the critical environmental resources in this district and the need to develop according to the limitations of natural resources, residential development is permitted on 10-acre lots while a minimum of 50 acres is required for processing activities.

A small portion of the Sourland Mountain region is located in the Limited Manufacturing District (LM). The LM district's permitted uses include, farms, offices, existing single-family detached and limited manufacturing. The minimum lot area for the LM district is 2-5 acres. Johnson & Johnson Consumer Products Division owns this entire district. The company is developing plans for future build-out that remains on the property.

8.2.5 West Amwell Township, Hunterdon County (2003)

The Sourland Regional Planning District (SRPD) addresses the unique regional environmental qualities including important woodland habitat, limited groundwater recharge, steep slopes and other qualities. The SRPD permits single-family residential development at 1 unit per 8 acres. The zone also allows for residential cluster development options.

The Rural Residential Northern District (RR-4) of the Township contains subsurface and geological features most conducive to groundwater recharge. Therefore this region can support a higher density of development with a minimum lot size of 4 acres with cluster development provisions allowed.

The Rural Residential Central District (RR-5) has severely limited access to groundwater and limited recharge opportunities, and thus lower density development on lot sizes of 5 acres is permitted. Clustering is offered as a permitted development option.

The Rural Residential Southern District (RR-6) lies south of the SRPD and has constrained groundwater limitation. This zone contains larger parcels and agricultural areas and the lot size for this zone is 6 acres.

The Village Residential Zone (R-9) permits single-family development on lots containing 31,250 square feet. The R-1A zone is designed to allow single-family development as a result of Mt. Laurel settlement.

The Neighborhood Commercial District (NC) permits a limited variety of nonresidential uses to provide localized, neighborhood-oriented personal services and limited retail opportunities. The minimum lot size is 1 acre.

The Limited Highway Commercial Zone (LHC) permits a limited variety of nonresidential uses centered around highway-oriented commercial, retail and office uses that can serve to help stabilize the local tax base and provide needed jobs and services. This zone requires a minimum lot size of 1.5 acres.

The Highway Commercial (HC) zone is designed to permit shopping and services by providing sites for highway-oriented business, warehousing and offices. Within this area West Amwell hopes to avoid a strip-commercial development appearance. The maximum floor area ratio for this zone is 15% and the maximum impervious coverage is 50%.

The Light Industrial District (LI) is intended to provide warehousing and distribution activities. This zone has a minimum lot size of 5 acres with a maximum floor area ration of 15% and a maximum impervious coverage of 40%.

8.3 Existing Board of Health Regulations

Healthy, efficient and well maintained septic systems are critical to maintaining the quality of the drinking water supply for the residents in the Sourlands. The Sourland Alliance will seek to employ public education and other mean to address this important issue.

The 2005 Smart Growth Planning and Management Project for the Sourland Mountain provided a detailed review of Board of Health regulations for all 5 municipalities in the Study Area. Since the release of the previous Project, amendments to the New Jersey Department of Environmental Protections Water Quality Management Program (N.J.A.C. 7:15) have been adopted. The new regulations require Counties to be the lead agencies for wastewater management planning in the State through the preparation of a Water Quality Management Plan (WQMP).

The WQMP will contain chapters devoted to each municipality within the County and updated plans are to be submitted to NJDEP by April 7, 2011 (Administrative Order No.2010-03). Amendments identify septic density standards based on a 2 ppm (parts per million) nitrate dilution standard on a HUC 11 basis. In addition, the new amendments encourage clustering and lot averaging development options. State approval of the Water Quality Management Plan will be conditioned upon municipalities adjusting their zoning to be in line with the NJDEP septic density standards (Figure 18).

Also mandatory to satisfying the adopted NJDEP WQMP rules, is the adoption of three ordinances: Septic Management, Riparian Zone (stream corridor), and Steep Slope Protection.

The Sourland Mountain Region includes parts of five (5) HUC 11 subwatersheds where maximum septic density ranges from one septic per 5.6 acres to 6.5 acres, as identified in the Table 3.

Table 3: Septic Density Standards for the Sourland Region (N.J.A.C 7:15)

HUC 11 ID	HUC 11 Name	Acres per Septic System
02030105030	Neshanic River	6.0
02030105040	Raritan River South Branch	5.6
02030105090	Stony Brook	6.2
02030105110	Millstone River	6.5
02040105210	Alexauken Creek	6.0

While these septic density standards will have to be taken into consideration for any development regulation in the Sourland Region, they allow more development than is permitted by ordinance today and fail to account for the limited aquifer potential of the mountain. It is noteworthy that under the newly adopted Highlands Regional Master Plan, where resource management concerns mirror those in the Sourlands, septic densities are far lower than those permitted by NJDEP in the Sourlands. These results from a lower nitrate target in the Highlands designed to provide enhanced protection for the Highlands' precious, yet abundant, water supply. Ironically, much of the Sourland region is so "water poor" that an enhanced nitrate standard would appear to be at least as important here.

8.3.1 Water Supply Regulations

East Amwell Water Supply Ordinance #03-03 BH

The East Amwell water supply ordinance recognizes that water supply and well performance widely varies throughout East Amwell Township and that East Amwell's sole water source is groundwater. Well performance requires a discharge test, a residential three-part pump test or a non-residential three-part aquifer test and required separation distances between wells are established in the ordinance as well as certain technical analyses. Three part pump tests require interference testing with neighboring wells. A residential three-part pump well test can be waived if the applicant obtains test waivers from all owners of adjacent wells eligible for interference observation. Actual yield would then be determined by the Drilling Discharge test.

However, this test cannot be waived in the Sourland Mountain District; all wells must undergo a three-part pump test with interference testing to certify the well for a specific volume before subdivision approval or a building permit is issued. Existing residential water wells require re-certification to support alterations to wells that will increase demand by 20% or more over its certified capacity, or, if not certified, over 20% increase over its present use. In addition, all major subdivisions require an aquifer test and hydrogeologic report to be submitted prior to granting approval and certified wells for each lot in a subdivision are required. In Sourland Mountain District, before approval for any lot is given, a well must be tested and certified. Non residential uses - including agricultural uses under 100,000 gallons per day (which falls under NJDEP jurisdiction) - also require three part pump tests and, depending on the quantity that is to be used, may require a hydrogeologic analysis and report.

Hillsborough Township Water Supply Ordinance Chapter 350

Hillsborough Township requires all new wells be pump tested and that any subdivision must have approved wells prior to issuance of construction permits on each lot proposed in that subdivision. The capability of a well to meet the peak demand and the total daily demand of its user shall be evaluated through a three-part pump test. Interference test is restricted to the MZ-Zone, or any zone in which the well driller's report indicates the presence of diabase or argillite rock formations, and is an evaluation of the influence a new well will have on existing well(s) so as to determine if that influence would be sufficiently large as to interfere with operation of existing wells

Hopewell Township Water Supply Ordinance

Ordinance BH 2003-1- "Private Wells and Septic Systems"

The purpose of this ordinance is to protect and educate buyers, sellers or occupants of properties in the Township whenever there is a transfer of property, change in use or change in tenancy.

No transfer or change in use or tenancy of a property that utilizes an onsite public or private well system for potable water supply can be conducted until the administrative authority issues a Letter of Review stating that the water system complies or does not comply with water quality standards specific to NJDEP regulations. In the event of non-compliance all involved parties shall be notified.

Ordinance No. 03-1298 - "Land Use Development"

The purpose and intent of this Section is to ensure that residential development of two new lots or more and all site plan applications demonstrate that adequate water supply is available without adverse affect on neighboring wells and other resources including but not limited to wetlands and streams. The testing procedures for a subdivision of two or more new lots and all site plans shall be based on a hydrogeologic analysis and a minimum of one aquifer test. The aquifer test shall consist of at least one constant-rate pumping test conducted at a sufficient rate and duration to be able to determine aquifer characteristics such as transmissivity and storage coefficient. As part of the aquifer test, observation wells are to be monitored to determine and evaluate the cone of depression and aquifer parameters, and predict the effect of long term pumping on existing and future wells

Ordinance No. 03-1299 - Wells, Well Tests and Water Supplies"

The purpose of this section is to assure that adequate water supply is available without adverse effect on others and to maintain the long-term natural equilibrium of the ground and surface waters of Hopewell Township. The provisions of the ordinance are applicable to all new, altered and replacement supply wells, wells on existing lots, and wells installed or to be partially or totally used for non-essential use. A three-part aquifer test will be conducted with the first part evaluating the peak demand, the second part determining the constant head yield and the third part determining the rate of recovery.

Montgomery Township Water Systems Ordinance BH: 4-1

Montgomery Township requires that new wells or single family dwellings or cottages be located in a geological region designated in the Montgomery Township Natural Resources Inventory (1984) Geology and Groundwater Map as "Lockatong Argillite" or "Diabase" or are located in a geological region designated in the Montgomery Township Natural Resources Inventory (1984) Geology and Groundwater "Stockton Sandstone" or "Brunswick Shale" and have a yield less than 5 gallons per minute or in an area where it has been demonstrated by performance in existing wells in the vicinity. Testing will take place in two parts, a "peak demand test" and a "constant head test" and notification of test is to be given 72 hours prior to the test to the Administrative Authority. In addition, all new wells for single-family dwellings in either the Lockatong Argillite or Diabase Regions must be approved before any approval of permits relating to the construction of individual or community subsurface sewage disposal systems.

West Amwell Township Board of Health Ordinance BOH 96-01 for Water Supply Systems

West Amwell requires that an initial test is performed to determine the yield of the well, which must produce 5 gallons per minute or more for a single-family home. Water supply for "major" developments must prove that water supplies are adequate to meet the demands of the project without adversely impacting existing wells.

8.3.2 Septic System and Sewage Disposal Regulations

East Amwell Board of Health Regulations Code of East Amwell Chapter 171: Sewage Disposal Systems, Individual

East Amwell adopted regulations in 1995 more stringent than NJAC 7:9A, and subsequently amended these regulations in November 2003. The current regulations require that septic systems be constructed, installed and operating prior to issuance of certificate of occupancy by the building inspector and that a permit to construct septic system is required prior to issuance of other building permits. Further the water well for the property must be tested and certified by the Board of Health prior to the approval of the septic system. In the Sourland Mountain District, the septic system must be approved prior to subdivision, minor or major. Other requirements that are stricter than NJAC 7:9A include: the Township requires a reserve expansion/replacement area with approved soil tests that meet NJAC 7:9A that is equivalent to 100% of the approved disposal area for lots based on soils; extra soil tests and a permeability test is required for each system.; the minimum separation distance between disposal field and property line is 25 feet; the slope of a mounded system is required to be no more than 15%; no garbage disposals are allowed; the system cannot be located any closer than 50 feet to a flood hazard area and other setbacks and safety measures are included in the ordinance. In the Sourland Mountain District the minimum separation distance allowed for septic tank and septic field from a water course, well, reservoir, or water line, is 200 feet. In all other districts the minimum separation distance of a septic field from a water course, well, reservoir or water line is 100 feet.

East Amwell also has an ordinance regulating sanitation units and chemical toilets ("port-a-potties").

Code of East Amwell Chapter 159: Holding Tanks

East Amwell adheres to NJAC 7:9A, which strictly regulates the use of holding tanks for sewage management. A holding tank can only be used in certain circumstances and must be approved by both NJDEP and the municipal Board of Health. The Board of Health has a local ordinance that has additional requirements. Permission to use a holding tank can only be granted for existing premises where a sewage disposal system has failed and the Board is satisfied that the failure cannot be rectified.

Hillsborough Township Individual Sewage Systems – Chapter 333

Hillsborough Township requires all new septic system construction permitted within the Mountain Zone (MZ) must be completed and approved by the administrative authority before a building permit is issued.

Hopewell Township Individual Subsurface Disposal Systems

Ordinance BH 2003-1- "Private Wells and Septic Systems"

The purpose of this ordinance is to protect and educate buyers, sellers or occupants of properties in the Township whenever there is a transfer of property, change in use or change in tenancy.

No transfer or change in use or tenancy of a property that utilizes an onsite septic system can occur until a report by an independent inspection company is conducted. If the inspection reveals an inadequate system a plan must be submitted to the Board of Health itemizing how the system will be brought up to compliance.

Ordinance 2005 "Individual Septic Disposal"

Purpose. Due to the environmental characteristics of Hopewell Township, the board of health developed this ordinance in 1978 to address the widespread use of onsite sewage disposal systems and water supply wells. Onsite sewage disposal systems may constitute a potential source of pollution of ground and surface waters, resulting in contamination of potable water supplies, foul odors and nuisance problems and may pose other hazards to public health. It is determined to be in the interest of public health, safety and welfare to develop an ordinance to provide site specific requirements in the conducting of soil testing, specifying lot area, restricting system locations and providing additional design and installation requirements for onsite sewage disposal systems in Hopewell Township.

Aerobic Sewage Treatment Systems. If an individual subsurface disposal system design is submitted for approval and the design contains or has as a principal operating part thereof an aerobic or aeration type waste treatment system, the board of health may approve such design, but only under the terms and conditions as contained in this subsection and N.J.A.C. 79A.

Holding Tanks.
1. The board of health shall allow holding tanks for use only in accordance with N.J.A.C. 7:9a3.4c and 3.12. The use of holding tanks shall be allowed only after a detailed written analysis has been submitted to the board of health analyzing other possible methods of disposal and reasons why they are not acceptable. Holding tank systems designed to accommodate flows greater than 2,000 gallons per day must be reviewed and approved by NJDEP.

The lot area required for onsite sewage disposal systems and water supply wells shall meet certain contiguous net square footage or acreage requirements located outside of any watercourses, wetlands, wetlands buffers, State open waters, areas of steep slopes, or any areas restricted against development by State, Federal or local approvals.

Each lot to be approved for subdivision, site plan, or dwelling construction have two acceptable adjoining areas within 50 feet of each other for the construction of a primary and reserve area for onsite sewage systems. Primary and reserve soil tests and profile pits are required in both areas. All soil testing must be witnessed by a representative of the board of health.

Ordinance BH 2004-1- Waivers for Reduction of Lot Area for Preexisting Lots:

Hopewell Township allows waivers for reduction of lot area for pre-existing lots only if the waiver being requested is for not less than 80% of the net area requirements. The applicant must seek approval of the Zoning Board of Adjustment, only after receiving conditional approval for the design from the Board of Health. The Board of Health will review the design to assure it meets all other Township & NJDEP site and technical design conditions.

Montgomery Township Individual Subsurface Disposal Systems - BH: 6-1

Montgomery Township requires that soil evaluation be conducted and witnessed by an individual with experience in the matter and that all site tests must be conducted within 12 months of the systems construction. If testing was completed prior to 12 months, approval to continue must be granted or a demonstration that no significant changes have occurred in the Code with respect to testing procedures or data in question. For sites where mounded disposal field or mounded soil replacement disposal must be utilized, the engineer must provide the Board with a design that utilizes the lowest profile and the best possible system in order to secure the public's health, safety and welfare. Any disposal system must be located in areas free of encroachments by man-made and natural obstacles that could potential clog any part of the system.

Closed Sewage Systems (BH: 6-2)

Closed Sewage Systems are only allowable with special permission from the Board of Health. Permission is granted only in cases where soil tests indicate septic system will not function properly within the State regulations and where no other method of handling sewage is available at the time of application.

Non-individual Subsurface Sewage Disposal Systems (BH:6-3)

A non-individual system is defined as any system servicing more than one property, dwelling, commercial unit or other realty improvement. An applicant must demonstrate that the regulations for individual disposal systems are impossible or impractical by reasons. No portion of the disposal field is to be located within 150 feet of the boundary line, a 50 foot buffer along the lot is to be landscaped, and cannot be located within 100 feet from another disposal field and at least four groundwater monitoring wells are to be provided.

West Amwell BOH Ordinance 01, 2003 – Sewage Disposal Systems

West Amwell requires a textural analysis is to be completed and must contain 85 to 95 percent sand (fine and very fine sand to 25% or less by weight) from 5 to 15 percent silt plus clay, minimum 2 % clay. All permits must be obtained for location, construction, alteration or repairs of sewage disposal systems.

West Amwell BOH Ordinance 01, 2006 – Reserve Disposal Areas

It shall be the requirement that each lot to be approved for subdivision, site plan or building permit for a new dwelling unit have two acceptable areas, separated by a minimum distance of 30 feet, for the construction of a primary and reserve area for on-site sewage systems. Soil testing and profile pits are required in both areas. The requirement of a reserve disposal area shall also apply to any application for subdivision, site plan or building permit for improvements that involve new commercial or industrial land uses that would require a new on-site wastewater disposal system.

Groundwater readings and soil logs shall be taken during the wet season (January through April, unless the period is lengthened or shortened by NJDEP or by the administrative authority due to a significant departure from normal climatic conditions) for all new construction or subdivisions where the soil is rated as having severe constraints for septic disposal fields in the Soil Survey of Hunterdon County, prepared by the U.S. Department of Agriculture and severe limitations of soil and slopes as defined in the "Evaluation of Groundwater Resources of West Amwell Township," Matthew J. Mulhall, as defined in the West Amwell Township Master Plan. These readings shall be in accordance with the Standards for Individual Subsurface Sewage Disposal Systems, per N.J.A.C. 7:9A.

Groundwater readings and soil logs may be performed at any time of year for all new construction or subdivisions where the soil is not rated as having severe constraints, as defined in § 173-17A and shall be performed in accordance with the Standards for Individual Subsurface Sewage Disposal Systems, per N.J.A.C 7:9A and as per the conditions of § 173-16L.

8.4 Existing Design Regulations

Design regulations address the siting and specific development details of any new development or redevelopment. Such regulations can have a significant impact on the overall look and feel of new development, as well as the impact new development has on the natural systems. Regulations that

manage the amount of tree clearing allowed, the siting of new development, the amount of allowable impervious or building coverage on a site, or the location of development in relation to natural features all have a cumulative effect that can protect natural resources, rural character and appropriate development strategies.

The following summary identifies municipal efforts to address smart growth strategies in the Sourland Mountain Region.

8.4.1 East Amwell Township

As noted in 8.2.1, East Amwell has substantial Region acreage in two districts: Amwell Valley Agricultural District (AVAD) and Sourland Mountain District (SM). The purpose of the zoning regulations in the two districts is quite different, agricultural retention in AVAD and preservation of the Sourland ecosystem in SM. Agricultural retention has recently been the subject of a detailed Comprehensive Farmland Preservation Plan, May 2010, approved by East Amwell and by the NJ State Agricultural Development Committee. That Plan is available on-line on either the East Amwell Township website or the NJ SADC website, so various zoning provisions designed to conserve agriculture and discourage suburban development will not be detailed here.

Up-to-date details of zoning regulations in all East Amwell districts are available on the Township's web site. Below are selected features of the SM regulations:

- Agricultural practices are a conditional use in the Sourland Mountain District, however new clearing in the Sourland Mountain Region for agricultural purposes is prohibited. (§92-89:D (4))
- Maximum lot coverage uses a sliding scale as follows: first, 5 acres are allowed 5% maximum lot coverage, lot area between 5 and 15 acres are permitted 3% maximum lot coverage and additional lot area over 15 acres are permitted 1% maximum lot coverage. (§92-89:F)
- Maximum Gross Floor Area is also on a sliding scale according to lot area. (§92-89:G)
- Design standards and forest preservation efforts require that clearing of trees and native vegetation not exceed 30,000 square feet for any lot, exclusive of driveways. (§92-89:I(1)(a))
- All clearing and development shall be limited to an area within 500 feet of the street line when the lot abuts a street (§92-89:I(1)(b)), and a 100 foot setback from the road is required. No trees or other vegetation may be removed in this 100 foot buffer area.
- Each new lot created must have a minimum of 22,500 square feet of unconstrained area within the required 500 foot diameter circle inscribed within its lot lines. Unconstrained areas include those free of wetlands and their transition, floodplains and slopes greater than 12%. (§92-89:I(4)(b))
- No new flag lots can be created.

8.4.2 Hillsborough Township

- A stream corridor ordinance that applies to all residential zones that restricts activities on lots that are partially or completely within a stream corridor. Stream corridor areas are to remain in their natural state with limited to no clearing of trees and brush, expect for dead vegetation or pruning, there is to be no altering the watercourse, and no construction activities shall occur in the stream corridor area unless stated. (Ordinance 2005-02)
- Stream corridor areas to be removed from developable lot area calculations (§188-46)

- Steep slopes in excess of 12% must be removed from the developable area calculation of a lot (§188-46).
- Agricultural practices are a conditional use however, maximum clearing is one acre or 10% of the lot, whichever is less (except for those farms in existence prior to the passage of the ordinance). (§188-99.4:D(3))
- Lot Suitability is defined for all residential development as: "In any development application, no residential building lot with a private well and individual septic system shall contain less than 22,500 contiguous square feet of unconstrained land area on which any building using such well and septic system shall be located. Soil boring or percolation/permeability tests shall show the ground conditions to be adequate for proper septic disposal, wherever the septic system is located on the lot, according to Board of Health regulations." (§188-3)
- Stream corridors, and their associated buffers, are defined as the area within a floodway, flood plain, flood hazard area, buffer strips 100 feet from the top of the channel banks of the stream, intermittent stream and/or State open water, and the area that extends 100 feet from the 100-year flood hazard line on both sides of the stream. If there is no 100-year flood hazard line delineated, the distance of 100 feet is measured from the top of the banks of the stream channel on both sides of the stream, intermittent stream and/or State open water. If slopes greater than 15% abut the outer boundary of the stream corridor, the area of such slopes shall also be included as the stream corridor. If the flood plain or flood hazard area extends for more than one hundred (100) feet from the top of the channel bank, said larger area shall be the stream corridor. (§16-6.4(c)(13))
- Steep slope disturbance proposed for any variance application must be approved prior to construction (§16-6.2.e.)

8.4.3 Hopewell Township

- The lot area is contained within the lot lines, including wetland buffer areas, but not including any portion of a street nor any lands within the 100-year flood plain of any watercourse or lake site, wetlands, any areas reserved for future roadways, or areas encompassed within any easements, except that in areas with sewer service, lot areas need only deduct streets, future roadways, and 100-year flood plains.
- Hopewell Township contains an extensive Water Supply and Analysis Requirement Ordinance (§17-149). The purpose of this ordinance is to ensure that residential development of two or more new lots demonstrate that adequate water supply is available without adverse effect on neighboring wells and other resources.
    - The testing procedures for a subdivision of two or more new lots and all site plans shall be based on a hydrogeologic analysis and a minimum of one aquifer test. A geologic and hydrogeologic report containing appropriate maps, well logs, aquifer test data and observation well data shall be prepared and submitted. Prior to conducting any aquifer test, a preliminary hydrogeologic evaluation and the design of the aquifer test(s) shall be submitted for review and approval by the Township Planning Board or Board of Adjustment herein after referred to as Board.
- Hopewell Township also provides Transfer of Development rights out of the Mountain Resource Conservation Zone to municipally designated Villages in the VRC District. The intent is to provide an opportunity to create an alternative development opportunity that furthers the goals of resource conservation in the Township, while also providing a development form that supports the goals and policies of the Master Plan. (§17-160).

- No disturbance of steep slopes greater than 25% is allowed. Areas of slope between 15%-25% allows a disturbance of up to 15% (§17-116).
- Hopewell Township requires the retention or creation of woodland buffer areas of 200' from street line (§17-160).

8.4.4 Montgomery Township

Montgomery Township has passed a variety of ordinances to address natural resource protection in the Sourland Mountain Region. These include:

- A contiguous land area of at least 43,560 square feet (1 ac) within any lot proposed for the development of a residential unit, free of freshwater wetlands, wetlands transition areas, 100-year flood plains and/or topographic slopes fifteen (15%) percent or greater, any hydric soils, any detention or retention basin, and any land within a designated stream corridor. Additionally, the 43,560 square feet of land must be in the shape of a circle with a diameter of at least two hundred five (205) feet within its bounds. (§16-4.2d)
- Conservation Design Subdivisions are permitted as optional development alternatives within the R-5 and MR zoning districts only, with individual lots served either by public sewage treatment facilities or by individual septic systems, and with minimum sized tracts of land areas as follows:
    - Tracts of contiguous land twenty-five (25) acres in size and larger
    - Tracts of contiguous land less than twenty-five (25) acres in size, but in no case less than ten (10) acres in size, may be permitted to be developed in accordance with the optional single-family conservation design subdivision provisions of this subsection, provided that the Planning Board concludes the following based upon evidence provided by the applicant:
    - The lands to be conserved as open space are noted for preservation in the Conservation Plan Element portion of the Montgomery Township Master Plan; and/or
    - The lands to be conserved as open space are adjacent to existing lands already conserved, or expected to be conserved, as open space; and/or
    - The lands to be conserved as open space are heavily treed and/or provide a notable scenic vista; and/or
    - The resulting development pattern of the single-family homes to be constructed within the single-family conservation design subdivision will safeguard the environmental attributes of the subject land significantly more than a conventional development. (§16-6.5g)
- A variety of stormwater drainage and non-point pollution sources are addressed (§16-5.2o). The Township requires a non-point source pollutant loading analysis for all subdivision and site plans as well as for applicants seeking subdivision or site plan approval or approval for "d" variances pursuant to N.J.S.A. 40:55D-70d or for "c" variances for lot coverage. The applicant shall be required to address nonpoint source pollution as follows:
    - Each application must have .a Land Use Planning and Source Control Plan. This plan shall provide a demonstration of how the goals and standards of subsection 16-5.2g. through j. are being met. The focus of this plan shall be to describe how the site is being developed to meet the objective of controlling groundwater recharge, stormwater quality and stormwater quantity standards through the use of nonstructural or low impact development techniques and source control to the maximum extent practicable before relying on structural BMPs.

  - Nonstructural stormwater management measures are the preferred method to reduce nonpoint source pollutant loadings. The developer must protect areas that provide water quality benefits, such as riparian corridors and areas near watercourse vegetation, regulations promulgated under the Flood Hazard Area Control Area Act, and Critical Areas section of the Township code. Areas of impervious coverage are to be minimized. Where practicable, storm sewers shall discharge to vegetated swales. Stormwater management should decrease from pre-construction time to post-construction time to the extent reasonably practicable and environmentally beneficial. Landscaping with natural vegetation requiring minimal fertilization or pesticide treatment and minimization of land disturbances and new lawn areas are preferred. Adverse impacts of pollutants flows on habitat for Helonias bulbs (Swamp Pink) and/or Clemmys muhlenbergi (Bog Turtle) documented in the Natural Heritage Database as defined in N.J.A.C. 7:5C-1.4 shall be minimized or avoided.
- Steep slope disturbance is prohibited for variance applications unless approval is granted (§16-6.2.e.)

8.4.5 West Amwell Township

- West Amwell Township offers two cluster development options to preserve open space and critical features.
- The minimum lot area standards include the following environmental constraint factors; slopes of 25% or greater, flood hazard areas, wetlands, wetland transition areas, open water (§4-A (3)(e)).
- The disturbance of sloped areas shall be limited to the following (§109-145).
  - Slopes of 15%, but less than 20%; a maximum of 30% of the total area in this slope category may be disturbed for development purposes
  - Slopes of 20%, but less than 25%; a maximum of 20% of the total area in this slope category may be disturbed for development purposes
  - Slopes of 25% or more; Disturbance of slopes in this category shall be prohibited, except where an applicant can demonstrate that such disturbance is essential in order to achieve access to a property or in order to establish any reasonable use of the property
- West Amwell provides a stream corridor protection ordinance whereby only minor property maintenance is allowed in the stream corridor protection area which extends 75’ to 150’ from stream delineations (§109-146).
- A Woodland Protection ordinance was created in the Township to protect woodland resources. The ordinance requires no more than 10% of priority woodlands can be removed from a site and any removal requires mitigations. In addition, each site with woodlands is allowed a maximum area of woodlands removed based on a sliding scale per acreage (§109-269).

8.5 Models of Municipal Cooperation

Municipal cooperation will be key to achieving the goals and objectives outlined in this Comprehensive Management Plan, and the shared objectives of the adopted local plans and ordinances help this process. Just as the plant and animal communities of the Region transcend municipal boundaries, as does its history, a regional initiative offers the best hope for a compatible and coordinated set of policies and regulations to guide land management and protection of the Sourland Mountain. Water resources and critical wildlife habitat will require multi-level partnerships extending beyond political boundaries. In

New Jersey, a number of inter-municipal cooperative agreements have helped to harmonize municipal plans and regulations with regional planning and watershed management objectives.

8.5.1 Ten Towns Great Swamp Watershed Management Committee

The Phase 1 Plan highlighted this example of a successful inter-municipal cooperation. The Ten Towns Great Swamp Watershed Management Committee (Ten Towns Committee) was established in June 1995 to coordinate regional watershed management efforts. The model recognized that a top-down approach would be opposed by local municipalities and suggested harnessing the collective land-use decision-making powers of the affected municipalities. The result was Ten Towns Committee, created through an inter-municipal agreement adopted unanimously by the ten municipal governing bodies (Bernards Township, Bernardsville, Chatham Township, Harding Township, Long Hill Township, Madison Borough, Mendham Township, Mendham Borough, Morris Township, and Morristown).

The specific purpose of the agreement was the development and implementation of a watershed management plan for the Great Swamp watershed. The non-profit organization has 501 (c) (3) status and is supported by annual financial contributions from each of the ten towns within the Great Swamp watershed and by Somerset and Morris Counties. Educational efforts of the Ten Towns Committee have been aided through grants from the US EPA and NJ DEP, Section 319 Non-Point Source Program.

The Ten Towns Committee consists of three representatives from each municipality, appointed by the governing body, and including an elected official, an administrative official, and a citizen from each town. The five member executive committee and part-time executive director handle day-to-day activities to coordinate the watershed management program. Since adoption of the management plan, the Ten Towns Committee has advocated ongoing water quality management education for committee members, municipal officials, and the public. It has also analyzed environmental regulations and prepared model ordinances that have been presented to municipal governing bodies for adoption.

A state of the art chemical water monitoring program has been undertaken to provide baseline data on water quality in the Great Swamp and to aid in evaluating changes over time. A companion macro-invertebrate monitoring program evaluated the biotic elements of the watershed from 2000 to 2005. During its first ten years, the Ten Towns Committee found widespread acceptance of its core values, and it continues to advocate for municipal ordinances for environmental protection.

The United States Fish and Wildlife Service (USFWS) awarded the Ten Towns Committee funding for a stream bank restoration program through the Service's Natural Resource Restoration Assistance program during 2006. USFWS designated the Committee as the lead agency for publicizing the program to agencies within the Great Swamp Watershed.

As the Ten Towns have harmonized their environmental land use policies and regulations, they stand together to effectively protect the Great Swamp Watershed into the 21st Century and beyond.

The 2005-2006 Annual Report of the Ten Towns Committee noted that "One of the major strengths of the Ten Towns Committee has been the continuity of leadership during its first ten years of existence".

For more information: http://www.tentowns.org/10t/.

8.5.2 Southern Medford/Evesham Sub-Regional Resource Protection Plan

Another example of inter-municipal cooperation is seen in the Southern Medford/Evesham Sub-Regional Area of the New Jersey Pinelands. This regional effort comprises a large area located in the regulated Pinelands in Burlington County. The Pinelands Commission had designated the area as having the potential for modest residential development; however, recent studies identified a high concentration of rare plant and animals, as well as identifying the Mullica River and Rancocas Creek watersheds as having high quality water, aquatic and wetlands resources. The combination of these factors led to several high-profile legal disputes between the Commission and local developers.

The Pinelands Commission, through grants from the William Penn Foundation, undertook the preparation of a natural resource conservation planning project for southern portions of Evesham and Medford. The Pinelands Commission organized a steering committee, comprised of representatives from the NJ DEP and the two municipalities to oversee development of a conservation plan for a 22-square-mile project area. The result was a detailed natural resource conservation plan that included innovative zoning, land preservation, resource management and community design recommendations. Also included is a comprehensive natural resource inventory and integrated land acquisition strategy. In coordination with enhanced resource protections, the plan may include streamlined regulatory requirements for developing in the appropriate locations and within certain standards.

8.5.3 The Raritan-Highlands Compact

The Raritan-Highlands Compact, another inter-municipal cooperative effort, is a joint venture of nine municipalities in the Upper Raritan River basin, the County of Morris, Morris Tomorrow (formerly Morris 2000), the Morris County Municipal Utilities Authority, the New Jersey Water Supply Authority, the Upper Raritan Watershed Association and the South Branch Watershed Association. The Raritan-Highlands Compact shares the natural resource conservation goals reflected in the Ten Towns Committee and Rockaway River Cabinet inter-municipal cooperative agreements, and demonstrates the value and efficacy of inter-municipal alliances.

8.6 Framework for Regional Land Use Regulations

Effective protection of the Sourland Mountain Region will depend on regional initiatives that look beyond political borders and focus on the broader ecosystem function and extended human neighborhood. The Sourland Mountain, characterized by the expansive ridge that slopes into grassland and agricultural uses, is a composite of these vastly different yet interconnected systems which enrich the Sourland Mountain region and its prominence in the regional landscape.

As best practices are identified to protect the region, a paradigm shift may be appropriate in the arena of environmental protection. While management standards that categorically regulate steep slopes, wetlands, floodplains, forest resources, critical habitat, water quality all address important issues, a more systemic approach that recognizes the interconnectedness of these resource areas can result in the sum of the whole system approach being greater than the combination of the separate parts.

In order to achieve this goal, creative ordinances should holistically approach all resource features within the watershed as they relate to each other, from the lowest drainages to the highest ridges and everywhere in between. Recognizing that the ecosystem also varies throughout the region, ordinances should be creative and flexible enough to allow for best management practices that can be expanded as

the need arises. To this end, the Plan seeks to identify regulations and best management practices that will provide protection to the ecosystem but which can be uniquely adapted to fit local circumstances. Appendix A provides Model/Sample Ordinances addressing the following resource management concerns:

1. Stream Corridor Protection
2. Woodlands Protection/Forest Management/Tree Conservation
3. Well head protection

Municipal Sustainability Initiatives

Municipalities are increasingly embracing more sustainable practices and educating residents and businesses about these principles. One example includes the ***Hopewell Township Living Greener Resource Guide*** (Appendix B) which is also posted on the Township website.[10] Hillsborough Township created a Sustainable Hillsborough Committee and developed a Sustainability Plan with targets and indicators for a more sustainable community. These efforts are just a few examples of the evolving municipal commitment to more sustainable practices, and the SA should seek to coordinate and guide such education efforts toward practices that are most beneficial, efficient and cost-effective (Appendix C). In the long run, cost considerations will help drive society toward a greener future.

9. Summary

The Sourland Mountain is an ecological goldmine with a storied past. As this heritage and natural beauty continues to attract increasing regional tourism, including hiking, cycling, birding and other active recreation pursuits, the region gains in appeal. Yet the potential for encroaching sprawl to overdraw the limited water supply, combined with the mountain's limited ability to assimilate septic effluent, make inappropriate additional development a threat to the water supply, the forest, the farm fields and the appeal to visitors and residents alike.

The recommendations of the Phase 1 Plan remain appropriate and await implementation in this phase of smart growth planning for the mountain. Briefly restated, these are grouped under four headings:

Planning

- Develop a Sourland Alliance
- Identify the forest core and corridors for preservation
- Identify an agricultural retention area
- Prepare a comprehensive Forest Management Plan for the region
- Prepare a comprehensive cultural resource management plan for the region
- Prioritize open space acquisitions
- Develop a greenway plan
- Promote diverse partnerships to assure enhanced stewardship
- Develop a coordinated indicators program to measure and monitor ecological health

[10] Hopewell Township Sustainability website: http://www.hopewelltwp.org/sustainability-main.html

Management

- Promote effective deer management
- Promote use of best management practices for woodland, grassland and wetland habitat.
- Protect surface and groundwater quality and quantity
- Prepare a comprehensive cultural resource management plan.
- Protect the core forest
- Promote forest revitalization

Regulation

- Explore enhanced environmental protection standards.
- Manage limited growth to be compatible with ecological constraints.
- Explore use of a Transfer of Development Rights (TDR) program
- Limit anthropogenic demands on the environment
- Develop equitable strategies to phase out incompatible activities within the water-poor forested core area.
- Minimize impervious coverage in aquifer recharge areas
- Limit water use by new development and agriculture.
- Require each buildable lot to have a primary and a reserve septic field.

Education

- Catalog and disseminate sound habitat management
- Develop land stewardship programs for farmers, woodland owners and homeowners
- Provide public education about resource conservation
- Provide learning opportunities about the Sourlands

Properly managed tourism can aid the protection of scarce resources, as both the academic and casual study of native flora and fauna and regional heritage promote greater awareness of the fragile nature of these resources. The tourism appeal of the region comes from its expansive forest canopy, its picturesque farms and roadsides and its history. None of these values are improved by overdevelopment, which subtracts from the countryside character. Repair and restoration objectives should be prioritized and working partnerships formed to carry out an aggressive program to reclaim areas of environmental damage and maintain the scenic natural character of the mountain.

Among the hidden threats to the water supply of mountain residents is the potential for replacement houses to substantially increase water use, even when no additional unit is created, since water use increases with the size of the buildings and lawns. Thus, while the relatively low densities permitted for new development on the mountain will help to protect the scarce water resources of the forest core, it will not assure that existing homesites won't be redeveloped by new owners with a preference for "taming" the forest "wilderness" and replacing it with a non-native, water-dependent landscape. Municipalities should examine their regulations governing building and other impervious surface coverage, to prevent overdevelopment within the "envelope" of permitted development. Similarly, standards regarding forest fragmentation and vegetative destruction should be compared and

synchronized where possible. Such controls will be critical elements in the protection of the scarce Sourland Mountain water supply.

The formation of the Sourland Alliance should be a joint effort of the host communities with input from the non-profit partners that have been instrumental in conservation and preservation efforts to date. Working through effective alliances, municipalities can better coordinate their efforts, combine their purchasing power for the broadest possible blanket of preservation, and benefit from each other's experiences and work efforts.

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Appendix A.1

MODEL STREAM CORRIDOR PROTECTION ORDINANCE STONY BROOK-MILLSTONE WATERSHED ASSOCIATION (AUGUST 2007)

The purposes of this ordinance are as follows:

(1) Restore and maintain the chemical, physical, and biological integrity of the water resources of [***the watershed]***;

(2) Protect significant ecological components of stream corridors such as wetlands, floodplains, woodlands, steep slopes and wildlife and plant life habitats within the stream corridors of the watershed; and prevent flood related damage to the communities of the watershed.

(3) Prevent excessive nutrients, sediment, and organic matter from reaching surface waters by optimizing opportunities for filtration, deposition, absorption, adsorption, plant uptake, biodegradation, and de-nitrification, which occur when stormwater runoff is conveyed through vegetated buffers as stable, distributed sheet flow prior to reaching receiving waters;

(4) Increase stream bank stability and maintain natural fluvial geomorphology of the stream system, thereby reducing stream bank erosion and sedimentation and protecting habitat for aquatic organisms; and

(5) Complement existing state, regional, county, and municipal stream corridor protection and management regulations and initiatives.

SECTION 2.00 STATUTORY AUTHORITY

Municipality is empowered to regulate land uses under the provisions of the New Jersey Municipal Land Use Law, N.J.S.A 40:55D-1 *et seq.*, which authorizes each municipality to plan and regulate land use in order to protect public health, safety and welfare by protecting and maintaining native vegetation in riparian areas ***Municipality*** is also empowered to adopt and implement this ordinance under provisions provided by the following legislative and regulatory authorities of the State of New Jersey:

A. Water Pollution Control Act, N.J.S.A. 58:10A *et seq.*
B. Water Quality Planning Act, N.J.S.A. 58:11A-1 *et seq.*
C. Spill Compensation and Control Act, N.J.S.A. 58:10-23 *et seq.*
D. Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 *et seq.*
E. Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 *et seq.*
F. Stormwater Management Rule, N.J.A.C. 7:8
G. Water Quality Management Planning Rule, N.J.A.C. 7:15

SECTION 3.00 DEFINITIONS

As used in this ordinance, the following words and terms shall have the following meanings:

Activity means any land disturbance, including any development for which an application for development is necessary[1].

Administrative Authority means the Planning Board or Board of Adjustment or Construction Office with all of the powers delegated, assigned, or assumed by them according to statute or ordinance.

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[1]This ordinance covers development activities whether or not covered by site plan and subdivision review and, unless the reference to "any land disturbance" is deleted, should be included in the Other Provisions section of the zoning regulations. If it is deleted, the ordinance should be included in the site plan and subdivision regulations.

Applicant means a person applying to the Planning Board, Board of Adjustment or the Construction Office proposing to engage in an activity that is regulated by the provisions of this ordinance, and that would be located within a regulated Riparian Buffer Conservation Zone.

Bank means the land area immediately adjacent to and which slopes toward the bed of a watercourse and which is necessary to maintain the integrity of the watercourse. Banks are called right or left as viewed facing in the direction of the flow.

Bed means the floor or bottom on which any body of water rests.

Category One (C1) Waters are those waters, designated in the Surface Water Quality Standards at N.J.A.C. 7:9B-1.15, which have been identified for protection from degradation in water quality characteristics because of their clarity, color, scenic setting, and other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources.

Floodway shall have the meaning ascribed to this term by the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 *et seq.*) and regulations promulgated thereunder published at N.J.A.C. 7.13 *et seq.*, and any supplementary or successor legislation and regulations from time to time enacted or promulgated.

Intermittent Stream means surface water drainage channels with definite bed and banks in which there is not a permanent flow of water. Streams shown as a dashed line on either the United States Geological Services (USGS) topographic quadrangle maps or the United States Department of Agriculture (USDA) County Soil Survey Maps of the most recent edition that includes hydrography are included as intermittent streams.

Lake, Pond, or Reservoir means any impoundment, whether naturally occurring or created in whole or in part by the building of structures for the retention of surface water, excluding sedimentation control and stormwater retention/detention basins and ponds designed for treatment of wastewater.

One Hundred Year Flood Line is the area that is formed by following the outside boundaries of the area inundated by a 100-year flood. A 100-year flood is estimated to have one percent chance or one chance in 100 of being equaled or exceeded in any one year.

Stream means a pathway for surface water with bed and banks that confine and conduct continuously or intermittently flowing water. Stream shall not include man-made ditches, unless they convey water to a Stream whether ephemerally, intermittently, or continuously, or detention basins.

Stream Corridor shall mean the area within 150 feet outward from the greater of (a) the top of the defined bank on either side of the stream channel, or the centerline if the bank is not defined, and from the defined edge of a Lake, Pond, or Reservoir at bank-full flow or level or (b) the 100-Year Flood Line; *provided* that in either case, for Category One Waters, the area shall be measured as defined at NJAC 7:8-5.5(b), or as defined by this Ordinance, whichever is wider. If slopes greater than 12% abut the outer boundary of the stream corridor or if such areas of steep slopes, or any areas of impervious surface, occur within the stream corridor, the area of such slopes or impervious surface shall also be included as the stream corridor [If the riparian zone, as defined by {proposed} Flood Hazard Rule NJAC 7:13-4.1 extends beyond the border of the stream corridor then the riparian zone shall also be included as the Stream Corridor] Where a stream's origin is identified, this being its headwaters, and where this location comprises a groundwater source that encompasses groundwater formations commonly known by names such as “wet soils,” "seeps" and "springs," and where this area is not under the jurisdiction of state wetlands laws and regulations, the Stream Corridor shall include a 150 foot radius around the outer limits of that point[2]

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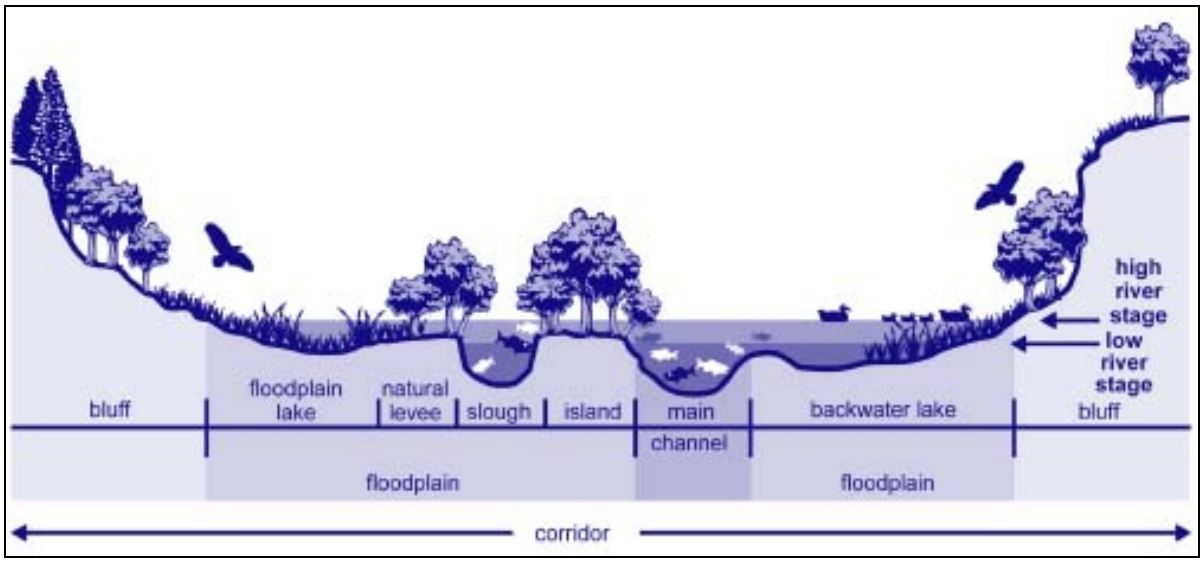
[2] [The stream corridor width of 150 feet recommended here is the optimum to effectively protect water quality by controlling sediment loading. This width also provides benefits of bank stabilization, aquatic wildlife protection and nutrient removal. If the municipality has specific stream corridor management objectives (for all waterbodies or for certain ones), consider a wider riparian buffer. Terrestrial wildlife management objectives may justify a buffer of 200-300 feet or greater (for example, to protect habitat for forest-interior-breeding birds, buffers of 600 to 1000 feet may be necessary). Wider buffers may also be justified where a municipality seeks a higher level of water quality (for example, while a typical 100-foot buffer effectively removes 75% of nitrogen, a typical 300-foot buffer removes 90% of nitrogen). SOURCES: Eightmile River Wild and Scenic Study Committee, *Riparian Buffer Zones: Functions and Recommended Widths* (April 2005); Chagrin River Watershed Partners, *Riparian Setbacks: Technical Information for Decision Makers* (Rev. Jan. 2006); North Jersey RC&D *Introduction to Riparian Buffers for the Northern New Jersey Watershed* (April 2002); Delaware Riverkeeper Network Fact Sheet: *Wide*

***Stream Corridor Management Pla**n* shall mean a plan submitted to and approved by the Planning Board under Section 4.26 of this Ordinance.
Surface Water Body means any Stream, Lake, Pond, or Reservoir, as defined herein. In addition, any state open waters identified in a letter of interpretation issued by the New Jersey Department of Environmental Protection pursuant to the Freshwater Wetlands Protection Act, N.J.S.A. 58:9B-1 et seq. shall also be considered surface water bodies.



source: Farm-A-Syst, North Carolina
http://www.soil.ncsu.edu/assist/Stream/

<u>SECTION 4.00</u> STREAM CORRIDOR PROTECTION

4.10 APPLICABILITY

All real property falling in whole or in part within a Stream Corridor shall be subject to the standards set forth in section 4.20 et. seq., provided that when an activity is also reviewed by the Delaware and Raritan Canal Commission under N.J.A.C. 7:45-7: Stream Corridor Impact Regulations for the Review Zone of the Delaware and Raritan Canal State Park (adopted February, 1994) or successive regulations and amendments the result that is more restrictive, and less permissive, to a landowner or applicant, shall apply.[3].

4.11 OVERLAY [where SCO is adopted as part of Zoning law.]

A Stream Corridor is an overlay to existing zoning districts. The zoning provisions of the underlying district shall remain in full force, except where the provisions of the Stream Corridor differ from the zoning provisions of the underlying district, in which case the provision that is more restrictive, and less permissive, to a landowner or applicant, shall apply.

Riparian Zones Need To Be Regulated (n.d.); U.S.EPA, *Riparian Buffer Width, Vegetative Cover and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations* (Oct. 2005); Connecticut Association of Wetland Scientists, *Vegetative Buffers for Water Quality Protection: An Introduction and Guidance Document*, Draft Version 1.0 (Feb 2004); US Forest Service Chesapeake Bay Program, *Riparian Forest Buffer Widths* (Dec. 2003).]

[3] NJAC 7-45:6.6 provides that where the Canal Commission determines that a municipal stream corridor ordinance applies and is more stringent, compliance with the stricter requirements shall be a condition to the Commission's approval.

4.20 STANDARDS

4.21 DISTURBANCE PERMITTED IN STREAM CORRIDORS

Stream corridors shall remain in their natural state, with no clearing or cutting of trees or brush (except for (a) removal of dead vegetation and (b) pruning, in either case solely for reasons of imminent public safety), planting, seeding, mowing, dumping, use of pesticides or fertilizers, storage of material, keeping or feeding of animals, altering of watercourses, re-grading or construction, operation of machinery or vehicles, or any other use whatsoever, except for the following activities:

(1) Woodland preserves, but excluding enclosed structures, provided that such activities are done under a Stream Corridor Management Plan.

(2) Commercial agricultural production, other than new structures or new structures or impervious surface (which shall only be permitted under Section 4.22), [active as of the date of adoption of this Ordinance,][4] constituting agricultural management practices, provided that such disturbance is consistent with [*Municipality's* Right-to-Farm law and] National Conservation Practice Standards, developed by the USDA, Natural Resources Conservation Service (NRCS) and contained in the NRCS Field Office Technical Guide; or as rules promulgated by the State Agricultural Development Committee. [5]

(3) Unpaved, winding, pervious hiking trails.

(4) Access for fishing, boating, swimming or hunting (excluding permanent structures such as docks, ramps or piers except if such structures are open to the public.

(5) Reconstruction of a structure that pre-dates the adoption of this ordinance in the event of damage or destruction by fire, storms, flood or other natural hazards provided that the reconstruction does not have a greater footprint or total area than that of the damaged structure and that no change in land use occurs; and further provided that the reconstruction shall be permitted only if no more than 50% of the structure is destroyed.

(6) Restoration or stabilization of riparian areas provided that where disturbance is more than one-quarter acre, such activities are done under a Stream Corridor Management Plan.

(7) Planting of indigenous riparian species as defined from time to time on a list maintained by the [Environmental Commission].

(8) Removal of Invasive Species identified as "Reported Invasive" in New Jersey on the Plant Conservation Alliance - Alien Plant Working Group's List of Invasive Plants or as defined from time to time on a list maintained by the [Environmental Commission].

4.22 DISTURBANCES PERMITTED IN STREAM CORRIDORS WHEN PROHIBITNG SUCH ACTIVITIES WOULD CAUSE EXTREME ECONOMIC HARDSHIP

(a) New structures or impervious surface (other than those permitted as exceptions under section 4.21), including retaining walls, parking facilities and roads other than roads parallel to the stream, are permitted in a Stream Corridor only:

(1) Upon a clear and convincing demonstration by the applicant that prohibiting such activity would result in extreme economic hardship or would conflict with a compelling public need.

i. The board of jurisdiction shall use the following standards in determining whether extreme economic hardship exists:

1. Prohibiting the activity would result in an extreme economic hardship, as distinguished from mere inconvenience, because of the particular physical surroundings, shape or topographical conditions of the property involved. The

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[4] A municipality may wish to consider regulating only new agricultural disturbances.

[5] Under the state Right to Farm Act, N.J.S.A. 4:1C-1–10, primary jurisdiction to regulate agricultural management practices rests with the State Agricultural Development Committee and County Agricultural Boards, which must give appropriate consideration to local zoning and land use ordinances in the resolution of any disputes. See Township of Franklin v. David den Hollander et als., 172 N.J. 147, 796 A.2d 874 (2002).

necessity of acquiring additional land to locate development outside the Stream Corridor shall not be considered an economic hardship unless the applicant can demonstrate that there is no adjacent land which is reasonably available; and

2. An applicant shall be deemed to have established the existence of an extreme economic hardship only if the applicant demonstrates, based on the specific facts, that the subject property is not capable of yielding a reasonable economic return if its present use is continued or if it is developed as authorized by provisions of this Ordinance and that this inability to yield a reasonable economic return results from unique circumstances peculiar to the subject property which:
    a. do not apply to or affect other property in the immediate vicinity;
    b. relate to or arise out of the characteristics of the subject property rather than the personal situations of the applicant; and
    c. are not the result of any action or inaction by the applicant or the owner or his predecessors in title.

3. An applicant shall be deemed to have established compelling public need if the applicant demonstrates, based on specific facts, that:
    a. the proposed project will serve as an essential public health or safety need;
    b. the public health and safety require the proposed activity;
    c. the proposed use is required to serve existing public health or safety need;
    d. there is no alternative available to meet the established public health or safety need;
    e. the activity will not be materially detrimental or injurious to other property or improvements in the area in which the subject property is located and will not endanger public safety; and
    f. the exception granted is the minimum relief necessary to relieve the compelling public need.

(b) If the Stream Corridor includes more than 75% of the tract:

(1) If an exception[6] set forth in subsections 4.22-(1)-(a) or (b) is granted the board of jurisdiction or the zoning officer, as the case may be, shall grant relief only to the extent of the minimum required to accomplish the approved activity, which relief may reduce the width of the Stream Corridor but in no case to less than 50 feet from the applicable point of measurement of the Stream Corridor.

(2) If such an exception is granted, the applicant shall rehabilitate an environmentally degraded Stream Corridor within or adjacent to the same tract at least equivalent in size to the Stream Corridor reduction permitted and if not possible rehabilitate or expand a Stream Corridor of such size within a nearby tract and if available, within the same watershed, approved by the [Planning Board]. Rehabilitation shall include reforestation, stream bank stabilization and removal of debris and shall be done under a Stream Corridor Management Plan.

4.23 LOCATION OF ACTIVITIES ON TRACTS PARTIALLY WITHIN STREAM CORRIDORS

All new lots in major and minor subdivisions and site plans shall be designed to provide sufficient areas outside of Stream Corridors to accommodate primary structures as well as any normal accessory uses appurtenant thereto.

4.24 PROHIBITED ACTIVITIES

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[6] If the standards set forth in section 4.20 are included in the zoning regulations rather than in the site plan and subdivision section, this exception should be treated as a conditional use.

All activities not permitted pursuant to subsection 4.21 or 4.22 shall be prohibited

4.25 PROVISIONS GOVERNING ACTIVITIES IN STREAM CORRIDORS

(a) In addition to any other requirements for rehabilitation, management or restoration set forth in Sections 4.21 and 4.22 the applicant for any activity permitted in a stream corridor shall:

(1) rehabilitate any degraded areas within the Stream Corridor, including reforestation, stream bank stabilization, debris removal or any other measures required by and done in a manner acceptable to, the board of jurisdiction (in the case of an application for development) or the zoning officer, as the case may be;

(2) rehabilitate or cure the effects of the disturbance caused during construction;
(3) maintain the integrity of the surrounding habitat; and
(4) maintain the ability of the Stream Corridor to buffer the stream.

(b) The applicant shall provide whatever additional measures the board of jurisdiction or the zoning officer as the case may be, determines are necessary to assure that areas designated as Stream Corridors will be preserved and to prevent additional encroachments in Stream Corridor likely to occur as a result of the approval granted.

4.26 STREAM CORRIDOR MANAGEMENT PLAN

(a) Within any Stream Corridor, no land disturbance or encroachment shall be permitted by right under Section 4.21 (1) or (6) or by approval under Section 4.22 unless the effects of such development are accompanied by preparation, approval, and implementation of a Stream Corridor Management Plan.

(b) The landowner, applicant, or developer shall submit to the [board of jurisdiction] a Stream Corridor Management Plan that assesses the effects of any proposed disturbances on the Stream Corridor. This plan shall identify the existing conditions including:

(1) Existing vegetation;
(2) Field delineated streams and surface water bodies;
(3) Field delineated wetlands;
(4) The one-hundred-year floodplain;
(5) Flood hazard areas, including floodways, flood-fringe areas and riparian areas, as defined by the New Jersey Department of Environmental Protection;
(6) Soil classifications as found on soil surveys;
(7) Existing subdrainage areas of site with HUC-14 (Hydrologic Unit Code) designations; and
(8) Slopes in each subdrainage area segmented into sections of slopes that are above 12% but less that 20%; above 20% but less than 25%; and greater than 25%.

(b) The plan shall describe all proposed uses/activities, and evaluate the effects of all proposed uses/activities in a Stream Corridor, and all proposed management techniques, including proposed vegetation, stabilization, and any other measures necessary to offset disturbances to the Stream Corridor. A discussion of activities proposed, as well as management techniques proposed to offset disturbances and/or enhance the site to improve the Stream Corridor's ability to function effectively as a Stream Corridor, shall also be included with the management plan.

(c) The plan shall be reviewed by [the Environmental Commission] and submitted for approval by the [Planning Board]. A report with recommendations by [the Environmental Commission] shall be submitted to the Planning Board prior to its rendering a decision.

(d) The management plan shall include management provisions in narrative and/or graphic form specifying:

(1) The manner in which the area within the Stream Corridor will be owned and by whom it will be managed and maintained.

(2) The conservation and/or land management techniques and practices that will be used to conserve and protect the Stream Corridor, as applicable.

(3) The professional and personnel resources that are expected to be necessary, in order to maintain and manage the Stream Corridor.

(4) If any vegetation will be removed or harmed by the proposed uses/activities, a revegetation plan, which in the case of forested areas shall include three layers of vegetation, including herbaceous plants that serve as ground cover, understory shrubs and small trees, and trees that form an overhead canopy. Vegetation selected must be native and consistent with the soil, slope and moisture conditions of the site. The revegetation plan shall include measures to minimize deer-browse damage to the plants prior to their establishment.

(e) The Zoning Officer shall verify performance of the Stream Corridor Management Plan for a minimum of five years after approval. Failure to satisfactorily implement an approved Stream Corridor Management Plan shall subject the landowner, applicant or developer to penalties pursuant to section 4.40 of this Ordinance.

4.27 *CONSERVATION EASEMENTS*

(a) As a condition to the approval of any major or minor subdivision or any site plan; or prior to the commencement of any disturbance permitted by right under Section 4.21(1), (2), (3), or (5), or by approval under Section 4.22, portions of lots within the Stream Corridor shall be permanently restricted by a recorded conservation easement held by [***municipality***] [and, it is recommended where feasible to add another public or private land conservation organization.] The conservation easement shall be perpetual, shall be in the form approved by [***municipality***] and shall run with the land, and be binding upon the property owner and the successors in interest in the property or in any part thereof, and shall include the right of [***municipality***] or its authorized agents, upon reasonable notice to the property owner, to enter upon the property for the purposes of accessing the Stream Corridor to inspect and monitor compliance with the terms of the conservation easement and this article. Conservation easements shall be established by deed if no subdivision map is being filed, or by plat filed with the county recording officer in compliance with the Map Filing Law. The recorded conservation easement shall, at a minimum, also include:

(1) Date of issuance, a written narrative of authorized regulated activities permitted in this section of this Ordinance, all of the prohibitions set forth at N.J.S.A. 13:8B-2b(1) through (7), and in the case of disturbances permitted under Section 4.21 or 4.22, a description of the disturbance(s) to be implemented;

(2) Survey plans for the property as a whole and, where applicable, for any additional properties subject to the conservation easements. Such survey plans shall be submitted on the surveyor's letterhead, signed and sealed by the surveyor, and shall include metes and bounds descriptions of the property, the site, and the areas subject to the conservation easement in New Jersey State Plane Coordinates, North American Datum 1983, and shall depict the boundaries of the site and all areas subject to the conservation easement as marked with flags, signs or stakes on site. All such survey plans shall be submitted on paper and in digital CAD or GIS file on a media and format defined by the municipality. The flags, signs or stakes shall be numbered and identified on the survey plan; and

(3) A copy or copies of deeds for the property as a whole that indicate the deed book and pages where it has been recorded in the office of the clerk of the applicable county or the registrar of deeds and mortgages of the applicable county.

(b) The easement shall require the landowner to establish and maintain visible monuments at prominent locations along the boundary of the area subject to the easement.

(c) The conservation easement may include language reserving the right to make de minimis changes to accommodate necessary regulatory approvals upon the written consent of [***municipality***], provided such changes are otherwise consistent with this Ordinance. Any subsequent requests for de minimis changes to a conservation easement not associated with another land use application shall be subject to approval by [***the Zoning Officer***]. Such requests shall be in writing and shall be accompanied by all necessary supporting documentation. Upon the complete submittal of the written request and supporting documentation,

[***municipality***]shall have 90 days to decide whether to grant the request, pending an extension upon mutual agreement of all parties involved.

4.30 SUBMISSION AND PROCEDURAL REQUIREMENTS

(a) An applicant for a disturbance in a Stream Corridor shall submit to the municipality a map of the project site delineating the following (at a scale of 1 inch:200 ft), using the best available information:

(1) One Hundred Year Flood Line;
(2) State freshwater wetlands boundary lines;
(3) the stream corridor boundary;
(4) soils, particularly those that have high erosion potential;
(5) any slopes >12% within the site; and
(6) the location of all improvements and land disturbance proposed to be located within any of the above boundaries.

(b) In addition, the following shall be submitted:
Town to add any other submission and procedural requirements

4.40 ENFORCEMENT

(a) (1) Unauthorized Stream Corridor alterations. When a Stream Corridor has been altered in violation of this Ordinance, all ongoing development work shall stop and the Stream Corridor shall be restored. **(*Municipality*)** shall have the authority to issue a stop-work order to cease all ongoing development work and order restoration, rehabilitation or replacement measures at the expense of the owner or other responsible party, as appropriate, in order to compensate for violation of the provisions of this Ordinance.

(2) Site investigations: The [Zoning Officer] is authorized to make site inspections and take such actions that are necessary in order to enforce the provisions of this Ordinance. A prompt investigation shall be made by the appropriate personnel of ***(Municipality),*** of any person or entity believed to be in violation hereof. If, upon inspection, a condition which is in violation of this article is discovered, a civil action in a court of competent jurisdiction by the filing and serving of appropriate process. Nothing in this Ordinance shall be construed to preclude the right of ***(Municipality)*** pursuant to N.J.S.A. 26:3A2-25, to initiate legal proceedings hereunder in Municipal Court. The violation of any section or subsection of this Ordinance shall constitute a separate and distinct offense independent of the violation of any other section or subsection, or of any order issued pursuant to this Ordinance. Each day a violation continues shall be considered a separate offense. *[ADDITIONAL PENALTIES MAY BE IMPOSED BY THE ORDINANCE OR BY CROSS-REFERENCE.]*

(b) If, upon inspection or investigation, the [Zoning Officer] or his/her designee is of the opinion that any person has violated any provision of this Ordinance, he/she shall with reasonable promptness issue a correction notice to the person. Each such notice shall be in writing and shall describe the nature of the violation, including a reference to the provision within this Ordinance, which has been violated. In addition, the notice shall set a reasonable time for the abatement and correction of the violation.

(c) If it is determined that the violation or violations continue after the time fixed for abatement and correction has expired, the director shall issue a citation by certified mail to the person who is in violation. Each such notice shall be in writing and shall describe the nature of the violation, including a reference to the provision within this Ordinance, which has been violated, and what penalty, if any, is proposed to be assessed. The person charged has thirty (30) days within which to contest the citation or proposed assessment of penalty and to file a request for a hearing with the director or his designee. At the conclusion of this hearing, the director or his designee will issue a final order, subject to appeal to the appropriate authority. If, within thirty (30) days from the receipt of the citation issued by the director, the person fails to

contest the citation or proposed assessment of penalty, the citation or proposed assessment of penalty shall be deemed the final order of the director.

(d) Penalties which may be assessed for those deemed to be in violation may include:

(1) A civil penalty not to exceed one thousand dollars ($1,000.00) for each violation with each day's continuance considered a separate violation.

(2) A criminal penalty in the form of a fine of not more than one thousand dollars ($1,000.00) for each violation or imprisonment for not more than ninety (90) days, or both. Every day that such violations shall continue will be considered a separate offense.

(3) Anyone who knowingly makes any false statements in any application, record, plat, or plan required by this ordinance shall upon conviction be punished by a fine of not more than one thousand dollars ($1,000.00) for each violation or imprisonment for not more than thirty (30) days, or both

(e) In addition to any other sanctions listed in this Ordinance, a person who fails to comply with the provisions of this Ordinance shall be liable to the agency in a civil action for damages in an amount equal to twice the cost of restoring the buffer. Damages that are recovered in accordance with this section shall be used for the restoration of buffer systems or for the administration of programs for the protection and restoration of water quality, streams, wetlands, and floodplains.

Appendix A.2

Model Stream Corridor Protection Ordinance

1. Intent and Purpose

The governing body of _____ finds that riparian lands adjacent to streams that are appropriately vegetated provide important environmental protection and resource management benefits. It is necessary to protect and maintain the beneficial character of stream corridors by implementing specifications for the establishment, protection, and maintenance of protected corridors along the streams in _____. These stream corridors must be consistent with the interest of landowners in making reasonable economic use of parcels of land that include such designated areas, and with a broader public interest in ensuring water quality, preventing erosion and protecting important plant and animal habitats. This ordinance is intended to:

- Designate stream corridors and to provide for land use regulation that sufficiently protects water quality in the streams of _____;

- Protect riparian and aquatic ecosystems and to provide for the environmentally sound use of land resources in _____;

- Maintain the high quality of streams within _____ by providing an adequate vegetative buffer along stream corridors, including headwaters and intermittent streams, which will protect water resources, including streams that flow into other watersheds that provide drinking water for thousands of New Jersey residents;

- More fully protect the water quality in these streams by preserving significant ecological components of stream corridors such as woodlands, wildlife and plant habitats, and other significant natural features within the steam corridors, and protect property from erosion and flood-related damage;

- More fully protect these natural stream corridor buffers where, under normal conditions, soils and natural vegetation trap sediments from upslope erosion and filter fertilizers, pesticides, and other pollutants that run off from developed areas. These areas perform a function that is important to our township's community character, in that they support trees, shrubs, grasses, and other plant and animal species that depend on changeable conditions;

- Reduce land development impacts on stream water quality and flows; to protect existing natural drainage features; to protect the rights of property owners within the same watershed from adverse effects of improper stream

- Preserve natural features in stream corridors that perform important services to our community, such as headwater areas, groundwater recharge zones, floodways, floodplains, springs, streams, wetlands, woodlands, and wildlife habitats;

- Maintain consistency with state, regional and county stream corridor protection and management regulations; and

- Support other regulations that may pertain to stream corridors, such as those within the jurisdiction of the Delaware and Raritan Canal Commission and state Department of Environmental Protection. The more restrictive regulations among these shall be followed.

2. Definitions

Stream – A pathway for surface water with bed and banks that confine and conduct continuously or intermittently flowing water. Characteristically, a stream's flow is a combination of surface water from the direct runoff overland of precipitation, or groundwater from natural features including wet soils, seeps, and springs that discharges into the stream and comprises its base flow. These waters, which include intermittent or ephemeral small streams, shall exhibit characteristics of natural watercourses, and shall not include ponds, lakes, or man-made features such as ditches and detention basins.

Riparian zone – The waterway's buffer, which under normal conditions, employs natural vegetation to trap sediments from upslope erosion and filter fertilizers, pesticides, and other pollutants than run off farmland and other developed areas. This is often a wet area that supports trees, shrubs, grasses, and other plant and animal species that depend on changeable conditions.

Flood plain – The lowland area adjacent to a stream that floods regularly with high flows from heavy rainfall or after snow melts. The periodic flooding of this area creates a specific habitat for flora and fauna that characteristically inhabit a flood plain. In many areas of New Jersey in recent years, these areas have seen increased development pressure, even though in most cases they are unsuitable areas for building.

One Hundred Year Flood Plain – This is the area that is formed by following the outside boundaries of the area inundated by a 100-year flood. A 100-year flood is estimated to have one percent chance or one chance in 100 of being equaled or exceeded in any one year.

Steep Slopes – Lands having a slope of 15 percent or greater. Protecting slopes helps control sediment and pollutants and keep development away from unsuitable areas. Undisturbed slopes help preserve stream banks, support groundwater base flows and provide habitat. Steep slopes cannot effectively remove contaminants**.** The slope shall be protected from concentrated runoff from adjacent land, except for natural streams.

Category One (C1) Waters – Those waters designated in the Surface Water Quality Standards at N.J.A.C. 7:9B-1.15, that have been identified for protection from degradation in water quality because of their clarity, color, scenic setting, and other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources.

Conservation Easement – An area traversed or bordered by a stream or other important natural feature that a landowner or the Township desires to preserve. These areas provide important, natural environmental services that protect water quality, preserve plant and animal habitats, or help prevent pollution, erosion, sedimentation or other impacts from land use practices. These easements shall be of sufficient area and width to protect and preserve the aforementioned features, and such further width or construction, or both, as will be adequate or required to achieve said purposes. Creation of a conservation easement shall not automatically confer rights of public access within the easement area. Such access shall be subject to agreement and permission of the landowner. Such easements shall carry the following limitations:

A. They shall remain undisturbed in order to preserve plant and animal habitats located within the easement area, and to maintain their natural ability to protect the environmental quality of riparian areas, especially water quality, from erosion and excess runoff.
B. No trees or shrubs shall be removed or destroyed on lands in the easement except in accordance with permitted uses listed in the Township Stream Corridor Ordinance or approved forest management practices.
C. No structures of any description shall be erected unless permitted by the Planning Board or Board of Adjustment.
D. No fill or excavation of any kind shall be permitted.

Stream Corridor Management Plan – The document required under Section 6.E. of this ordinance that describes the effects of any development approved by the Planning Board or Board of Adjustment within any stream corridor. The Stream Corridor Management Plan shall describe in detail all development activities anticipated within the stream corridor, and it shall be filed as part of the normal application review process in accordance with Section 6.E. of this ordinance.

3. <u>Establishment of a Stream Corridor</u>

A. Stream Corridors shall be delineated as follows:

1) For Category One Waters, the stream corridor shall be measured as defined in the Flood Hazard Area Control Rules, N.J.A.C. 7:13, or as defined by this ordinance, whichever is more restrictive.
2) For Trout Maintenance and Production Waters, the stream corridor shall be measured as defined in the Flood Hazard Area Control Rules, N.J.A.C. 7:13, or as defined by this ordinance, whichever is more restrictive
3) For all other streams, the stream corridor shall be measured 150 feet from the top of the bank of an intermittent or perennial stream, or centerline if the bank is not defined.
4) Where steep slopes (in excess of 15 percent) are located within the designated widths, those slopes will only count for 50 percent of the dimensional criteria of the stream corridor buffer.
5) Where there is a 100-year flood plain delineated, the stream corridor shall encompass the flood plain.
6) Where a stream's origin is identified, this being its headwaters, and where this location comprises a groundwater source that encompasses groundwater formations commonly known by names such as wet soils, seeps and springs, and where this area is not under the jurisdiction of state wetlands laws and regulations, the area of stream corridor protection for this headwaters origin point shall be a 150-foot radius from that point.

B. A stream corridor is an overlay to the existing zoning districts. The provisions of the underlying district shall remain in full force, except where the provisions of the stream corridor differ, in which case the provision that is more restrictive and more protective of stream corridors and water resources shall apply. The provisions **o**f Section 3A are intended to modify the type of land use, siting of structures, and engineering of all proposed development on parcels located within the stream corridor. These provisions apply to land disturbances resulting from or related to any activity or use requiring application for any of the following permits or approvals, such as:

- Site plan,
- Construction permit for new construction that results in a net increase in lot coverage,
- Use variance,
- Conditional use permit,
- Subdivision/land development approval application.

C. The Township shall develop and maintain a map of stream corridors as required under this ordinance. The sources of information that will comprise this map will be the U.S. Geological Survey (USGS) map, Hunterdon County Soil and conservation District mapping, the Township tax map, and current state aerial photography. This map shall be updated by the municipal engineer or as

otherwise directed by the Township Committee at a minimum with each re-examination of the Township Master Plan.

a. All applicants for a construction permit shall identify on the plot plan all stream segments present within 150 feet of the proposed disturbance associated with the permit or certify as to the absence thereof. All applicants for subdivision review (excluding boundary line adjustments where no new lots are created and agricultural divisions of land) or site plan review shall fully identify and map on their submitted plans all streams and features regulated under this ordinance. All mapped stream segments shall have the appropriate stream corridor applied to them, as stipulated in Section 3A of this ordinance, and these mapped stream segments shall be recorded by the township. The approving authority shall verify the stream corridor boundaries based on input from the municipal engineer and Environmental Commission, and, where required, the N.J. Department of Environmental Protection.

E. The Planning Board shall recommend approval or denial of requests for permits to the municipal governing body. Municipal approval shall not waive the necessity to obtain the assent or permit required by any other agency, ordinance or statute before proceeding with the proposed activity or use. Other approval of permits that may be required are solely the responsibility of the applicant. The applicant shall initiate no operations or uses until such other approvals or permits as may be required are obtained.

4. Permitted Uses

Stream corridors shall remain in their natural, indigenous state, with no clearing or cutting of trees and brush, altering of watercourses, regrading or construction. The following shall be permitted uses or activities in stream corridors, provided that they do not disturb the indigenous character of the area:

- Any agricultural use or activity except for the creation of feed lots, barnyards or farm waste disposal facilities or the construction of structures such as barns, stables or poultry buildings, subject to existing zoning regulations and provisions of the township's Right to Farm ordinance;
- A disturbance associated with an approved stormwater management plan;
- Fishing, swimming, boating and hunting;
- Installation of an open fence in accordance with existing zoning requirements;
- Trail access to the stream and trails in adjacent parks;
- Maintenance of landscaping in place as of the adoption of this ordinance;
- Removal of dead vegetation, fallen trees and in-channel debris;
- Pruning for reasons of imminent public safety;
- Removal of invasive species as noted on a list that will be kept and updated by the Township Environmental Commission;

- Other projects that promote the preservation of plant and animal habitats and passive recreation, subject to approval by the Township Planning Board;
- Reconstruction of a structure that pre-dates the adoption of this ordinance in the event of damage or destruction by fire, or natural hazards, provided the reconstruction does not have a greater footprint or total area than that of the damaged structure and no change in land use occurs. Any such reconstruction shall be performed in accordance with current state and federal construction standards within flood plains, or
- Repair, replacement or alteration of a septic system existing prior to the adoption of this ordinance, in accordance with NJAC 7:9A, subject to granting of a waiver from the local Board of Health.

5. Performance Standards

For all stream corridors, the following conditions shall apply:
A. All activities regulated under this ordinance shall be designed to provide sufficient areas outside of the stream corridor to accommodate primary structures, any normal accessory uses appurtenant thereto, as well as all planned lawn areas.

B. In order to ensure continued protection of stream corridors, applications subject to subdivision review (excluding boundary line adjustments where no new lots are created and agricultural divisions of land) or site plan review shall permanently restrict regulated stream corridor areas by a recorded deed of conservation easement to _____. The conservation easement recorded in this manner shall be in the form approved by the municipality and shall run with the land, and be binding upon the property owner and the successors in interest in the property or in any part thereof. The conservation easement may include language reserving the right to make *de minimus* changes to accommodate necessary regulatory approvals upon the written consent of the municipality, provided such changes are otherwise consistent with this chapter. The recorded conservation easement shall, at a minimum, include:

1) A written narrative of authorized regulated activities permitted in Section 5 of this ordinance, date of issuance, and date of expiration, and the conservation easement that, in addition, includes all of the prohibitions set forth at N.J.S.A. 13:8B-2b(1) through (7);

2) Survey plans for the property as a whole and, where applicable, for any additional properties subject to the conservation easements. Such survey plans shall be submitted on the surveyor's letterhead, signed and sealed by the surveyor, and shall include metes and bounds descriptions of the property, the site, and the areas subject to the conservation easement in New Jersey State Plane Coordinates, North American Datum 1983, and shall depict the boundaries of the site and all areas subject to the conservation easement as marked with flags, signs or stakes onsite. All

3) A copy or copies of deeds for the property as a whole that indicate the deed book and pages where it has been recorded in the office of the clerk of the applicable county or the registrar of deeds and mortgages of the applicable county.

C. Any lands proposed for development within all or a portion of any stream corridors shall as a condition of any land use application provide for the vegetation or revegetation of any portions of the stream corridor which are not vegetated at the time of the application or which were disturbed by prior land uses, including for agricultural use. Said vegetation plan shall utilize native tree and plant species in accordance with an approved Stream Corridor Management Plan, described in Section 7E of this ordinance.

D. Any subsequent requests for *de minimus* changes to a conservation easement not associated with another land use application shall be subject to approval by the Township Committee. Such requests shall be in writing and shall be accompanied by all necessary supporting documentation. Upon the complete submittal of the written request and supporting documentation, the Township Committee shall have 90 days to decide whether to grant the request, pending an extension upon mutual agreement of all parties involved.

6. Activities Permitted in Stream Corridors Under Hardship

A. For Category One stream corridors, requests for exemptions must be authorized by the state Department of Environmental Protection.

B. For all other stream corridors, applicable variances may be granted by the Board of Adjustment or the Planning Board, whoever has jurisdiction, in cases of a preexisting lot (existing at the time of adoption of this ordinance), when there is insufficient room outside the stream corridors for uses permitted by the underlying zoning and there is no other reasonable or prudent alternative to placement in the stream corridors, including obtaining variances from setback or other requirements that would allow conformance with the stream corridors requirements. A variance may be granted according to Section 40:55D-70 of the Municipal Land Use Law and only if it is shown that the activity is in conformance with all applicable local, state, and federal regulations, including but not limited to the Stormwater Management rules, N.J.A.C. 7:8, and the Flood Hazard Area Control Act rules, N.J.A.C. 7:13.

C. Any relief granted shall be the minimum required to allow a proposed development project to move forward, in order to meet the intent and purpose of this section and ordinance.

D. In consideration of such a request, the applicant shall compensate to the maximum extent practical by expanding or rehabilitating a stream corridor area on the same property or on another property owned by the same applicant at a ratio not to exceed two-to-one, based on the number of square feet reduced. Rehabilitation shall include reforestation, stream bank stabilization and removal of debris, in accordance with a stream corridor management plan. The applicant shall also obtain all other relevant permits, such as Stream Encroachment and Freshwater Wetlands.

E. Stream Corridor Management Plan

1) Within any stream corridor, no land disturbance or encroachment shall be permitted unless the effects of such development are accompanied by preparation, approval, and implementation of a Stream Corridor Management Plan.

2) The landowner, applicant, or developer shall submit to the Planning Board or Board of Adjustment, depending on which has jurisdiction, a stream corridor management plan prepared by an environmental professional, professional engineer or other qualified professional which fully evaluates the effects of any proposed uses on the stream corridor. This plan shall identify the existing conditions including:

   a) Existing vegetation;
   b) Field delineated streams;
   c) Field delineated wetlands;
   d) The 100-year floodplain;
   e) Flood Hazard Areas, including Floodway and Flood Fringe areas, as delineated by the New Jersey Department of Environmental Protection;
   f) Soil classifications as found on Soil Surveys;
   g) Existing subdrainage areas of site with HUC-14 (Hydrologic Unit Code) designations; and
   h) Slopes in each subdrainage area segmented into sections of slopes that are above 15 percent but less that 20 percent; above 20 percent but less than 25 percent; and greater than 25 percent.

3) The proposed plan shall describe all proposed uses/activities, and fully evaluate the effects of all proposed uses/activities in a stream corridor, and all proposed management techniques, including proposed vegetation and any other measures necessary to offset disturbances to the stream corridor. A discussion of activities proposed as well as management techniques proposed to offset disturbances and/or enhance the site to improve the

4) The plan shall be reviewed by the Township Planning Board engineer, in consultation with the Environmental Commission. A report with recommendations by the Township Planning Board engineer shall be submitted to the Planning Board or Board of Adjustment prior to its rendering a decision. For applications from owners of properties the Board of Adjustment may waive submission of any or all sections of the Stream Corridor Management Plan if the Board decides that the proposed disturbance is limited and that preparation of a full plan is not warranted. In all cases, however, the applicant must at a minimum show the location of any stream that is on the property consistent with other sections of this ordinance.

5) The management plan shall include management provisions in narrative and/or graphic form specifying:

   a) The manner in which the area within the stream corridor will be owned and by whom it will be managed and maintained.
   b) The conservation and/or land management techniques and practices that will be used to conserve and protect the stream corridor, as applicable.
   c) The professional and personnel resources that are expected to be necessary, in order to maintain and manage the stream corridor.
   d) A revegetation plan, if applicable, that includes: three layers of vegetation, including herbaceous plants that serve as ground cover, under story shrubs, and trees that form an overhead canopy. Vegetation selected must be native and consistent with the soil, slope and moisture conditions of the site, as defined by guidance provided by the county Planning Board. The revegetation plan shall be prepared by a qualified professional such as a landscape architect or engineer, and shall be subject to the approval of the Municipal Engineer, in consultation with the Environmental Commission. Dominant vegetation in the stream corridor management plan shall consist of plant species that are suited to the stream buffer environment. The Engineer may require species suitability to be verified by qualified experts from the Soil Conservation District, Natural Resources Conservation Service, New Jersey Department of Environmental Protection, US Fish and Wildlife Service and/or State or Federal forest agencies.

F. The Zoning Officer shall verify performance of the Stream Corridor Management Plan for a minimum of two years of time. Failure to satisfactorily

7. Boundary Interpretation, Appeals Procedures, Inspections, Enforcement.

A. Boundary interpretations: The Zoning Officer, with the advice of the Township engineer and Environmental Commission, shall make interpretations, where needed, as to the exact location of the boundaries of stream corridors, especially where there appears to be a conflict between the mapped or proposed mapped boundaries and actual field conditions. The Board of Adjustment shall be designated as the agency to act as the appeal authority to hear and decide all appeals from the decision of the Zoning Officer.

Any applicant wishing to appeal the decision of the Zoning Officer relative to the issuance of a stream corridor permit shall file a notice of appeal within 20 days of receipt of the Zoning Officer's decision, specifying the grounds of such an appeal. The Zoning Officer shall immediately transmit to the Board of Adjustment all the documents constituting the record upon which the action appealed from was taken.

B. Inspections: Lands within or adjacent to an identified stream corridor may be inspected by the Environmental Commission as part of the normal review process when:

1) A subdivision or land development plan is submitted;
2) A construction permit is requested for new construction which results in a net increase in lot coverage;
3) A change or resumption of a nonconforming use is proposed;
4) A discontinued nonconforming use is resumed more than a year later. The party contesting the discontinued use shall have the burden of proof to demonstrate when the use was discontinued.
5) Excessive or potentially problematic erosion is present, other problems are discovered, or at any time when the presence of an unauthorized activity or structure is brought to the attention of municipal officials or when the downstream surface waters are indicating reduction in quality.

C. Enforcement

1) Unauthorized stream corridor alterations: When a stream corridor has been altered in violation of this section, all ongoing development work shall stop and the stream corridor shall be restored. The township shall have the authority to issue a stop work order to cease all ongoing

2) Site Investigations: The Zoning Officer is authorized to make site inspections and take such actions that are necessary in order to enforce the provisions of this Section. A prompt investigation shall be made by the appropriate personnel of _____, of any person or entity believed to be in violation hereof. If, upon inspection, a condition which is in violation of this Ordinance is discovered, a civil action in the Special Part of the Superior Court, or in the Superior Court, if the primary relief sought is injunctive or if penalties may exceed the jurisdictional limit of the Special Civil Part, by the filing and serving of appropriate process. Nothing in this Ordinance shall be construed to preclude the right of _____pursuant to N.J.S.A 26:3A2-25, to initiate legal proceedings hereunder in Municipal Court. The violation of any section or subsection of this Ordinance shall constitute a separate and distinct offense independent of the violation of any other section or subsection, or of any order issued pursuant to this Ordinance. Each day a violation continues shall be considered a separate offense.

8. Conflicts

All other ordinances, parts of ordinances, or other local requirements that are inconsistent or in conflict with this ordinance are hereby repealed to the extent of any inconsistency or conflict, and the provisions of this ordinance apply.

9. Penalties

Refer to the violations section of the Township Zoning Ordinance.

10. Severability

A. This Ordinance shall be so construed as not to conflict with any provision of New Jersey or Federal law.

B. Notwithstanding that any provision of this Ordinance is held to be invalid or unconstitutional by a court of competent jurisdiction, all remaining provisions of the Ordinance shall continue to be of full force and effect.

C. The provisions of this Ordinance shall be cumulative with, and not in substitution for, all other applicable zoning, planning and land use regulations.

11. Adoption

Upon adoption, this Ordinance will be incorporated into and become part of the Code of _____.

12. Effective Date

This Ordinance shall take effect immediately upon final passage and publication as provided by law, and upon filing a copy thereof with the _____ County Planning Board in accordance with N.J.S.A. 40:55D-16.

Appendix A.3

6/1/04

PREREQUISITES

1. The municipal Master Plan should be amended to identify existing woodlands within the municipality and prioritize them (as “Priority Woodlands”) in terms of their types and relative values. This will require the municipality to determine and balance the often competing goals of woodlands retention and retention of agricultural lands. Potential publicly owned lands suitable for woodlands mitigation plantings should also be identified in the Master Plan.

2. The municipal Zoning Ordinance should accommodate the preservation of woodlands by establishing uses and densities/intensities and development alternatives that permit development to occur without necessitating the destruction of prioritized woodlands. In some zones (such as commercial and industrial zones) it may not be possible to achieve both land use goals and woodland conservation goals. The Master Plan should anticipate this and establish guidelines for addressing the conflict or recommend appropriate zoning changes. The municipality should decide whether this Ordinance will be applicable to all developments or only to "major developments" as defined by the municipality.

3. Municipality will also need to adopt a separate Tree/Woodland Protection Ordinance as a regular police power ordinance to cover tree removal on properties that are not the subject of a development application.

4. Municipality may wish to adopt a separate ordinance establishing the position and responsibilities of the Woodlands Advisor who will advise the municipal agencies reviewing site plans and subdivisions and who would also be charged with enforcing any separate Tree/Woodland Protection Ordinance, overseeing construction activities, monitoring the implementation of mitigation plans and policing conservation easements.

5. The checklist requirements for complete applications will need to include the information described in Sections IV and V of the attached Ordinance. Please note that many of the requirements of Section IV are already required by the municipality as part of the submission requirements for an Environmental Impact Statement. If so, the requirements of Section IV should be used to amend and supplement the existing EIS requirements so that the additional data needed for woodlands preservation are provided.

6. The municipality has the responsibility for enforcing the terms of any conservation easements relating to woodlands preservation. The municipality must be willing to accept this responsibility and develop a plan for executing it.

7. A Reference List of technical resources should be appended to both the Master Plan and the Zoning Ordinance. A suggested Reference List of technical resources to be included is attached to the back of this Ordinance.

8. The municipal fee schedule should be amended to include fees for optional pre-application meetings with and site inspections by the Woodlands Advisor. It is anticipated that escrow fees, paid by the applicant at the time of the submission of a formal site plan or subdivision application, will cover all services performed by the Woodlands Advisor thereafter.

WOODLANDS RETENTION ORDINANCE

AN ORDINANCE ESTABLISHING REQUIREMENTS AND PROCEDURES FOR THE RETENTION AND PROTECTION OF TREES AND WOODLANDS IN THE DEVELOPMENT OF LAND

I. Purpose

The purpose of this Ordinance is to promote the intent of the municipal Master Plan and the purposes of the Municipal Land Use Law (set forth at N.J.S. 40:55D-2) by protecting critical environmental resources, including air quality, water quality, soil cover, animal and plant habitat and viewsheds, that are negatively affected by the removal of woodlands. Retention of woodlands helps to control the velocity and amount of stormwater runoff, thereby reducing flooding; filters sediments and pollutants before they reach streams; promotes groundwater recharge; stabilizes the soil and reduces soil erosion; improves air quality by filtering pollutants from the air; preserves viewsheds; offers a stable habitat for associated plant species and for animal wildlife; and provides shade and windbreaks that help moderate the effects of climate conditions. Protection of woodlands along a stream corridor is essential to the maintenance of stream biota, and protection of woodlands on steep slopes is essential to soil stabilization. The retention of woodlands is essential to the scenic quality of a community and helps to preserve the diversity of native plantlife and animal species. The protection of woodlands is consistent with New Jersey's Stormwater Management Rules and Best Management Practices. The protection of woodlands also has an intrinsic value. Once removed or mismanaged, the restoration or replacement of woodlands can be a lengthy, delicate, complex and expensive process. The time, difficulties and costs inherent in this process render existing woodlands tantamount to a non-renewable resource in a community.

The purpose section of this Ordinance establishes the legal basis for adopting the Ordinance by tying it to the health, safety and welfare of the community. The purpose section can draw from the municipality's master plan, restating specific environmental, health and aesthetic benefits of woodlands that relate to health, safety and welfare.

II. Definitions

A. Caliper - The diameter of a balled and burlapped or bare root nursery stock tree trunk taken 6 inches above the ground for trees up to 4 inches in diameter and taken 12 inches above the ground for trees larger than 4 inches in diameter.

B. Critical Root Zone - The region measured outward from the trunk of a tree to and beyond the dripline to include the entire area within which the tree's feeder roots are located, as determined by probing of the soil around the tree to a depth of 18 inches by a qualified tree care professional.

C. Diameter at Breast Height (dbh) - The measurement of the diameter of the trunk of a tree planted in the ground taken 4.5 feet from the ground level on the uphill side of the tree.

D. Determination of Inapplicability - A determination by the Municipal Agency or its designee that the criteria of Section III.C. herein have been satisfied and that the applicant is thereby relieved of all other submission requirements and procedures of this Ordinance.

E. Dripline - A vertical line extending from the outermost edge of the tree canopy or shrub branch to the ground beneath.

F. Forest - A biological community dominated by trees having an average canopy height greater than 20 feet and other woody plants covering a land area of at least 10,000 square feet (.23 acres) and generally characterized by a tree density of 100 or more trees per acre with at least 50 percent of such trees having a dbh of two (2) inches or greater. A forest may have been cut (but not cleared) in conjunction with an approved forestry management plan or may be intact. An orchard or a tree nursery is not a forest. The term “woodland” is used interchangeably with the term “forest” in this Ordinance.

G. Forest Stand - A contiguous grouping of trees growing on a site that are sufficiently uniform in age-class distribution, composition and structure and are of sufficiently uniform quality to be a distinguishable unit.

H. Forest Stewardship Management Plan - A plan prepared for qualifying property owners participating in the federally funded Forest Stewardship Program. The Management Plan and Program are intended to encourage management of private forests for their non-commodity benefits, such as wildlife, recreation, aesthetics and water quality, in addition to or in lieu of their traditional commodities such as timber and wood products. Forest stewardship promotes long-term active management while emphasizing consideration of all resources and benefits associated with forests.

I. Municipal Agency - The Planning Board, Zoning Board of Adjustment or Land Use Board of the municipality having jurisdiction to review and approve an application for development pursuant to N.J.S.A. 40:55D-1, *et seq*.

J. Specimen Tree - A tree in good health of unusual or exceptional form, size, age or shape for its species and/or occupying a significant position within the landscape. A Specimen Tree would necessarily include, but not by way of limitation, any tree included on the "Big Tree List" of the New Jersey Bureau of Forestry, Community Forestry Program; any endangered species of tree; or any tree that has been identified or would qualify as a "heritage tree" having significant historical or cultural value to the community.

K. Woodlands Advisor - An expert qualified in woodlands management and forestry retained by the Municipal Agency for the purposes of offering advice and recommendations concerning the implementation of this Ordinance. The Woodlands Advisor should be a New Jersey Approved Forester, New Jersey Certified Landscape Architect or New Jersey Certified Tree Expert.

Definitions of terms that specifically relate to the Woodland Retention and Preservation Ordinance can be listed separately within the Woodland Retention and Preservation Ordinance or included under general definitions found in the municipality's land development regulations. Alternatively, they can be restated in both places. If they are included in more than one section of the municipality's land development regulations, definitions must be consistent.

All technical terms should be adopted from reliable sources (see references provided in Appendix A for sources from which definitions in this model ordinance were derived). The term "caliper" is used in the nursery industry to define the size class of a tree when purchasing nursery stock for landscaping purposes. The term "Diameter at Breast Height" or "dbh" is used when classifying trees in a forest.

The definition of "Specimen Tree" is intentionally left broad. Each municipality is encouraged to develop a comprehensive list and associated map of known Specimen Trees within the municipality and/or a set of guidelines for determining that a tree qualifies as a Specimen Tree. This information should be included in the municipal Master Plan and should be developed in consultation with the Woodlands Advisor and other municipal agencies; the "Big Tree List" of the New Jersey Bureau of Forestry, Community Forestry Program; lists of endangered tree species; lists of "heritage trees" (trees having historic or cultural value within the community); and consideration of the extraordinary characteristics of particular trees, such as their size relative to other members of the same species or their significant placement within the landscape.

The municipality should adopt a separate ordinance establishing the position of a "Woodlands Advisor." This individual may advise the municipal reviewing agencies not only as per the provisions of this Ordinance, but also regarding: 1) any separate police power Tree/Woodland Protection Ordinance; 2) overseeing the implementation of this Ordinance during construction activities; 3) monitoring implementation of mitigation plans; and 4) policing woodland conservation easements.

III. Applicability

A. The regulations set forth herein shall apply to any tract of land that is the subject of an application for site plan or subdivision approval.

B. The removal of trees on a lot or tract of land that is not the subject of an application for site plan or subdivision approval shall be governed by the regulations of Chapter ___, Tree Protection Ordinance.

C. An applicant, after submitting the information required in Section IV.B.1. of this Ordinance to the Municipal Agency, may thereafter request a determination of inapplicability by the Municipal Agency if all of the following apply:

1. If the application proposes no encroachment into forested areas;

2. If the application proposes no removal of specimen trees; and

3. If the Woodlands Advisor concurs that conditions 1. and 2. above exist.

A determination of inapplicability shall relieve the applicant of all other submission requirements and procedures of this Ordinance.

In the event an applicant proposes the development of only a portion of a tract, the balance of which is proposed to remain in agricultural use or agricultural woodland management use, a determination of inapplicability shall be rendered with respect to the portion of the tract that is proposed to remain in agricultural use or agricultural woodland management use.

D. It is strongly recommended that each prospective applicant schedule a pre-application meeting with the Woodlands Advisor prior to submitting a formal application for development to the Municipal Agency for the purpose of evaluating the impact of this Ordinance on the plans for development. The fees for such pre-application meeting are set forth in Article _____ of the municipal Code.

The Model Woodland Retention and Preservation Ordinance applies to all subdivisions and site plans including major and minor, residential and nonresidential. Each municipality must determine how broadly it chooses the Ordinance to apply. Ideally, each municipality should also adopt a Tree/Forest Removal Ordinance as part of the municipality's police power regulations to address tree/forest removal on properties not subject to a subdivision or site plan application. This ensures forest conservation not only at the time a property is being developed, but also in a variety of other situations. These may include routine tree removal activities by landowners for septic system replacement, construction of a deck or other accessory structures, or other land disturbance activities that do not constitute a subdivision or site plan but potentially affect tree/woodland resources.

Please note that the municipal fee schedule should be amended to include fees for development reviews conducted by the Woodlands Advisor.

IV. Environmental Resource Inventory

A. Each application for site plan or subdivision approval shall be accompanied by an environmental resource inventory documenting the existing natural features on the site. The purpose of the environmental resource inventory is to permit the Municipal Agency to evaluate the importance of

the existing woodlands to the preservation of high priority natural resources and ecosystems. The environmental resource inventory shall be prepared by one or more qualified professionals such as an engineer, forester, ecologist or landscape architect and shall be site specific. The environmental resource inventory requirements set forth herein may be submitted as part of the environmental resource inventory required for the development application as a whole.

B. The inventory shall consist of a natural resource inventory map, an aerial photograph and a report.

1. The natural resource inventory map shall show the following on the tract and within 500' of the tract boundary at a scale of 1" = 100' or larger and at the same scale as the rest of the site plan or subdivision submission:

a. Topography at two-foot contour intervals;

b. A critical slope analysis showing areas of steep slope in each of the following ranges: >12%-15%, >15%-20%, >20%-25% and >25%, as well as areas of highly erodible soils on slopes of 12% or less and on slopes of >12%-15% (based on the Natural Resources Conservation Service, Soil Survey data);

c. State-designated Forested Natural Heritage Priority Sites;

d. Woodlands identified in the New Jersey Landscape Project as either Forests or Forested Wetlands that create a habitat having a ranking of 3, 4 or 5 for rare, threatened or endangered species;

e. Intermittent and perennial streams, lakes, and other water bodies;

f. 100-year floodplains;

g. Wetlands, with legend, and required wetlands transition areas and vernal pools;

h. Required stream corridor buffers;

i. Soils with a legend showing soil names and characteristics, including the limitations and potential for forest growth and the types of native forest species typically associated with each soil type, based on the Natural Resources Conservation Service, Soil Survey;

j. Areas of groundwater recharge equal to or greater than the median groundwater recharge rate for the municipality as a whole, based upon the New Jersey Geological Survey or municipally-approved alternate data source, if available;

k. Locations of sinkholes, disappearing streams and other features associated with the presence of carbonate rock and any other unusual geological features of the tract;

l. Aerial extent of forest and tree cover which shall encompass the outside perimeter of the canopy of individual trees;

m. Forest stand data: the forested portions of the property shall be divided into separate forest stands for the purpose of describing the different forested areas of the tract as required in Sections 3.a. and b. below; stands smaller than five (5) acres shall be fully described; stands of five (5) acres or larger shall be sampled, and the stand shall be statistically described based on the sample data; *(See Technical Appendix for Forest Stand and Sample Data Sheet)*

n. Locations, species and sizes of <u>all</u> specimen trees and of all individual trees that are not located in a delineated forest stand; and

o. Existing man-made structures.

2. The most current and readily available aerial photograph of the tract and the area within 1000 feet thereof at a scale of 1" = 400' or larger and preferably at the same scale as the natural resource inventory map.

3. The natural resource inventory report shall include the following:

a. A description of each forest stand on the site including, for each stand, the dominant and codominant species, understory vegetation, range of sizes in diameter at breast height (dbh), the health and condition of the trees in the stand, and the extent and nature of invasive species within the stand; and

b. Copies of the sampling point data sheets and summaries.

The elements of an Environmental Resource Inventory (ERI) outlined in Section IV.B.1. are meant to supplement the ERI requirements that may already be contained in a municipality's land development regulations. Items IV.B.1.d., l., m. and n. are specifically required for the implementation of this Ordinance and may not already be included among the submission requirements the municipality has in place.

The qualifications of the professional(s) preparing the various components of the ERI should be carefully scrutinized by the Municipal Agency. Experts qualified to undertake items IV.B.1.d., l., m. and n. and to prepare the natural resource inventory report include: New Jersey Approved Foresters, New Jersey Certified Landscape Architects and New Jersey Certified Tree Experts.

Item 1.d., New Jersey Landscape Project, spearheaded by the New Jersey DEP Endangered and Nongame Species Program, is a project to protect New Jersey's biological diversity by mapping and maintaining critical habitats of rare wildlife populations. Upland forests and forested wetlands are two such critical ecosystems that have been mapped statewide. The rankings of 3, 4, and 5 refer to habitats of state-listed threatened species, state-listed endangered species and federally-listed threatened or endangered species respectively. This information is available at http://www.nj.gov/dep/fgw/ensp/landscape/download.htm

Note that all information required to be submitted under Sections IV and V of this Ordinance should also be included in the municipal site plan and subdivision checklist requirements for determining the completeness of an application.

V. Woodland Retention and Preservation Plan

A. A woodland retention and preservation plan shall be submitted for approval. The plan shall include a report articulating how the requirements of Section VI of this Ordinance will be met by the proposed woodland retention and preservation plan; how the proposed development will affect the existing natural resources on the tract; the quantity of existing woodlands, and of individual trees not located within a designated forest stand, that will be removed and that will be retained; and what specific techniques will be used to protect woodlands and individual trees during the construction process.

B. The woodland retention and preservation plan shall be prepared using the information requested in Section IV of this Ordinance and shall be certified by a New Jersey Approved Forester, A New Jersey Certified Landscape Architect or a New Jersey Certified Tree Expert.

C. The woodland retention and preservation plan shall include all of the information provided on the natural resource inventory map as well as:

1. Proposed topography as shown on the proposed grading plan;

2. Surveyed locations of the following:

a. All individual trees 6" dbh or larger that are not located in a delineated forest stand but are nevertheless proposed to be retained and are located within the proposed areas of disturbance; and

b. If a forest stand or portion thereof is proposed to be retained, all individual trees 6" dbh or greater located within the first 25 feet of such area, measured toward the interior of the woodland from its proposed perimeter.

3. Cultural features, historic sites, and critical viewsheds as identified and/or mapped in the Township Master Plan;

4. Existing man-made structures to be removed and to remain;

5. All proposed development including buildings, roads, driveways, utilities and other improvements;

6. A table listing the tract area in square feet; the square footage of existing and proposed woodlands located within the tract, classified according to the priority categories listed in Section VI.A. of this Ordinance; and the percentage of the net tract area covered by existing and proposed woodlands, classified according to the priority categories listed in Section VI.A. of this Ordinance;

7. A clear, graphic indication of the woodland preservation areas on the site;

8. A clear, graphic indication of the proposed limit of disturbance line, "tree save" fencing and other proposed tree protection measures;

9. Locations of proposed soil stockpile areas; and

10. A clear written and graphic indication of all proposed methods to be employed in protecting existing trees that are proposed to be retained but lie within the limits of disturbance during construction.

11. Existing preservation/conservation easements on the tract.

The Woodland Retention and Preservation Plan is critical. It is in this Plan that the applicant assesses the impact of proposed activities on the site's natural features and the proposed means of addressing these impacts. The requirements under Subsection A are especially important. Although the Municipality's Woodlands Advisor will be able to assess the impact of proposed activities on the site's trees/woodlands according to the mapped information and supportive technical materials that are submitted by the applicant, the report requirement under Subsection A integrates the information from Sections IV, V and VI into a cohesive package that can be reviewed and understood by the Municipal Agency.

Subsection C.2. requires certain trees 6" or greater that are targeted for preservation to be surveyed as part of the inventory process. The purpose for doing this is to evaluate the impacts of the proposed site design on individual trees and to ensure proper protection measures are utilized during the construction process to protect these trees. For example, tree roots that extend into the proposed area of disturbance can be harmed by soil compaction unless proper measures are taken to avoid this.

VI. Woodland Retention Requirements

A. The intent of this Ordinance is to retain rather than to replace existing woodlands. To that end, development shall be designed to maximize the area of existing woodlands to be retained. If woodlands are to be disturbed or removed, the applicant shall design the development in such a way as to avoid or minimize removal of priority woodlands, which shall consist of woodlands in any of the following priority categories:

1. Any woodlands prioritized in the municipal Master Plan;

2. Any woodlands within required stream corridor buffers, wetlands, wetland transition areas or floodplains;

3. Woodlands on slopes of 15% or more or woodlands located in highly erodible soils on slopes of less than 15%, with the steepest slopes having the highest priority;

4. Woodlands associated with a critical groundwater recharge area, defined as having a recharge rate greater than or equal to the median recharge rate for the municipality as a whole.

5. Woodlands associated with a critical viewshed identified in the municipal Master Plan;

6. Woodlands identified in the New Jersey Landscape Project as either Forests or Forested Wetlands that create a habitat having a ranking of 3, 4 or 5 for rare, threatened or endangered species;

7. Woodlands that are connected to a larger woodlands corridor extending beyond the tract boundaries; and

8. Woodlands and hedgerows that provide visual screening, are associated with an historic site or line a rural roadway.

Not more than ten (10) percent of priority woodlands existing on the site prior to its development shall be removed or otherwise disturbed for development. Any removal of priority woodlands shall require mitigation, irrespective of the exemptions set forth in Sections VI.D. and E. below.

B. All woodland areas designated for retention shall be protected by a Conservation Easement in accordance with Section VIII of this Ordinance. *(See also Technical Appendix for model Conservation Easement)*

C. To the extent that the use of the clustering or lot averaging techniques permitted in the applicable zoning district will maximize the retention of woodlands in the development of the tract, such techniques shall be used.

D. Subject to the provisions of Section VI.A. above, if the application is for a subdivision, a portion of the woodlands existing on the tract prior to development may be permitted to be removed for development as follows:

1. Up to 10 percent of the woodlands existing on the tract prior to development may be removed for the construction of necessary public and private streets, public utilities and common or public stormwater management facilities; and

2. Reasonable and necessary removal of woodlands shall also be permitted on each new residential lot within the subdivision provided that such removal shall not exceed the following:

   a. To allow the construction of a dwelling, with an average of up to 30 feet of clearance around the dwelling, and permitted accessory building(s);

   b. To allow a driveway with up to 5 feet of clearance on each side of the driveway;

   c. To allow a septic bed with up to 20 feet of clearance around the perimeter of the septic bed; and

   d. To allow underground utility lines with a maximum corridor width of 20 feet.

3. All improvements on new residential lots shall be located so as to retain any specimen tree or any other desirable healthy individual tree as identified by the Woodlands Advisor.

Improvements must also be located and designed to minimize forest removal and fragmentation.

4. The above criteria for permitted removal of woodlands on new residential lots shall not result in the removal of woodlands on any lot in excess of the following:

Acreage of Lot[1]	Maximum Area of Woodlands Removed[2]
1	20,000 sq. ft.
2	30,000 sq. ft.
3	40,000 sq. ft.
4	50,000 sq. ft.
5 acres and over	60,000 sq. ft.

Notes: [1] For lots with a lot area less than or between these size ranges, interpolation shall be used.

[2] Or an area equal to twice the impervious surface coverage permitted in the zone, whichever is less.

E. Subject to the provisions of Section VI.A. above, if the application is for site plan approval, up to ____ percent (*to be determined by the municipality based upon appropriate zoning and the characteristics of the district*) of the woodlands existing on the lot prior to development may be removed for development, provided, however, that all improvements shall be located so as to retain any specimen tree or any other desirable healthy individual tree as identified by the Woodlands Advisor.

For developments involving both site plan and subdivision approval, the requirements of Sections VI.D. shall apply to the development of the tract as a whole and to the development of any new residential lots within the development, and the requirements of this Section VI.E. shall apply only to the development of any nonresidential lots within the development.

F. If the approval of the application and of any permits issued pursuant to such approval will result in the removal of more woodlands than the limits set forth in Sections VI.D. and E. above, or will result in the removal of <u>any</u> priority woodlands identified in Section VI.A. above, mitigation shall be required on an acre for acre basis to the extent of such excess removal or removal of priority woodlands. Mitigation shall be undertaken in accordance with Section VII of this Ordinance. Prior to approving a plan for mitigation, the Municipal Agency shall first determine that the proposed design cannot reasonably be modified to reduce woodlands removal or to locate improvements outside of priority woodlands.

G. The following procedures and requirements for the protection of the woodlands and individual trees to be retained shall be adhered to in the construction phase of the development:

1. During construction, no permanent or temporary material, including soil, shall be placed or deposited within the critical root zone or within six (6) feet, whichever is greater, of any tree to be retained or of the trees at the perimeter of any forest stand to be retained. Such area shall be protected by orange blazed fencing placed outside of such area during construction, and the fencing shall be inspected and approved by the Woodlands Advisor prior to the start of any site disturbance. Permanent monuments and signs, if required by the municipality for the demarcation of conservation easements, must be installed prior to the start of construction.

2. Where necessary, pursuant to an approved grading plan, to fill or remove soil within an area that encompasses either the critical root zone or the area within six (6) feet, whichever is greater, of any individual tree to be retained in the area of disturbance or of the trees within the perimeter of any forest stand to be retained, the existing grade around each such tree shall be maintained to the extent of the critical root zone or six (6) feet, whichever is greater, by a tree well and extension tiles (in the case of fill) or by a retaining wall (in the case of a cut).

3. No chemicals shall be disposed of and no concrete trucks shall be rinsed within the critical root zone of any tree or of the trees at the perimeter of any forest stand to be retained.

4. During construction, individual trees to be retained and trees located at the perimeter of a forest stand to be retained shall be maintained in accordance with a maintenance schedule and plan under the direction of the Woodlands Advisor.

5. If equipment must temporarily invade the critical root zone of any individual tree to be retained or of any tree(s) located at the perimeter of a forest stand to be retained, the Woodlands Advisor shall approve and inspect the installation of required critical root zone protection measures within the path of such equipment, shall inspect the invasion of the critical root zone and shall thereafter inspect the removal of all temporary protective measures and the replacement of the protective fencing.

6. If the approved plan calls for the installation of any pavement or utilities within the critical root zone of any individual tree to be retained or of any tree(s) located at the perimeter of any forest stand to be retained, special techniques for such installation shall be employed to minimize the impact on the critical root zone(s), and such installation shall be directed, inspected and monitored by the Woodlands Advisor.

7. In the event any of the foregoing procedures and requirements for construction are violated, the Municipal Engineer or Construction Official shall issue a stop work order until the violation is remedied.

This Ordinance addresses the protection of existing woodland resources only. There are other types of ordinances that are designed not only to minimize impacts to existing forests on site but also to plant new forests (afforestation) where they are absent or where they once existed (reforestation). One example of this approach is Ordinance # 103.53, Natural and Cultural Resource Conservation of Washington Township, Mercer County, NJ. An advantage of the latter approach is that it discourages landowners from deforesting their properties prior to making a subdivision or site plan application. Another advantage is that it fosters reforestation or afforestation of areas where woodland resources would provide a public health, safety and welfare benefit such as enhanced ground water recharge, water quality protection, etc. However, afforestation and reforestation requirements can result in significant financial impacts on property owners. Therefore, municipalities should carefully weigh the costs and benefits of such requirements before proceeding.

In order for a Woodland Retention and Preservation Ordinance to be effective in protecting existing woodland resources, the municipal zoning regulations must work in concert with this objective. Specifically, they should accommodate the preservation of woodlands by establishing uses, densities/intensities, development alternatives (such as clustering or lot size averaging) and site design regulations (such as reduced setback requirements, impervious coverage limits, etc.) that permit development to occur while minimizing destruction of woodlands. Conversely, in some zones, such as commercial and industrial zones, it may not be possible to achieve both land use goals and woodland conservation goals because site improvements may necessitate extensive forest removal. In other zones, where preservation of farmland is a priority, forest resources may have to be sacrificed in order to achieve this overriding goal.

For this Ordinance to be most effective, the municipal Master Plan should identify and map existing woodlands in the community and then prioritize them according to their types and relative value. This will require the municipality to determine and balance the often competing goals of woodland retention and retention of agricultural lands. The Master Plan then becomes the basis for establishing priority woodland resources and assigning the appropriate mitigation requirements accordingly.

According to Sections VI.A.1.-A.3. of this Ordinance, no more than 10% of priority woodlands may be cleared and any such clearing requires mitigation on an acre-for-acre basis.

Section VI.D. establishes the design standards for improvements that necessitate forest removal. Only the minimum necessary forest removal is permitted according to the criteria spelled out in Sections VI.D.1. and 2., providing said clearing results in removal no greater than that set forth in Section VI.D.4. These criteria and thresholds were established based on an examination of several residential subdivision plats and discussions with municipal and county engineers. The thresholds established under Section IV.D.4. were tested on lots of varying sizes and found to be reasonable. Each municipality should carefully review said standards, however, and adjust them as needed to fit its own unique complexion.

Section VI.D.3. ensures that Specimen Trees and other noteworthy trees not within a forest stand are protected as well. Many local ordinances specify that trees of a certain size be protected. This Ordinance does not specify a minimum size. Health, form, size relative to other members of the same species, age, shape or position within the landscape are generally more important to the desirability of maintaining a given tree than size alone. Thus, the Ordinance directs the municipal Woodlands Advisor to work with the applicant to identify and protect Specimen Trees and any other trees that the Advisor deems desirable based on species, health, size and any other relevant factors.

Subsection E. above applies primarily to nonresidential developments. Each municipality must determine the appropriate threshold for maximum forest removal in its nonresidential zones based on its own zoning requirements, extent of existing forest cover, priority forest resources, and local forest protection objectives.

VII. Woodlands Mitigation

A. If mitigation is required, a woodlands mitigation plan shall be presented which shall consist of one or more of the following alternative approaches (in descending order of desirability):

1. Mitigation planting on-site.

2. Mitigation planting off-site on public land (including County or State land) or on other land designated in or meeting the requirements identified in the municipal Master Plan that is, to the extent practicable, located within the same subwatershed as the woodlands being removed.

3. Mitigation planting off-site on privately-owned land to be permanently deed-restricted for that purpose that is, to the extent practicable, located within the same subwatershed as the woodlands being removed.

B. Requirements for mitigation planting on and off-site:

1. Landscaping in accordance with an approved landscaping plan may be credited as mitigation if the landscaped area has a width of 35 feet or more in all directions and equals or exceeds 2,500 square feet in area and if the quantity of plantings per each 2,500 square foot area is at least 7 trees and 20 shrubs.

2. A woodlands mitigation planting plan that is not part of the approved landscaping plan shall be reviewed and approved by the Municipal Agency based on the recommendations of the Woodlands Advisor. All of the following shall ordinarily be planted on each acre of woodlands mitigation area:

a. 35 trees per acre at a 2" caliper size; and

b. 70 trees per acre at a 1" caliper size; and

c. 100 trees per acre installed as whips (5' to 6' in height); and

d. 40 woody shrubs per acre, to be located at the edges of the planting area; and

e. A native grass mix shall be seeded over the entire planting area.

A diversity of native species shall be planted in each of the above categories. The species selection shall be informed by the information collected in the natural resource inventory required at Section IV of this Ordinance and shall be subject to the approval of the Woodlands Advisor, who shall also inspect and approve all planting materials upon delivery to the site and prior to and following their installation.

3. The applicant's Landscape Architect or New Jersey Certified Tree Expert or New Jersey Approved Forester shall prepare the cost estimate for the woodlands mitigation planting plan. Such estimate shall be separate and apart from the estimate pertaining to the approved landscaping plan. The cost of the woodlands mitigation planting plan shall include all materials, installation costs and continuing costs associated with the implementation of the maintenance plan. The cost estimate for the woodlands mitigation planting plan shall be reviewed and approved by the Woodlands Advisor and shall thereafter be transmitted to the municipal engineer for inclusion in the cost estimate for the performance guarantee for the entire project.

4. Prior to the release of any portion of the performance guarantee covering the woodlands mitigation planting plan, the Woodlands Advisor shall inspect the plantings and shall make a recommendation to the municipal engineer as to whether the plantings have been installed in accordance with the approved woodlands mitigation planting plan. The applicant shall post a maintenance guarantee following the inspection and approval or acceptance by the municipality of the installation of the plantings included in the woodlands mitigation planting plan. The amount and timing of the maintenance guarantee shall be in accordance with N.J.S. 40:55D-53.

5. Prior to the release of the maintenance guarantee or portion thereof covering the woodlands mitigation area, the Woodlands Advisor shall inspect the mitigation area. The maintenance guarantee shall not be released unless the following conditions have been met:

a. Survival of 100% of the trees installed at 2" caliper size and 100% of the woody shrubs;

b. Survival of 85% of trees installed at 1" caliper size;

c. Survival of 75% of trees installed as whips;

d. All surviving plant material shall be found to be in good health and free of diseases and pests; and

e. There shall be no evidence of exotic and invasive plant material.

6. To ensure the survival rates and conditions in paragraph 3. above, a maintenance plan shall be submitted to the Woodlands Advisor for approval prior to the grant of final approval by the Municipal Agency. The maintenance plan shall include, but not by way of limitation, the following: plans and schedules for weeding, watering and deer protection (including fencing or tree shelters). For individual trees, the maintenance plan may also be required to include mulching, fertilizing, and treatments for pests and diseases. The Woodlands Advisor shall inspect the premises periodically following the installation of the woodlands mitigation planting to ensure that the maintenance plan is being implemented and to recommend additional maintenance requirements, if necessary, to ensure the health and survival of the woodlands mitigation area.

7. A preservation/conservation easement shall be placed on the woodlands mitigation area. The preservation/conservation easement shall allow for continued maintenance of the woodlands mitigation area by the owner via the removal of hazardous or diseased trees or tree limbs, removal of exotic and invasive planting species, erection of protective fencing, and the installation by hand of new plantings intended to replace dead trees or supplement existing growth, but only with the approval of the Woodlands Advisor.

C. Information to be provided for mitigation planting on and off-site:

1. A table and description of soil preparation methods, species, sizes and spacing to be utilized for the new plantings;

2. A binding two-year maintenance and management agreement that details how the area(s) designated for new plantings will be maintained to ensure satisfactory establishment of the new woodland including:

a. Regular watering;

b. Regular removal of invasive plant species;

c. Protection from deer grazing; and

d. Contact name and phone number for party responsible for maintenance.

3. A mitigation table identifying the percent of the tract area in woodlands that is proposed to be cleared as a result of the proposed development; the number of acres of existing woodlands to be cleared; the applicable replacement requirements; and the number of acres of mitigation plantings proposed.

Section VII of this Ordinance establishes the criteria and procedures for replanting forests (mitigation) when required. The first priority is to plant forests on the same site where forest cover was removed in excess of the maximums established in Sections VI.D. and E. If mitigation cannot occur on site due to site constraints or other limitations, then the next priority is to plant off-site on public lands or on other lands either designated for this purpose in the municipal master plan or satisfying the criteria outlined in the municipal master plan for mitigation planting.

This Section also provides that the applicant post performance and maintenance guarantees and establishes the requirements for the condition of the mitigation plantings upon completion of the two-year maintenance period. This two-year period is the maximum permitted by the Municipal Land Use Law. Municipalities will need to develop maintenance strategies that will cover the time beyond this two-year period, to ensure the long-term health and survival of mitigation plantings.

In addition, this Section requires that conservation easements be placed on retained woodlands or on woodlands mitigation areas to ensure their long-term protection. Section VI.G.1. had suggested that the municipality mandate the placement of monuments and signs demarcating such protected areas prior to construction. Monuments and/or signs are also a means of notifying landowners of the existence of conservation easements with special requirements that must be adhered to, even on private property.

VIII. Conservation Easement

A. A conservation easement shall be placed on any portion(s) of a lot or tract on which woodlands are proposed to be retained and on any areas designated for woodlands mitigation. The conservation easement shall be shown on the filed plat, if applicable; shall be referenced by legal description in the deed to the lot or tract; and shall be filed with the County Recording Officer. Monuments and signs shall be placed to demarcate the conservation easement as required by the Municipal Agency.

B. The conservation easement shall identify those activities and improvements that are specifically permitted (for example, walking paths, fences and play structures), the maximum sizes of, or areas to be covered by, permitted improvements and those activities and improvements that are specifically prohibited within the affected area.

C. The conservation easement shall include the following limitations:

1. No tree with a diameter greater than six (6) inches dbh or more than thirty (30) feet in height may be cut down, removed or destroyed within the conservation easement area

without cause and without the prior written consent of the Woodlands Advisor. Diseased or hazardous trees or tree limbs may be removed to prevent personal injury or property damage provided notice is served upon the Woodlands Advisor at least ten (10) days prior to such removal. Where an emergency situation renders the giving of notice impracticable, the tree or limb may be removed without prior notice, but a notarized statement from the owner of the underlying title giving the reasons for such removal shall be submitted to the Woodlands Advisor within seven (7) days thereof, along with appropriate documentation of the reasons in the form of photographs, corroborative letters or other evidence.

2. Understory plant materials, including, but not limited to, brush, shrubs, saplings, seedlings, undergrowth and vines may not be cut down, removed or destroyed within the conservation easement area except to control exotic or invasive species, and then only with the prior written consent of the Woodlands Advisor.

3. Fences may be erected within or around the conservation easement area if approved by the municipal agency initially or, thereafter, with the prior written consent of the Woodlands Advisor, if the approved deer control measures have proven to be ineffective.

4. New plantings may be installed within the conservation easement area if needed to supplement existing vegetation or to replace dead trees or other vegetation, provided such plantings are characteristic of native growth and with the prior written consent of the Woodlands Advisor.

D. The following activities shall be specifically prohibited within the conservation easement area once it has been legally established:

1. Construction, excavation, grading or the erection of retaining walls, buildings or other structures, roads, driveways, fences or utilities.

2. Any grading or other activities that would or might impair soil or slope stability or alter drainage patterns on or off the site.

3. Commercial timber cutting or harvesting of vegetative products for commercial purposes.

4. Maintenance or grazing of livestock.

5. Excavation, grading, dredging or removal of topsoil, sand, gravel, loam, rock or other materials.

6. Dumping or composting of soil, grass clippings, garden waste, household waste, sawdust, ashes, trash, construction materials or other debris of any kind.

7. Operation of any mechanical equipment of any kind, including recreational vehicles such as ATVs and snowmobiles, except as needed to undertake approved activities identified herein or in the conservation easement itself.

E. The conservation easement may provide for a municipally approved forest stewardship program that may also be used to satisfy the requirements for a Forest Stewardship Plan to be approved by the State Forester.

F. The conservation easement language shall specifically provide for the right of the municipality through any of its officers or agents to enter and inspect the conservation easement area to determine that the terms of the conservation easement are being adhered to and that necessary maintenance is being undertaken. The municipality shall have the right, and the conservation easement shall so state, to issue citations for any violations of the terms of the conservation easement or of this Ordinance or of the development application approval pursuant to which the conservation easement was established.

The Technical Appendix provides model language for conservation easements placed on woodlands. A conservation easement is a legal covenant restricting the use of land and/or natural features of the land that is described in the property deed and shown on a filed plat. In this case, the restrictions stipulated in the conservation easement ensure proper long term protection, maintenance and health of the woodlands. The conservation easement is held by a third party – typically a land trust or government entity. This party is responsible for the enforcement of any restrictions stipulated in the easement. Land held in a conservation easement may still be able to be used by the land owner, subject to the restrictions in the easement.

XI. Fees, Violations and Penalties

A. Fees:

1. The fees charged for inspections undertaken and other services provided by the Woodlands Advisor shall be established by the municipal governing body by ordinance at the time of the appointment of the Woodlands Advisor. Such fees may, from time to time, be amended by ordinance.

2. All charges made against escrow accounts for the services of the Woodlands Advisor shall be in accordance with N.J.S. 40:55D-53.2.

B. Violations and Penalties:

1. Any violation of the provisions of this Ordinance shall be punishable by a fine not exceeding $1,000.00 or by imprisonment or community service not exceeding 90 days, or both, for each separate offense.

2. Each day on which a duly noticed violation is continued or remains unremedied while work is progressing shall constitute a separate offense, punishable as set forth herein.

3. Upon notification by the municipality or its agent of the existence of a violation, the violation shall be immediately remedied. If a violation cannot be remedied immediately, the municipality or its agent may issue a “Stop Work Order” until the violation is remedied. If a violation causes irreversible damage to a tree or woodland slated for retention, the municipality or its agent shall issue a “Stop Work Order” and the developer shall be required to submit a new preliminary and final plan to the municipal agency for its approval before resuming work.

4. The Municipal Agency shall reserve the right to revoke or withdraw any approval granted for subdivision or site plan upon notice to the applicant and public hearing, in the event that there is any deviation from, or alteration of, the approved woodlands retention and preservation plan, unless prior written approval for such deviation or authorization has been obtained from the Municipal Agency. Minor deviations and field changes may be authorized solely by the Woodlands Advisor in writing and only after consultation with the Chairman of the applicable Municipal Agency to determine if the proposed minor deviations and field changes deviate from the intent of the original approval with respect to the woodlands retention and preservation plan. If it is determined by this consultation that the changes proposed are not minor, the matter must be referred to the full Board, and no changes may be effected until such Board gives its approval.

5. Each of the terms and conditions of any approval relating to woodlands retention and preservation are material elements of the development approval based upon the submission of the application in its entirety, and the non-compliance with any term or condition by the applicant or its successors or assigns shall be deemed a material default subjecting the applicant to revocation of such approval. The request to change any single condition, since all conditions are integrally related, shall open the entire application to the applicable Municipal Agency for reconsideration, possible re-approval, and new terms and conditions in addition to those terms and conditions contained in the original approval.

The ability to impose penalties and issue Stop Work Orders is needed to address those situations in which the provisions of this Ordinance are found to have been violated.

TECHNICAL APPENDIX

SAMPLE WOODLANDS CONSERVATION EASEMENT

THIS INDENTURE dated _____
between _____
residing at _____
hereinafter referred to as GRANTOR, and _____, a municipal corporation of the State of New Jersey, having its principal office at _____ in _____, New Jersey, hereinafter referred to as GRANTEE,

WITNESSETH:

WHEREAS, Grantor, in order to comply with the applicable provisions of the Woodlands Retention Ordinance of Grantee (and for no money paid by Grantee), does by these presents grant and convey to the Grantee a conservation easement over premises in _____, County of Hunterdon and State of New Jersey, as more particularly described and set forth in Schedule "A" annexed hereto, and hereinafter referred to as THE PROPERTY.

Within the conservation easement, the following terms and conditions shall apply:

1. No tree with a diameter greater than six (6) inches dbh or more than thirty (30) feet in height may be cut down, removed or destroyed on The Property except for selective cutting and thinning required for woodlands management in connection with a forest stewardship or woodlands management plan to be approved by the Grantee, which plan may also be used to satisfy the requirements for a Forest Stewardship Plan to be approved by the State Forester. Notwithstanding the foregoing, diseased or hazardous trees or tree limbs may be removed to prevent personal injury or property damage provided notice shall be served upon the Grantee at least ten (10) days prior to such removal. Where an emergency situation renders the giving of notice impracticable, the tree or limb may be removed without prior notice, but a notarized statement from the owner of the underlying title giving the reasons for such removal shall be submitted to the Grantee within seven (7) days thereof, along with appropriate documentation of the reasons in the form of photographs, corroborative letters or other evidence.

2. Understory plant materials, including, but not limited to, brush, shrubs, saplings, seedlings, undergrowth and vines shall not be cut down, removed or destroyed within The Property, except as needed to control exotic or invasive species in connection with a forest stewardship or woodlands management plan to be approved by the Grantee, which plan may also be used to satisfy the requirements for a Forest Stewardship Plan to be approved by the State Forester.

3. Fences for deer control may be erected within or around The Property, if approved as part of the woodlands maintenance plan or with the consent of the Grantee if previously approved deer control measures have proven to be ineffective.

4. New plantings may be installed within The Property if needed to supplement existing vegetation or to replace dead trees or other vegetation, provided such plantings are characteristic of native growth and have been approved by the Grantee.

5. The following activities shall be specifically prohibited within The Property:

   a. Construction, excavation, grading or the erection of retaining walls, buildings or other structures, roads, driveways or utilities.

   b. Any grading or other activities that would or might impair soil or slope stability or alter drainage patterns on or off the site.

   c. Commercial timber cutting or harvesting of vegetative products from The Property for commercial purposes.

   d. Maintenance or grazing of livestock.

   e. Excavation, grading, dredging or removal of topsoil, sand, gravel, loam, rock or other minerals from The Property.

   f. Dumping or composting of soil, grass clippings, garden waste, household waste, sawdust, ashes, trash, construction materials or other debris of any kind on The Property.

   g. The operation of any mechanical equipment of any kind, including recreational vehicles such as ATVs and snowmobiles, except as needed to undertake approved activities identified in this conservation easement.

6. Although the conservation easement granted and intended to be granted hereby has been created for the benefit of the general public through the retention and maintenance of existing woodlands or the protection of a woodlands mitigation area, nothing herein contained shall be construed to convey to the public any right of access to or use of The Property, and Grantor, his heirs, successors and assigns shall, subject to paragraph 7 hereof, retain the exclusive right of access to and use of The Property.

7. The municipally-approved forest stewardship program/woodlands management plan for The Property shall be as follows: (*to be filled in for the particular site after consultation with the Woodlands Advisor*.)

8. Grantee and its agents shall be permitted limited access to enter upon The Property at all reasonable times for the purpose of inspection in order to assure compliance with the terms and conditions herein contained. In the event of non-compliance with the terms hereof, the Grantee shall have the right to enter the premises and fulfill the obligations imposed herein and charge the reasonable cost thereof to the Grantor or to issue citations for any violations of the terms and conditions of this conservation easement or of the development application approval or ordinance pursuant to which this conservation easement has been established.

9. Nothing herein contained shall be deemed to restrict the right of Grantor to maintain all trails and strictures existing upon The Property on the date hereof.

10. Grantee may at any time transfer and assign the easement and interest created hereby to any succeeding public corporation or entity.

11. It is understood that this instrument imposes no obligation on the Grantor and no restrictions on the use of The Property except as specifically set forth herein and nothing herein contained shall be construed to interfere with the right of the Grantor, its heirs, successors and assigns and their licensees and any party claiming rights under them to utilize The Property in such manner as they or any of them may deem desirable, subject to the terms and conditions hereof.

12. This instrument shall be binding upon the Grantor, its heirs, successors and assigns and upon the Grantee, its successors and assigns.

IN WITNESS WHEREOF Grantor and Grantee have duly executed this instrument as of the date first above written.

_____ _____

For Grantor For Grantee

Attested by: _____

Site Plan Review - The Right Questions To Ask

1. Do plans include a tree stand delineation identifying one or more tree stands (groups of similar trees) by species and locating "specimen" trees?

2. Do plans include a tree survey identifying trees that will be impacted by construction and describing their existing size, species, health and overall condition?

3. Do soil erosion and sediment control plans and grading plans indicate tree save areas? Do soil erosion and sediment control plans and grading plans complement or conflict with tree save areas?

4. Is protective fencing delineated around tree save areas?

5. Is protective fencing placed around the tree using either the dripline method (at the dripline for broad-canopied trees and up to 1.5 times the dripline for narrow-canopied trees) or the critical root zone method?

6. Do plans include proposed measures to protect and/or enhance tree save areas as needed (e.g. management of invasive species, wind protection, planting of new species to increase species diversity within protected tree stands)?

7. Do plans include language prohibiting grading, trenching or equipment storage within designated tree save areas?

8. Do plans require erection of tree protection fencing prior to any clearing, demolition, grubbing, grading or construction on site?

9. Do plans require that protective fencing remain in place until all construction is complete?

10. Do soil erosion and sediment control plans show installation of silt fences sufficient to keep excess soil away from roots of trees to be saved?

11. Where root loss will affect trees in tree save areas, are adequate measures indicated on the plans to properly prune roots and trees and otherwise minimize damage to trees?

12. Where temporary construction roads must pass over root areas of trees to be retained, are adequate measures proposed to minimize soil compaction? (e.g., a temporary road bed of 6 inches of mulch or gravel)?

13. Are methods indicated in plans for remedying unintended damage to trees in tree save areas?

14. Where cuts or fills affect roots of trees in tree save areas, are appropriate stabilizing measures indicated on plans (e.g. retaining walls, tree wells)?

15. Where barriers are not possible to keep vehicular or foot traffic away from tree roots, do plans indicate protective methods to be employed (e.g., spreading several inches of wood chips; pumping concrete through conveyor pipes instead of driving trucks over root systems; bridging root areas with plates of steel)?

16. Are underground utilities proposed to be installed by tunneling rather than trenching to avoid damaging tree roots?

17. As a general rule of thumb, are all of the existing trees that are proposed to be saved at least 5 feet from any proposed new structure?

18. How will the forested area(s) to be retained be cared for?

19. What are the stewardship needs of the retained forested area(s) and of any proposed mitigation area(s)?

20. How will the health and vigor of the retained forested area(s) be sustained?

21. How will the health and vigor of any proposed mitigation area(s) be assured?

FOREST STAND SAMPLE DATA SHEET

NAME OF DEVELOPMENT Woodlands Stand Descriptions					
Map Key	Size (Acres)	Species	Size Range in DBH	Condition (1)	Priority (2)
A					
B					
C					
D					

NAME OF DEVELOPMENT Specimen Trees				
Map Key	Species	DBH	Condition(1)	Comments(3)
001				
002				
003				
004				
005				
006				
007				
008				
009				
010				
011				
012				
013				
014				
015				
016				
017				
018				
019				
020				
021				
022				
023				
024				
025				
026				
027				
028				
029				
030				

NOTES:

(1) Rank as "Good", "Fair", "Poor" "or "Dead".

(2) Priorities refer to those set forth in the Woodlands Retention Ordinance and the municipal Master Plan.

(3) Expand upon description of condition; indicate if remediation of a poor or fair condition is possible/advisable.

How to Hire a Woodlands Advisor for your Community

Communities adopting the model Woodlands Retention Ordinance developed through the Hunterdon County Woodlands Toolbox Advisory Committee will need to employ a "Woodlands Advisor" to provide advice and recommendations concerning the implementation of the ordinance on behalf of the municipality. The ordinance defines a "Woodlands Advisor" as an expert qualified in woodlands management and forestry.

Woodlands Advisors must have technical expertise to:

- Complete forest stand assessments describing forest complex groupings, dominant and co-dominant species, range of size in diameter breast height (dbh), health and condition, and extent and nature of invasive species, all in accordance with approved statistical point sampling techniques as well as visual observations and descriptions.

- Assess forest health issues including: insect and disease identification and control, invasive species impacts and deer impacts on forest health and regeneration. Knowledge of appropriate remedies to improve or address forest health issues is necessary.

- Prepare and review reforestation plans (woodlands mitigation plans) and assess such plans when submitted for consideration by a municipal agency for: compatibility with onsite forest characteristics; invasive species management; elimination, mitigation and/or best management of grade changes (cuts and fills planned for the site); wind protection at edges of cleared areas; and soils, drainage and soil erodibility conditions.

- Design and direct the installation of tree protection measures such as tree wells, tree shelters and tree protection fencing.

- Identify critical root zones and undertake and direct the implementation of techniques to minimize and mitigate root loss and damage, including root pruning, tunneling and placement of root barrier materials, soil compaction mitigation and temporary root protection best management practices.

- Undertake and advise as to proper arboricultural practices and standards for tree care.

Qualified Woodlands Advisors must hold a license or be duly accredited in at least one of the following fields:

State of New Jersey Approved Foresters: To be included on the list, an approved forester must have graduated from a four year college or university accredited by the Society of American Foresters with a major course in Forest

Management or have completed the Cook College-Rutgers University Forest Management option within the Natural Resource Management curriculum or have a graduate degree that the DEP determines to be equivalent to the aforementioned major course work in Forest Management; must have two years of experience in the preparation of woodland management plans or the implementation of forestry practices for the protection, development, marketing and utilization for forest land resources; and must abide by the Society of American Forester's Code of Ethics. The Society of American Foresters (SAF) is the national scientific and educational organization representing the forestry profession.

Landscape Architects: Landscape architects in New Jersey are licensed professionals. Landscape architecture encompasses the analysis, planning, design, management and stewardship of the natural and built environments. Most landscape architects maintain a membership in the American Society of Landscape Architects, a national professional association representing landscape architects.

New Jersey Certified Tree Experts: New Jersey Certified Tree Experts (CTE's) are experts in arboricultural practices and tree care. Many CTE's maintain membership in The International Society of Arboriculture (ISA), a scientific and educational organization serving tree care professionals.

REFERENCE LIST

American National Standards Institute, Inc., American Standard for Nursery Stock, *ANSI Z60.1-1986, Revision of Z60.1-1949 (R1980)*, published by the American Association of Nurserymen, Inc., Washington, D.C., May 2, 1986.

Carter, Marybeth H., ASLA, AICP, Building Greener Communities, Planning for Woodland Conservation, North Jersey Resource Conservation and Development Council and Hunterdon County Planning Board, June, 2003.

Duerksen, Christopher J., with Suzanne Richman, Tree Conservation Ordinances, *Planning Advisory Service Report Number 446*, American Planning Association, Chicago, Illinois, and Scenic America, Washington, D.C., August, 1993.

Helms, John A., editor, The Dictionary of Forestry, Society of American Foresters, Bethesda, Maryland, 1998.

Kuser, John E., editor, Handbook of Urban and Community Forestry in the Northeast, Cook College, Rutgers University, Kluwer Academic/Plenum Publishers, New York, New York, 2000.

Matheny, Nelda, and James R. Clark, Trees and Development, A Technical Guide to Preservation of Trees During Land Development, International Society of Arboriculture, Champaign, Illinois, 1998.

Miller, Robert W., Urban Forestry: Planning and Managing Urban Greenspaces, Prentice-Hall, Inc., A Division of Simon & Schuster, Englewood Cliffs, New Jersey, 1988.

New Jersey Big Tree Program,
www.nj.gov/dep/parksandforests/forest/community/bigtree.html
Identifies and catalogues by species New Jersey's largest individual trees.

New Jersey Forest Stewardship Program,
www.nj.gov/dep/parksandforests/forest/stw_inc_prog.html
Federally funded program promoting the management of privately owned forests for environmental benefits through technical and financial assistance to landowners.

Snyder, David, and Sylvan R. Kaufman, An Overview of NonIndigenous Plant Species in New Jersey, New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, Trenton, New Jersey, 2004.

Appendix A.4

MODEL WOODLANDS PROTECTION ORDINANCE

An Ordinance establishing requirements and procedures for the retention and protection of forest areas and other woodlands during land development in _____ Township

I. Purpose

The purpose of this Ordinance is to promote the goals and intent of the _____ Township Master Plan and the purposes of the Municipal Land Use Law (N.J.S.A. 40:55D-2) by protecting critical environmental resources, including air quality, water quality, soil cover, animal and plant habitat and viewsheds. These resources provide great benefits to the quality of life in towns, but they often are greatly impaired when woodlands are removed during development. Retention of woodlands helps to control the velocity and amount of stormwater runoff, thereby reducing flooding; filters sediments and pollutants before they reach streams; promotes groundwater recharge; stabilizes the soil and reduces soil erosion; improves air quality by filtering pollutants from the air; preserves scenic views that residents often come to cherish; offers a stable habitat for associated plant species and for animal wildlife; and provides shade and windbreaks that help moderate the effects of climate conditions.

Protection of woodlands along a stream corridor is essential to the maintenance of stream biota, and protection of woodlands on steep slopes is essential to soil stabilization. The retention of woodlands is essential to the scenic quality of a community and helps to preserve the diversity of native plant life and animal species. The protection of woodlands is consistent with New Jersey's Stormwater Management Rules and Best Management Practices.

Indeed, protecting _____ woodlands and forest is consistent with the Township Master Plan, where the Conservation Element includes an extensive section on Woodlands Protection and Management. The Master Plan cites the abundance of _____ "large, contiguous tracts of woodlands and forest that are considered essential to the Township's community character." The Master Plan cites the value of these wooded areas to ground water recharge, especially on the Sourland Ridge and in the southern portion of the Township.

As the Master Plan states, the "extensive woodlands and forest are among the natural and cultural features that _____ residents wish to preserve. They are valuable components of our community character that help make _____ unique." The Master plan goes on to describe the importance of forest and woodland areas in the Township to clean air, water quality and quantity, passive recreation, and habitat for threatened and endangered plant and animal species.

The Master Plan cites as a goal: to maintain woodlands and forest in _____ in their current nonfragmented state in order to preserve the high quality environmental functions that they currently perform. To accomplish this goal, the Master Plan recommends:

- adopting a tree protection ordinance that would limit and regulate tree-cutting in major subdivisions;
- requiring new development to preserve existing woodlands, to carefully demonstrate the reasons why wooded areas are to be cut down and to use best management practices to replace and restore wooded areas as part of any development plan;
- adopting ordinances that would protect wooded areas along scenic roads and byways, by limiting the clearing of natural vegetation and limiting new curb cuts on such roads;
- increasing stream corridor protection to 100 feet on each side of a waterway, which would protect trees and most vitally important areas of _____;
- actively preserving wooded and forested areas in their undisturbed state to the greatest extent possible, especially in watershed areas and along stream corridors;
- requiring the use of creative site design and development techniques that maximize the preservation of existing wooded areas;
- promoting the use of native species in plantings wherever possible, including municipal facilities and new development;
- preserving the existing expanse of remaining woodland along the Delaware River by requiring any future development to keep intact forested areas in an unbroken and unfragmented state; and educating and informing residents, property owners and developers of the importance of forests and woodlands to _____.

It is the purpose of this ordinance to help accomplish these Master Plan goals and preserve forest and woodland areas in _____ as much as possible.

II. Definitions

Caliper – The diameter of a balled and burlapped or bare root nursery stock tree trunk taken 6 inches above the ground for trees up to 4 inches in diameter and taken 12 inches above the ground for trees larger than 4 inches in diameter.

Critical Root Zone – The region measured outward from the trunk of a tree to and beyond the dripline to include the entire area within which the tree's feeder roots are located, as determined by probing of the soil around the tree to a depth of 18 inches by a qualified tree care professional.

Diameter at Breast Height (dbh) – The measurement of the diameter of the trunk of a tree planted in the ground taken 4.5 feet from the ground level on the uphill side of the tree.

Determination of Inapplicability – A determination by the Municipal Agency or its designee that the criteria of Sections III.B and/or C. herein have been satisfied and that the applicant is thereby relieved of all other submission requirements and procedures of this Ordinance.

Dripline – A vertical line extending from the outermost edge of the tree canopy or shrub branch to the ground beneath.

Forest – A biological community dominated by trees having an average canopy height greater than 20 feet and other woody plants covering a land area of at least 10,000 square feet

(.23 acres) and generally characterized by a tree density of 100 or more trees per acre with at least 50 percent of such trees having a dbh of two inches or greater. A forest may have been cut (but not cleared) in conjunction with an approved forestry management plan or may be intact. An orchard or a tree nursery is not a forest. The term "woodland" is used interchangeably with the term "forest" in this Ordinance.

Forest Stand – A contiguous grouping of trees growing on a site that is sufficiently uniform in age and class distribution, composition and structure and are of sufficiently uniform quality to be a distinguishable unit.

Forest Stewardship Management Plan – A plan prepared for qualifying property owners participating in the federally funded Forest Stewardship Program. The Management Plan and Program are intended to encourage management of private forests for their non-commodity benefits, such as wildlife, recreation, aesthetics and water quality, in addition to or in lieu of their traditional commodities such as timber and wood products. Forest stewardship promotes long-term active management while emphasizing consideration of all resources and benefits associated with forests.

Invasive species – Aggressively growing nonindigenous tree, shrub and herbaceous plant species that tend to overwhelm and degrade natural ecosystems, impair agricultural economy and compromise cultural and recreational land use activities. A list of these species as defined by the New Jersey Department of Environmental Protection, through their N.J. Invasive Species Management Planning process and Policy Directive 2004-02, is on file in the Municipal Clerk's office.

Municipal Agency – The Planning Board or Zoning Board of Adjustment of _____, whichever has jurisdiction to review and approve an application for development pursuant to N.J.S.A. 40:55D-1, et seq.

Specimen Tree – A tree in good health of unusual or exceptional form, size, age or shape for its species and/or occupying a significant position within the landscape. A Specimen Tree would necessarily include, but not by way of limitation, any tree included on the "Big Tree List" of the New Jersey Bureau of Forestry, Community Forestry Program; any endangered species of tree.

Understory – Lower-growing tree and shrub populations that often comprise a separate plant and animal habitat immediately beneath the forest canopy. Understory species characteristically attain modest height compared to dominant species in a mature forest area, but may reach heights of 25 to 50 feet and generally comprise shade-tolerant tree species essential to the regenerative health of a natural forest stand.

Woodlands Advisor – An expert qualified in woodlands management and forestry retained by the Municipal Agency for the purposes of offering advice and recommendations concerning the implementation of this Ordinance. The Woodlands Advisor should be a New Jersey Approved Forester, New Jersey Certified Landscape Architect or New Jersey Certified Tree Expert. In all cases, if no Woodland Advisor has been appointed, Woodland Advisor

duties under this ordinance shall be overseen by the Township Engineer, in consultation with the Community Forestry Committee.

III. Applicability

A. The regulations set forth herein shall apply to any tract of land that is the subject of an application for site plan or subdivision approval.

B. An applicant, after submitting the information required in Section IV of this Ordinance to the Municipal Agency, may thereafter request a determination of inapplicability by the Municipal Agency if the Township Engineer in consultation with the township Community Forestry Committee determines that all of the following apply:

1. If the application proposes no encroachment or undue impact into forested areas;
2. If the application proposes no removal of specimen trees; and
3. If the Woodlands Advisor concurs that condition 1 and 2 above exist.

An applicant for a minor subdivision may request relief from submitting the information required in Section IV of this ordinance by demonstrating to the Township Engineer, in consultation with the township Community Forestry Committee, that the application proposes no encroachment or undue impact into forested areas.

An applicant for a minor subdivision may request relief from submitting the information required in Section IV.B.12 and Section IV.D. of this ordinance by demonstrating to the Township Engineer, in consultation with the township Community Forestry Committee, that the application proposes no encroachment or undue impact into areas designated by the Township as Priority Forest areas.

An applicant for a minor subdivision in an area designated by the township as Priority Forest must submit the information required in Section IV of this ordinance.

A determination of inapplicability shall relieve the applicant of all other submission requirements and procedures of this Ordinance.

C. In the event an applicant proposes the development of only a portion of a tract, the balance of which is proposed to remain in agricultural use or agricultural woodland management use, a determination of inapplicability shall be rendered by the Township Engineer, in consultation with the township Community Forestry Committee**,** with respect to the portion of the tract that is proposed to remain in agricultural use or agricultural woodland management use.

D. It is strongly recommended that each prospective applicant schedule a pre-application meeting with the Woodlands Advisor, before submitting a formal application for development to the Municipal Agency for the purpose of evaluating the impact of this Ordinance on the plans for development. The fees for such pre-application meeting shall be set forth in Chapter 109-6 of the Code of the Township of _____.

IV. Environmental Resource Inventory

A. Each application for site plan or subdivision approval shall be accompanied by an environmental resource inventory documenting the existing natural features on the site. The purpose of the environmental resource inventory is to permit the Municipal Agency to evaluate the importance of the existing woodlands to the preservation of high priority natural resources and ecosystems. The environmental resource inventory shall be prepared by one or more qualified professionals such as an engineer, forester, ecologist or landscape architect and shall be site specific. The environmental resource inventory requirements set forth herein may be submitted as part of or in addition to an environmental impact statement required for a development application.

B. The inventory shall consist of a natural resource inventory map, an aerial photograph and a report.

1. The natural resource inventory map shall show the following on the tract and within 200 feet of the tract boundary at a scale of 1” = 100' or larger and at the same scale as the rest of the site plan or subdivision submission:
2. Topography at two-foot contour intervals;
3. A critical slope analysis showing areas of steep slope in each of the following ranges: greater than 15 percent but less than 20 percent, 20 percent but less than 25 percent, and greater than 25 percent, as well as areas of highly erodible soils on slopes of 12 percent or less and on slopes of greater than 12 percent to 15 percent (based on the Natural Resources Conservation Service, Soil Survey data); State-designated Forested Natural Heritage Priority Sites;
4. Woodlands identified in the New Jersey Landscape Project as either Forests or Forested Wetlands designated with a ranking of **3** through 5 as areas containing threatened or endangered species or containing suitable habitats for threatened and endangered species;
5. Intermittent and perennial streams, lakes, and other water bodies;
6. 100-year floodplains;
7. Wetlands, with legend, and required wetlands transition areas and vernal pools;
8. Stream corridor buffers consistent with the Township Stream Corridor Ordinance.
9. Soils with a legend showing soil names and characteristics, including the limitations and potential for forest growth and the types of native forest species typically associated with each soil type, based on the Natural Resources Conservation Service Soil Survey;
10. Areas of groundwater recharge equal to or greater than the median groundwater recharge rate for the municipality as a whole, based upon the New Jersey Geological Survey or municipally-approved alternate data source, if available;
11. Aerial extent of forest and tree cover which shall encompass the outside perimeter of the canopy of individual trees. This shall be based on the latest aerial photography available from the State or County and other resources.
12. Forest stand data: the forested portions of the property shall be divided into separate forest stands for the purpose of describing the different forested areas of the tract as

required in Section IV.D.; stands smaller than five acres shall be fully described; stands of five acres or larger shall be sampled, and the stand shall be statistically described based on the sample data; (See Appendix A for Forest Stand and Sample Data Sheet.) Locations, species and sizes of all specimen trees and of all individual trees that are not located in a delineated forest stand; and

13. Existing man-made structures.

C. The natural resources inventory aerial map shall be the most current and readily available aerial photograph of the tract and the area within 1000 feet thereof at a scale of 1” = 200’ or larger and preferably at the same scale as the natural resource inventory map.

D. The natural resource inventory report shall include the following:

1. A description of each forest stand on the site including, for each stand, the dominant and codominant species, understory vegetation, range of sizes in diameter at breast height (dbh), the health and condition of the trees in the stand, and the extent and nature of invasive species within the stand; and
2. Copies of the sampling point data sheets and summaries.

V. Woodland Retention and Preservation Plan

A. A woodland retention and preservation plan shall be submitted for the approval of the Municipal Agency, in consultation with the Woodland Advisor and the Community Forestry Committee. The plan shall include a report articulating how the requirements of Section VI of this Ordinance will be met by the proposed woodland retention and preservation plan; how the proposed development will affect the existing natural resources on the tract; the quantity of existing woodlands, and of individual trees not located within a designated forest stand, that will be removed and that will be retained; and what specific techniques will be used to protect woodlands and individual trees during the construction process.

B. The woodland retention and preservation plan shall be prepared using the information requested in Section IV of this Ordinance and shall be certified by a New Jersey Approved Forester, a New Jersey Certified Landscape Architect or a New Jersey Certified Tree Expert.

C. The woodland retention and preservation plan shall include all of the information provided on the natural resource inventory map as well as:

1. Proposed topography as shown on the proposed grading plan;
2. Surveyed locations of the following:
   a. All individual trees 6” dbh or larger that are not located in a delineated forest stand but are nevertheless proposed to be retained and are located within the proposed areas of disturbance; and
   b. If a forest stand or portion thereof is proposed to be retained, all individual trees 6” dbh or greater located within the first 25 feet of such area, measured toward the interior of the woodland from its proposed perimeter.

3. Cultural features and historic sites as identified and/or mapped in the Township Master Plan;
4. Existing structures to be removed and to remain;
5. All proposed development including buildings, roads, driveways, utilities and other improvements;
6. A table listing the tract area in square feet; the square footage of existing and proposed woodlands located within the tract, classified according to the priority categories listed in Section VI.A. of this Ordinance; and the percentage of the net tract area covered by existing and proposed woodlands, classified according to the priority categories listed in Section VI.A. of this Ordinance;
7. A clear, graphic indication of the woodland preservation areas on the site;
8. A clear, graphic indication of the proposed limit of disturbance line, "tree save" fencing and other proposed tree protection measures;
9. Locations of proposed soil stockpile areas; and
10. A clear written and graphic indication of all proposed methods to be employed in protecting existing trees that are proposed to be retained but lie within the limits of disturbance during construction.
11. Existing preservation/conservation easements on the tract.

VI. Woodland Retention Requirements

A. The intent of this Ordinance is to retain rather than to replace existing woodlands. To that end, development shall be designed to maximize the area of existing woodlands to be retained. If woodlands are to be disturbed or removed, the applicant shall design the development in such a way as to avoid or minimize removal of priority woodlands, which shall consist of woodlands in any of the following priority categories:

1. Any woodlands prioritized in the municipal Master Plan;
2. Any woodlands located along the area commonly known as the Sourland Ridge, which for the purpose of this Ordinance corresponds to the Sourland Regional Planning District as shown on the Township Zoning Map;
3. Any woodlands within required stream corridor buffers, wetlands, wetland transition areas or floodplains;
4. Woodlands on slopes of 15 percent or more, or woodlands located in highly erodible soils and on slopes of less than 15 percent, with the steepest slopes having the highest priority;
5. Woodlands associated with a critical groundwater recharge area, defined as having a recharge rate greater than or equal to the median recharge rate for the municipality as a whole.
6. Woodlands identified in the New Jersey Landscape Project as either Forests or Forested Wetlands designated with a ranking of ~~1~~ 3 through 5 as areas containing threatened or endangered species or containing suitable habitats for threatened and endangered species;
7. Woodlands that are connected to a larger woodlands corridor extending beyond the tract boundaries; and

8. Woodlands and hedgerows that provide visual screening, are associated with an historic site or line a rural roadway.

B. Not more than 10 percent of priority woodlands existing on the site prior to its development shall be removed or otherwise disturbed for development. Any removal of priority woodlands shall require mitigation, irrespective of the exemptions set forth in Sections VI.D. and E.

C. All woodland areas designated for retention shall be protected by a Conservation Easement in accordance with Section VIII of this Ordinance. (See Appendix B for a Model Conservation Easement.)

D. To the extent that the use of the clustering or lot averaging techniques permitted in the applicable zoning district will maximize the retention of woodlands in the development of the tract, such techniques should be considered.

E. Subject to the provisions of Section VI.A. above, if the application is for a subdivision, a portion of the woodlands existing on the tract prior to development may be permitted to be removed for development as follows:

1. Up to 10 percent of the woodlands existing on the tract prior to development may be removed for the construction of necessary public and private streets, public utilities and common or public stormwater management facilities; and
2. Reasonable and necessary removal of woodlands shall also be permitted on each new residential lot within the subdivision provided that such removal shall not exceed the following:

    a. To allow the construction of a dwelling, with an average of up to 30 feet of clearance around the dwelling, and permitted accessory building(s);
    b. To allow a driveway with up to five feet of clearance on each side of the driveway, beyond any site triangle easements;
    c. To allow a septic bed with up to 20 feet of clearance around the perimeter of the septic bed; and
    d. To allow underground utility lines with a maximum corridor width of 20 feet.

3. All improvements on new residential lots shall be located so as to retain any specimen tree or any other desirable healthy individual tree as identified by the Woodlands Advisor. Improvements must also be located and designed to minimize forest removal and fragmentation.
4. The above criteria for permitted removal of woodlands on new residential lots shall not result in the removal of woodlands on any lot in excess of the following:

Acreage of Lot (1)	Maximum Area of Woodlands Removed (2)
1 – 1.99	20,000 sq. ft.
2 – 2.99	30,000 sq. ft.

3 -3.99	40,000 sq. ft.
4 - 4.99	50,000 sq. ft.
5 acres and over	60,000 sq. ft.

Notes
(1) This requirement shall not apply to lots under 1 acre.
(2) Or an area equal to twice the impervious surface coverage permitted in the zone, whichever is less.

F. Subject to the provisions of Section VI.A. above, if the application is for site plan approval, the percentage of the woodlands existing on the lot prior to development that may be removed for development shall not exceed allowable impervious area coverages under the Township Land Use Ordinance, in addition to the area needed for a septic tank and other utilities, provided, however, that all improvements shall be located so as to retain any specimen tree or any other desirable healthy individual tree as identified by the Woodlands Advisor.

G. For developments involving both site plan and subdivision approval, the requirements of Section VI.D. shall apply to the development of the tract as a whole and to the development of any new residential lots within the development, and the requirements of Section VI.E. shall apply only to the development of any nonresidential lots within the development.

H. If the approval of the application and of any permits issued pursuant to such approval will result in the removal of more woodlands than the limits set forth in Sections VI.D. and E. above, or will result in the removal of any priority woodlands identified in Section VI.A. above, mitigation shall be required on an acre for acre basis to the extent of such excess removal or removal of priority woodlands. Mitigation shall be undertaken in accordance with Section VII of this Ordinance. Prior to approving a plan for mitigation, the Municipal Agency shall first determine that the proposed design cannot reasonably be modified to reduce woodlands removal or to locate improvements outside of priority woodlands.

I. The following procedures and requirements for the protection of the woodlands and individual trees to be retained shall be adhered to in the construction phase of the development:

1. During construction, no permanent or temporary material, including soil, shall be placed or deposited within the critical root zone or within eight feet, whichever is greater, of any tree to be retained or of the trees at the perimeter of any forest stand to be retained. Such area shall be protected by orange blazed fencing placed outside of such area during construction, and the fencing shall be inspected and approved by the Woodlands Advisor prior to the start of any site disturbance. Permanent monuments and signs, as required by the Township for the demarcation of conservation easements, must be installed prior to the start of construction.
2. Where necessary, pursuant to an approved grading plan, to fill or remove soil within an area that encompasses either the critical root zone or the area within eight feet, whichever is greater, of any individual tree to be retained in the area of disturbance or

of the trees within the perimeter of any forest stand to be retained, the existing grade around each such tree shall be maintained to the extent of the critical root zone or eight feet, whichever is greater, by a tree well and extension tiles (in the case of fill) or by a retaining wall (in the case of a cut).

3. No chemicals shall be disposed of and no concrete trucks shall be rinsed within the critical root zone of any tree or of the trees at the perimeter of any forest stand to be retained.
4. During construction, individual trees to be retained and trees located at the perimeter of a forest stand to be retained shall be maintained in accordance with a maintenance schedule and plan under the direction of the Woodlands Advisor.
5. If equipment must temporarily invade the critical root zone of any individual tree to be retained or of any tree(s) located at the perimeter of a forest stand to be retained, the Woodlands Advisor shall approve and inspect the installation of required critical root zone protection measures within the path of such equipment, shall inspect the invasion of the critical root zone and shall thereafter inspect the removal of all temporary protective measures and the replacement of the protective fencing.
6. If the approved plan calls for the installation of any pavement or utilities within the critical root zone of any individual tree to be retained or of any tree(s) located at the perimeter of any forest stand to be retained, special techniques for such installation shall be employed to minimize the impact on the critical root zone(s), and such installation shall be directed, inspected and monitored by the Woodlands Advisor.
7. In the event any of the foregoing procedures and requirements for construction are violated, the Municipal Engineer or Construction Official shall issue a stop work order until the violation is remedied.

J. The map and a list of properties designated as Priority Woodlands under this ordinance, by block and lot, shall be kept in the Office of the Municipal Clerk.

VII. Woodlands Mitigation

A. If mitigation is required, a woodlands mitigation plan shall be presented which shall consist of one or more of the following alternative approaches (in descending order of desirability):

1. Mitigation planting on-site.
2. Mitigation planting off-site on public land (including County or State land) or, to the extent practicable, located within the same subwatershed as the woodlands being removed.
3. Mitigation planting off-site on privately-owned land to be permanently deed-restricted for that purpose that is, and to the extent practicable, located within the same subwatershed as the woodlands being removed.

B. Requirements for mitigation planting on and off-site:

1. Landscaping in accordance with an approved landscaping plan may be credited as mitigation if the landscaped area has a width of 35 feet or more in all directions and

equals or exceeds 2,500 square feet in area and if the quantity of plantings per each 2,500 square foot area is at least 7 trees and 20 shrubs.

2. A woodlands mitigation planting plan that is not part of the approved landscaping plan shall be reviewed and approved by the Municipal Agency based on the recommendations of the Woodlands Advisor. All of the following shall ordinarily be planted on each acre of woodlands mitigation area:
   a. 35 trees per acre at a 2” caliper size; and
   b. 70 trees per acre at a 1” caliper size; and
   c. 100 trees per acre installed as whips (5' to 6' in height); and
   d. 40 woody shrubs per acre, to be located at the edges of the planting area; and
   e. A native grass mix shall be seeded over the entire planting area.

3. A diversity of native species shall be planted in each of the above categories. The species selection shall be informed by the information collected in the natural resource inventory required at Section IV of this Ordinance and shall be subject to the approval of the Woodlands Advisor, who shall also inspect and approve all planting materials upon delivery to the site and prior to and following their installation.
4. The applicant's Landscape Architect or New Jersey Certified Tree Expert or New Jersey Approved Forester shall prepare the cost estimate for the woodlands mitigation planting plan. Such estimate shall be separate and apart from the estimate pertaining to the approved landscaping plan. The cost of the woodlands mitigation planting plan shall include all materials, installation costs and continuing costs associated with the implementation of the maintenance plan. The cost estimate for the woodlands mitigation planting plan shall be reviewed and approved by the Woodlands Advisor and shall thereafter be transmitted to the municipal engineer for inclusion in the cost estimate for the performance guarantee for the entire project.
5. Prior to the release of any portion of the performance guarantee covering the woodlands mitigation planting plan, the Woodlands Advisor shall inspect the plantings and shall make a recommendation to the municipal engineer as to whether the plantings have been installed in accordance with the approved woodlands mitigation planting plan. The applicant shall post a maintenance guarantee following the inspection and approval or acceptance by the municipality of the installation of the plantings included in the woodlands mitigation planting plan. The amount and timing of the maintenance guarantee shall be in accordance with N.J.S.A. 40:55D-53.
6. Prior to the release of the maintenance guarantee or portion thereof covering the woodlands mitigation area, the Woodlands Advisor shall inspect the mitigation area. The maintenance guarantee shall not be released unless the following conditions have been met:

   a. Survival of 100 percent of the trees installed at 2” caliper size and 100 percent of the woody shrubs;
   b. Survival of 85 percent of trees installed at 1” caliper size;
   c. Survival of 75 percent of trees installed as whips;
   d. All surviving plant material shall be found to be in good health and free of diseases and pests; and
   e. There shall be no evidence of exotic and invasive plant material.

7. To ensure the survival rates and conditions in Section VII.B., a maintenance plan shall be submitted to the Woodlands Advisor for approval before the Municipal Agency grants final approval. The maintenance plan shall include, but not by way of limitation, the following: plans and schedules for weeding, watering and deer protection (including fencing or tree shelters). For individual trees, the maintenance plan may also be required to include mulching, fertilizing, and treatments for pests and diseases. The Woodlands Advisor shall inspect the premises periodically following the installation of the woodlands mitigation planting to ensure that the maintenance plan is being implemented and to recommend additional maintenance requirements, if necessary, to ensure the health and survival of the woodlands mitigation area.
8. A conservation easement shall be placed on the woodlands mitigation area. The conservation easement shall allow for continued maintenance of the woodlands mitigation area by the owner via the removal of hazardous or diseased trees or tree limbs, removal of exotic and invasive planting species, erection of protective fencing, and the installation by hand of new plantings intended to replace dead trees or supplement existing growth, but only with the approval of the Woodlands Advisor.

C. Information to be provided for mitigation planting on and off-site:

1. A table and description of soil preparation methods, species, sizes and spacing to be used for the new plantings;
2. A binding two-year maintenance and management agreement that details how the area(s) designated for new plantings will be maintained to ensure satisfactory establishment of the new woodland including:

    a. Regular watering;
    b. Regular removal of invasive plant species;
    c. Protection from deer grazing; and
    d. Contact name and phone number for party responsible for maintenance.

3. A mitigation table identifying the percent of the tract area in woodlands that is proposed to be cleared as a result of the proposed development; the number of acres of existing woodlands to be cleared; the applicable replacement requirements; and the number of acres of mitigation plantings proposed.

VIII. Conservation Easement

A. A conservation easement shall be placed on any portion(s) of a lot or tract on which woodlands are proposed to be retained and on any areas designated for woodlands mitigation. The conservation easement shall be shown on the filed plat, if applicable; shall be referenced by legal description in the deed to the lot or tract; and shall be filed with the County Recording Officer. Monuments and signs shall be placed to demarcate the conservation easement as required by the Municipal Agency.

B. The conservation easement shall identify those activities and improvements that are specifically permitted (for example, walking paths, fences and play structures), the maximum sizes of, or areas to be covered by, permitted improvements and those activities and improvements that are specifically prohibited within the affected area**.**

C. The conservation easement shall include the following limitations:

1. No tree with a diameter greater than six inches dbh or more than 30 feet in height may be cut down, removed or destroyed within the conservation easement area without cause and without the prior written consent of the Woodlands Advisor. Diseased or hazardous trees or tree limbs may be removed to prevent personal injury or property damage provided notice is served upon the Woodlands Advisor at least 10 days before such removal. Where an emergency situation renders the giving of notice impracticable, the tree or limb may be removed without prior notice, but a notarized statement from the owner of the underlying title giving the reasons for such removal shall be submitted to the Woodlands Advisor within seven days thereof, along with appropriate documentation of the reasons in the form of photographs, corroborative letters or other evidence.
2. Understory plant materials, including, but not limited to, brush, shrubs, saplings, seedlings, undergrowth and vines may not be cut down, removed or destroyed within the conservation easement area except to control exotic or invasive species, and then only with the prior written consent of the Woodlands Advisor.
3. Fences may be erected within or around the conservation easement area if approved by the municipal agency initially or, thereafter, with the prior written consent of the Woodlands Advisor if the approved deer control measures have proven to be ineffective.
4. New plantings may be installed within the conservation easement area if needed to supplement existing vegetation or to replace dead trees or other vegetation, provided such plantings are characteristic of native growth and with the prior written consent of the Woodlands Advisor.

D. The following activities shall be specifically prohibited within the conservation easement area once it has been legally established:

1. Construction, excavation, grading or the erection of retaining walls, buildings or other structures, roads, driveways, fences or utilities.
2. Any grading or other activities that would or might impair soil or slope stability or alter drainage patterns on or off the site.
3. Commercial timber cutting or harvesting of vegetative products for commercial purposes.
4. Maintenance or grazing of livestock.
5. Excavation, grading, dredging or removal of topsoil, sand, gravel, loam, rock or other materials.
6. Dumping or composting of soil, grass clippings, garden waste, household waste, sawdust, ashes, trash, construction materials or other debris of any kind.

7. Operation of any mechanical equipment of any kind, including recreational vehicles such as ATVs and snowmobiles, except as needed to undertake approved activities identified herein or in the conservation easement itself.

E. The conservation easement may provide for a municipally approved forest stewardship program that may also be used to satisfy the requirements for a Forest Stewardship Plan to be approved by the State Forester.

F. The conservation easement language shall specifically provide for the right of the municipality through any of its officers or agents to enter and inspect the conservation easement area to determine that the terms of the conservation easement are being adhered to and that necessary maintenance is being undertaken. The municipality shall have the right, and the conservation easement shall so state, to issue citations for any violations of the terms of the conservation easement or of this Ordinance or of the development application approval pursuant to which the conservation easement was established.

G. Appendix B provides standard language for conservation easements placed on woodlands. A conservation easement is a legal covenant restricting the use of land and/or natural features of the land that is described in the property deed and shown on a filed plat. In this case, the restrictions stipulated in the conservation easement ensure proper long-term protection, maintenance and health of the woodlands. The conservation easement is held by a third party, typically a land trust or government entity, and shall run with the land. This party is responsible for the enforcement of any restrictions stipulated in the easement.

H. Land held in a conservation easement can be used by the landowner, subject to the restrictions in the easement.

IX. Severability

Notwithstanding that any provision of this Ordinance is held to be invalid or unconstitutional by a court of competent jurisdiction, all remaining provisions of the Ordinance shall continue to be of full force and effect. The provisions of this Ordinance shall be cumulative with, and not in substitution for, all other applicable zoning, planning and land use regulations.

All ordinances or parts of ordinances deemed to be inconsistent with this ordinance are hereby repealed.

X. Fees, Violations and Penalties

A. Fees:

1. The fees charged for inspections undertaken and other services provided by the Woodlands Advisor shall be established by the municipal governing body by ordinance at the time of the appointment of the Woodlands Advisor. Such fees may, from time to time, be amended by ordinance.

2. All charges made against escrow accounts for the services of the Woodlands Advisor shall be in accordance with N.J.S.A. 40:55D-53.2.

B. Violations and Penalties:

1. Any violation of the provisions of this Ordinance shall be punishable by a fine not exceeding $1,000.00 or by imprisonment or community service not exceeding 90 days, or both, for each separate offense. Each day on which a duly noticed violation is continued or remains unremedied while work is progressing shall constitute a separate offense, punishable as set forth herein.
2. Upon notification by the municipality or its agent of the existence of a violation, the violation shall be immediately remedied. If a violation cannot be remedied immediately, the municipality or its agent may issue a "Stop Work Order" until the violation is remedied. If a violation causes irreversible damage to a tree or woodland slated for retention, the municipality or its agent shall issue a "Stop Work Order" and the developer shall be required to submit a new preliminary and final plan to the municipal agency for its approval before resuming work.
3. The Municipal Agency shall reserve the right to revoke or withdraw any approval granted for subdivision or site plan upon notice to the applicant and public hearing, in the event that there is any deviation from, or alteration of, the approved woodlands retention and preservation plan, unless prior written approval for such deviation or authorization has been obtained from the Municipal Agency. Minor deviations and field changes may be authorized solely by the Woodlands Advisor in writing and only after consultation with the Chairman of the applicable Municipal Agency to determine if the proposed minor deviations and field changes deviate from the intent of the original approval with respect to the woodlands retention and preservation plan. If it is determined by this consultation that the changes proposed are not minor, the matter must be referred to the full Board, and no changes may be effected until such Board gives its approval.
4. Each of the terms and conditions of any approval relating to woodlands retention and preservation are material elements of the development approval based upon the submission of the application in its entirety, and the non-compliance with any term or condition by the applicant or its successors or assigns shall be deemed a material default subjecting the applicant to revocation of such approval. The request to change any single condition, since all conditions are integrally related, shall open the entire application to the applicable Municipal Agency for reconsideration, possible re-approval, and new terms and conditions in addition to those terms and conditions contained in the original approval.

This Ordinance shall become effective immediately upon final adoption and publication in accordance with the laws in the State of New Jersey, and upon filing a copy thereof with the Hunterdon County Planning Board in accordance with N.J.S.A. 40:55D-16.

Appendix A.5

MODEL MUNICIPAL WELL HEAD PROTECTION ORDINANCE[1]

Prepared by Hunterdon Environmental Toolbox Committee
Water Resources Subcommittee, WHP Work Group
2005

Completed reviews:
Water Resources Subcommittee
Joseph Novak, Esq.
Hunterdon County Environmental Toolbox Committee

[1] This model ordinance is based in part on a model developed by the Passaic Valley Ground Water Protection Committee, using funding from a Section 319 (h) Grant by the New Jersey Department of Environmental Protection, Division of Watershed Management. The Hunterdon County Environmental Toolbox Committee wishes to thank the PVGWPC for their permission to use and revise their model ordinance.

MODEL MUNICIPAL WELL HEAD PROTECTION ORDINANCE

Prepared by Hunterdon Environmental Toolbox Committee
Ground Water Subcommittee, WHP Work Group

Ordinance Text	Commentary
SUMMARY OF ORDINANCE REGARDING WELL HEAD PROTECTION	
The purpose of this Ordinance is to protect the public health, safety and welfare through the protection of the ground water resources underlying the municipality, and to ensure a supply of safe and healthful drinking water for the present and future generations of local residents, employees and the general public in this municipality, as well as users of these water supplies outside this municipality. Areas of land surrounding each public community water supply well, public noncommunity water supply well, or cluster of domestic wells, known as Well Head Protection Areas (**hereinafter "**WHPA"), from which contaminants may move through the ground to be withdrawn in water taken from the well, have been delineated. Through regulation of land use, physical facilities and other activities within these areas, the potential for ground water contamination can be reduced. The purpose of the regulations contained in this ordinance is to prevent the migration of potential pollutants from areas within a WHPA into ground water that is withdrawn from a public well or cluster of domestic wells.	This model ordinance provides municipalities with the option of protecting three types of water supply wells: • Public community water supply wells • Public noncommunity water supply wells • Clusters of domestic wells Each municipality should identify the wells or well clusters of concern and decided which of the three types should be subject to the protections in this ordinance. The Toolbox Committee does not recommend applying this model ordinance to isolated domestic or nonpublic water supply wells.
Any applicant for a permit requesting a change in land use or any "**development" as defined** under the provisions of the Municipal Land Use Law and other pertinent regulations, which is located within a delineated WHPA, and which involves a Potential Pollutant Source (**hereinafter "**PPS") shall comply with the requirements of this ordinance. This ordinance requires the following: ➢ Any change in land use or activity that introduces a Major or Minor PPS shall be prohibited within a Tier 1 WHPA. ➢ Any change in land use or activity that introduces a Major PPS shall be prohibited within a Tier 2 WHPA. ➢ Any change in land use or activity that involves any PPS within any WHPA, that is not prohibited, shall comply with Best Management Practice Standards. ➢ Existing land use activities that pose significant potential threats within a WHPA must be properly managed and monitored.	The ordinance can be written to focus just on new and modified land uses, or may also focus on improved management of existing land uses that pose potential threats to water supply wells. The ordinance has functions for both the Planning Board/Board of Adjustment (regarding regulation of new land uses – Section VI) and for the municipal Board of Health (regarding ongoing efforts to ensure that land uses are managed properly once they exist – Section VIII).

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SECTION I. STATEMENT OF FINDINGS	
The governing body of [municipality] finds that:	
A. The ground water underlying this municipality is [the sole] [the primary] [the major] source of existing and future water supplies, including drinking water.	Choose one description based on the level of ground water reliance in the municipality.
B. The ground water aquifers are integrally connected with the surface waters, lakes and streams, which also constitute a major source of water for human and ecosystem needs.	
C. Accidental spills and discharges of toxic and hazardous substances may threaten the quality of these ground water supplies and related water sources.	
D. Contaminated water from any source is a detriment to the health, welfare and comfort of the residents of this municipality, and other users of these water resources.	
E. Spills or discharges of hazardous substances or hazardous wastes may contaminate or pollute water. As a preventive measure, the proximity of such materials to sources of water supplies, such as public community wells[, public noncommunity well and cluster of domestic wells], should be restricted so that there will be sufficient time to find and clean up such spills or discharges before water supplies become contaminated.	Include well types as appropriate for the specific municipal needs.
SECTION II. PURPOSE	
The purpose of this Ordinance is to protect the public health, safety and welfare through the protection of the ground water resources underlying the municipality to ensure a supply of safe and healthful drinking water for the present and future generations of local residents, employees and the general public in this municipality, as well as users of these water supplies outside this municipality. Areas of land surrounding each public community well [, public noncommunity well and cluster of domestic wells], known as Well Head Protection Areas (WHPAs), from which contaminants may move through the ground to be withdrawn in water taken from the well, have been delineated. Through **orderly** regulation of land use, physical facilities and other activities within these areas, the potential for ground water contamination can be reduced. The purpose of the regulations contained in this ordinance is to prevent the migration of potential pollutants to water supply wells.	Include well types as appropriate for the specific municipal needs.

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SECTION III. STATUTORY AUTHORITY	
The municipality of [municipality] is empowered to regulate these activities under the provisions of the New Jersey Municipal Land Use Law, N.J.S.A 40:55D-1 et seq., which authorizes each municipality to plan and regulate land use to secure a safe and adequate drinking water supply for its residents. The Board of Health of this municipality has autonomous power granted by the State Legislature to develop this Ordinance to protect public health, safety and welfare, as set forth in the New Jersey Local Boards of Health Law, N.J.S.A. 26:3-1 et seq.	N.J.S.A. 26:3-31(a) provides that municipal board of health is empowered "To protect the public water supply and prevent the pollution of any stream of water or well, the water of which is used for domestic purposes, and to prevent the use of or to close any well, the water of which is polluted or detrimental to the public health." Each municipality should modify the language regarding its contract to the County Health Department as appropriate. Note: For Counties with a County Board of Health, the New Jersey County Environmental Health Act, N.J.S.A. 26:3A2-21 et seq. also provides authority to the County Board of Health where the municipal Board of Health has delegated enforcement of its regulations to the County Board of Health.
SECTION IV. DEFINITIONS	
Administrative Authority – The Planning Board or Board of Adjustment and the Board of Health, acting jointly **and/or** in consultation, with all of the powers delegated to, assigned to, or assumed by them according to statute or ordinance.	
Applicant – Person applying to the Board of Health, Planning Board, Board of Adjustment or the Construction Office proposing to engage in an activity that is regulated by the provisions of this ordinance, or that owns or operates an existing **Major Potential Contaminant Source (hereinafter "PCS"),** and that would be located within a regulated Well Head Protection Area.	

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Aquifer – A formation, group of formations, or part of a formation that contains sufficient saturated permeable rock, sand, or gravel that is capable of storing and transmitting usable quantities of water to wells and springs.	
Best Management Practices (hereinafter "BMP") – Performance or design standards established to minimize the risk of contaminating ground water or surface waters while managing the use, manufacture, handling or storage of hazardous substances or hazardous wastes.	
Cluster of Domestic Wells – a grouping of wells providing potable water supplies to individual homes, with either: (1) 5 homes on lots that cumulatively are less than or equal to 2.5 acres; or (2) 25 homes on lots that cumulatively are less than or equal to 25 acres. Groups of domestic wells that otherwise meet the thresholds but have a linear configuration (e.g., stretched along a road, not in a cluster) shall not constitute a Cluster of Domestic Wells.	Definition is based on having a dense enough grouping of wells that they create a potential to affect ground water flow and contaminant migration in aquifers typical of Hunterdon County. Different geology and soils may be of interest in other counties, leading to different thresholds for a cluster of domestic wells.
Contaminant – a substance capable of causing contamination of a water supply.	
Contamination – The presence of any harmful or deleterious substances in the water supply, including but not limited to hazardous substances, hazardous wastes, and substances listed in the NJ Administrative Code at NJAC 7:6-6 (Ground Water Quality Standards), NJAC 7:9B (Surface Water Quality Standards) and NJAC 7:10 (NJ Safe Drinking Water Act Regulations), and as these regulations may be, from time to time, amended.	These lists contain many of the same substances, but are not mutually inclusive. Having the definition contain the references provides the greatest level of coverage and allows for changes over time.
Development – The division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any building or other structure, or of any mining, excavation of landfill, and any use or changing use of any building or other structure, or land or extension of use of land, or for which permission may be required pursuant to the Municipal Land Use Law. N.J.S.A. 40:55D-1, et. seq. (hereinafter "MLUL")	This definition is direct from the MLUL. It is worth noting that, according to the MLUL: "Subdivision means the division of a lot, tract or parcel of land into two or more lots, tracts, parcels or other divisions of land for sale or development. The following shall not be considered subdivisions within the meaning of this act, if no new streets are created: (1) divisions of land found by the planning board or subdivision committee thereof appointed by the chairman to be for agricultural purposes where all resulting parcels are 5 acres or larger in size, (2) divisions of property by testamentary or intestate provisions, (3) divisions of property upon court order, including but not limited to

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	judgments of foreclosure, (4) consolidation of existing lots by deed or other recorded instrument and (5) the conveyance of one or more adjoining lots, tracts or parcels of land, owned by the same person or persons and all of which are found and certified by the administrative officer to conform to the requirements of the municipal development regulations and are shown and designated as separate lots, tracts or parcels on the tax map or atlas of the municipality. The term 'subdivision' shall also include the term 'resubdivision.'"
Discharge – Any intentional or unintentional action or omission, unless pursuant to and in compliance with the conditions of a valid and effective Federal or State Permit, resulting in the releasing, spilling, pumping, pouring, emitting, emptying or dumping of a hazardous substance into the waters or lands of the State or into waters outside the jurisdiction of the State when damage may result to the lands, waters or natural resources within the jurisdiction of the State.	
Ground Water – Water contained in interconnected voids of a saturated zone in the ground. A saturated zone is a volume of ground in which the voids in the rock or soil are filled with water greater than or equal to atmospheric pressure.	
Hazardous Substance – Any substance designated under 40 CFR 116 pursuant to Section 311 of the Federal Water Pollution Control Act Amendments of 1972 [Clean Water Act] (Public Law 92-500; 33 U.S.C. 1251 et seq.), the Spill Compensation and Control Act, N.J.S.A. 58:10-23.ll et seq., or Section 4 of the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) **and as these regulations may, from time to time, be amended.** Substances listed include petroleum, petroleum products, pesticides, solvents and other substances.	The intent of this definition is to provide an inclusive list of substances that have been found to be hazardous under at least one major statute, federal or state.
Hazardous Waste – Any solid waste that is defined or identified as a hazardous waste pursuant to the Solid Waste Management Act, N.J.S.A. 13:1E et seq., N.J.A.C. 7:26-8, or 40 CFR Part 261.	
Major Potential Contaminant Sources (PCS) – include the following, consistent with the New Jersey Safe Drinking Water Act regulations, N.J.A.C. 7:10-11.7 through 12.12: 1) Permanent storage or disposal of hazardous wastes, industrial or	NOTE: Some dry cleaning facilities (#10) are just drop off/pick up sites, where no actual dry cleaning is performed and therefore no chemicals are stored or used. Such drop

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municipal sludge or radioactive materials, including solid waste landfills. 2) Collection and transfer facilities for hazardous wastes, solid wastes that contain hazardous materials, and radioactive materials. 3) Any use or activity requiring the underground storage of a hazardous substance or waste in excess of an aggregate total of 50 gallons. 4) Underground fuel and chemical storage and oil tanks regulated by NJDEP under provisions of the Underground Storage of Hazardous Substances Act (N.J.S.A. 58:10A-21 et seq.). 5) Above-ground storage facility for a hazardous substance or waste with a cumulative capacity greater than 2,000 gallons. 6) Any industrial treatment facility lagoon. 7) Any facility with a SIC Code number included under the New Jersey Safe Drinking Water Act Regulations at N.J.A.C 7:10A-1.14, Table II(N), with a toxicity number of II or greater. (See Appendix A.) 8) Automotive service center (repair & maintenance). 9) Landfill. 10) Dry cleaning processing facility. 11) Road salt storage facility. 12) Cemetery. 13) Highway maintenance yard. 14) Truck, bus, locomotive maintenance yard. 15) Site for storage and maintenance of heavy construction equipment and materials. 16) Site for storage and maintenance of equipment and materials for landscaping. 17) Livestock operation containing more than X animal units as defined by the New Jersey Department of Agriculture pursuant to its regulations at NJAC XXXX [in development as of April 2005]. 18) Quarrying and/or mining facility. 19) Asphalt and/or concrete manufacturing facility. 20) Junkyard/auto recycling and scrap metal facility. 21) Residential or agricultural motor fuel in NJDEP exempted underground storage tanks (i.e., under 1,000 gallons).	off/pick up sites are not to be regulated as a Major PCS. NOTE 2: NJDEP's current regulations under the Underground Storage of Hazardous Substances Act (N.J.S.A. 58:10A-21 et seq.) may require that a municipality proposing to exclude the type of underground storage tanks regulated under the Act from a WHPA must receive NJDEP authorization to be more stringent than the NJDEP regulations. This provision definitely applies if an underground storage tank is to be allowed, but with design or monitoring requirements that exceed those in NJDEP's regulations. Until NJDEP modifies its regulations to address this issue, municipalities should submit their WHPA ordinances to NJDEP for certification, just to be sure that the municipality is within its legal authority. NOTE 3: The NJ Department of Agriculture is developing rules regulating livestock manure management. This rule will have two thresholds for application. The WHP Model Ordinance will use the lower of the two NJDAg thresholds as the threshold for a "Minor PCS" and the higher of the two NJDAg thresholds as the threshold for a "Major PCS."
Minor Potential Contaminant Sources (PCS) – include the following, consistent with the New Jersey Safe Drinking Water Act, N.J.A.C. 7:10-11.7 through 12.12: 1) Underground storage of hazardous substance or waste of less than 50	NOTE: The NJ Department of Agriculture is developing rules regulating livestock manure management. This rule will have two

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gallons. 2) Underground heating oil storage tank with a capacity of less than 2,000 gallons. 3) Sewage treatment facility regulated by a NJPDES permit granted under NJAC 7:14A. 4) Sanitary sewer system, including sewer line, manhole, or pump station. (See conditions in Section VI.G.) 5) Industrial waste line. (See conditions in Section VI.G.) 6) Septic leaching field. 7) Facility requiring a ground water discharge permit issued by the NJDEP pursuant to N.J.A.C 7:14A et seq. 8) Stormwater retention-recharge basin. 9) Dry well. (See conditions in Section VI.G.) 10) Storm water conveyance line. (See conditions in Section VI.G.) 11) Waste oil collection, storage and recycling facility. 12) Agricultural chemical bulk storage and mixing or loading facility including crop dusting facilities. 13) Above-ground storage of hazardous substance or waste in quantities of less than 2,000 gallons. 14) Livestock operation containing more than X animal units as defined by the New Jersey Department of Agriculture pursuant to its regulations at NJAC XXXX. 15) Other PCS of similar nature that are not listed in (1) through (13) above or in the definition of Major PCS	thresholds for application. The WHP Model Ordinance will use the lower of the two NJDAg thresholds as the threshold for a "Minor PCS" and the higher of the two NJDAg thresholds as the threshold for a "Major PCS."
NJDEP – New Jersey Department of Environmental Protection.	
Person – Any individual, public or private corporation, company, partnership, firm, association, owner or operator, political subdivision of this State, and any state, Federal or interstate agency or an agent or employee thereof.	
Potential Contaminant Source (PCS) – Activity or land use that may be a source of a contaminant that has the potential to move into ground water withdrawn from a well.	
Public Community Well – A public water supply well that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.	Definition same as in NJAC 7:10-1.3.

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Public Noncommunity Well – a public water supply well that is not a public community well and that regularly serves at least 25 individuals for at least 60 days in any given calendar year.	This definition includes wells for both public noncommunity transient and nontransient water supply systems as defined by NJAC 7:10-1.3.
SIC-- Standard Industrial Classification.	
Time of Travel (TOT) – The average time that a volume of water will take to travel in the saturated zone from a given point to a pumping well.	
Tier 1 Well Head Protection Area – That area of land within a WHPA from which ground water may enter the well within 2 years. (See maps referenced under Section V, or Master Plan.)	
Tier 2 Well Head Protection Area – That area of land within a WHPA from which ground water may enter the well within 5 years but more than 2 years. (See maps referenced under Section V, or Master Plan.)	
Tier 3 Well Head Protection Area – That area of land within a WHPA from which ground water may enter the well within 12 years but more than 5 years. (See maps referenced under Section V, or Master Plan.)	
Well Head – The well borehole and appurtenant equipment for a public community well, public noncommunity well, or domestic well within a cluster of domestic wells.	
Well Head Protection Area (WHPA) – An area described in plan view around a well, from which ground water flows to the well and ground water contamination, if it occurs, may pose a significant threat to the quality of water withdrawn from the well.	
WHPA – Well Head Protection Area.	

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SECTION V. ESTABLISHMENT OF WELL HEAD PROTECTION AREAS AND MAPS	
A. Well Head Protection Area Maps:	**Inclusion of Well Head Protection Area Zoning into Master Plan:** The municipal Master Plan provides the legal basis for zoning and land use regulation at the local level. The technical foundation for local well head protection in this municipality should be incorporated into the Master Plan. A technical report on the need for well head protection in [municipality] may be adopted as part of the Master Plan (N.J.S.A 40:55D-28b(11)). The technical report should include the following information: • A statement setting forth the rationale and need to protect the public water supply through a program of well head protection for public community wells. • Reference to the method used to delineate the Well Head Protection Areas (WHPAs) according to the "tiered" level of protection for public community wells based upon the time of travel (TOT) of ground water, as developed by the New Jersey Geological Survey. The method for clusters of domestic wells is adapted from a report by the Cape May County Planning Board, 1992, "Well Head Protection for Domestic Well Clusters;" the adaptation addresses the difference between sand aquifers and the rock aquifers typical of Hunterdon County by using the cluster of wells itself as Tier 1 and then using the NJGS report as the source of circular diameters for Tiers 2 and 3.
1) The delineations of Tier 1, Tier 2 and Tier 3 of Well Head Protection Areas shall be established in the following manner:	
a. Public community wells, as published by the New Jersey Geological Survey of the New Jersey Department of Environmental Protection, are incorporated herein and made a part of this Ordinance. The WHPAs are designated as follows: New Jersey Well Head Protection Areas, Edition 2, Geospatial Data Presentation, New Jersey Digital Data Series, DGS02-2, dated 18 June 2002, or more current version as updated and published by NJDEP. A description of these WHPAs, which has been excerpted from these materials, is appended as Appendix B.	
b. Public noncommunity wells, as defined by the Calculated Fixed Radius Method of the New Jersey Geological Survey Open File Report OFR-03-1 (2003 or most current version), and as delineated in the most current Source Water Assessment Report published by the NJDEP for each public noncommunity well.	
c. Clusters of domestic wells, using the area created by delineating a boundary around the outer perimeter of the cluster of domestic wells, as Tier 1, and then defining Tier 2 and Tier 3 using the Calculated Fixed Radius Method of the New Jersey Geological Survey Open File Report OFR-03-1 (2003 or most current version).	
d. A map of the Well Head Protection Areas located within [municipality] is included as part of this Ordinance, is appended as Figure [?], and is adopted as of [date] [or is included in the Master Plan adopted as of [date]]. Maps of the municipality on which these delineations have been overlain shall be on file and maintained by the offices of the Clerk of [municipality], and of the Board of Health of [municipality] **and the County Board of Health Office**	

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2) Well Head Protection Areas, as shown on the maps described in Section V.A(1), shall be considered to be superimposed over any other established zoning district. Land in a Well Head Protection Area may be used for any purpose permitted in the underlying district, subject to the additional restriction **set forth** herein.	It is expected that WHPAs for clusters of domestic wells will be needed only for existing developed areas, as future developments will either use public supplies (if developed compactly) or have large enough lots that a cluster would not be formed.
B. Assignment of Restriction within Well Head Protection Areas:	
1) Properties located wholly or partially within a Well Head Protection Area shall be governed by the restrictions applicable to the Well Head Protection Area.	WHPAs will frequently cut across parcels, and this ordinance should apply to the full WHPA, including affected parts of all parcels.
SECTION VI. REGULATION OF WELL HEAD PROTECTION AREAS	
A. Any applicant for a permit requesting a change in land use or any "development" as defined under the provisions of the Municipal Land Use Law and other pertinent regulations of [municipality], [code references], and which is located within a delineated WHPA, as defined in Section V, that involves a Major or Minor PCS, as defined in Section IV, shall comply with the requirements of this ordinance.	
B. Any applicant for a permit requesting a change in land use or development which is subject to the requirements of this ordinance, shall file an Operations and Contingency Plan, as required by Section VIII, with the Administrative Authority. No permit that allows a change in land use or development, which is subject to the requirements of this ordinance, shall be granted unless an Operations and Contingency Plan for the proposed change has been approved by the Administrative Authority. Any plan approved by the Administrative Authority shall be kept on file in the office of the [office] of [municipality], and shall be available to the public for inspection.	A municipality may choose to have the Board of Health review all Plans, regardless of the type of permit or approval sought, and then provide a report to the Administrative Authority if that is not the Board of Health. Alternatively, a consultant may be used.
C. Any existing land use or activity that constitutes a Major PCS, as defined in Section IV, and is located within Tier 1 or 2 of a WHPA shall comply with the provisions of Section VIII.C.	This provision is Board of Health function.

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D. Any change in land use or activity that introduces a Major or Minor PCS, as defined in Section IV, shall be prohibited within a Tier 1 WHPA. In the event that the proposed configuration of a specific lot does not allow placement of a proposed Minor or Major Potential Contaminant Source outside of the Tier 1 WHPA, and the combination of the municipality's Development Regulations and the provisions of this ordinance would prohibit any economically viable land use, then the applicant may submit a Variance Application, and upon submission of required proofs under the MLUL and testimony as to the constraints on the property as a result of this Ordinance, be granted a variance, with any appropriate conditions deemed necessary by the Planning Board / Board of Adjustment, for the installation of a Minor PCS with Best Management Practices as would apply within the Tier 2 WHPA, with such variance being limited to the minimum necessary to provide for an economically viable land use.	Tier 1 is very close to a well, and a ground water contamination incident often will not be discovered or corrected in time to project the water supply. A municipality considering this model ordinance should ensure that its zoning and the WHP overlay do not constitute a "taking" by (among other things) carefully comparing the uses allowed by the underlying zoning and those prohibited within the WHPA (Tier 1 <u>and</u> Tier 2). Please note the underground storage tanks issue described in the Section IV definition of Major PCS.
E. Any change in land use or activity that introduces a Major PCS, as defined in Section IV, shall be prohibited within a Tier 2 WHPA.	Tier 2 is far enough away from the well that Minor PCS are not likely to cause a problem, but Major PCS can still contaminate the well in less time than a remedial action usually requires for any major discharge.
F. Any change in land use or activity that involves any PCS, as defined in Section VII, within any WHPA, that is not prohibited pursuant to Section VI.D. or VI.E., shall comply with the Best Management Practice Standards, as defined in Section IX.	
G. Any change in an existing land use or activity that involves replacing an existing Major or Minor PCS with an equivalent Major or Minor PCS (e.g., a replacement septic system, sewer line, parking lot or underground storage tank) shall be permitted if the replacement: 1) does not involve an increase in capacity to the PCS; 2) will meet the applicable Best Management Practices from Section VII; 3) will be located as far from the affected well as is reasonably feasible within the existing property; and 4) will result in a reduction of risk to ground water quality.	This provision is written to prevent a situation where an upgrade to an existing potential contaminant source would be prohibited due to its location in Tier 1 or 2 of a well head protection area. Some facilities require periodic replacement (e.g., septic system leaching fields) and prohibiting that upgrade would be contrary to the intent of protection the affected well.

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H. This Ordinance is supplementary to other laws and Ordinances in this municipality. Where this Ordinance or any portion thereof imposes a greater restriction than is imposed by other regulations, the provisions of this Ordinance shall supersede. These Rules and Regulations shall in no way affect the limitations or requirements applicable in the underlying municipal land use and zoning districts.	The WHP Ordinance is essentially an overlay ordinance for land use regulation purposes, and should be addressed in the Master Plan in this manner.
I. Conditions:	
(a) Sanitary sewer lines, industrial waste lines and storm water conveyance lines may be located no closer than 100 feet to a well head, and only within a Tier 1 or 2 areas if they are constructed of watertight construction (that is steel, reinforced concrete, cast iron, PVC or other suitable material with watertight construction and verification).	Because these lines and facilities are underground, hard to monitor and linear, they can pose a major threat to a well unless watertight.
(b) Manhole and/or connections to a sanitary sewer system are prohibited within 100 feet of a regulated well.	
(c) Dry wells dedicated to roof runoff and serving residential properties or commercial or industrial properties with SIC codes not listed in Appendix A may be located no closer than 100 feet to a well head.	
SECTION VII. BEST MANAGEMENT PRACTICE PERFORMANCE STANDARD	
Any applicant proposing any change in land use or activity that involves any PCS, as defined in Section IV, that would be located either wholly or partially within any WHPA shall comply with and operate in a manner consistent with the following Best Management Practices:	These provisions heavily emphasize measures to sequester hazardous substances from any contact with water, or risk of migration from proper use areas.
A. All portions or areas of a facility in which hazardous substances or hazardous wastes are stored, processed, manufactured or transferred outdoors, shall be designed so that the discharges of hazardous substances will be prevented from overflowing, draining, or leaching into the ground water or surface waters.	Facilities with industrial stormwater permits, especially individual permits, should already be in compliance with many of these provisions.
B. Outdoor storage, dispensing, loading, manufacturing or processing areas of hazardous substances or hazardous wastes must be protected from precipitation, stormwater flows and flooding.	

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C. Wherever hazardous substances are stored, processed, manufactured or transferred outdoors, the design features shall include secondary containment and/or diversionary structures which may include but not be limited to: (a) Containers, dikes, berms or retaining walls sufficiently impermeable to contain spilled hazardous substances, for the duration of a spill event. (b) Curbing. (c) Gutter, culverts and other drainage systems. (d) Weirs, booms and other barriers. (e) Lined diversion ponds, lined lagoons and lined retention basins, holding tanks, sumps, slop tanks and other collecting systems. (f) Drip pans.	
D. Secondary containment and/or diversionary systems, structure or equipment must meet the following standards:	
(a) The system must block all routes by which spilled hazardous substances could be expected to flow, migrate, or escape into the ground water or surface waters.	
(b) The system must have sufficient capacity to contain or divert the largest probable single discharge that could occur within the containment area, plus an additional capacity to compensate for any anticipated normal accumulation of rainwater.	
(c) In order to prevent the discharge of hazardous substances into ground water, all components of the system shall be made of or lined with impermeable materials sufficient to contain the substance for the duration of a spill event. Such material or liner must be maintained in an impermeable condition.	
(d) No manufacturing area, processing area, transfer area, dike storage area, or other storage area, or secondary containment/diversion system appurtenant thereto shall drain into a watercourse, or into a ditch, sewer, pipe or storm drain that leads directly or indirectly into a surface or subsurface disposal area, unless provision has been made to intercept and treat any spilled hazardous substances in an NJDEP approved industrial wastewater treatment or pre-treatment facility, or other NJDEP approved facility.	

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(e) Catchment basins, lagoons and other containment areas that may contain hazardous substances should not be located in a manner that would subject them to flooding by natural waterways.	
E. Stormwater shall be managed so as to prevent contamination of ground water, and so as to be in accordance with applicable laws and regulations of the State of New Jersey, and of [municipality].	
F. The provisions of this section shall not apply to the extent that they are either superceded by or less stringent than any relevant and applicable State law or regulation, including but not limited to the Underground Storage Tank regulations at N.J.A.C. 7:14B.	
SECTION VIII. OPERATIONS AND CONTINGENCY PLAN	
A. Any applicant proposing any change in land use or **development** that involves any PCS, as defined in Section IV, that would be located either wholly or partially within any WHPA shall submit an Operations and Contingency Plan to the Administrative Authority. This Operations and Contingency Plan shall inform the Administrative Authority about the following aspects of the proposal: 1) Types of PCS proposed for the site; 2) Types and quantities of hazardous substances or hazardous wastes that may be used or stored on site; 3) Means to be employed to contain or restrict the spillage or migration of hazardous substances or hazardous wastes from the site into ground water; 4) Means to be used to contain or remediate accidental spillage of such materials; 5) Means to notify administrative authority about any accidental spillage of such materials; 6) Demonstration that the proposed use and/or **development** would employ, to the maximum extent possible, best management practices as set forth in Section VII, to protect ground water quality in the WHPA and minimize the risk of potential ground water contamination. 7) Where a Major or Minor PCS is allowed to be developed pursuant to Section VI of this ordinance may submit a permit or certification from	This model ordinance focuses on major and minor new potential contaminant sources, many of which tend to be owned by businesses or government. However, residential storage, use and disposal of chemicals can be a major concern, especially in clusters of domestic wells. Municipalities are advised to consider ways in which homeowners, renters and other residents can be educated about the potential for well contamination from residential chemicals and hazardous wastes. The provision at A(7) avoids a situation of duplicate regulation by the municipality and the State for an new potential contaminant source that is otherwise permitted to be developed under Section VI. The municipality should accept such permits as sufficient for well head protection. Because State permits rarely consider siting issues with regard to well head

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the New Jersey Departments of Agriculture or Environmental Protection that specifically addresses the components listed in Section VIII.A(1) through (6) as the Operations and Contingency Plan for that Major or Minor PCS.	protection zones, they so should not affect a decision under Section VI as to whether the PCS should be allowed at that location.
B. The Administrative Authority shall review, and shall approve or reject, **in consultation with the Board of Health, and** Operations and Contingency Plan prior to approving or denying the application for a land use change or **development.**	
C. Any existing Major PCS located within Tier 1 or Tier 2 of a WHPA shall submit an Operations and Contingency Plan to the Board of Health, with the components listed in Section VIII.A(1) through (6), within six months of the effective date of this ordinance.	This provision was written to improve controls on existing facilities, so that a municipality is not regulating new PCS and not existing. The language is written to avoid a situation where a Major PCS submits an unsatisfactory Plan and then continues to resubmit versions that still don't meet the requirements, as a way of delaying its compliance requirement.
1) The Operations and Contingency Plan shall be implemented within six months of **approval**, unless the Board of Health approves an alternative schedule.	
2) The Board of Health shall review and approve or disapprove the Plan within 2 months of receipt. If disapproved, the Plan must be resubmitted within 1 month of disapproval for Board of Health review.	
3) Regardless of Plan approval status, the provisions of Section IX regarding inspections and enforcement shall apply to all existing Major PCS.	
4) An existing Major PCS that is currently regulated by the New Jersey Departments of Agriculture or Environmental Protection in a manner that addresses the components listed in Section VIII.A(1) through (6) shall submit the State permit or certification to the Board of Health as the Operations and Contingency Plan for that Major PCS. The State permit or certification shall only apply to the Major PCS specified in the permit or certification, and not to any other Major PCS on the property. Acquisition of a State permit or certificate does not exempt new Major or Minor PCS from regulation under Section VI of this ordinance.	This provision avoids a situation of duplicate regulation by the municipality and the State for an existing potential contaminant source. The municipality should accept such permits as sufficient for well head protection, and without a review fee. However, State permits rarely consider siting issues, and so should not affect a decision under Section VI as to whether the PCS should be allowed at that location.
D. Any Operations and Contingency Plan submitted shall be available for public review and comment.	

Ordinance Text	Commentary
E. Each Major PCS shall be licensed by the board of health, and the license shall require continued conformance with the approved Operations and Contingency Plan. The licensing year shall run from January 1st through December 31st.	This provision ensures ongoing BMPs for any Major PCS, through an annual license similar to those required of retail food establishments.
F. Each licensed Major PCS shall submit an annual inspection fee of $____ to the Board of Health and also shall submit an annual evaluation of the Operations and Contingency Plan and any recommended changes thereto, as a condition of continuing operations.	Inspections do have a cost associated with them, due to the need for technical expertise. For new facilities, this cost is covered as part of the construction inspection process. However, a fee will be required to cover the annual inspection costs. To avoid burdening minor facilities, the fee and annual expectation are applied only to a Major PCS.
SECTION IX. INSPECTIONS AND ENFORCEMENT	
If, upon inspection, a condition which is in violation of this Ordinance is discovered, a civil action **may be commenced by the municipality or the Board of Health** in the Special Part of the Superior Court, or in the Superior Court, if the primary relief sought is injunctive or if penalties may exceed the jurisdictional limit of the Special Civil Part, by the filing and serving of appropriate process. Nothing in this Ordinance shall be construed to preclude a municipality's right, pursuant to N.J.S.A 26:3A-25, to initiate legal proceedings hereunder in Municipal Court. The violation of any section or subsection of this Ordinance shall constitute a separate and distinct offense independent of the violation of any other section or subsection, or of any order issued pursuant to this Ordinance. Each day a violation continues shall be considered a separate offense. Inspections shall be performed on the following basis: 1. A prompt investigation shall be made by the appropriate personnel of the Health Department of [municipality], of any person or entity believed to be in violation hereof. 2. An investigation of an existing Major PCS shall be made approximately one year after the effective date of this ordinance, regardless of the status of approval for an Operations and Contingency Plan under Section VIII.C, to determine whether the Major PCS poses an imminent threat of contamination within the WHPA.	

Ordinance Text	Commentary
3. An inspection of each Major PCS approved under Section VIII.B shall be made to confirm that the Major PCS has been constructed in accordance with the land use approval. 4. An annual inspection of each Major PCS shall be made to confirm that the Major PCS is operating in accordance with its Operations and Contingency Plan as approved under Section VIII.	
SECTION X. SEVERABILITY	
If any section, sentence, clause or phrase of this Ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, then said holdings shall in no way affect the validity of the remaining portions of this Ordinance.	
SECTION XI. EFFECTIVE DATE	
This Ordinance shall take effect upon final adoption and publication in accordance with the law on [date].	

Appendix A

Types of Facilities that are Major Potential Pollutant Sources Facilities with Toxicity Ratings of II or Greater N.J.A.C. 7:10A-1.14(c)4, Table II(N)		
*SIC Code for Industrial Facility**	*Description of Industrial Facility which includes activities that may release hazardous substances*	*Toxicity Rating*
Any SIC Code	All ground water remediation of toxic substances, including priority pollutants	V
Any SIC Code	Contaminated storm water runoff from any type of facility listed below	
0721	Crop dusting and spraying	IV
10xx	Metal mining	V
12xx	Coal mining	III
1475	Phosphate rock mining	IV
22xx	Textile mills with finishing operations (dyeing, coating, etc.)	V
2491	Wood preserving	VI
2493	Reconstituted wood products	II
25xx	Furniture & fixtures with metal finishing	V
261x, 262x, 263x	Pulp, paper, and paperboard mills	V
27xx	Printing & publishing	II
2812	Inorganic chemicals, alkalies & chorine	V
2813	Industrial gases	II
2816	Inorganic pigments	IV
2819	Industrial inorganic chemicals	IV
282x	Plastic materials & synthetic resins	V
283x	Drugs	V
284x	Soaps, detergents, etc.	III
285x	Paints, etc.	IV
2861	Gum & wood chemicals	III
2865, 2869	Industrial organic chemicals	VI
2879	Pesticides & agricultural chemicals	VI
289x, except 2891	Miscellaneous chemical products	IV
2891	Adhesives & sealants	V
29xx	Petroleum refining	V
30xx	Rubber & plastic products	IV
3111	Leather tanning & finishing	IV
331x, except 3313	Steel mills	VI
3313	Electrometallurgical products, except steel	III
332x	Iron & steel foundries	V
333x	Primary smelting, nonferrous metals	VI
334x	Secondary smelting, nonferrous metals	V
335x	Rolling, drawing, extruding, nonferrous metals	V
336x	Nonferrous foundries	V
339x	Miscellaneous primary metals products	V
341x, 342x, 343x, 344x, 345x, 346x, except 3431 & 3463	Fabricated metal products, with metal finishing	V
3431	Enameled sanitary ware, cast iron basis	VI
3463	Nonferrous forgings	V
347x	Plating & coating	V
348x	Ordinance, with metal finishing	V
348x	Ordinance, explosive load, assembly, packing	IV
349x, except 3497	Miscellaneous fabricated metal products, with metal finishing	V
3497	Metal foil & leaf	V

*SIC Code for Industrial Facility**	*Description of Industrial Facility which includes activities that may release hazardous substances*	*Toxicity Rating*
35xx	Industrial/commercial machinery & equipment, with metal finishing	V
36xx	Electronic equipment, with metal finishing or porcelain enameling	V
3624	Carbon & graphite products	V
3671	Cathode ray tubes	V
3672	Printed circuit boards	V
3674	Semiconductors	VI
3679	Electronic crystals only	III
3691, 3692	Batteries	IV
37xx, except 3731	Transportation equipment, with metal finishing	V
3731	Shipbuilding	IV
38xx	Measuring, analyzing & controlling instruments, with metal finishing	V
3844, 3845	Measuring, analyzing & controlling instruments, with electron tube manufacture	V
3861	Photographic related chemicals	V
39xx	Miscellaneous manufacturing industries, with metal finishing	V
4231	Trucking terminals	III
4493	Marinas	III
4499	Water transportation services	III
46xx	Pipelines, except natural gas	V
4911, 4931	Electric services	IV
4941	Water supply	IV
4953	Solid waste facilities	IV
4953	Hazardous waste treatment facilities	VI
5052	Coal & other minerals & ores	V
5093	Scrap & waste materials	VI
5169	Chemicals & allied products	VI
5171	Petroleum bulk stations & terminals	V
5191	Farm supplies	IV
7211, 7215, 7216 & 7217	Laundries, dry-cleaning & carpet/upholstery cleaning	II
7213, 7218	Linen supply & industrial launderers	IV
7342	Disinfecting & pest control services	VI
7389	Solvents recovery services only	VI
7542	Car & truck washes	II
7699	Repair shops, with metal finishing	V
8062	General medical & surgical hospitals	VI
8069	Specialty hospitals	VI
8071	Medical laboratories	VI
8731	Commercial research organizations	IV
8733	Noncommercial research organizations	IV

* For the purposes of this table, SIC (Standard Industrial Classification) Codes are determined from the Federal Standard Industrial Classification Manual (1987) issued by the United States Office of Management and Budget.

Appendix B
New Jersey Department of Environmental Protection (NJDEP) Delineations of Well Head Protection Areas (WHPAs) around Public Community Water Supply Wells

Excerpts from:
New Jersey Geological Survey, New Jersey Department of Environmental Protection,
New Jersey Public Community Water Supply Well Head Protection Areas, Edition 2,
Geospatial Data Presentation, New Jersey Digital Data Series, DGS02-2, dated 18 June 2002.

Description of WHPAs: A Well Head Protection Area (WHPA) is an area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of groundwater captured by a well pumping at a specific rate over two-, five-, and twelve-year periods of time. The area of capture is defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System (GIS). GIS coverages are produced for each PCWS well and for the set of all PCWS wells in a county using the ARC/INFO UNION command on individual coverages. WHPA delineation methods are described in "Guidelines for Delineation of Well Head Protection Areas in New Jersey (<http://www.state.nj.us/dep/njgs/whpaguide.pdf>). An ARC/INFO point coverage of associated PCWS wells is available as N.J. Geological Survey Digital Geodata Series DGS97-1 (<http://www.state.nj.us/dep/njgs/geodata/dgs97-1.htm>).

Internet Address:
<http://www.state.nj.us/dep/njgs/geodata/dgs02-2.htm>

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5. Users shall require any independent contractor, hired to undertake work that will utilize digital data obtained from the NJDEP, to agree not to use, reproduce, or redistribute NJDEP GIS data for any purpose other than the specified contractual work. All copies of NJDEP GIS data utilized by an independent contractor will be required to be returned to the original user at

the close of such contractual work. Users hereby agree to abide by the use and reproduction conditions specified above and agree to hold any independent contractor to the same terms. By using data provided herein, the user acknowledges that terms and conditions have been read and that the user is bound by these criteria.

Process Description:

The WHPA delineations were created using the methods outlined in "Guidelines for Delineation of Well Head Protection Areas in New Jersey" available as a download at <http://www.state.nj.us/dep/njgs/whpaguide.pdf>. Coordinate files delineating each WHPA boundary were generated using a custom MS-DOS program on-file at the offices of the N.J. Geological Survey. The MS-DOS coordinate files are formatted as ARC/INFO coverages and contain line attributes specifying each time of travel tier for groundwater to the well. Each coverage was built as both a line and a polygon coverage having both arc and polygon attributes for the three Time of Travel (TOT) tiers. PCWS wells were located using a Global Positioning System (GPS). WHPA delineations are considered to have an accuracy of plus or minus 40 feet in any direction from the mapped location. WHPA delineations for wells completed in the glacial sand and gravel aquifer were clipped to a custom hydrologic boundary. Sand and gravel aquifers occur where deposits are more than 50 feet thick. The hydrologic boundary is generated as a 2000 foot buffer around the polygon representing the contact of the sand and gravel aquifer for those areas where the aquifer is less than 50 feet thick. This distance was selected based on an average distance between the 50 and 100 foot thickness contours of the sand and gravel aquifer. The average inter contour distance was doubled to provide a conservative estimate of the thickness variation. Therefore, any portion of the WHPA delineation that lies beyond this extent is clipped.

Appendix A.6

MODEL WELL HEAD PROTECTION ORDINANCE

The purpose of this Ordinance is to protect the public health, safety and welfare through the protection of the ground water resources underlying the municipality, and to ensure a supply of safe and healthful drinking water for the present and future generations of local residents, employees and the general public in this municipality, as well as users of these water supplies outside this municipality. Areas of land surrounding each public community well, known as Well Head Protection Areas (WHPAs), from which contaminants may move through the ground to be withdrawn in water taken from the well, have been delineated. Through regulation of land use, physical facilities and other activities within these areas, the potential for ground water contamination can be reduced. The purpose of the regulations contained in this ordinance is to prevent the migration of potential pollutants from areas within a WHPA into ground water that is withdrawn from a public community well.

Any applicant for a permit requesting a change in land use or activity which is subject to review under the provisions of the Municipal Land Use Law and other pertinent regulations, which is located within a delineated WHPA, and which involves a Potential Pollutant Source (PPS) shall comply with the requirements of this ordinance. This ordinance requires the following:

✍ Any change in land use or activity that introduces a Major or Minor PPS shall be prohibited within a Tier 1 WHPA.

✍ Any change in land use or activity that introduces a Major PPS shall be prohibited within a Tier 2 WHPA.

✍ Any change in land use or activity that involves any PPS within any WHPA, that is not prohibited, shall comply with Best Management Practice Standards.

This ordinance applies to future activities, not existing uses.

SECTION I. STATEMENT OF FINDINGS

The governing body of [municipality] finds that:

A. The ground water underlying this municipality is a major source of existing and future water supplies, including drinking water. The ground water underlying this municipality lies within the Buried Valley Aquifer Systems of the Central Passaic River Basin, which are designated as a "sole source" aquifer under Section 1424(e) of the federal Safe Drinking Water Act of 1974.

B. The ground water aquifers are integrally connected with, are recharged by, and flow into the surface waters, lakes and streams, which also constitute a major source of water for drinking, commercial and industrial needs.

C. Accidental spills and discharges of toxic and hazardous materials may threaten the quality of these ground water supplies and related water sources.

D. Contaminated water from any source is a detriment to the health, welfare and comfort of the residents of this municipality, and other users of these water resources.

E. Spills or discharges of hazardous substances or hazardous wastes may contaminate or pollute water. As a preventive measure, the proximity of such materials to sources of water supplies, such as public community wells, should be restricted so that there will be sufficient time to find and clean up such spills or discharges before water supplies become contaminated.

SECTION II. PURPOSE

The purpose of this Ordinance is to protect the public health, safety and welfare through the protection of the ground water resources underlying the municipality to ensure a supply of safe and healthful drinking water for the present and future generations of local residents, employees and the general public in this municipality, as well as users of these water supplies outside this municipality. Areas of land surrounding each public community well, known as Well Head Protection Areas (WHPAs), from which contaminants may move through the ground to be withdrawn in water taken from the well, have been delineated. Through regulation of land use, physical facilities and other activities within these areas, the potential for ground water contamination can be reduced. The purpose of the regulations contained in this ordinance is to prevent the migration of potential pollutants from areas within a WHPA into ground water that is withdrawn from a public community well.

SECTION III. STATUTORY AUTHORITY

The municipality of [municipality] is empowered to regulate these activities under the provisions of the New Jersey Municipal Land Use Law, N.J.S.A 40:55D-1 *et seq.*, which authorizes each municipality to plan and regulate land use to secure a safe and adequate drinking water supply for its residents. The Board of Health of this municipality has autonomous power granted by the State Legislature to develop this Ordinance to protect public health, safety and welfare, as set forth in the New Jersey Local Boards of Health Law, N.J.S.A. 26:3-1 *et seq.,* and the New Jersey County Environmental Health Act, N.J.S.A. 26:3A2-21 *et seq.*

SECTION IV. DEFINITIONS

Administrative Authority-- The Planning Board or Board of Adjustment and the Board of Health, acting jointly and in consultation, with all of the powers delegated, assigned, or assumed by them according to statute or ordinance.

Applicant-- Person applying to the Board of Health, Planning Board, Board of Adjustment or the Construction Office proposing to engage in an activity that is regulated by the provisions of this ordinance, and that would be located within a regulated Well Head Protection Area.

Aquifer-- A formation, group of formations, or part of a formation that contains sufficient saturated permeable rock, sand, or gravel which is capable of storing and transmitting usable quantities of water to wells and springs.

Best Management Practices (BMP) -- These are performance or design standards established to minimize the risk of contaminating ground water or surface waters while managing the use, manufacture, handling or storage of hazardous substances or hazardous wastes.

Contamination-- The presence of any harmful or deleterious substances in the water supply.

Development-- The carrying out of any construction, reconstruction, alteration of surface or structure or change of land use or intensity of use.

Discharge-- Any intentional or unintentional action or omission, unless pursuant to and in compliance with the conditions of a valid and effective Federal or State Permit, resulting in the releasing, spilling, pumping, pouring, emitting, emptying or dumping of a hazardous substance into the waters or lands of the State or into waters outside the jurisdiction of the State when damage may result to the lands, waters or natural resources within the jurisdiction of the State.

Ground Water-- Water contained in interconnected pores of a saturated zone in the ground, also known as well water. A saturated zone is a volume of ground in which the voids in the rock or soil are filled with water at a pressure greater than atmospheric.

Hazardous Substance-- Any substance designated under 40 CFR 116 pursuant to Section 311 of the Federal Act, the Spill Compensation and Control Act, N.J.S.A. 58:10-23.ll *et seq*., or Section 4 of the State Act. Substances listed include petroleum, petroleum products, pesticides, solvents and other substances.

Hazardous Waste-- Any solid waste that is defined or identified as a hazardous waste pursuant to the Solid Waste Management Act, N.J.S.A. 13:1E *et seq*., N.J.A.C. 7:26-8, or 40 CFR Part 261.

Maximum Contaminant Level-- Maximum permissible level of a contaminant in water which is delivered to any user of a Public Community Water System.

NJDEP-- New Jersey Department of Environmental Protection.

Person-- Any individual, public or private corporation, company, partnership, firm, association, owner or operator, political subdivision of this State, and any state, Federal or interstate agency or an agent or employee thereof.

Polluted Water-- In the content of drinking water, water is polluted when a pollutant is present in excess of a maximum contaminant level or bacteriological limit established by law or regulation.

Potential Pollutant Source (PPS)-- Activity or land use which may be a source of a pollutant that has the potential to move into ground water withdrawn from a well. For the purposes of this ordinance Potential Pollutant Sources are defined in Section VII.

PPS-- Potential Pollutant Source

Public Community Well-- A public water supply well which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

SIC-- Standard Industrial Classification.

Sole Source Aquifer-- Any drinking water aquifer upon which more than 50% of a population group depends and for which there is no practicable or affordable alternate water supply, as certified by the United States Environmental Protection Agency.

Time of Travel (TOT)-- The average time that a volume of water will take to travel in the saturated zone from a given point to a pumping well.

Tier 1 Well Head Protection Area-- That area of land within a WHPA from which ground water may enter the well within 2 years. (See maps referenced under Section V.)

Tier 2 Well Head Protection Area-- That area of land within a WHPA from which ground water may enter the well within 5 years. (See maps referenced under Section V.)

Tier 3 Well Head Protection Area-- That area of land within a WHPA from which ground water may enter the well within 12 years. (See maps referenced under Section V.)

Well Head-- The well borehole and appurtenant equipment.

Well Head Protection Area (WHPA)-- An area described in plan view around a well, from which ground water flows to the well and ground water pollution, if it occurs, may pose a significant threat to the quality of water withdrawn from the well.

WHPA-- Well Head Protection Area.

SECTION V. ESTABLISHMENT OF WELL HEAD PROTECTION AREAS AND MAPS

A. Well Head Protection Area Maps:

1) The delineations of Well Head Protection Areas for public community wells, which were published by the New Jersey Geological Survey of the New Jersey Department of Environmental Protection, are incorporated herein and made a part of this Ordinance. They are designated as follows: New Jersey Well Head Protection Areas, Edition 2, Geospatial Data Presentation, New Jersey Digital Data Series, DGS02-2, dated 18 June 2002. A description of these data, which has been excerpted from these materials, is appended as Appendix B. A map of the Well Head Protection Areas located within [municipality] is included as part of this Ordinance, is appended as Figure [?], and is adopted as of [date]. Maps of the municipality on which these delineations have been overlain shall be on file and maintained by the offices of the Clerk of [municipality], and of the Board of Health of [municipality].

2) Well Head Protection Areas, as shown on the maps described in Section V.A(1), shall be considered to be superimposed over any other established zoning district. Land in a Well Head Protection Area may be used for any purpose permitted in the underlying district, subject to the additional restriction presented herein.

B. Assignment of Restriction within Well Head Protection Areas:

Properties located wholly or partially within a Well Head Protection Area shall be governed by the restrictions applicable to the Well Head Protection Area.

C. Inclusion of Well Head Protection Area Zoning into Master Plan:

The municipal Master Plan provides the legal basis for zoning and land use regulation at the local level. The technical foundation for local well head protection in this municipality should be incorporated into the Master Plan. A technical report on the need for well head protection in [municipality] may be adopted as part of the Master Plan (N.J.S.A 40:55D-28b(11)). The technical report should include the following information:

1) A statement setting forth the rationale and need to protect the public water supply through a program of well head protection for public community wells.

2) Reference to the method used to delineate the Well Head Protection Areas (WHPAs) according to the "tiered" level of protection for public community wells based upon the time of travel (TOT) of ground water, as developed by the New Jersey Geological Survey.

SECTION VI. REGULATION OF WELL HEAD PROTECTION AREAS FOR PUBLIC COMMUNITY WELLS

A. The Administrative Authority for administering the provisions of this Ordinance shall be the Planning Board or Board of Adjustment and the Board of Health of [municipality] acting jointly and in consultation.

B. Any applicant for a permit requesting a change in land use or activity, which is subject to review under the provisions of the Municipal Land Use Law and other pertinent regulations of [municipality], [code references], and which is located within a delineated WHPA, as defined in Section V, that involves a Potential Pollutant Source (PPS), as defined in Section VII, shall comply with the requirements of this ordinance.

C. Any applicant for a permit requesting a change in land use or activity, which is subject to the requirements of this ordinance, shall file an Operations and Contingency Plan, as required by Section IX, with the Administrative Authority. No permit that allows a change in land use or activity, which is subject to the requirements of this ordinance, shall be granted unless an Operations and Contingency Plan for the proposed change has been approved by the Administrative Authority. Any plan approved by the Administrative Authority shall be kept on file in the office of the [office] of [municipality], and shall be available to the public for inspection.

D. Any change in land use or activity that introduces a Major or Minor Potential Pollutant Source (PPS), as defined in Section VII, shall be prohibited within a Tier 1 WHPA.

E. Any change in land use or activity that introduces a Major PPS, as defined in Section VII, shall be prohibited within a Tier 2 WHPA.

F. Any change in land use or activity that involves any PPS, as defined in Section VII, within any WHPA, that is not prohibited pursuant to Section VI.D. or VI.E., shall comply with the Best Management Practice Standards, as defined in Section IX.

G. This Ordinance is supplementary to other laws and Ordinances in this municipality. Where this Ordinance or any portion thereof imposes a greater restriction than is imposed by other regulations, the provisions of this Ordinance shall supersede. These Rules and Regulations shall in no way effect the limitations or requirements applicable in the underlying municipal land use and zoning districts.

SECTION VII. POTENTIAL POLLUTANT SOURCES LISTED

The following are Major and Minor Potential Pollutant Sources (PPS) subject to the requirements of this Ordinance. This listing is consistent with the New Jersey Safe Drinking Water Act, N.J.A.C. 7:10-11.7 through 12.12.

A. Major PPSs include:

1) Permanent storage or disposal of hazardous wastes, industrial or municipal sludge or radioactive materials, including solid waste landfills.

2) Collection and transfer facilities for hazardous wastes, solid wastes that contain hazardous materials, and radioactive materials.

3) Any use or activity requiring the underground storage of a hazardous substance or waste in excess of an aggregate total of 50 gallons.

4) Underground fuel and chemical storage and oil tanks regulated by NJDEP under provisions of the Underground Storage of Hazardous Substances Act (N.J.S.A. 58:10A-21 et seq.).

5) Above-ground storage facility for a hazardous substance or waste with a cumulative capacity greater than 2,000 gallons.

6) Any industrial treatment facility lagoon.

7) Any facility with a SIC Code number included under the New Jersey Safe Drinking Water Act Regulations at N.J.A.C 7:10A-1.14, Table II(N), with a toxicity number of II or greater. (See Appendix A.)

8) Automotive service center (repair & maintenance).

9) Landfill.

10) Dry cleaning facility.

11) Road salt storage facility.

12) Cemetery.

13) Highway maintenance yard.

14) Truck, bus, locomotive maintenance yard.

15) Site for storage and maintenance of heavy construction equipment and materials.

16) Site for storage and maintenance of equipment and materials for landscaping.

17) Livestock operation.

18) Quarrying and/or mining facility.

19) Asphalt and/or concrete manufacturing facility.

20) Junkyard/auto recycling and scrap metal facility.

21) Residential or agricultural motor fuel in NJDEP exempted underground storage tanks (i.e., under 1,000 gallons).

B. Minor PPSs include:

1) Underground storage of hazardous substance or waste of less than 50 gallons.

2) Underground heating oil storage tank with a capacity of less than 2,000 gallons.

3) Sewage treatment facility.

4) Sanitary sewer system, including sewer line, manhole, or pump station. (See conditions in Section VII.C.)

5) Industrial waste line. (See conditions in Section VII.C.)

6) Septic leaching field.

7) Facility requiring a ground water discharge permit issued by the NJDEP pursuant to N.J.A.C 7:14A *et seq*.

8) Stormwater retention-recharge basin.

9) Dry well. (See conditions in Section VII.C.)

10) Storm water line. (See conditions in Section VII.C.)

11) Waste oil collection, storage and recycling facility.

12) Agricultural chemical bulk storage and mixing or loading facility including crop dusting facilities.

13) Above-ground storage of hazardous substance or waste in quantities of less than 2,000 gallons.

C. Conditions:

1) Sanitary sewer lines, industrial waste lines and storm water lines may be located no closer than 100 feet to a regulated well, and only if they are constructed of watertight construction (that is steel, reinforced concrete, cast iron, PVC or other suitable material).

2) Manhole and/or connections to a sanitary sewer system are prohibited within 100 feet of a regulated well.

3) Dry wells dedicated to roof runoff and serving residential properties or commercial or industrial properties
with SIC codes not listed in

SECTION VIII. BEST MANAGEMENT PRACTICE PERFORMANCE STANDARD

Any applicant proposing any change in land use or activity that involves any PPS, as defined in Section VII, that would be located either wholly or partially within any WHPA shall comply with and operate in a manner consistent with the following Best Management Practices:

A. All portions or areas of a facility in which hazardous substances or hazardous wastes are stored, processed, manufactured or transferred outdoors, shall be designed so that the discharges of hazardous substances will be prevented from overflowing, draining, or leaching into the ground water or surface waters.

B. Outdoor storage, dispensing, loading, manufacturing or processing areas of hazardous substances or hazardous wastes must be protected from precipitation, stormwater flows or flooding.

C. Wherever hazardous substances are stored, processed, manufactured or transferred outdoors, the design features shall include secondary containment and/or diversionary structures which may include but not be limited to:

1) Containers, dikes, berms or retaining walls sufficiently impermeable to contain spilled hazardous substances, for the duration of a spill event.

2) Curbing.

3) Gutter, culverts and other drainage systems.

4) Weirs, booms and other barriers.

5) Lined diversion ponds, lined lagoons and lined retention basins, holding tanks, sumps, slop tanks and other collecting systems.

6) Drip pans.

D. Secondary containment and/or diversionary systems, structure or equipment must meet the following standards:

1) The system must block all routes by which spilled hazardous substances could be expected to flow, migrate, or escape into the ground water or surface waters.

2) The system must have sufficient capacity to contain or divert the largest probable single discharge that could occur within the containment area, plus an additional capacity to compensate for any anticipated normal accumulation of rainwater.

3) In order to prevent the discharge of hazardous substances into ground water, all components of the system shall be made of or lined with impermeable materials sufficient to contain the substance for the duration of a spill event. Such material or liner must be maintained in an impermeable condition.

4) No manufacturing area, processing area, transfer area, dike storage area, or other storage area, or secondary containment/diversion system appurtenant thereto shall drain into a watercourse, or into a ditch, sewer, pipe or storm drain that leads directly or indirectly into a surface or subsurface disposal area, unless provision has been made to intercept and treat any spilled hazardous substances in an NJDEP approved industrial wastewater treatment or pre-treatment facility, or other NJDEP approved facility.

5) Catchment basins, lagoons and other containment areas that may contain hazardous substances should not be located in a manner that would subject them to flooding by natural waterways.

E. Stormwater shall be managed so as to prevent contamination of ground water, and so as to be in accordance with applicable laws and regulations of the State of New Jersey, and of [municipality].

SECTION IX. OPERATIONS AND CONTINGENCY PLAN

A. Any applicant proposing any change in land use or activity that involves any PPS, as defined in Section VII, that would be located either wholly or partially within any WHPA shall submit an Operations and Contingency Plan to the Administrative Authority. This Operations and Contingency Plan shall inform the Administrative Authority about the following aspects of the proposal:

1) Types of PPS proposed for the site;

2) Types and quantities of hazardous substances or hazardous wastes that may be used or stored on site;

3) Means to be employed to contain or restrict the spillage or migration of hazardous substances or hazardous wastes from the site into ground water;

4) Means to be used to contain or remediate accidental spillage of such materials;

5) Means to notify administrative authority about any accidental spillage of such materials;

6) Demonstration that the proposed use and/or activity would employ, to the maximum extent possible, best management practices as set forth in Section VIII, to protect ground water quality in the WHPA and minimize the risk of potential ground water contamination.

B. The Administrative Authority shall review, and shall approve or reject any Operations and Contingency Plan prior to approving or denying the application for a land use change or activity.

C. Any Operations and Contingency Plan submitted shall be available for public review and comment.

SECTION X. ENFORCEMENT

A prompt investigation shall be made by the appropriate personnel of the Health Department of [municipality] , of any person or entity believed to be in violation hereof. If, upon inspection, a condition which is in violation of this Ordinance is discovered, a civil action in the Special Part of the Superior Court, or in the Superior Court, if the primary relief sought is injunctive or if penalties may exceed the jurisdictional limit of the Special Civil Part, by the filing and serving of appropriate process. Nothing in this Ordinance shall be construed to preclude a municipality's right, pursuant to N.J.S.A 26:3A-25, to initiate legal proceedings hereunder in Municipal Court. The violation of any section or subsection of this Ordinance shall constitute a separate and distinct offense independent of the violation of any other section or subsection, or of any order issued pursuant to this Ordinance. Each day a violation continues shall be considered a separate offense.

SECTION XI. SEVERABILITY

If any section, sentence, clause or phrase of this Ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, then said holdings shall in no way affect the validity of the remaining portions of this Ordinance.

SECTION XII. EFFECTIVE DATE

This Ordinance shall take effect upon final adoption and publication in accordance with the law on [date].

APPENDIX A - NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJ DEP) DELINEATIONS OF WELL HEAD PROTECTION AREAS (WHPAs) AROUND PUBLIC COMMUNITY WATER SUPPLY WELLS

Excerpts from:

New Jersey Geological Survey, New Jersey Department of Environmental Protection,

New Jersey Public Community Water Supply Well Head Protection Areas, Edition 2,

Geospatial Data Presentation, New Jersey Digital Data Series, DGS02-2, dated 18 June 2002.

Description of WHPAs: A Well Head Protection Area (WHPA) is an area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of groundwater captured by a well pumping at a specific rate over two-, five-, and twelve-year periods of time. The area of capture is defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System (GIS). GIS coverages are produced for each PCWS well and for the set of all PCWS wells in a county using the ARC/INFO UNION command on individual coverages. WHPA delineation methods are described in "Guidelines for Delineation of Well Head Protection Areas in New Jersey (http://www.state.nj.us/dep/njgs/whpaguide.pdf). An ARC/INFO point coverage of associated PCWS wells is available as N.J. Geological Survey Digital Geodata Series DGS97-1 (http://www.state.nj.us/dep/njgs/geodata/dgs97-1.htm).

Internet Address:<http://www.state.nj.us/dep/njgs/geodata/dgs02-2.htm>

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Process Description:

The WHPA delineations were created using the methods outlined in "Guidelines for Delineation of Well Head Protection Areas in New Jersey" available as a download at <http://www.state.nj.us/dep/njgs/whpaguide.pdf>. Coordinate files delineating each WHPA boundary were generated using a custom MS-DOS program on-file at the offices of the N.J. Geological Survey. The MS-DOS coordinate files are formatted as ARC/INFO coverages and contain line attributes specifying each time of travel tier for groundwater to the well. Each coverage was built as both a line and a polygon coverage having both arc and polygon attributes for the three Time of Travel (TOT) tiers. PCWS wells were located using a Global Positioning System (GPS). WHPA delineations are considered to have an accuracy of plus or minus 40 feet in any direction from the mapped location. WHPA delineations for wells completed in the glacial sand and gravel aquifer were clipped to a custom hydrologic boundary. Sand and gravel aquifers occur where deposits are more than 50 feet thick. The hydrologic boundary is generated as a 2000 foot buffer around the polygon representing the contact of the sand and gravel aquifer for those areas where the aquifer is less than 50 feet thick. This distance was selected based on an average distance between the 50 and 100 foot thickness contours of the sand and gravel aquifer. The aveage inter contour distance was doubled to provide a conservative estimate of the thickness variation. Therefore, any portion of the WHPA delineation that lies beyond this extent is clipped

Appendix B

Hopewell Township Living Greener Resource Guide

Introduction

The *Living Greener Resource Guide* was prepared by the Rutgers Center for Green Building to help inform residents of Hopewell Township about green living practices that are easy to implement in typical residential settings. This guide is broken down into five sections including Energy Resources, Water Conservation Resources, Waste Reduction Resources, Lawn and Garden Care Resources, and Healthy Home Indoor Environment Resources.[1]

Energy Resources

The positives associated with energy, which enables home appliances, lighting, heating and cooling, are indisputable, but energy is often wasted as a result of outdated appliances and practices leading to preventable pollution and expense. Modern technology has supplied us with new, innovative appliances that are lighter, faster, cleaner and more efficient. Although some of these technologies have an added up-front cost, they pay for themselves over time, sometimes by a large factor. Additional opportunities to make efficient financial and environmental decisions are found in simple changes to routine habits and design decisions taken when renovating a home. Examples of these follow.

10 Easy-to-Implement Energy Saving Tips

1) Conduct a home energy audit to determine the largest savings potential.
2) Use a programmable thermostat to control the heating and cooling in your home.
3) Turn down the water heater thermostat to 120º F.
4) Use energy-saving settings on refrigerators, dishwashers, washing machines, and clothes dryers.
5) Dry your laundry on a clothes line or drying rack.
6) Save 100-kilowatt hours (and $12) a month by plugging appliances and electronics into power strips and turning them off when they are not in use.[2]
7) Change your computer setting to power save mode when not in use. Better yet, turn it off!
8) Install energy efficient lighting such as compact fluorescent light bulbs (cfl) the next time light bulbs burn out. You'll save electricity and replace bulbs less frequently.
9) Turn off incandescent lights when leaving a room and cfls when not returning for more than 15 minutes.
10) Lower the amount of gas or electricity used to heat and cool your home. In summer, open windows at night to let in cool air and close both windows and shades during the day to keep out

[1] The ideas presented in this guide are considered best practices and easy-to-implement actions that by and large were deemed a good fit for residents of Hopewell Township. However, the suggestions are in no way intended to be a substitute for seeking professional advice. In some cases, users should check with Hopewell Township to make sure that actions comply with local land use codes and regulations.

[2] www.popularmechanics.com

heat. During winter, do the opposite. Open shades in the morning to capture sunlight and close them at night to retain the heat.

Appliances

In a typical U.S. home, appliances and home electronics are responsible for about 20% of the energy bill. These appliances and electronics include clothes washers and dryers, computers, refrigerators and freezers, home audio equipment, room air conditioners, televisions, dvd players, and water heaters.[3] When purchasing an appliance, cost considerations include both the up front cost of the purchase and the operating cost through its lifetime, which can be many times greater than the initial purchase cost.

The best way to reduce energy consumption by home appliances is to look for the EnergyGuide and ENERGY STAR® labels. The Federal Trade Commission requires EnergyGuide labels on most home appliances, but not stove ranges and ovens or home electronics, such as computers, televisions, and home audio equipment. EnergyGuide labels provide an estimate of a product's energy consumption or energy efficiency. They also show the highest and lowest energy consumption or efficiency estimates of similar appliance models. ENERGY STAR labels appear on appliances and home electronics that meet strict energy efficiency criteria established by the U.S. Department of Energy and U.S. Environmental Protection Agency. The ENERGY STAR labeling program includes most home electronics and appliances except for water heaters, stove ranges, and ovens.

For more information on purchasing energy efficient appliances visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"*
  http://www.eere.energy.gov/consumer/
- *American Council for an Energy Efficient Economy, "Home Energy Checklist for Action"*
  http://www.aceee.org/consumerguide/checklist.htm
- *Energy Star Appliances*
  http://www.energystar.gov/index.cfm?c=appliances.pr_appliances
- *Alliance to Save Energy*
  http://www.ase.org/content/article/detail/4050
- *New Jersey Clean Energy Program- Online Home Energy Analysis (Energy Audit)*
  http://www.njcleanenergy.com/residential/tools-and-resources/home-energy-analysis/online-analysis/online-home-energy-analysis

[3] US DOE, *Appliances and Home Electronics.*
http://www.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10020

Lighting

Lighting upgrades are a high-return, low-risk investment. Residents can improve the lighting efficiency of their homes by installing dimmer switches, motion sensor lights, compact florescent lights (cfls), solar powered lights, and light-emitting diodes (LEDs). In order to save the most energy and money, the most frequently used fixtures or the light bulbs in them should be replaced with energy-efficient models. The five highest use fixtures in a home are typically kitchen ceiling lights, living or family room table and floor lamps, and outdoor porch or post lamps. ENERGY STAR qualified lighting fixtures and replacement bulbs can be found at home improvement and hardware stores, lighting showrooms, and other retail stores, including on-line outlets. You can also find retailers in the Mercer County area by visiting the official ENERGY STAR website listed below.[4]

Residents can also improve lighting efficiency by considering implementing more daylighting techniques when renovating a home. When properly designed and effectively integrated with the electrical lighting system, daylighting can offer significant energy savings by offsetting a portion of the electric lighting load. A related benefit is the reduction in cooling capacity and use by limiting internal heat sources. Windows also provide visual relief, contact with nature, time orientation, opportunities for ventilation, and emergency egress.[5]

For more information on energy efficient lighting visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"* http://www.eere.energy.gov/consumer/
- *Energy Star Lighting* http://www.energystar.gov/index.cfm?c=lighting.pr_lighting
- *Edison Electric Institute* http://www.eei.org/industry_issues/retail_services_and_delivery/wise_energy_use/programs_and_incentives/progs.pdf
- *U.S. Department of Energy, "Daylighting"* http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html

[4] Energy Star, *Light Bulbs and Fixtures*. http://www.energystar.gov/index.cfm?c=lighting.pr_lighting
[5] US DOE, *Building Technologies Program.* *http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html*

Heating and Cooling

According to the U.S. Department of Energy (DOE), heating and cooling collectively account for about 56% of energy use in a typical U.S. home, making it the largest energy expense for most homeowners. Heating and cooling systems in the United States together emit 150 million tons of carbon dioxide into the atmosphere each year, adding to global climate change. They also generate about 12% of the nation's sulfur dioxide and 4% of the nitrogen oxides, the primary ingredients in acid rain.

No matter what kind of heating, ventilation, and air-conditioning system installed, homeowners can save money and increase comfort by properly maintaining and upgrading equipment. This, combined with appropriate insulation, air sealing, and thermostat settings, residents can cut energy use for heating and cooling, and reduce environmental emissions, by 20% to 50%.[6]

Heating and Cooling Tips[7]

- Set thermostat as low as is comfortable in winter and as high as is comfortable in summer.
- Clean or replace filters on furnaces once a month or as needed.
- Clean warm-air registers, baseboard heaters, and radiators as needed; make sure they're not blocked by furniture, carpeting, or drapes.
- Bleed trapped air from hot-water radiators once or twice a season.
- Turn off kitchen, bath, and other exhaust fans within 20 minutes after use; when replacing exhaust fans, consider installing high-efficiency, low-noise models.
- During the heating season, keep drapes and shades on south facing windows open during the day to allow sunlight to enter and closed at night to reduce chill.
- During the cooling season, keep window coverings closed during the day to prevent solar gain.
- Select energy efficient products when buying new heating and cooling equipment. Contractors should be able to provide energy fact sheets for different types, models, and designs for energy usage comparison. Look for high Annual Fuel Utilization Efficiency (AFUE) ratings on furnaces. The national minimum is 78% AFUE, but there are ENERGY STAR models on the market that exceed 90% AFUE.
- Look for high Seasonal Energy Efficiency Ratio (SEER) air conditioners. The current minimum is 13 SEER for central air conditioners. ENERGY STAR models are 13 SEER or more.

For more information on reducing energy consumption related to heating and cooling visit the following websites:

- *U.S. Department of Energy, "A Consumer's Guide to Energy Efficiency and Renewable Energy"*
  http://www.eere.energy.gov/consumer/
- *American Council for an Energy Efficient Economy, "Home Energy Checklist for Action"*
  http://www.aceee.org/consumerguide/checklist.htm
- *Energy Star, "Heat and Cool Efficiently"*
  http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac

[6] US DOE, Energy Savers http://www1.eere.energy.gov/consumer/tips/heating_cooling.html
[7] US DOE, Energy Savers http://www1.eere.energy.gov/consumer/tips/heating_cooling.html

Renewable Energy

The United States currently relies heavily on *nonrenewable* fossil fuels like coal, oil, and natural gas for its energy. Burning of fossil fuels is a significant source of carbon dioxide, sulfur dioxides and nitrogen oxides in our atmosphere, and their production draws on finite resources that will eventually dwindle, becoming too expensive or environmentally damaging to retrieve. In contrast, *renewable energy* resources—such as wind, biomass, geothermal, hydroelectric, and solar energy—are constantly replenished and will never run out.

Solar Energy- Most renewable energy comes either directly or indirectly from the sun. Sunlight, or solar energy, can be used directly for generating electricity and heating water.

- **Solar water heaters.** Solar water heating is a reliable and renewable energy technology used to heat water. Sunlight strikes and heats an "absorber" surface within a "solar collector" or a storage tank. Either a heat-transfer fluid or the actual potable water to be used, flows through tubes attached to the absorber and "absorbs" heat. The heated water is stored in a separate tank or a conventional water heater tank until needed. If additional heat is needed, it is provided by electricity or fossil-fuel energy by the conventional water-heating system. Home solar water heating systems cost on average $3000 to $6000 and can cut the average family's energy costs to heat water by 20% to 40%.

  For more information, see *Whole Building Design Guide: Solar Water Heating* http://www.wbdg.org/resources/swheating.php

- **Solar panels.** Solar cells convert one form of energy (sunlight) into another form of energy (electricity). When the sunlight is reduced or stopped, for example, when a cloud passes in front of the sun or when the sun goes down in the evening, the conversion process slows down or stops completely. When the sunlight returns, the conversion process resumes. Solar cells do not store electricity and therefore, when the conversion process slows, a solar electric system needs some form of energy storage, usually batteries, to draw upon instead of the solar cells.

  While solar rebates are no longer being offered for residential projects in New Jersey due to overwhelming demand, registrations are still being accepted for the Solar Renewable Energy Certificate (SREC) Program through 2008. All solar system owners in New Jersey with grid-connected generators can participate in the SREC program. Each time a solar system generates10000kWh (1MWh) of electricity, an SREC is issued which can then be sold or traded, helping individuals finance and invest in clean, emission free solar power.

  For more information, visit the *NJ Clean Energy* website (http://www.njcleanenergy.com/) and click on the *Solar Renewable Energy Certificate Program link (SREC)* or email njsrec@cleanpowermarkets.com

Wind Energy- The terms "wind energy" or "wind power" describe the process by which wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

- **Small wind systems.**[8] Homeowners have the option to purchase a small wind system. "Small wind" refers to wind-powered electric systems sized for homes, farms, and small businesses. These turbines are defined as 100 kilowatts in capacity and below.

  For more information, see the *New Jersey Anemometer Loan Program*
  http://www.rowan.edu/colleges/engineering/clinics/cleanenergy/anemometer_homepage.htm

Geothermal Energy- The Earth's heat, which constantly flows outward from its core, provides an enormous source of energy called *geothermal energy.*

- **Geothermal heat pump.** Geothermal heat pumps (sometimes referred to as GeoExchange, earth-coupled, ground-source, or water-source heat pumps) have been in use since the late 1940s. Geothermal heat pumps (GHPs) use the constant temperature of the earth as the exchange medium instead of the outside air temperature. According to the EPA, geothermal heat pumps can reduce energy consumption and corresponding emissions up to 44% compared to air-source heat pumps and up to 72% compared to electric resistance heating with standard air-conditioning equipment.

  For more information, see:
  - *U.S. Department of Energy: Consumer's Guide to Energy Efficiency and Renewable Energy- Geothermal Heat Pumps.*
    http://www.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12640
  - *Energy Star Geothermal Heat Pumps*
    http://www.energystar.gov/index.cfm?c=geo_heat.pr_geo_heat_pumps
  - *PATH (Partnership for Advancing Technology in Housing) Technology Inventory*
    http://www.toolbase.org/TechInventory/techDetails.aspx?ContentDetailID=754

Biomass Energy- Energy that is stored in green plants and other organic matter is referred to as biomass. Biomass facilities burn wood, agricultural wastes and/or methane gases from landfills to spin a turbine that generates electricity. Using biomass in this way helps reduce the amount of material that goes to landfills and reduces the amount of greenhouse gases that would otherwise be released into the atmosphere. Before the 20th Century, 90% of Americans burned wood to heat their homes. Today, residents can choose from a new generation of wood- and pellet-burning appliances that are cleaner burning, more efficient, and powerful enough to heat many average-sized, modern homes.

[8] Residents should consult Hopewell Township Land Use Code to see if an ordinance to allow small wind turbines has been passed. In 2007, NJ Board of Public Utilities' New Jersey Small Wind Working Group developed a NJ Small Wind Model Ordinance for use by NJ municipalities.

- **Pellet burning appliances**.[9] Pellet stoves burn small pellets made from compacted sawdust, wood chips, bark, agricultural crop waste, waste paper, and other organic materials. Some pellet fuel appliances can burn a wide variety of biomass fuels, including nutshells, corn kernels, small wood chips, barley, beet pulp, sunflowers, dried cherry pits, and soybeans. They are more convenient to operate and have much higher combustion and heating efficiencies than ordinary wood stoves or fireplaces. As a consequence of this, they produce very little air pollution. In fact, pellet stoves are the cleanest of solid fuel-burning residential heating appliances. With combustion efficiencies of 78% to 85%, they are also exempt from United States Environmental Protection Agency (EPA) smoke-emission testing requirements. Pellet stoves have heating capacities that range between 8,000 and 90,000 Btu per hour. They are suitable for single family homes, apartments and condominiums.

  For more information, see *U.S. Department of Energy: Consumer's Guide to Energy Efficiency and Renewable Energy- Wood and Pellet Burning Stoves.* *http://www.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12570*

Hydroelectric Energy- The energy produced from flowing water, called hydropower or hydroelectric power, is the oldest and most readily available form of renewable energy. Residents that have access to flowing water on their property may be able to use a microhydropower system to generate their own electricity.

- **Microhyropower systems**. Microhydropower systems usually generate up to 100 kilowatts (kW) of electricity. Most of the hydropower systems used by homeowners, including farmers, qualify as microhydropower systems. A 10-kilowatt microhydropower system can generally provide enough power for a large home.

Renewable Energy Providers- Residents can support renewable energy in New Jersey without installing their own solar panels, microhydropower systems, or wind turbines by signing up for the CleanPower Choice Program from the New Jersey Board of Public Utilities' Office of Clean Energy. The program allows residents to choose a clean, renewable energy provider that supplies energy from sources including solar, wind, geothermal, and sustainable biomass.

For more information on renewable energy and purchasing renewable energy and systems for your home, visit the following websites:

- *New Jersey's Clean Energy Program*
  http://www.njcleanenergy.com/residential/programs/
- *National Renewable Energy Laboratory*
  http://www.nrel.gov/learning/
- *U.S. Department of Energy, "Renewable Energy"*
  http://www.eere.energy.gov/consumer/renewable_energy/

[9] Before purchasing and installing a pellet stove, refer to the 2006 International Residential Code New Jersey Edition under sections R1003.11.6 and R1003.11.1 for information on proper installation for pellet burning appliances.

Water Conservation Resources

Global water consumption rose almost tenfold in the last century, and many parts of the world are now reaching the limits of their supply. Populations continue to increase while water supplies dwindle. To highlight this growing problem, the United Nations (U.N.) declared 2003 The International Year of Freshwater. According to the U.N., if current trends continue, "two out of every three people on earth will suffer moderate to severe water shortages in little more than two decades from now. Globally, one in six people still have no regular access to safe drinking water, and more than twice that number (2.4 billion people) lack access to adequate sanitation facilities."

The problem is local as well as global. Water is in demand for a myriad of uses: recreation, mining and industry, irrigation, and riparian habitat preservation, among others. In the U.S., almost 90 gallons per day of drinking water are used per capita.[10] Residents can do their part to conserve water by making changes to some of their routine habits. Examples of these follow.

10 Easy–to-Implement Water Conservation Tips

1) Conduct a Home Water Audit at www.wateruseitwisely.com
2) Test toilets for "invisible leaks" by placing a few drops of food coloring or a dye tablet into the toilet's tank. Wait a few minutes and if the coloring appears in the bowl, the toilet is leaking and needs to be fixed.
3) Fix leaky faucets.
4) Retrofit your house with high-efficiency toilets, which use 60% less water than pre-1994 models and can save you roughly $100 a year.[11]
5) Don't run water when brushing your teeth. Every minute you reduce your faucet use saves 3 gallons of water.
6) Use your dishwasher and washing machines only for full loads.
7) Use a broom instead of a hose to clean your driveway or sidewalk.
8) Designate one glass for your drinking water each day to cut down on dishwasher cycles.
9) Install low-flow fixtures such as faucets and showerheads.
10) Use the air dry option on dishwashers.

For additional suggestions about conserving water at home visit the following websites:

- *City of Cambridge Water Department*
  http://www.cambridgema.gov/CWD/
- *Greener Choices, Consumer Reports*
  http://www.greenerchoices.org/products.cfm?product=watersaving
- *Water Conservation, Energy Star*
  http://www.energystar.gov/index.cfm?c=products.pr_protect_water_supplies

[10] EPA. Water on Tap- what you need to know http://www.epa.gov/safewater/wot/pdfs/book_waterontap_full.pdf page 10
[11] www.popularmechanics.com

Waste Reduction Resources

According to New Jersey Future, New Jersey's solid waste generation has steadily increased from 11.4 million tons in 1985 to 21.5 million tons in 2005.[12] To put that number in perspective, New Jersey generates enough trash to fill 5,600 garbage trucks per day. On a per-capita basis, New Jersey residents produce about 5.4 pounds of trash per day—more than twice the daily output of most industrialized countries.[13] Trash poses significant costs to the environment, no matter how it is disposed of. While burning it in one of the state's five incinerators produces energy, it also increases air pollution and greenhouse gas emissions. Alternately, dumping trash in one of the state's 12 active commercial landfills poses a series of adverse long-term impacts on water and air quality. For instance, biodegradation can emit hazardous gases for centuries, among them methane—a greenhouse gas 21 times more potent than carbon dioxide.[14] Preventing generation of waste in the first place is the most preferred method of waste management and residents can do this by practicing the 3 Rs: Reduce, Reuse, and Recycle. Examples of these follow.

10 Easy–to-Implement Waste Reduction Tips

REDUCE

1) Avoid products that are packaged for single use. Buy items in bulk and transfer the products to your own reusable containers.
2) Carry a mug with you wherever you go for takeout beverages.
3) For small purchases, skip the shopping bag. For larger purchases, bring your own.

REUSE

4) Switch from disposable to reusable products: food and beverage containers, cups, plates, writing pens, razors, towels, shopping bags, batteries, etc.
5) Buy products that will last and take care of them.
6) Join in with neighbors to purchase infrequently used products such as lawn mowers, ladders, etc.
7) Buy, sell or donate used goods instead of throwing them out.

RECYCLE

8) Create designated holding "bins" for each type of recycled product and place in convenient locations in your home/garage.
9) Select products made from recycled materials.
10) Compost yard trimmings and food scraps.

For more information on how to reduce, reuse and recycle, see:

- *Mercer County Improvement Authority*
  http://www.mcia-nj.com/recyclingcurbside.html
- *EPA's Consumer Guide for Reducing Solid Waste*
  http://www.epa.gov/epaoswer/non-hw/reduce/catbook/problem.htm
- *Freecycle*
  http://www.freecycle.org/

[12] New Jersey Future (2007). New Jersey Facts, Oct 16, 2007. www.njfuture.org
[13] New Jersey Future
[14] U.S. Environmental Protection Agency: Methane http://www.epa.gov/methane/scientific.html

Composting Resources

Backyard composting is an easy and inexpensive way to dispose of yard waste such as grass clippings, fallen leaves and small prunings. [15] By mixing yard waste in a pile with enough air and water to start the natural decaying process, compost with valuable nutrients for plants is formed.[9]

In season, leaves may account for over half the municipal solid waste collected and on a yearly basis may comprise 5% to 30% of the total municipal solid waste stream.[16] From an environmental perspective, composting saves valuable landfill space, reduces costs and concerns associated with incineration, and produces compost which can be used to improve soil.

Follow these simple steps to establish a compost pile:

1) Collect fall leaves in a pile.
2) Keep pile moist but not soggy.
3) Mix pile periodically.

For more information on composting visit the following websites:

- *Sustainable Princeton: Starting a Compost Pile*
  http://njssi.org/princeton/green_challenge.asp?Level2ItemID=2
- *Rutgers Backyard Leaf Composting*
  http://njaes.rutgers.edu/pubs/publication.asp?pid=fs074
- *Mercer County Compost Center*
  http://www.mgofmc.org/compostbins.html
- *US EPA, "Compost"*
  http://www.epa.gov/compost/
- *The Lazy Composter*
  http://www.guvswd.org/compost

[15] NJSSI, *Sustainable Princeton*. http://njssi.org/princeton/green_challenge.asp?Level2ItemID=2
[16] NJ DEP. Leaf composting manual for NJ municipalities. http://www.nj.gov/dep/dshw/rrtp/compost/intro.htm

Green Purchasing

Green purchasing includes the purchase of products that have a lesser or reduced effect on human health and the environment when compared with competing products that serve the same purpose. Many factors are taken into account when making these comparisons, such as:

1) Raw materials, including energy and water, used in the manufacture of the product
2) Type of production, (i.e., use of cleaner production processes)
3) Packaging and method of distribution
4) Distance of transport/local production

Price and performance are also important factors to consider and are critical determinants for consumers.[17] Green purchasing practices can be incorporated into your buying habits by researching products and following some simple suggestions listed below.

1) Buy recycled
2) Buy in bulk or multi-packs
3) Buy used
4) Trade with friends
5) Use canvas shopping bags
6) Look for the ENERGY STAR label when purchasing electronics

For more information on green purchasing visit the following websites:

- *Building Green, "Green Products"*
  http://www.buildinggreen.com/menus/index.cfm
- *EPA, "Green Purchasing"*
  http://www.epa.gov/epaoswer/osw/specials/funfacts/shopping.htm
- *New American Dream*
  http://www.newdream.org/buy/
- *Green Seal*
  http://greenseal.org/
- *Green Purchasing: A Guide for Local Governments and Communities*
  http://www.state.nj.us/dep/dsr/bscit/epp.pdf
- *National Geographic: The Green Guide*
  http://www.thegreenguide.com/

[17] NJ DEP, *Green Purchasing: A Guide for Local Governments and Communities*, http://www.state.nj.us/dep/dsr/bscit/epp.pdf.

Lawn and Garden Care Resources

All residents can have a profound impact on the environmental health of Hopewell Township. By making smart decisions about lawn maintenance and landscaping techniques, water quality and local habitat can be improved. Environmentally responsible landscaping increases native plant diversity, provides food, cover, and nesting areas for wildlife, and reduces stormwater runoff that dumps sediment and pollutants into local rivers and streams.[18]

Easy–to-Implement Lawn and Garden Care Tips

1) Plant native species and/or plants.
2) Plant bushes, shrubs and trees that bear berries or other fruits for birds.
3) Don't use herbicides and pesticides.
4) Use companion plants in your vegetable plot.
5) Choose plants that thrive in local soil conditions and therefore do not need fertilizers or extra watering to survive.
6) Use mixed grasses or herbs such as chamomile for your lawn.
7) Keep a compost pile.
8) Grasscycle, i.e. leave your grass clippings on the lawn.
9) Mulch flower beds and trees with 3 inches of organic material.
10) Plant a tree and save energy and money by shading your houses in the summer.

Conventional Lawn Alternatives and Organic Lawns

Environmental concerns across the nation have spurred the movement to reduce the size of lawns or replace grass with other plants. Non-native grasses put an unnecessary strain on water resources while synthetic fertilizers and pesticides used to keep grass green and weed-free are degrading water quality and harming non-target animals and plants.

There are a number of viable strategies that can be employed to reduce the negative environmental impacts of a conventional lawn. To begin, native meadow and prairie plantings can be logical substitutes for conventional turf grass because they require less water. They can still be mowed at a low height to preserve the accepted neat appearance of a lawn or create a soft playing surface. Residents can also consider reducing the size of their lawns by allowing part of the yard to return to natural habitat and still maintain a small area as a conventional lawn.[19]

Many residents enjoy maintaining a conventional lawn however, and may not want to reduce its size or replace the vegetation with an alternative grass. These residents can still help to reduce some of the

[18] Chesapeake Bay Foundation, *In Your Backyard: Bay-Friendly Lawns.* http://www.cbf.org/site/PageServer?pagename=act_sub_yourpart_yard_landscaping.
[19] Brooklyn Botanic Garden, *Easy Lawns.* http://www.bbg.org/gar2/topics/sustainable/handbooks/lawns/index.html

negative environmental impacts of lawn care by employing the following organic lawn maintenance techniques:[20]

1) Mow high – The simplest way to help lawns grow up healthy and dense is to adjust the cutting height to the highest setting and cut grass to a height of 3-4 inches.
2) Leave clippings on the lawn - As grass clippings decompose, they contribute valuable nitrogen to the soil - almost 2 pounds of nitrogen per 1,000 square feet of soil each season or about half of the lawn's annual fertilizer needs. They also add organic matter and provide a variety of other benefits to the soil and grass.
3) Forgo fertilizers – There will be no need to use fertilizers if grass is mowed often (but not too low) with a sharp blade and grown in soil that's rich in organic matter and biological activity.

For more information on organic lawn best management practices visit the following websites:

- *Brooklyn Botanic Garden - "Easy Lawns"*
  http://www.bbg.org/gar2/topics/sustainable/handbooks/lawns/index.html
- *Organic Gardening - "Organic Lawn Care"*
  http://www.organicgardening.com/feature/0,7518,s1-4-77-142,00.html
- *NOFA Guide to Organic Lawn Care*
  http://www.ctnofa.org/documents/OrganicLandCareGuide_000.pdf

Water Efficient Landscaping and Native Plants


Although New Jersey has relatively abundant water, fluctuations in precipitation do cause periodic shortages. In addition, the demands of a growing population are straining some water supplies. In rapidly growing communities, summertime water shortages are no longer uncommon and restricted water use, particularly outdoors, is increasingly familiar. New Jersey's most easily exploited water supplies have already been developed. Understandably, concerns about the environment and rising labor and capital costs have delayed additional development. For these reasons, water conservation looms ever more important, and our use of water to irrigate landscaping becomes an appropriate subject for examination. Experts agree that properly designed and managed landscaping can save large amounts of water. By wisely using water outdoors, we can reduce peak water demand, prevent drops in water pressure that endanger a community's fire-fighting ability, eliminate watering restrictions, and save energy needed to pump water into storage areas around town.[21]

One way to improve the water efficiency of landscaping is to use native plants, which not only require minimal watering, but are also better acclimated to the local environment, reduce the need for fertilizers and pesticides, and eliminate the problems associated with the introduction of invasive species. Because native plants require minimal maintenance, these species limit the need for upkeep with fossil fuel powered equipment, saving valuable natural resources and funds.

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[20] Organic Gardening, *Organic Lawn Care.* http://www.organicgardening.com/feature/0,7518,s1-4-77-142,00.html
[21] NJ Agricultural Experiment Station, *Landscaping for Water Conservation.* http://njaes.rutgers.edu/pubs/publication.asp?pid=E080

For more information on water efficient landscaping and native plants visit the following websites:

- *Landscaping for Water Conservation: A Guide for New Jersey*
  http://njaes.rutgers.edu/pubs/publication.asp?pid=E080
- *Native Plant Society of New Jersey*
  http://www.npsnj.org/

Backyard Habitats

Wildlife habitat restoration is especially needed in locations where commercial and residential development has degraded natural ecosystems. Creating habitat benefits the entire community of people, plants and wildlife through the creation of sustainable landscapes that require little or no pesticides, fertilizers and excess watering. These landscapes help keep water and air resources clean and are healthier for people and the environment. Residents are able to create backyard habitats for local wildlife by providing the four basic elements that all wildlife need: food, water, cover and places to raise young. In order to create a backyard habitat, follow the steps below.[22]

1) Make a map of your backyard, showing:
   a. plants that might provide food (such as acorns, nuts, berries, seeds, buds, or nectar) for wildlife
   b. birdfeeders
   c. birdbaths or other water sources
   d. plants that provide shelter (such as dense shrubs, evergreens, brush piles)
   e. places for birds and wildlife to raise their young (trees, shrubs, birdhouses)
2) Think about what types of wildlife you want to attract to your yard. Research the types of plants and trees that will attract them (i.e., provide food, shelter, and/or places to raise young). The National Wildlife Federation's (NWF's) Backyard Habitat web site is a good place to start: www.nwf.org/backyardwildlifehabitat.
3) If you don't have them already, plant some of your favorite wildflowers, shrubs, and/or trees that will attract wildlife and provide food, shelter, and places to raise young.
4) Make sure that your backyard has a year-round source of water. This can be as simple as the bottom of a clay pot (for the summer) and a basic heated birdbath for winter months.

For additional information on this topic and to find out how to certify the entire Township as a Community Wildlife Habitat under the National Wildlife Federation, visit the following websites:

- *National Wildlife Federation's Backyard Wildlife Habitat*
  http://www.nwf.org/backyard/
- *Burlington Community Wildlife Habitat Initiative*
  http://www.burlingtongardens.org/Burlington_Habitat_Initiative.html

[22] Friends of Burlington Gardens and the Vermont Community Garden Network. *Burlington Community Wildlife Habitat Initiative*. http://www.burlingtongardens.org/Burlington_Habitat_Initiative.html.

Integrated Pest Management

Pesticides, including insecticides, herbicides, rodenticides, and fungicides, are poisonous chemicals designed to kill a variety of plants or animals. Both the active chemical compounds and inert ingredients in pesticides may ultimately be toxic to humans and wildlife.

In general, pesticide use can impose many health and environmental risks. Continued dependence on pesticides has caused the evolution of strains of insects with a high resistance to pesticides. Outbreaks of secondary pests due to the destruction of their natural controls and damaging impacts on wildlife have occurred because of concentrations of pesticides in various food chains. During routine residential applications, pesticides can drift and settle on ponds, laundry, toys, pools and furniture among other household items. They can also make their way into homes when family members and pets pick up toxic residues and track them inside.

Integrated Pest Management (IPM) minimizes environmental impacts by using environmentally friendly methods to control pests. IPM's preventative, monitoring, and controlling techniques serve as an alternative to routine, indiscriminate spraying of chemical pesticides. IPM techniques enhance sustainability of vital natural systems and help promote lawns, trees and shrubs that are more resistant to insects and disease. IPM protects beneficial insects since it uses little or no pesticides. IPM also reduces threats to wildlife and water quality by lessening the amount of chemicals that will reach our drinking and recreational water resources.[23]

For more information on integrated pest management techniques visit the following websites:

- *ANJEC Integrated Pest Management*
  http://www.anjec.org/html/ipm.htm
- *Beyond Pesticides*
  http://www.beyondpesticides.org/
- *Northeastern IPM Center*
  http://northeastipm.org/
- *Pest Management Office of Rutgers Cooperative Extension*
  http://www.pestmanagement.rutgers.edu/
- *IPM Institute of North America*
  http://www.ipminstitute.org/

[23] ANJEC, *Integrated Pest Management.* http://www.anjec.org/html/ipm.htm.

Porous Paving Materials

Impervious surfaces significantly impact water quality because as storm water runs off an impervious surface, it carries pollutants into local water bodies and groundwater sources. Impervious surfaces collect particulate matter from the atmosphere, nitrogen oxides from car exhaust, rubber particles from tires, debris from brake systems, phosphates from residential and agricultural fertilizers, and dozens of other pollutants.

Porous paving materials used for driveways and landscape construction projects can help mitigate the problem of storm water runoff. There are different types of porous paving materials and techniques, which include open-jointed pavers that can be filled with turf or aggregate, "soft" paving materials such as wood mulch and crushed shell, and traditional decking. Other families of porous materials include porous concretes and asphalts, which still provide solid, safe surfaces for foot and vehicle traffic, but allow rainwater to percolate down into subsurface soils.[24]

For more information on the issue of storm water runoff and porous paving materials visit the following websites:

- *Paving Paradise: The Peril of Impervious Surfaces*
  http://www.ehponline.org/members/2005/113-7/ehp0113-a00456.pdf
- *New Jersey Stormwater Best Management Practices Manual*
  http://www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/bmpfeb2004pdfs/feb2004chap9_7.pdf
- *Research Links for Permeable Paving*
  http://www.plantsf.org/Research_PermPavers_0511_Friedel.pdf

[24] Environmental Health Perspectives, *Paving Paradise: The Peril of Impervious Surfaces*. http://www.ehponline.org/members/2005/113-7/ehp0113-a00456.pdf

Healthy Home Indoor Environment Resources

Indoor environmental quality refers to the quality of the air and environment inside buildings, based on pollutant concentrations and conditions that can affect the health, comfort and performance of occupants - including temperature, relative humidity, light, sound and other factors. Improving indoor environmental quality in an existing home involves renovating and maintaining a house in ways that reduce pollution sources and remove indoor pollutants while ensuring that fresh air is continually supplied and properly circulated.[25]

10 Easy–to-Implement Healthy Home Tips

1) Use non-toxic, biodegradable cleaners.
2) Use low or no volatile organic compound (VOC) paints in home improvement projects.
3) Use renewable materials such as bamboo flooring and non-toxic furniture to avoid off-gassing.
4) Use organic fertilizers and pest control to cut down on the pollutants tracked into your home by pets and people.
5) Use plants to improve indoor air quality.
6) Keep your home well-ventilated by leaving doors between rooms open, opening windows to allow for a good supply of outdoor air, and installing exhaust fans in bathrooms to remove moisture and chemicals from the house.
7) Test your home for radon. www.epa.gov/radon/zonemap/newjersey.htm
8) Test your home for lead. www.nj.gov/dca/dcr/leadsafe/index.shtml
9) Burn only wood in your fireplace--never garbage, plastic, petroleum products or charcoal.
10) Use stainless steel, cast iron and enameled cast iron cookware instead of non-stick pans that when heated above 680 degrees, release toxic fumes.

Green Cleaning

Many standard cleaning products contain and emit harmful chemicals and volatile organic compounds (VOCs). This can be especially dangerous due to the proximity to occupants and the frequency in which these products are used. There are many options for safe, non-toxic cleaning products from environmentally responsible companies. These natural cleaners are free of chemicals, phosphates, artificial colors, fragrance, harsh fumes, and clean well. Concentrated products save on packaging and can save you money. By making informed choices, exposure to unhealthy chemicals and the impact on the environment can be limited.[26]

Further information on these techniques and products can be found by visiting the websites below.

- *Green Home Cleaning Tips* http://www.newdream.org/newsletter/greencleaning.php
- *"Greening the Cleaning"* http://www.dienviro.com/index1.aspx?BD=17793
- *Green Seal Certified Products* http://www.greenseal.org/findaproduct/index.cfm

[25] US EPA, *Green Indoor Environments*. http://www.epa.gov/iaq/greenbuilding/index.html.
[26] USGBC *REGREEN Draft*. Strategy Library, "Indoor Environmental Quality-Use."

- *Seventh Generation*
  http://www.seventhgeneration.com/living_green/toxic_cleaning/cleaning_tips.html
- *NC State University Family and Consumer Sciences*
  http://www.ces.ncsu.edu/depts/fcs/index.html

Low-emitting Materials Selection

Many materials and furnishings found inside the home emit odorous, irritating, or harmful contaminants that cause discomfort to installers and occupants. Some of these materials include paints, coatings, adhesives, carpets, and wood paneling products. When planning home renovation projects, low-emitting products can be chosen to control the level of indoor pollution.

Paints and Coatings: Paints and coatings fall into the following categories: Architectural paints and coatings, anti-corrosive and anti-rust paints, and clear-wood coatings, finishes and stains. Paints and coatings should meet the minimum low volatile organic compound limit established by Green Seal standards.[27]

Carpet Systems: All carpets and carpet cushions should meet testing and product requirements of the *Carpet and Rug Institute's Green Label Plus Program.* In addition, all carpet adhesive should demonstrate a volatile organic compound limit of 50g/L.[28] All carpet suppliers and installers should be aware of these characteristics and able to answer questions about the materials they are selling or installing.

Wood Paneling Products: Ensure that particleboard, medium-density fiberboard (MDF), and hardwood plywood substrates are certified to low formaldehyde emission standards ANSI A208.1, ANSI A208.2, and ANSI/HPVA HP1, respectively. Select composite wood/agrifiber panel products that either contain no added urea-formaldehyde resins or are third-party certified for low formaldehyde emissions.[29]

For more information on purchasing low-emitting materials visit the following websites:

- *Green Seal Certified Products*
  http://www.greenseal.org/findaproduct/index.cfm
- *Building Green, "Green Products"*
  http://www.buildinggreen.com/menus/index.cfm
- *Carpet and Rug Institute's Green Label Plus Program*
  http://www.carpet-rug.org/commercial-customers/green-building-and-the-environment/green-label-plus/index.cfm
- *EPA, "Indoor Air Quality for Homes"*
  http://www.epa.gov/iaq/homes/
- *Energy Star, "Indoor Air Package"*
  http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_iap

[27] LEED New Construction 2.2, Low-emitting materials: Paints and Coatings.
[28] LEED New Construction 2.2, Low-emitting materials: Carpet Systems.
[29] NAHB Green Home Guidelines, Indoor Environmental Quality.

Appendix C

Low Impact Development Guidelines

The following are some examples which may be used throughout the Sourland Mountain Region and should be tailored to each community, as needed.

Green Roofs

Like most pavement, roofs are designed to be impervious. Unlike pavement, pervious roofs are not acceptable. However, a technique known as green roofs is commonly used in Europe and frequently in this country. Green roofs use a combination of live plants and soil to create a stormwater management facility on roof tops. Green roofs are designed to hold water and provide for evapotranspiration and cleaning action, reducing the need for additional detention and pollutant reduction. They are installed on generally flat roofs where the roof can hold a significant amount of water and release it slowly. While there are some additional costs in installation, there are important energy savings that should offset the costs through energy savings and increased longevity of roof materials because they would not be subjected to extreme heat or cold or intensive sunlight.

Green roofs should be considered as a Low Impact Development technique for use on new non-residential development anywhere in the Sourlands. However, not all non-residential development can implement this technique since few have a real need for sloped roofs. The rooftops of apartment buildings should also be considered as appropriate locations for green roofs. The technique can be used in both development and redevelopment. The use on steeper roofs is more difficult, and so for most residential units green roofs will not prove to be a practical technique, though building codes should allow for green roofs in low density zones. The zoning or building codes should be modified to encourage green roofs on specific classes of buildings or land uses.

Projects which do not include a green roof should be required to demonstrate use of other methods whereby stormwater is captured and utilized on-site.

Narrower Roads

Narrower roads may be appropriate in the Sourlands neighborhoods to maintain the rural nature of the region. Local zoning or subdivision regulations should provide for narrower roads, where appropriate. The Sourlands Mountain Alliance should develop recommendations for adoption into the RSIS to implement this concept, which will simultaneously reduce runoff, save land, protect environmental resources and reduce development costs.

Rain Gardens

Rain gardens are small, specifically designed, vegetated depression areas typically used to store and recharge rain from a residential roof or driveway runoff, acting like a small retention facility. Rain gardens utilize native plants to intercept runoff from rooftops and adjacent impervious surfaces, allowing infiltration and recharge of ground water. The vegetated soil layer is underlain by gravel or small rock in a manner that ensures proper

drainage so that ponding does not occur. Rain gardens can be used primarily for single-family dwellings or two- or three-family dwellings.

All development and redevelopment projects should utilize rain gardens whenever feasible. Local site plan and subdivision applications should require rain gardens as part of the landscape plan submission. Where a rain garden is not feasible, the application should demonstrate an alternative method for capturing and recharging rainwater on-site. A useful publication prepared by the Native Plant Society of New Jersey, "The Rain Garden Manual for New Jersey," provides a "how to" guide for constructing a rain garden. Rain gardens may be designed for any size lot.

Vegetated Swales

A vegetated swale is a broad, shallow channel with a dense stand of vegetation covering the side slopes and bottom. Swales can be natural or manmade, and are designed to trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of storm water runoff. The vegetation in the swales should be native and should be mowed only once or twice a year to discourage invasive plants.

Vegetated swales can serve as part of a storm water drainage system and can replace curbs, gutters and storm sewer systems. Therefore, swales are best suited for residential, industrial, and commercial areas with low flow and smaller populations.

Curbless Roads

Curbs hold water on roads until it can be funneled into an engineered stormwater system. If water drains off the road into lawns or natural areas even when there is a storm sewer system, a portion of the stormwater is held on site for recharge. Time of concentration for stormwater runoff is reduced, which can reduce stormwater management costs.

This technique is most useful in residential development; in commercial and many other nonresidential areas, there generally is insufficient natural landscape or lawn area to handle the water. However, where there are extensive lawns in nonresidential areas, this technique may also be used. Site plan and subdivision regulations should provide for road crown and other standards that make a curbless road drain. A key part of this technique is to have reinforced shoulders, by installing base material several feet beyond the pavement. The regulations may need to identify areas where this is unsuited due to topography or require its use with other techniques. An alternative technique that may be used in more densely developed areas is the curb cut, which leads to a small sand infiltration area next to the road surface.

Swale Blocks

Swale blocks are small check dams in ditches or swales designed to slow runoff, allowing for greater recharge and cleaning and reduced peak runoff. Swale blocks may be used in road side ditches, swales or, where regulations permit, ephemeral streams. Local site plan and subdivision regulations should set forth areas where these should be used and

the thresholds for using them. Terrain which is very flat or very steep may not be appropriate locations.

Reverse Soil Compaction

During the process of development, even open spaces are compacted, greatly reducing the soil's capability to recharge and slow runoff. Grading, equipment movement, and temporary storage all result in compaction. Tilling the land that will be planted in lawns or other landscaped areas enhances the ability to function efficiently.

All lawn areas and open spaces that are being revegetated should be required to have reverse compaction. The graded areas should be tilled prior to replacing top soil and again after top soil is spread to achieve maximum results. Subdivision regulations should require this of all such areas containing more than 3,000 square feet per lot or pervious area.

Best Management Practices for Stormwater

The NJDEP Stormwater BMP Manual can be accessed on their website;
http://www.state.nj.us/dep/stormwater/bmp_manual2.htm

Figure 1: Sourland Mountain Regional Location

The Sourland Mountain

A Portion of Central New Jersey

September 2010

N
W E
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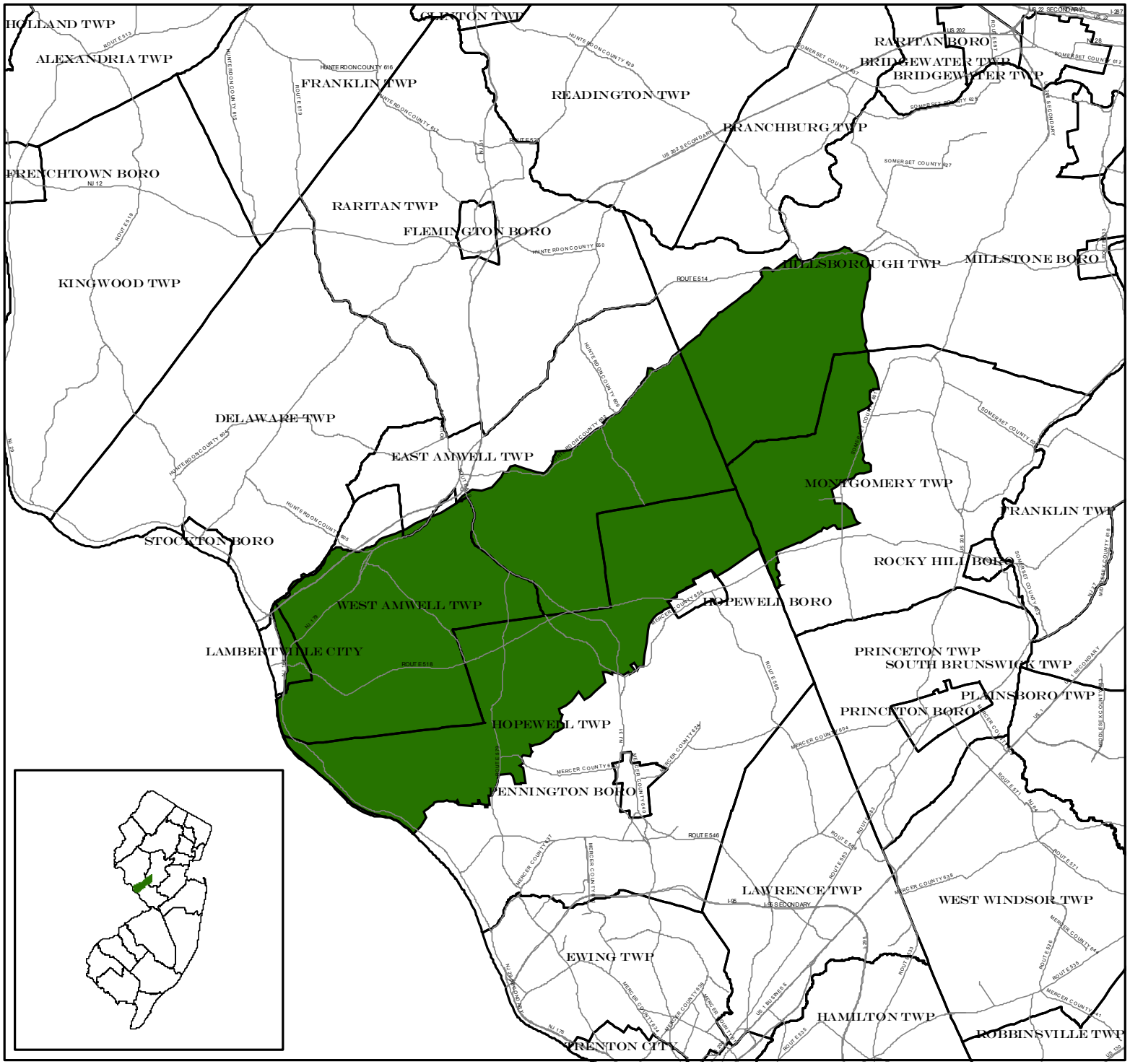
Legend

Sourland Mountain Region



This map was developed using New Jersey Department o Environmental Protection Geographic Information Systen digital data, but this secondary product has not been NJDEf verified and is not State-authorized.

Data Source:
NJDEP
New Jersey Office of Smart Growth

BANISCH
ASSOCIATES, INC.
Planning and Design

Figure 2: Sourland Mountain Study Area

The Sourland Mountain

A Portion of Central New Jersey

September 2010

0 0.5 1 2 Miles

Legend

Study Area Boundary

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Source:
NJDEP
New Jersey Office of Smart Growth

BANISCH ASSOCIATES, INC.
Planning and Design

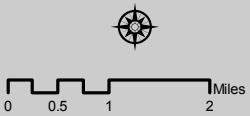
FRANKLIN TWP
KINGWOOD TWP
FLEMINGTON BORO
READINGTON TWP
BRANCHBURG TWP
RARITAN TWP
HILLSBOROUGH TWP
DELAWARE TWP
EAST AMWELL TWP
MONTGOMERY TWP
HOPEWELL BORO
WEST AMWELL TWP
PRINCETON TWP
LAMBERTVILLE CITY
HOPEWELL TWP
PRINCETON BORO
PENNINGTON BORO
LAWRENCE TWP
WEST WINDSOR TWP

Figure 3
Riparian Areas and 2007 Forested Areas

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



Legend

- Sourland Mountain Region
- Riparian Areas
- 2007 Forested Areas

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
2007 Land Use/Land Cover - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.
"NJDEP Ambient Biomonitoring Network (AMNET) 2000", Originator - New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), Source Data Scale - 1:24,000
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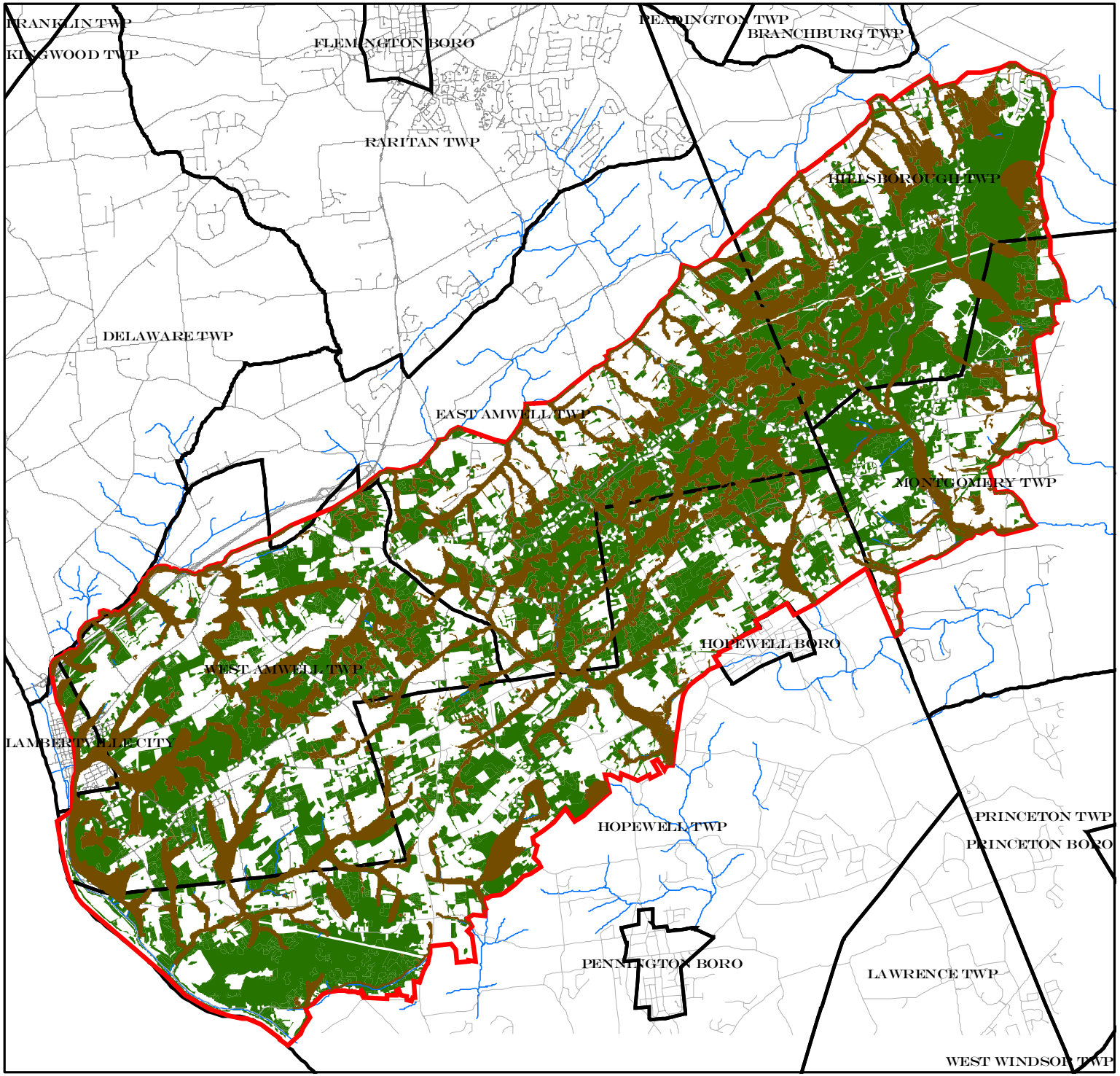
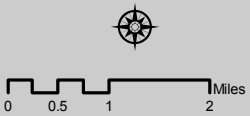


Figure 4
Wetlands and Vernal Pools

The Sourland Mountain Region
A Portion of Central New Jersey
September 2010



Legend

- Vernal pool
- Sourland Mountain Region
- 2007 Wetlands

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
2007 Land Use/Land Cover - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.
"NJDEP Ambient Biomonitoring Network (AMNET) 2000", Originator - New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), Source Data Scale - 1:24,000
Banisch Associates, Inc.

BANISCH
ASSOCIATES, INC.
Planning and Design

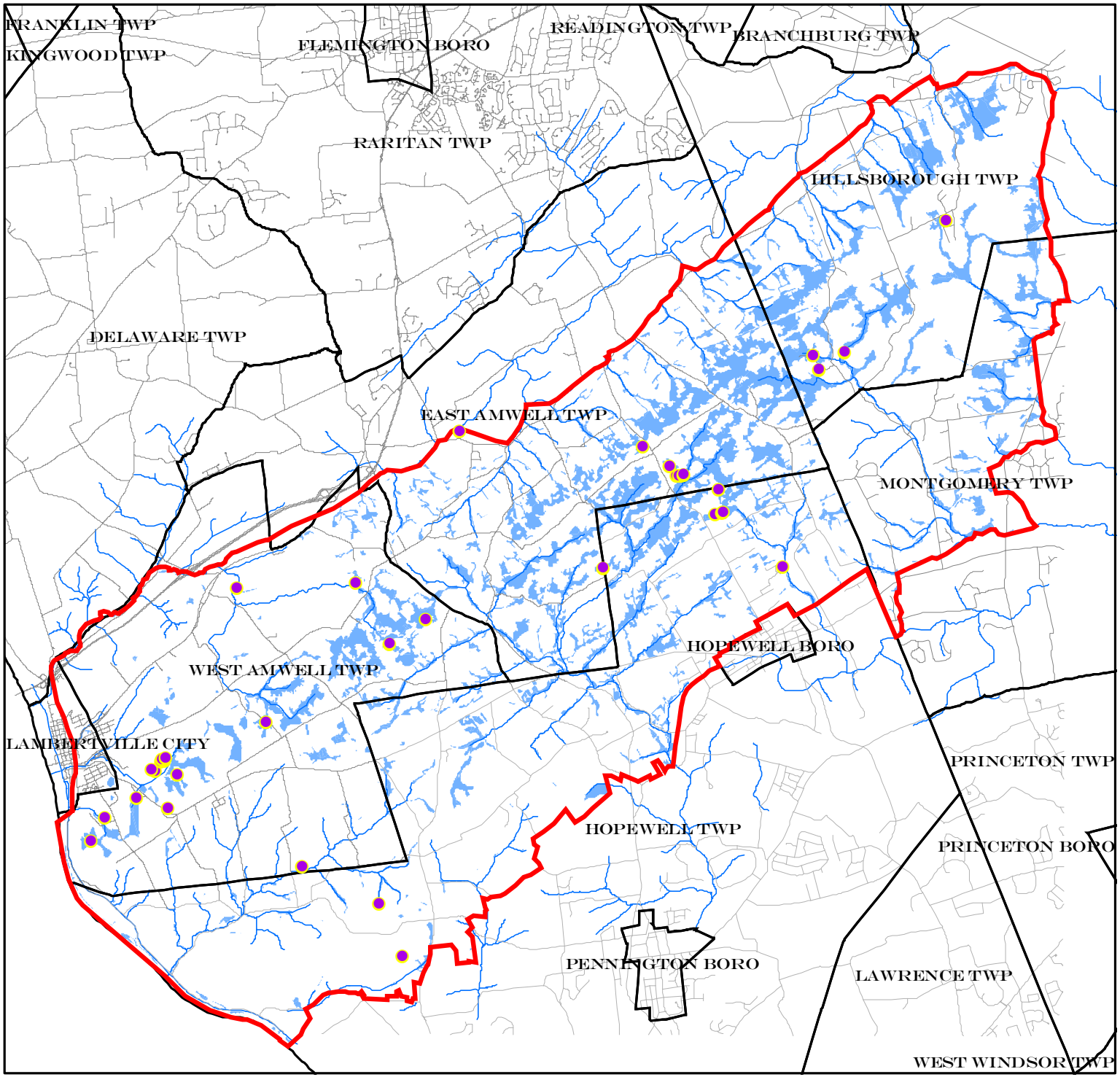
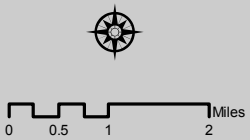


Figure 5
Steep Slopes

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



Legend

- Slopes less than 12%
- Slopes 12% to 15%
- Slopes greater than 15% to 25%
- Slopes greater than 25%

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
2007 Land Use/Land Cover Edition - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.
"NJDEP Ambient Biomonitoring Network (AMNET) 2000", Originator - New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), Source Data Scale - 1:24,000
Banisch Associates, Inc.

BANISCH
ASSOCIATES, INC.
Planning and Design

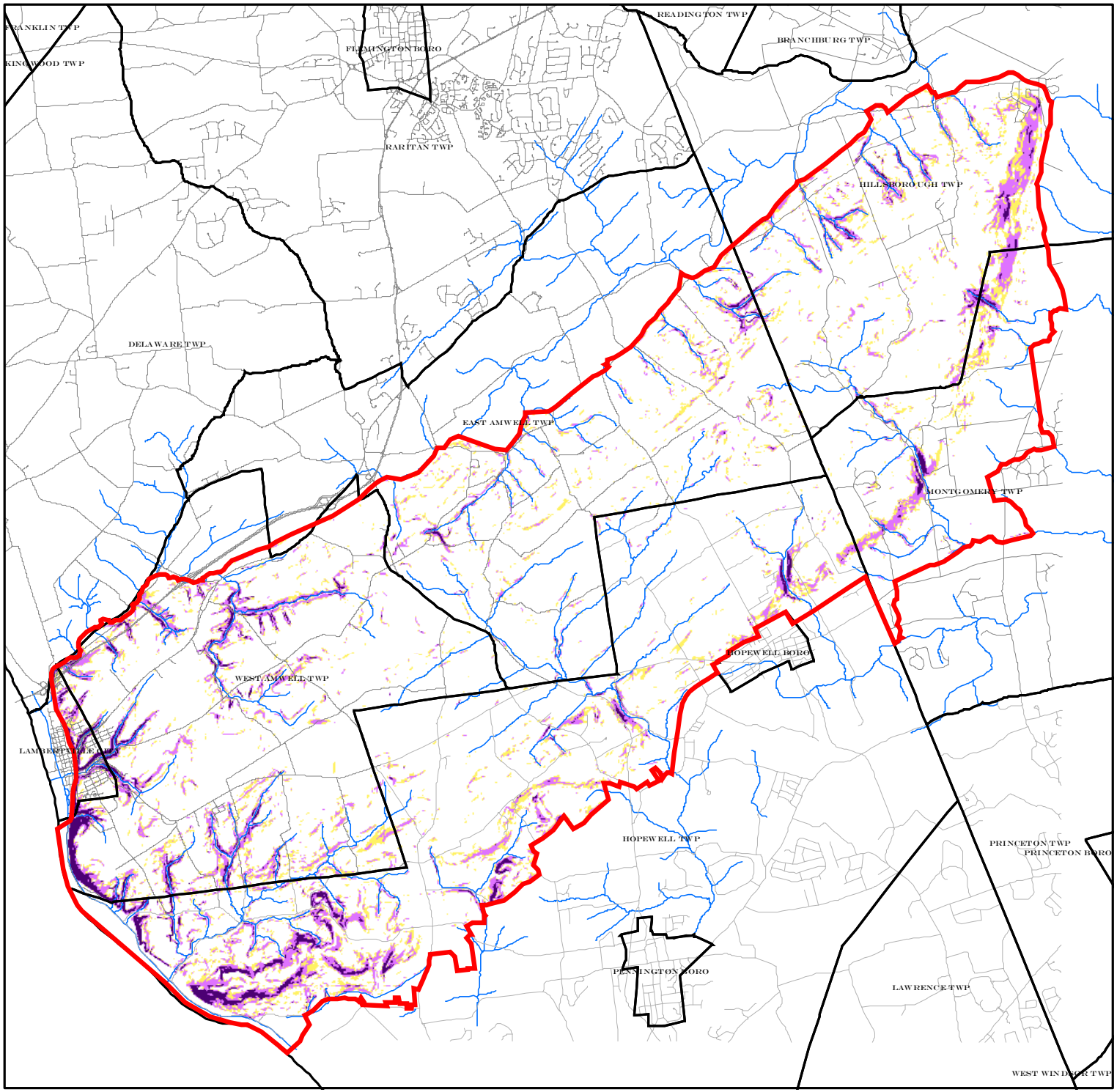
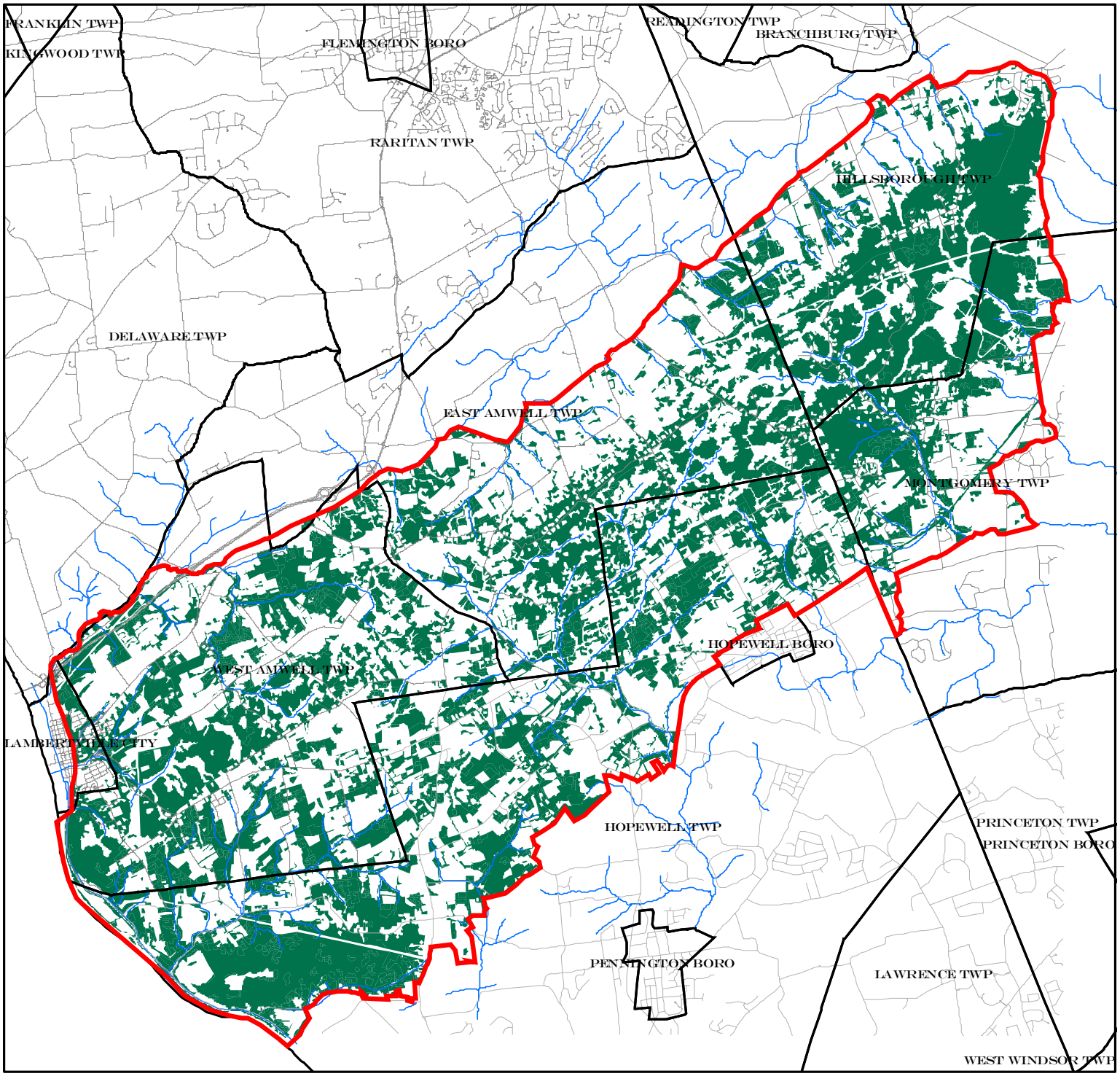


Figure 6
Forested Areas

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



Miles

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Legend

Sourland Mountain Region

Forest

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
2007 Land Use/Land Cover Edition - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.
"NJDEP Ambient Biomonitoring Network (AMNET) 2000", Originator - New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), Source Data Scale - 1:24,000
Banisch Associates, Inc.

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Figure 7
Grassland Areas

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010

0 0.5 1 2 Miles

Legend

Sourland Mountain Region

Grassland

This map was developed using New Jersey Department o Environmental Protection Geographic Information Syster digital data, but this secondary product has not been NJDEI verified and is not Stateauthorized.

Data Sources:
2007 Land Use/Land Cover Edition - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.
"NJDEP Ambient Biomonitoring Network (AMNET) 2000", Originator - New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), Source Data Scale - 1:24,000
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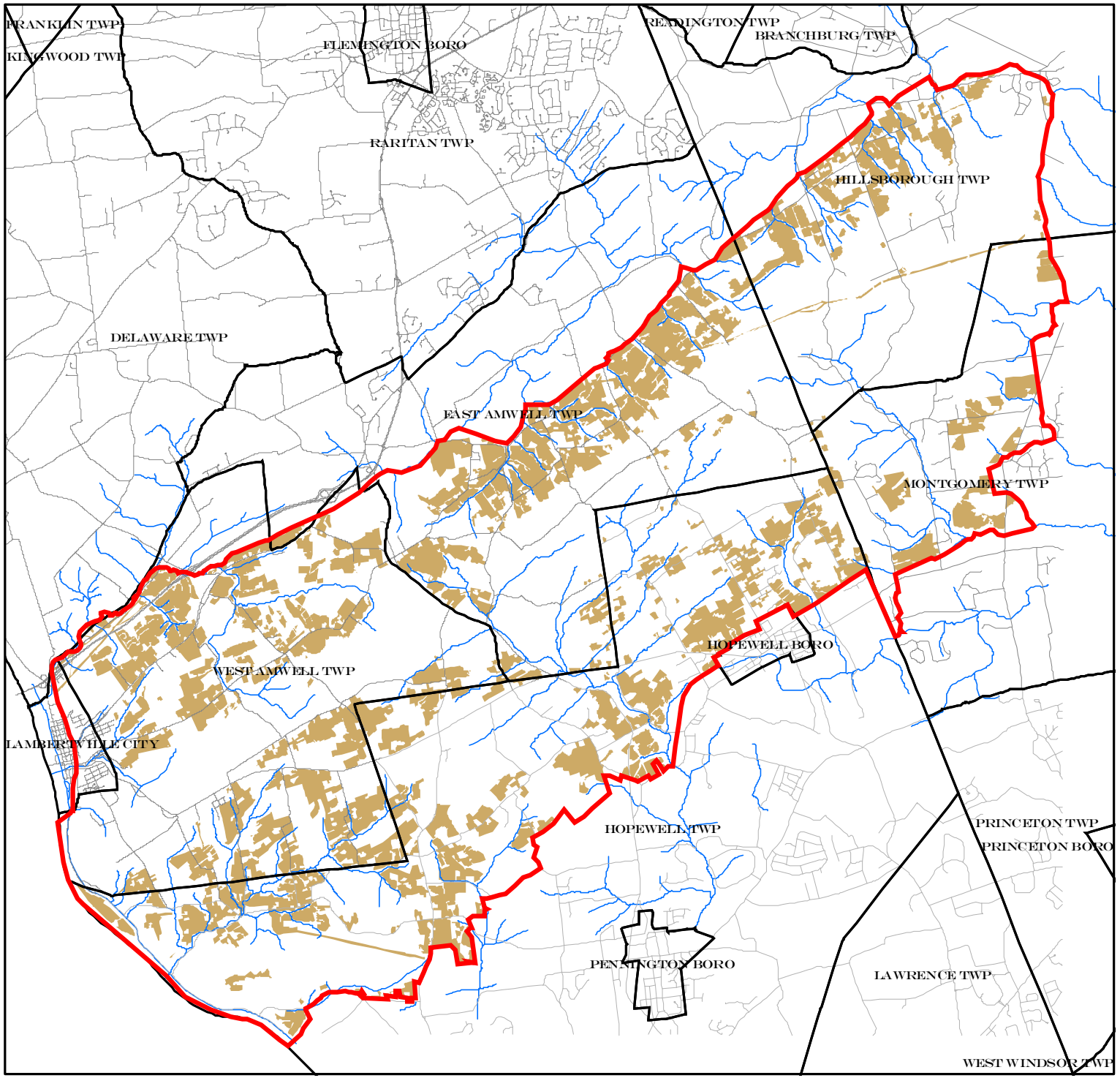

Figure 8
Critical Habitat

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010

0 0.5 1 2 Miles

Legend

- Rank 1
- Rank 2
- Rank 3
- Rank 4

Rank	Indication
1	Suitable habitat with no field survey conducted
2	Habitat patch with State special concern species present
3	Habitat patch with State threatened species present
4	Habitat patch with State endangered species present
5	Habitat patch wi th Federal threatened or endangered species present

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State -authorized.

Data Sources:
Source Data Scale - 1:24,000
NJ Landscapes Version 2.1
Banisch Associates, Inc.

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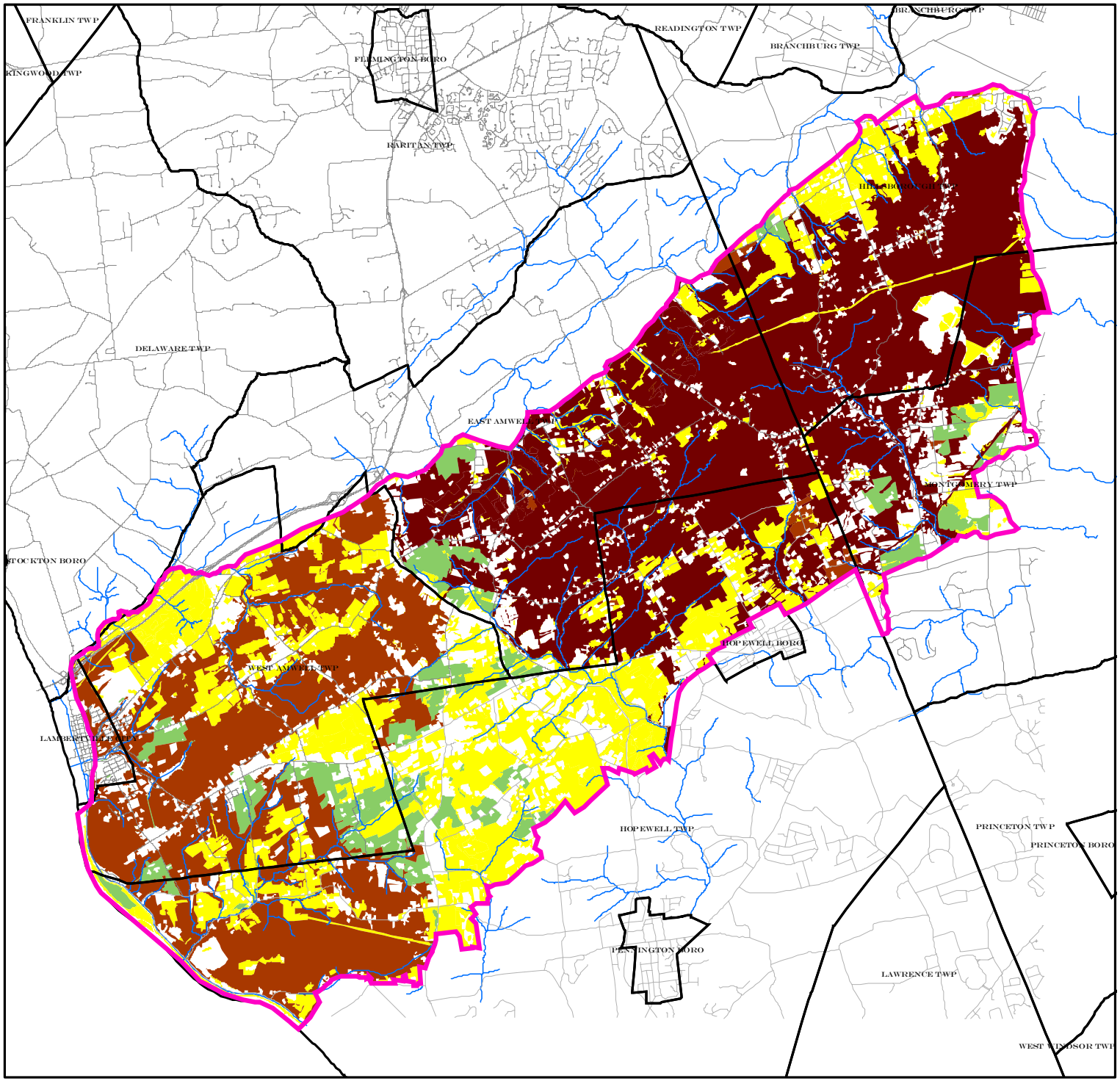
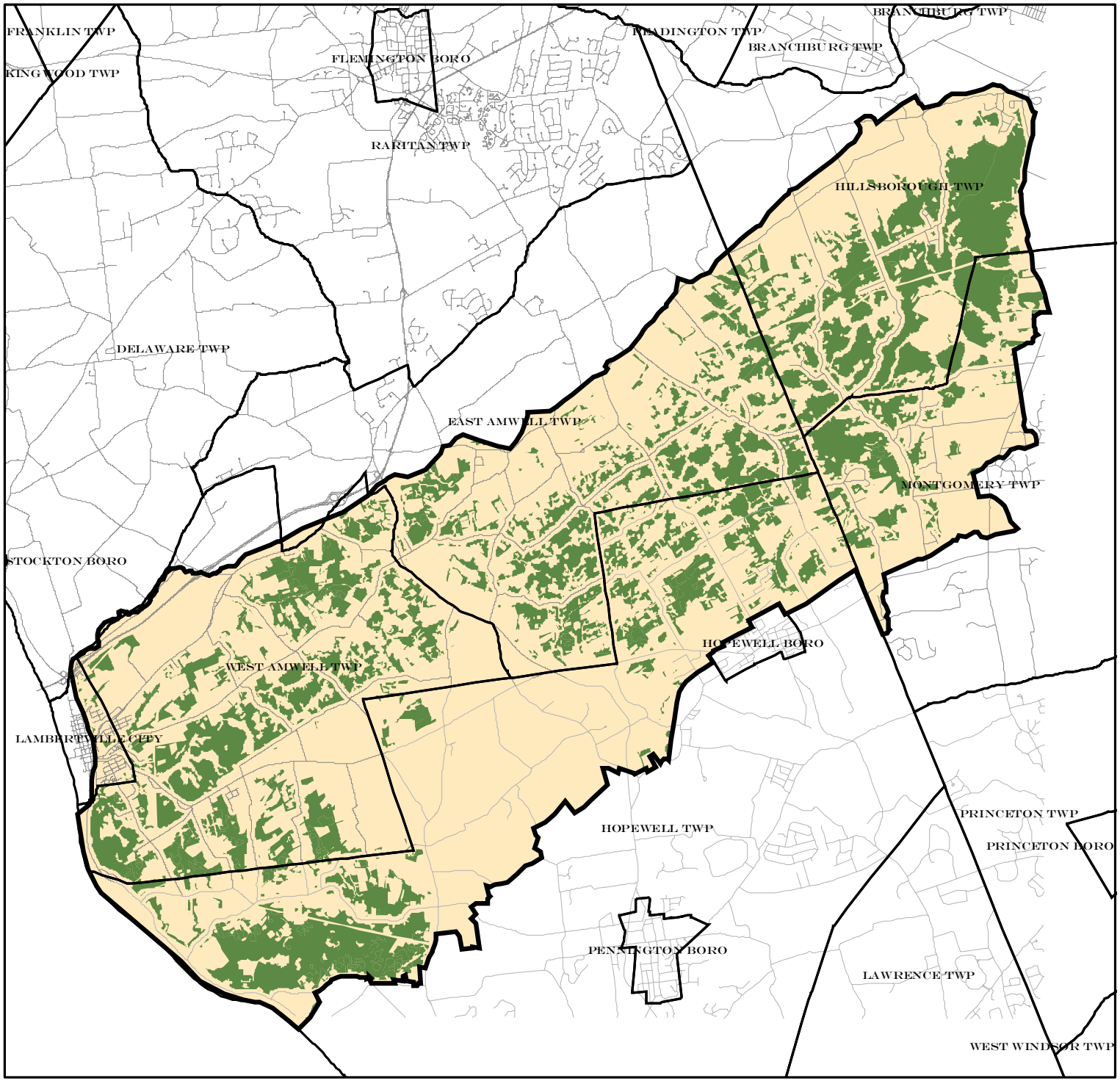


Figure 9
Core Forest Areas

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



0 0.5 1 2 Miles

Legend

- Forest Integrity Indicators
- Sourlands Mountain Region

This map was developed using New Jersey Dep
Environmental Protection Geographic Informatio
digital data, but this secondary product has not bee
verified and is not State authorized.

Data Sources:
2007 Land Use/Land Cover Edition - WMA 10 (Millstone Watershed Management Area), Originator - NJDEP
Source Data Scale - 1:24,000
NJ Landscapes Version 2.1 - New Jersey Department of Environmental Protection (NJDEP), Division of Fish Wildlife, Endangered Nongame Species Program (ENSP), Banisch Associates, Inc.

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Figure 10
Interior Forest Areas and Preserved Open Space

Sourland Mountain District
A Portion of Central New Jersey
September 2010

Legend

- Preserved Open Space
- Interior Forest Areas

0 0.5 1 2 3
Miles

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Source:
NJDEP
D&R Greenways

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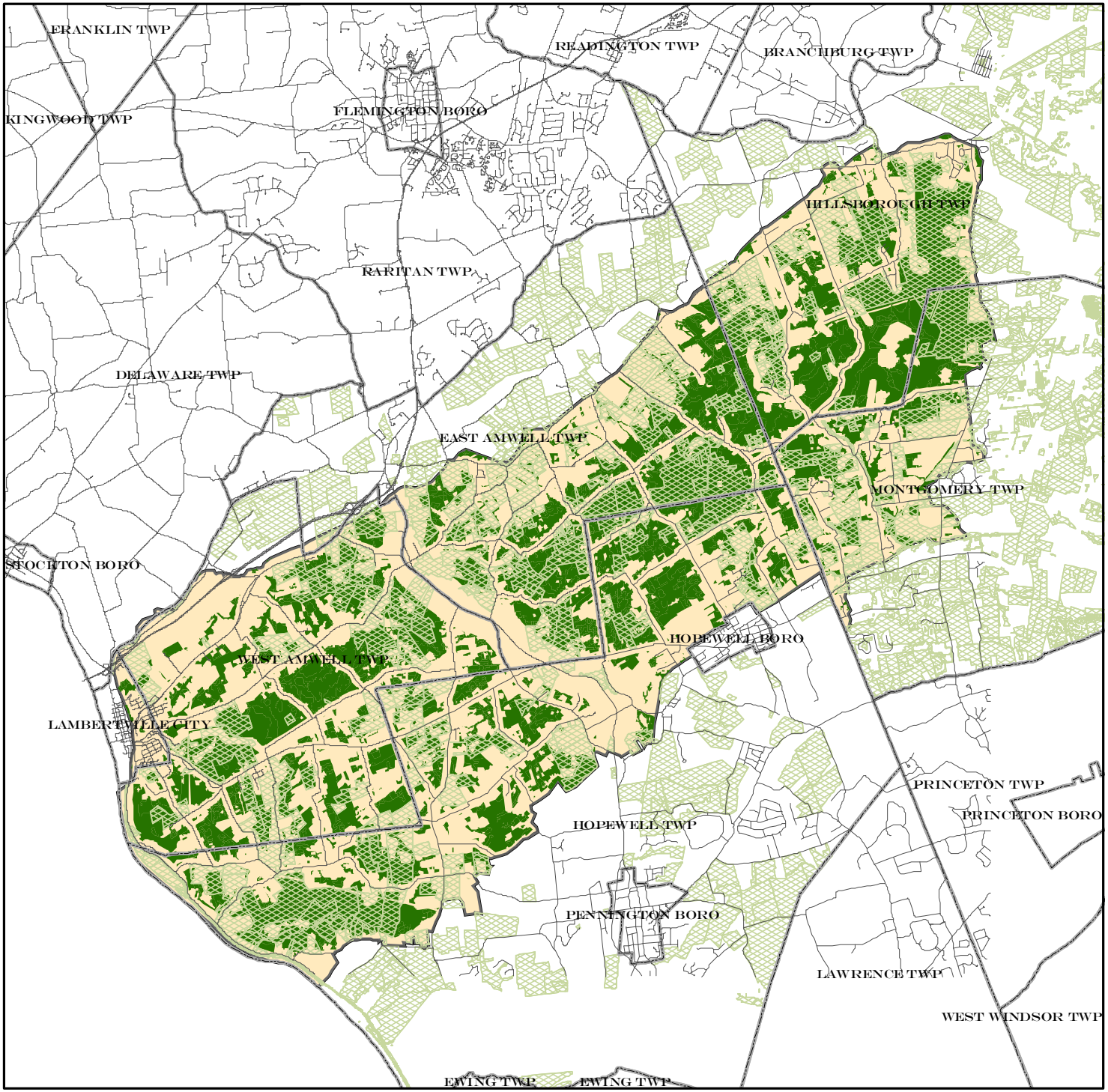

Figure 11
Open Space and Preserved Lands

Sourland Mountain District
A Portion of Central New Jersey

September 2010

Legend

- Sourlands Boundary
- Municipally Owned
- Board of Education
- County Owned
- State Owned
- Non-Profit/Private Preserved Land
- Conservation Easement
- Preserved Farmland
- Other Preserved Land

0 0.5 1 2
Miles

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Source:
NJDEP
D&R Greenways

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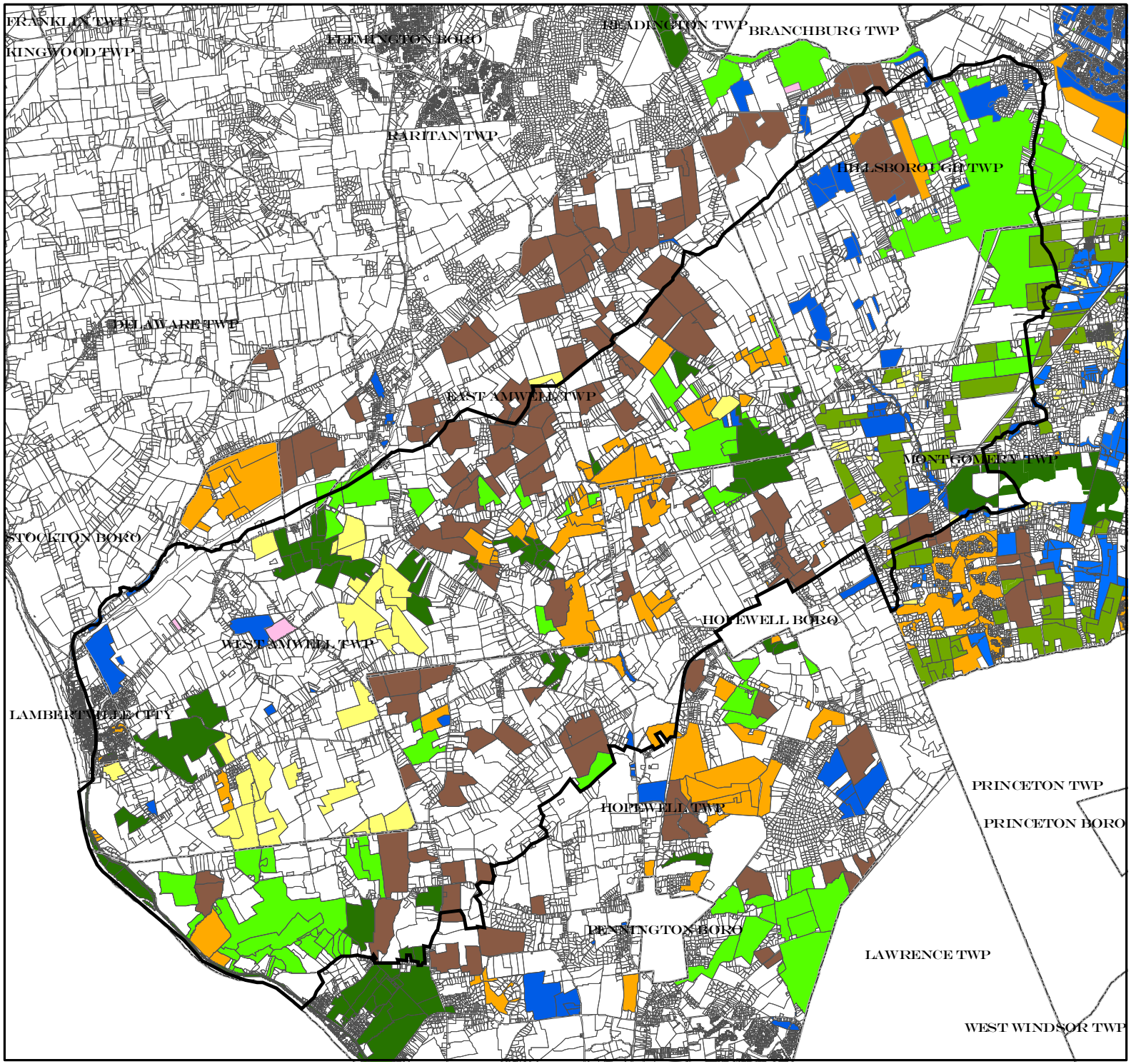
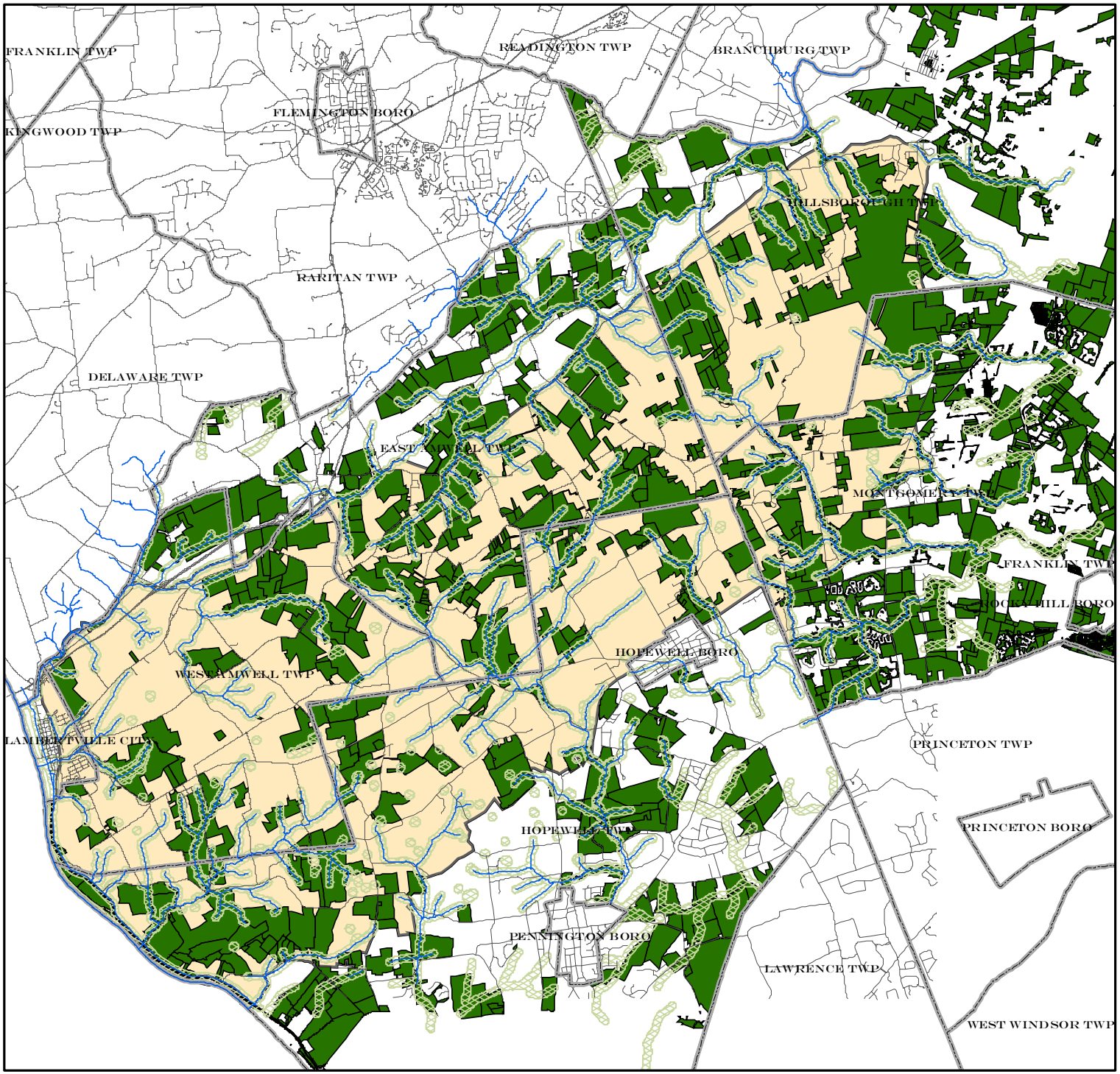


Figure 12
Suggested Greenway Linkages

Sourland Mountain District
A Portion of Central New Jersey

September 2010



Legend

- Sourland Mountain Region
- Suggested Greenway Linkages
- Preserved Open Space

N
W E
S

0 0.5 1 2
Miles

This map was developed using New Jersey Department o
Environmental Protection Geographic Information Syster
digital data, but this secondary product has not been NJDEI
verified and is not Stateauthorized.

Data Source:
NJDEP
D&R Greenways

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Figure 13:
Areas of Critical Importance for Water Resources

Sourland Mountain District
A Portion of Central New Jersey

September 2010

Legend

- 10% or Less Critical Importance
- 10%-50% Critical Importance
- 50%-90% Critical Importance
- 90%+ Critical Importance

0 0.5 1 2 3
Miles

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Source:
New Jersey Water Supply Authority
NJDEP
D&R Greenways

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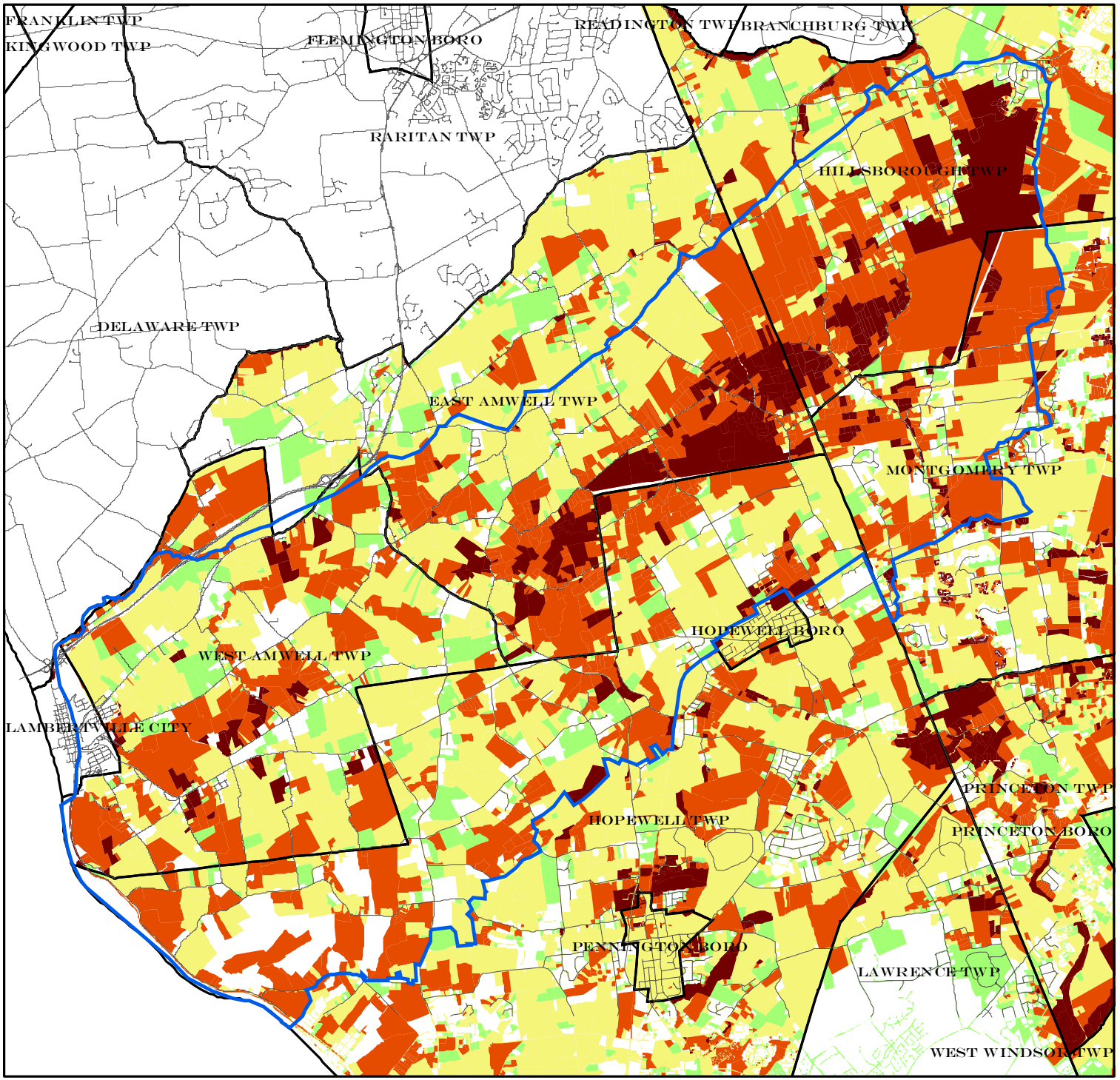

Figure 14
Garden State Greenways

Sourland Mountain District
A Portion of Central New Jersey

September 2010

Legend

Sourland Mountain Region

Garden State Greenways

- Agriculture/Grassland
- Emergent Wetland
- Forested Wetland
- Upland Forest

N
W E
S

0 0.5 1 2
Miles

This map was developed using New Jersey Department o
Environmental Protection Geographic Information Syster
digital data, but this secondary product has not been NJDEI
verified and is not Stateauthorized.

Data Source:
NJDEP
D&R Greenways

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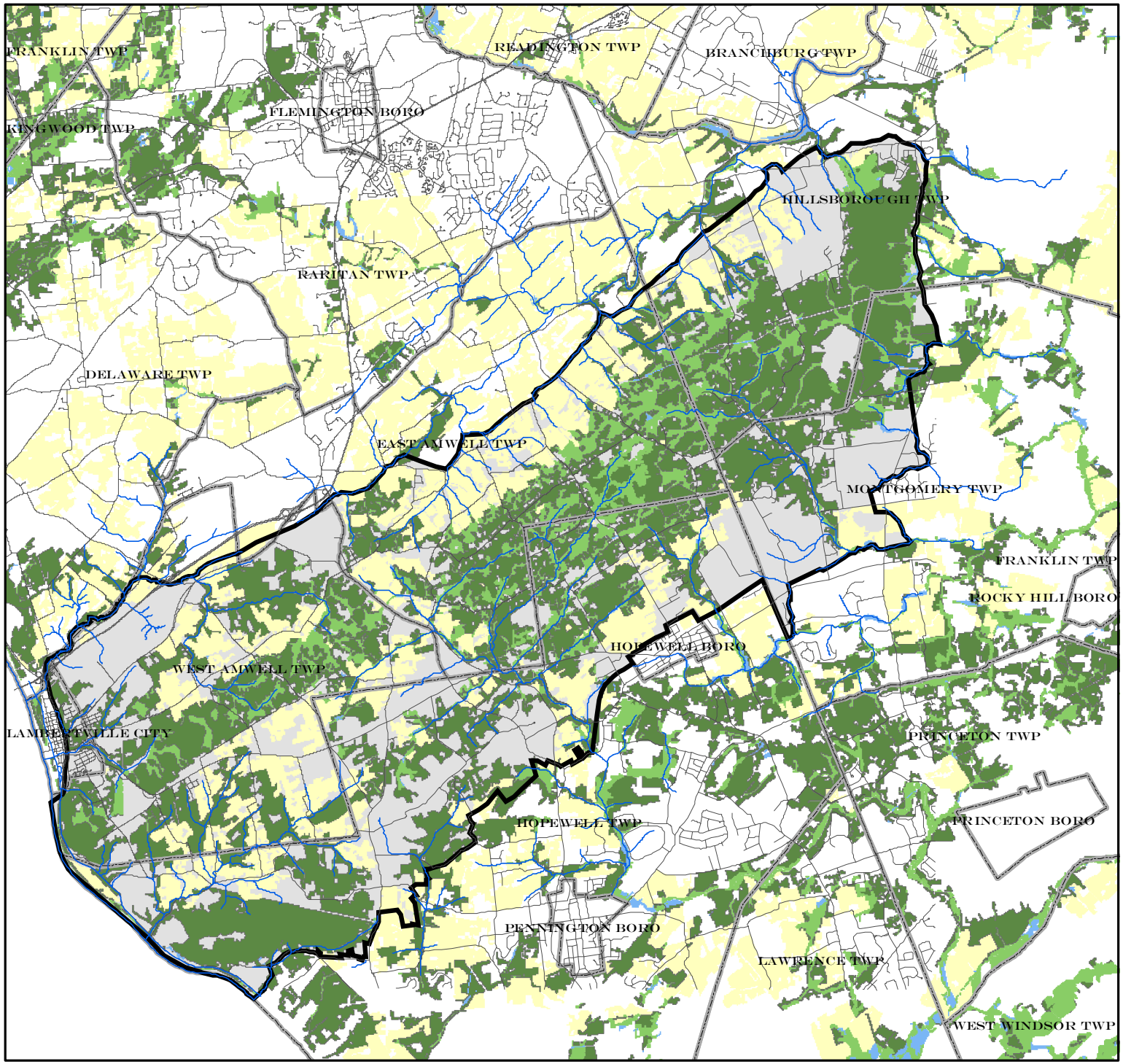


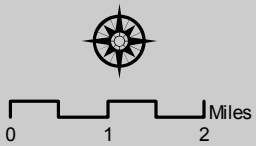
Figure 15

2007 Land Use/ Land Cover

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



Legend

- Agriculture
- Barren Land
- Forest
- Urban
- Water
- Wetlands

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
2007 Land Use/Land Cover
NJDEP

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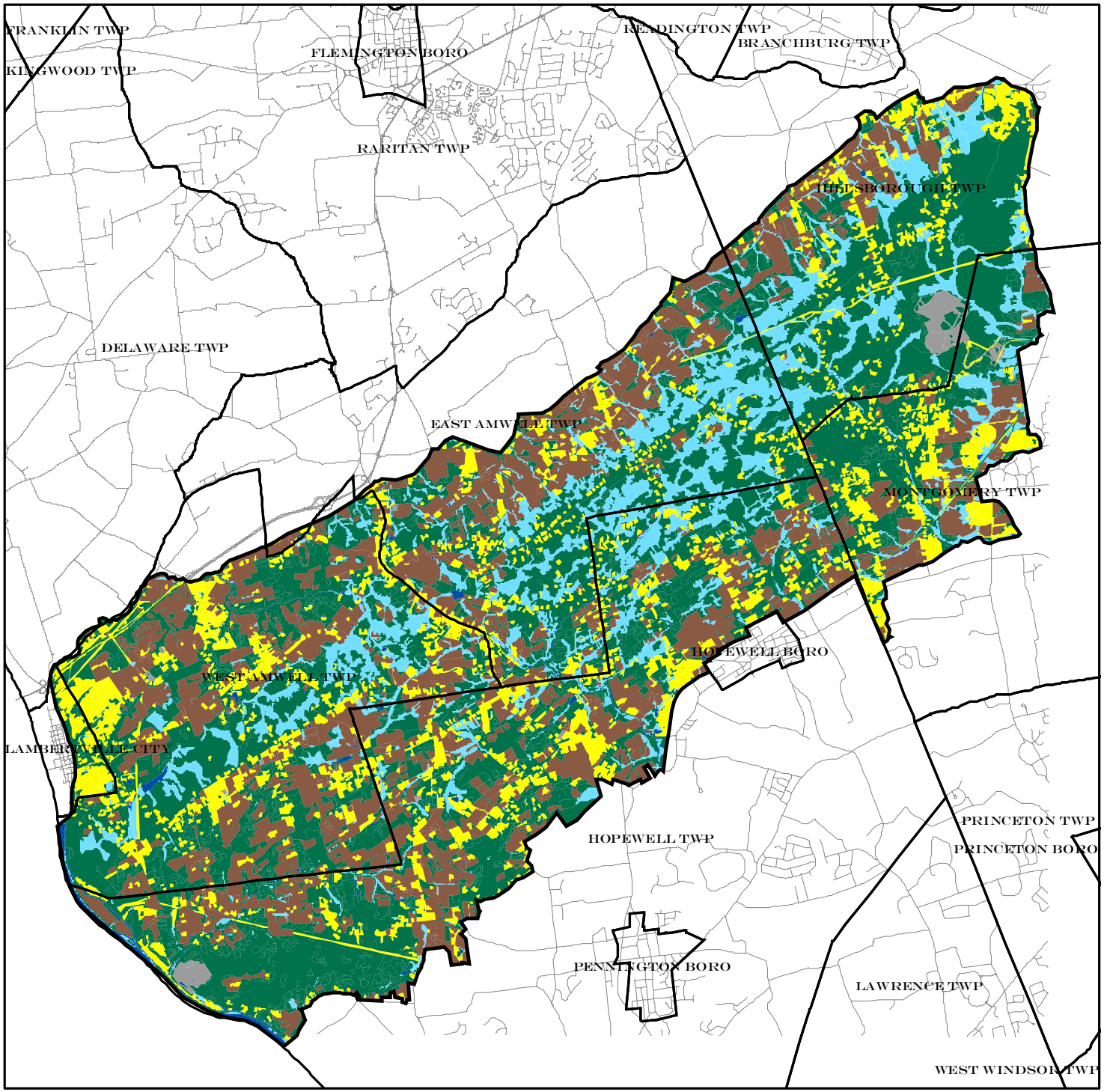


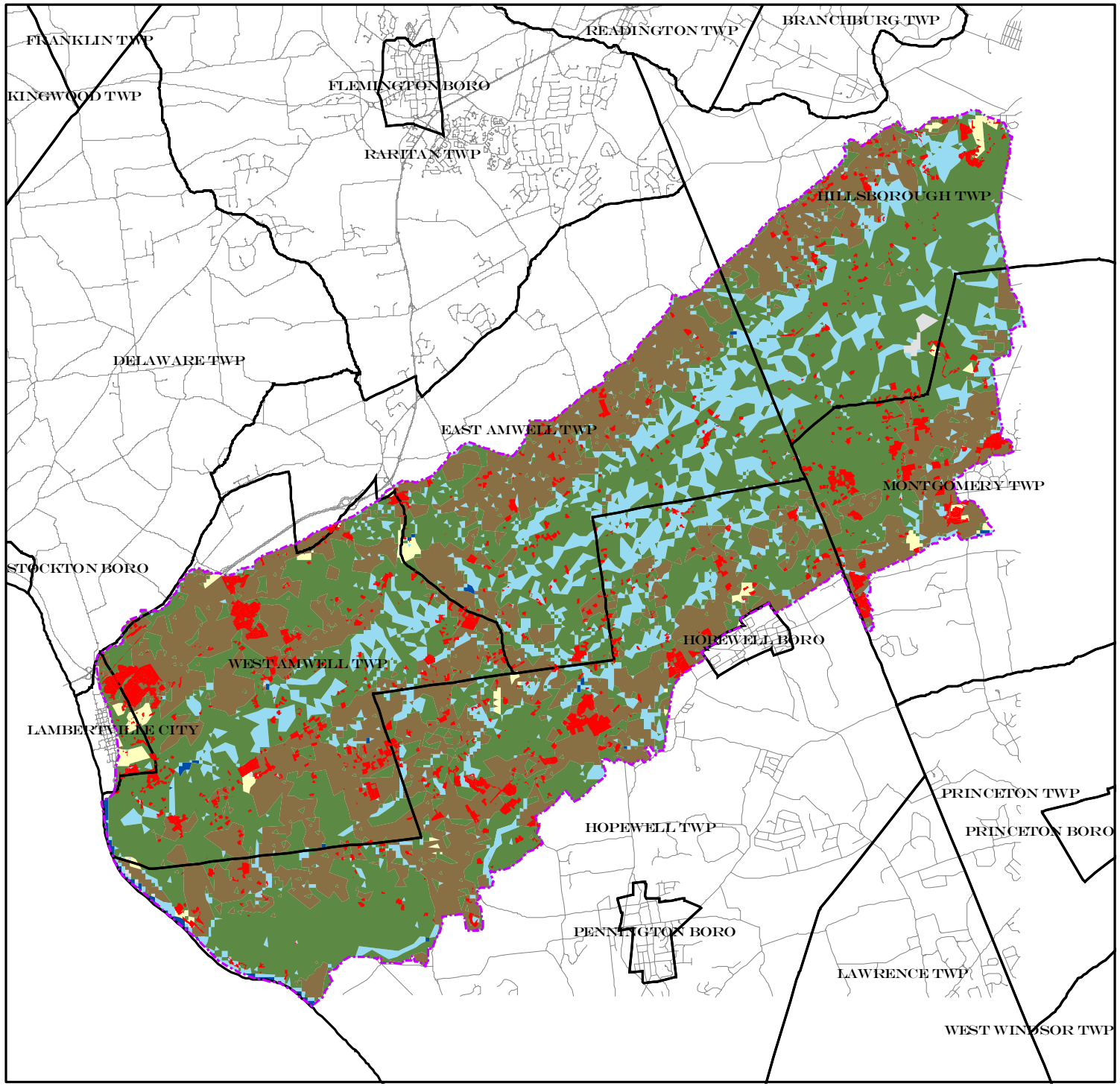
Figure 16

1972-2007 Land Use/ Land Cover Changes

The Sourland Mountain Region

A Portion of Central New Jersey

September 2010



Miles

0 1 2

Legend

- Sourland Mountain Region
- New Developed Areas Since 1972

1972 Land Use/Land Cover

- Barren Land
- Agriculture
- Urban
- Wetlands
- Forest
- Water

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Sources:
1972 Land Use/Land Cover; 1995 Land Use/Land Cover Edition 1.3 - WMA 10; (Millstone Watershed Management Area), 2002 Land Use/Land Cover, 2007 Land Use/Land Cover Originator - NJDEP, OIRM, BGIA, Source Scale 1:12,000.

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Figure 17: Zoning

The Sourland Mountain

A Portion of Central New Jersey

September 2010

N
W E
S

0 0.5 1 2 Miles

Legend

SYMBOL

- Mountain Districts
- Rural Agricultural Districts
- Residential
- Commercial Districts
- Industrial Districts
- Quarry
- Rural Conservation Districts

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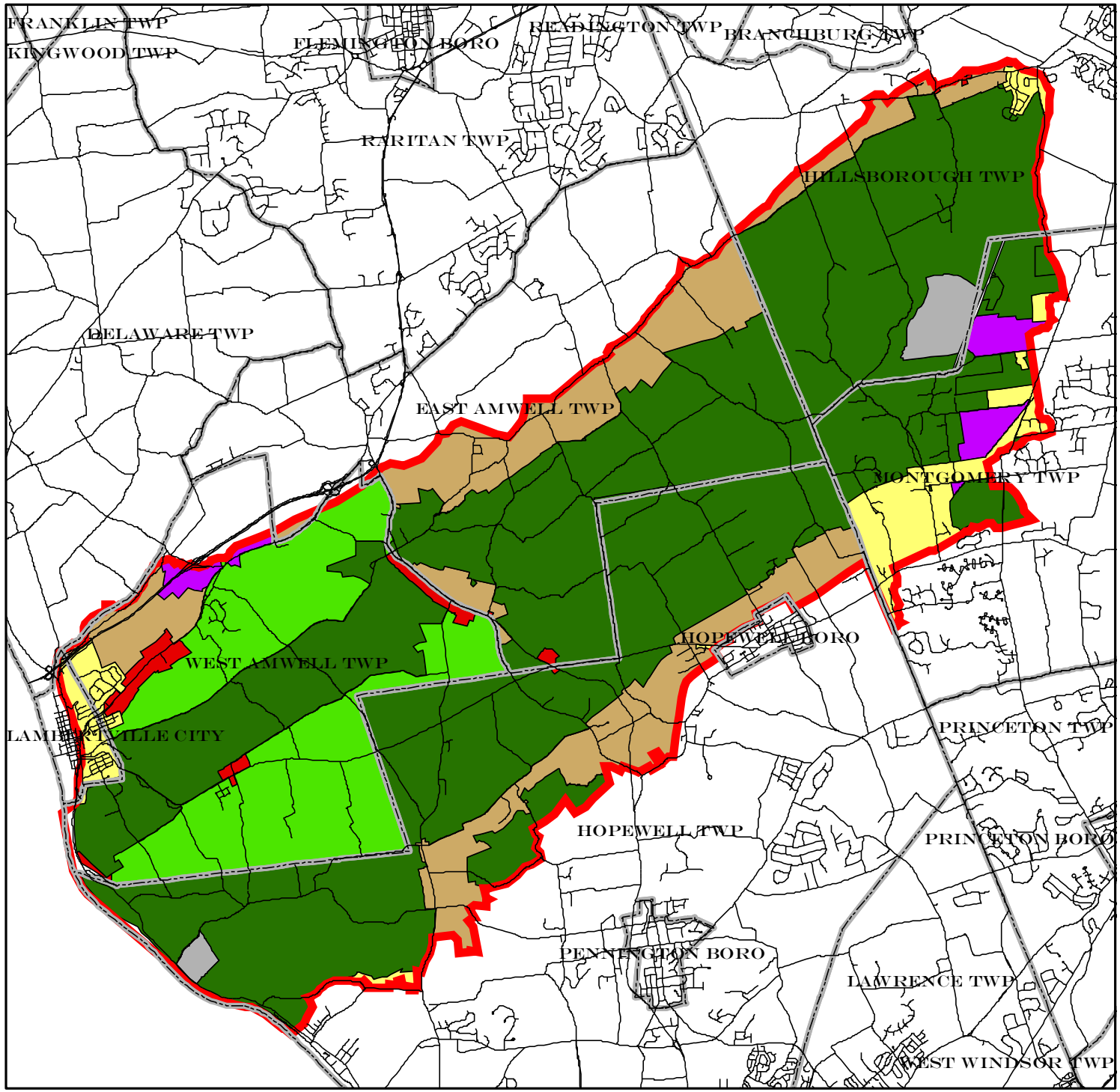
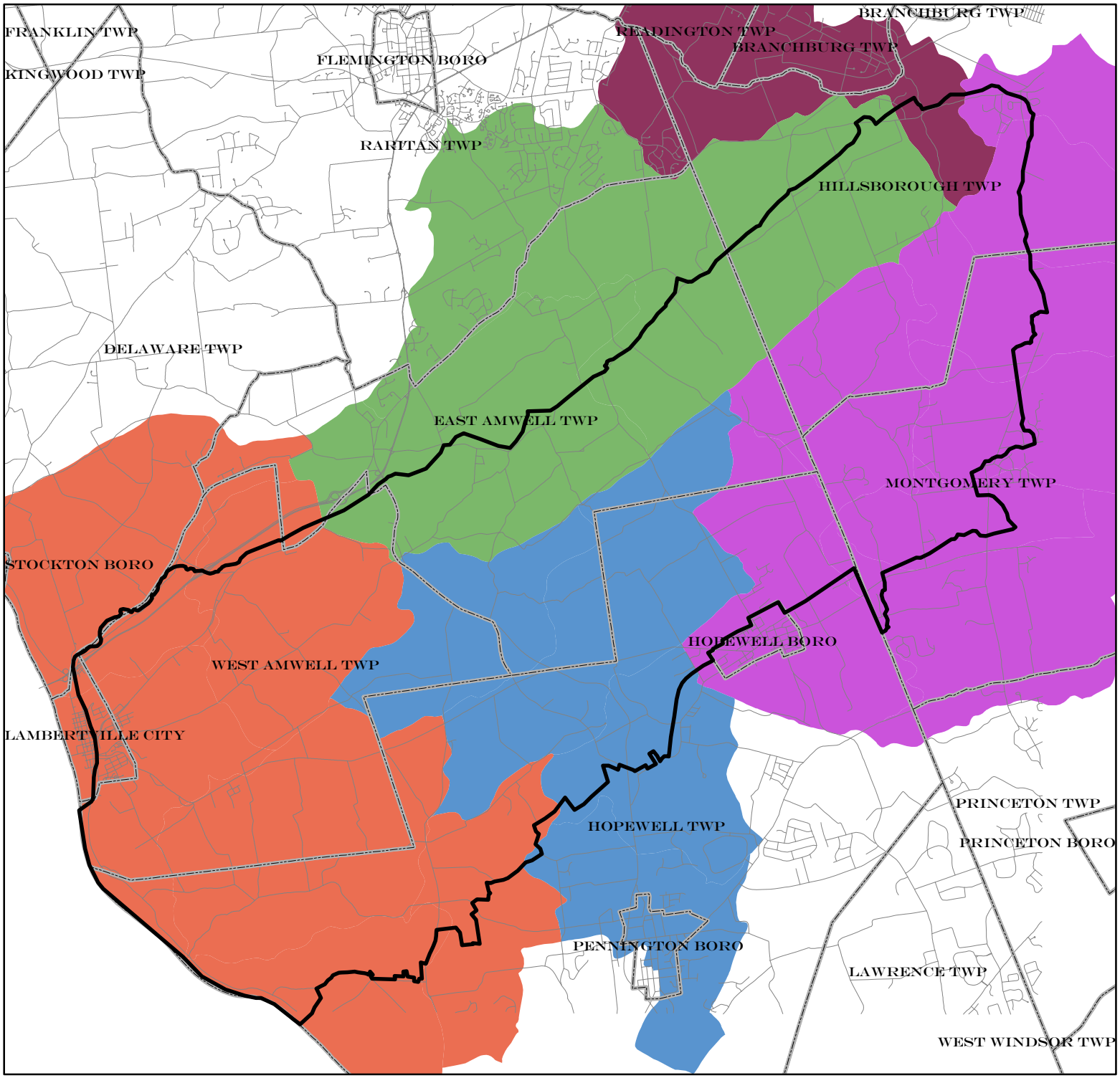


Figure 18: HUC 11 Subwatershed and Septic Density

The Sourland Mountain Region
A Portion of Central New Jersey
September 2010



Miles
0 0.5 1 2

HUC11 (Septic Density Avg. Acres/ISSDS)

- Study Area Boundary
- 02030105030 (6.0)
- 02030105040 (5.6)
- 02030105090 (6.2)
- 02030105110 (6.5)
- 02040105210 (6.0)

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

Data Source:
NJDEP
New Jersey Office of Smart Growth

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