



JON S. CORZINE  
*Governor*

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
[www.highlands.state.nj.us](http://www.highlands.state.nj.us)



JOHN R. WEINGART  
*Chairman*

EILEEN SWAN  
*Executive Director*

## **MEETING AGENDA**

***Thursday, November 1, 2007 - 4:00 p.m.***

1. CALL TO ORDER
2. ROLL CALL
3. OPEN PUBLIC MEETINGS ACT
4. PLEDGE OF ALLEGIANCE
5. APPROVAL OF MINUTES – October 18, 2007
6. CHAIRMAN'S REPORT (and Council Member Reports)
7. EXECUTIVE DIRECTOR'S REPORT
8. COMMITTEE REPORTS
  - a. TDR Committee - Council Member Whitenack
9. DISCUSSION OF REGIONAL MASTER PLAN ISSUES
  - a. COMMENT PERIOD ON REGIONAL MASTER PLAN
  - b. LANDS MODEL AND FUTURE LAND USE
  - c. CAPACITY ANALYSIS FOR WATER, WASTEWATER, AND SEPTIC SYSTEMS
  - d. REGION MASTER PLAN PROGRAMS
10. PUBLIC COMMENTS
11. EXECUTIVE SESSION
12. ADJOURN

NEW JERSEY HIGHLANDS WATER PROTECTION  
AND PLANNING COUNCIL  
MINUTES OF THE MEETING OF NOVEMBER 1, 2007

**PRESENT**

JOHN WEINGART	)	CHAIRMAN
KURT ALSTED	)	COUNCIL MEMBERS
ELIZABETH CALABRESE	)	
TRACY CARLUCCIO	)	
BILL COGGER	)	
TIM DILLINGHAM	)	
JANICE KOVACH	)	
MIMI LETTS	)	
ERIK PETERSON	)	
JACK SCHRIER	)	
GLEN VETRANO	)	
TAHESHA WAY	)	
SCOTT WHITENACK	)	

**VIA TELECONFERENCE**

DEBBIE PASQUARELLI

**CALL TO ORDER**

The Chairman of the Council, John Weingart, called the 57<sup>th</sup> meeting of the New Jersey Highlands Water Protection and Planning Council to order at 4:03 pm.

**ROLL CALL**

The members introduced themselves. Debbie Pasquarelli participated by telephone.

**OPEN PUBLIC MEETINGS ACT**

Chairman Weingart announced that the meeting was called in accordance with the Open Public meetings Act, N.J.S.A. 10:4-6, and that the Highlands Council had sent written notice of the time, date, and location of this meeting to pertinent newspapers or circulation throughout the State and posted on the Highlands Council website.

**PLEDGE OF ALLEGIANCE** was then recited.

**APPROVAL OF MINUTES OF OCTOBER 18, 2007**

Mr. Schrier introduced a motion to approve the October 18, 2007 minutes. Ms. Kovach seconded it. All members present voted to approve with two abstentions - Elizabeth Calabrese and Debbie Pasquarelli. The minutes were APPROVED.

## **CHAIRMAN'S REPORT**

Chairman Weingart asked if there were any reports from Council Members. There were none. He asked Ms. Swan to give her Executive Director's report.

## **EXECUTIVE DIRECTOR'S REPORT**

Ms. Swan discussed the ongoing work with staff and Siemon and Larson, the specifics of which would be covered in the discussion on the Regional Master Plan. She noted that she had attended the Smart Growth Retreat on October 19<sup>th</sup> hosted by OSG and Debbie Mans from the Governor's Office who also serves as the Smart Growth Ombudsman. The day long retreat focused on how state agencies could coordinate their work to ensure that the goals of Smart Growth are met. She also commented that she, Nancy Benecki (the Council's new Manager of Communications) and Tom Borden had attended the Plan Implementation Committee of the State Planning Commission on October 24<sup>th</sup>. Highlands staff had asked for waivers for the Highlands RMP from some of the standards under the proposed Plan Endorsement guidelines.. The following requests were accepted by the committee as amendments to the MOU:

1. The Plan Development Committee of the Highlands Council, or similarly composed Committee of the Council, shall satisfy the requirement of Plan Endorsement to create a Plan Endorsement Advisory Committee. This Committee shall guide the Highlands Council through the plan endorsement process, and shall serve as liaison with OSG and the other state agencies as it prepares the RMP for endorsement.
2. The Highlands Council has conducted the equivalent of a self-assessment through the preparation of the Regional Master Plan and as a result, the requirement for a self-assessment is waived under Plan Endorsement with the exception of the requirement to perform an assessment of the consistency of petitioner's plans and implementation mechanisms with the goals, policies and strategies of the State Development and Redevelopment Plan.
3. The Highlands Task Force engaged the communities of the Highlands Region in preparing a vision for the future development of the Highlands Region as reflect in the Highlands Act. The Highlands Council has taken additional steps necessary to ensure broad interactive public participation including municipal and county outreach. As a result, the requirement for additional visioning is waived under Plan Endorsement.

The MOU with OSG, SPC and the Highlands Council was forwarded with unanimous approval to the SPC by the Committee. No changes were proposed.

Ms. Swan then introduced two new staff members – Laura Forrest who has joined the staff as a part-time Administrative Assistant. Laura has experience in administration and has Environmental Education Certificates from Cook College at Rutgers.

She also introduced Nancy Benecki as the new Manager of Communications. She noted that Nancy was the Public Relations Officer for the Meadowlands Commission and has also worked for newspapers. She has a degree in English Literature with a minor in Communications.

She continued her report indicating that Municipal, County and Constituent Outreach is continuing. A meeting had been held on October 22nd with Morris County MUA where water supply issues were discussed. She commented that there had been continuing coordination with other state agencies regarding the proposed TDR Expansion Bill.

Chairman Weingart announced the next two meetings would be held on November 8<sup>th</sup> at 10 am and November 19 at 4 pm. He also noted that the TDR Committee Chair Report was available.

Scott Whitenack, Chair of the TDR Committee, apologized for not being at the last meeting, but was unable to attend as he was involved in work on the Prudential Arena in Newark. He had no additions or changes to the Chair report.

Chairman Weingart welcomed Council Member Alstede who joined the meeting. Mr. Weingart then asked Ms. Swan and Mr. Siemon to begin the discussion of Regional Master Plan issues.

#### **DISCUSSION OF REGIONAL MASTER PLAN ISSUES**

Ms. Swan reviewed the progress on the Land Use Analysis Support System (LANDS model) in particular the output of the model in the form of zones. She acknowledged the tremendous contribution of the staff led by Roger Keren and the LANDS team consisting of the GIS, Planning and Science staff to accomplish the current output that responded to comments received from Council members, state agencies and the public. She characterized the indicators as follows:

Twenty-one (21) indicators were used to characterize the Highlands Region and to assign the most appropriate overlay designations. Indicators can be categorized into three types:

- (1) feature based indicators - location and extent of geographic objects
- (2) intensity indicators – density mapping, the magnitude to which an area in question included a particular feature
- (3) integrity-based indicators -the relative degree of quality of a particular resource

The result was the creation of Three Primary Zones within the Highlands Region. She noted that the previous Planned Community Zone was essentially what is now the Existing Community Zone. She described the zones as:

- The **Protection Zone (PZ)** which consists of high resource value lands that are important to maintaining water quality, quantity, and sensitive ecological resources. Land acquisition is a priority in the Protection Zone and development activities will be extremely limited.
- The **Conservation Zone (CZ)** which consists of areas with significant agricultural use lands interspersed with associated woodlands and environmental features that should be preserved when possible. Non-agricultural development activities will be limited.

- The **Existing Community Zone (ECZ)** which consists of areas with regionally significant concentrated development signifying existing communities. These areas may have existing infrastructure that may support development and redevelopment provided that it is compatible with the protection and character of the Highlands environment, at levels that are appropriate to maintain the character of established communities.

The LANDS model utilized a 75 acre minimum mapping threshold for the delineation of the three Primary Zones though the level of detail of the map was at a 50ft by 50 ft grid cell of 2,500 sq. feet.

Ms. Swan also reminded the Council and public that any growth was voluntary. She then continued with a discussion of the three new sub-zones with their definitions.

- The **Conservation Zone – Environmental Constrained Sub-Zone (CZ-EC)** consisting of significant environmental features within the Conservation Zone that should be preserved and protected from non-agricultural development.
- The **Existing Community Zone – Environmental Constrained Sub-Zone (ECZ-EC)** which consists of significant contiguous critical habitat, steep slopes and forested lands within the Existing Community Zone that should be protected from further fragmentation.
- The **Lake Community Sub-Zone (LCZ)** consisting of existing community development around lakes within the Existing Community Zone. This sub-zone is where the Existing Community Zone overlaps the Lake Management Area. This zone has unique policies to prevent degradation of water quality and watershed pollution, harm to lake ecosystems, and to protect the community character of lake communities. She mentioned that these overlaps were a direct result of comments that had been received and that the shape files were still being evaluated.

She noted that the current LANDS layers are not RASTAR based as in the 2006 draft plan but GIS based and that the LANDS mapping can be replicated and shared with State, County and Municipal governments to assist them in their planning efforts. She then showed several slides to visually demonstrate the zones and sub-zones as they currently exist in the model.

Mr. Schrier spoke in support of the change in approach and thought that clarifying and changing the Planned Community Zone to Existing Community Zone would be helpful to municipalities and was more representative of the areas. Ms. Pasquarelli asked about the number of criteria and why they were changed. Mr. Siemon responded to her question discussing the refinement of the map that had been done by looking at the gross indicators. He reviewed the issue that had been addressed by this new approach, namely that there had been overlapping criteria that had been masking other features that were important for the analysis. He confirmed his opinion that there was more accuracy and more reliability with this new approach, particularly within the constrained zones that were such an important part of this Regional Master Plan. He also added that this map is more consistent with what is actually on the ground.

Ms. Pasquarelli asked about the zone name change for Planned Community Zone as she was having difficulty hearing. It was clarified by Chairman Weingart that the new zone was the Existing Community Zone.

There was additional discussion about the application of the standards applying to the Environmentally Constrained zones. Mr. Siemon commented on this subject to the extent that there are different protections in place depending on the subject matter.

There was another discussion with respect to septic density and how it would be applied in the zones. Ms. Swan commented that the septic density would not be applied by zone specifically, but by the primary zone in HUC14. She reviewed the strategy was to have each municipality have the option of making its own determination where the septic systems should be located, but having the local governments adhere to the number of systems as a limit. Ms. Swan also commented that Plan Conformance would be critical in having a consistent approach to septic density. Mr. Dillingham noted that Plan Conformance could require rezoning to accomplish these goals.

Mr. Siemon introduced the next section of future land use goals, policies and objectives. The two primary goals are:

- Guidance of development away from environmentally sensitive and agricultural lands and promote development and redevelopment in or adjacent to existing developed lands.
- Utilization of the highlands land use capability map as a framework for the character, location, and magnitude of new growth and development in the Highlands Region.

He emphasized that the LANDS model is not a local zoning map. He continued by adding that the relationship between the Land Use Capability Map to the ground will have to some extent be determined by municipalities during Plan Conformance. He also noted that he believed the Council should consider allowing Map Adjustments to boundaries by local government. He continued with the comment that for local governments to participate there has to be an opportunity for a merit based discussion for sound planning and smart growth to be implemented at the local level. He noted that for the Policy 6B3 it was important to define the criteria that would govern the Map Adjustments where appropriate.

Mr. Dillingham and Ms. Carluccio expressed their concern about allowing any deviation from the plan to the local municipalities and that County government should not have the authority to dictate to municipalities to make changes at the local level. Ms. Swan clarified that in the program on this matter is made clear that these adjustments require a municipal resolution and the language in the Goals, Policies and Objectives would be changed to reflect this. Mr. Schrier noted that the County Planning Act does not provide authority for the County to dictate this in any case. He spoke in support of allowing some choices for local government in order to encourage Plan Conformance. Ms. Letts also spoke in support of allowing what she characterized as flexibility and emphasized the importance of encouraging the creation of TDR receiving zones.

There was additional discussion on this policy and Chairman Weingart noted that there were not a majority of members who wanted to delete the Policy 6B3 and that additional discussion of the criteria of this program would take place on November 8<sup>th</sup>.

Ms. Swan continued the discussion commenting that the next sections were updates on matters already brought before the Council. The next section was water supply and wastewater utility capacity. She reviewed the methodology used by staff as follows:

- Identified facilities that serve any portion of the Highlands Region, regardless of whether the treatment facility itself is located within the Region, and their permit or Wastewater Management Plan limitations for flow. The facilities were limited to those serving more than a single property, eliminating non-community, commercial and industrial systems.
- Identify the Existing Area Served, both within and outside of the Highlands Region, to determine what portion of the service area is within the Region.
- Determine the maximum three-month discharges for each facility for the years 2002-2004, and pro-rate that amount to the Highlands Region depending on Step 2. The process of pro-rating discharges is necessary in the absence of facility-specific information on wastewater flows from each portion of their service area. More detailed information could modify the results.
- Compare the Highlands portion of the discharge flow against the Highlands portion of the permitted capacity and determine whether the facility is in deficit or has remaining capacity.

Ms. Swan also noted that these changes were undertaken to update information including that given to the staff as a result of public comment. Dr. Van Abs commented that further updates would be part of the current science agenda to procure and maintain updated information.

Ms. Swan reviewed the next agenda item: calculating septic system density and yield. She noted that there were a number of considerations to review:

- NJDEP Highlands Rules will apply in Preservation Area
- Septic system yield calculations are not included for the Existing Community Zone
- The computed median nitrate concentrations for the Protection and Conservation Zones within the Planning Area are 0.72 mg/l and 1.87 mg/l, respectively.
- For ground water recharge, the annual drought recharge was estimated for each HUC14 subwatershed by using GSR-32
- In the first table, excluding preserved lands, the total septic system yield for the Conservation and Protection Zones of the Planning Area is 6928 units

- In the second table, including preserved lands, the total septic system yield is 8160 units.
- Proposed alternative approach with special conditions for the Highlands.

A fundamental policy decision that the Council must make relates to the question of whether land dedicated as open space and farmland should be included in the analysis. Yield calculations were presented both ways, with preserved lands included and with them excluded, to give a comparison of the results. In many subwatersheds there is little difference, while in others the differences are significant. Ms. Swan explained that the staff recommendation is that the default approach is not to include preserved land but that municipalities may choose to include preserved lands in the analysis of septic system yields for the Conservation and Protection Zone as an alternative approach providing they meet certain conditions.

The first requirement for the alternate approach is that it must be consistent with NJDEP Water Quality Management Planning Rules. Further Dr. VanAbs explained that the municipality would have to demonstrate that including the septic system yields from the preserved lands results in a development density and pattern that is not greater than that allowed by existing zoning and is compatible with the pattern of development associated with the affected Zone; and also the municipality implements or causes to be implemented (by development applicants benefiting from the increased septic system yields either directly or through contribution to an implementation fund) agricultural management practices that will reduce nitrate loadings to the same HUC14 subwatershed by: at least the same amount as the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is lower than the relevant Conservation or Protection Zone median concentration, or at least equal to double the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is higher than the relevant Conservation or Protection Zone median concentration.

Ms. Carluccio asked about the monitoring of offsets and how that would be accomplished. Dr. Van Abs commented that monitoring of this type of non-point source pollution was difficult and that the approach would be to select a target and monitor to that target. He also noted in response to other comments that additional work was ongoing to create layout and design options for new septic systems. Ms. Carluccio said that she was writing up some changes for possible adoption on the septic density issues.

Mr. Siemon continued with calculation of net water availability. He began with the three important components that were used in the analysis of net water availability at a HUC14 subwatershed level :

- the sustainability of water resources (ground water capacity);
- the water that is “available” for human use (ground water availability); and

- the remaining water after current consumptive and depletive uses are deducted (net water availability).

Mr. Siemon also reviewed the thresholds by zones:

- In the Protection and Conservation Zones, the allowable threshold is 5% for potable or non-agricultural uses. For agricultural uses within a Conservation Zone, the threshold is 10%. In the Existing Community Zone, the threshold is 20%.
- Consumptive/depletive uses are those uses that are not returned to the subwatershed by a discharge back into ground or a stream. The analysis compared these consumptive/depletive uses against ground water availability. This difference is called net water availability.
- The RMP restricts additional uses in deficit subwatershed. The RMP conditionally allows an additional 1% of ground water availability in the Protection Zone and Conservation Zone, and 2% in the Existing Community Zone. However, these uses are conditional upon applicants providing demonstration of 125% mitigation.

Dr. Van Abs then reviewed the significance with slides demonstrating the areas that were in deficit and those with availability. He also noted that for the areas in deficit, they were also in deficit by the less stringent state standards. There was a further discussion about allowing any development in deficit areas. Mr. Dillingham reiterated his position that mitigation should be implemented before allowing additional uses and Ms. Letts commented that perhaps the Council should take a position with NJDEP that the allocations should be reviewed. Chairman Weingart asked is there would be any more information before the November 19<sup>th</sup> meeting on this subject and Dr. Van Abs noted that he is continuing with research and having ongoing conversations with NJDEP. He gave an example highlighting that conservation measures can be effective. Dr. Van Abs also mentioned a pilot program that the staff is working on with Clinton on their water management plan. There were some additional comments about the effectiveness of these studies on water availability for agriculture.

The next topic outlined was RMP program: Highlands restoration: water deficits

- The Highlands Council will continually update and verify the data utilized in its capacity assessments. Through the Plan Conformance process with municipalities and counties, the Council will obtain local-scale information about water use and water supply from local governments and utilities.
- Where water deficits within a subwatershed are identified and validated, affected stakeholders will develop a strategic approach to addressing these shortages. All of these strategies must be detailed and implemented as appropriate and feasible through a Water Management Plan.
- Development of HUC14 Water Management Strategies

- Coordination with NJDEP Water Allocation Program

Ms. Letts commented that staff should look at conservation plans State wide and seek to have them adopted more broadly.

Ms. Swan continued with the RMP program on redevelopment

The Regional Master Plan strives to accommodate regional growth and development needs primarily through the reuse and redevelopment of previously developed areas. The Highlands Redevelopment Program helps interested parties, municipalities, counties, state, and federal agencies understand where redevelopment opportunities are targeted by the RMP through the following:

- Site development standards will be provided
- The Highlands Council will seek to streamline the redevelopment process by establishing a Highlands Interagency Team.
- The Council will also provide technical assistance and grants.

The Highlands Council staff has analyzed developed areas and characterized them by their potential for enhanced growth opportunities and developed a redevelopment potential tool for use during Plan Conformance. She emphasized that it was a starting point for municipalities to identify where they should first look for redevelopment opportunities.

Ms. Swan showed several slides indicating how the tool could work.. Several members commented that developers would have to be involved in order to get these projects started. Ms. Swan spoke about an interagency team, BRIT, approach that had been effective at the Office of Smart Growth and that this approach could work effectively in redevelopment and revitalization working with municipalities. She also noted that there were municipal grant funds available that the Highlands Council can award to help planning for these projects. Mr. Schrier again noted the spelling of greyfields vs. grayfields.

Carbonate Rock or Karst was the next program subject introduced by Ms. Swan. The following are the major program issues:

- The Highlands Council will identify critical requirements for development ordinances.
- The Highlands Council will develop a technical guidance manual for use by municipalities that have land areas that are within or drain to the Carbonate Rock Area.
- The Highlands Council, working with municipalities during the site plan and subdivision approval process, will establish and maintain an inventory of karst features that are found in the Highlands Region.

Ms. Swan continued with the RMP Program: Restoration of Streams and Riparian Areas noting that staff continues to look for existing guidance and not create new programs where adequate ones already exist. The following are the major program issues:

- The Highlands Council will develop technical guidance for use by municipalities for the restoration of impaired streams. Existing guidance manuals, *Stream Restoration Design*, developed by the Natural Resources Conservation Service, and *Stream Corridor Restoration*, developed by the Federal Interagency Stream Corridor Restoration Working Group, will be used as two examples for the Council's work.
- The Highlands Council will develop or adapt technical guidance for use by municipalities for the restoration of impaired riparian areas. *Stream Corridor Restoration*, developed by the Federal Interagency Stream Corridor Restoration Working Group will be used as one example for the Council's work.

Mr. Siemon mentioned that he and Lane Kendig are still working with staff to strengthen the programs. He then reviewed the RMP Program: Historic Preservation Resource Protection. Municipalities will be encouraged to:

- establish a Historic Preservation Commission;
- adopt ordinances, zoning rules, development regulations and programs that protect these resources and to address their potential reuse and rehabilitation;
- adopt guidelines and/or regulations , where appropriate to address the issue of teardowns; and
- The Highlands Council will develop a historic preservation manual to provide guidance, technical assistance and potential funding information.

There were comments about several counties that offered grants for historic preservation – among them, Morris and Bergen

The last program presented was Scenic Resource Protection. This program establishes a procedure for identifying regionally significant scenic resources within the Highlands Region and provides methods to preserve these vistas through the following:

- Baseline Inventory
- The Council will establish procedures for nomination, evaluation and inventory of Highlands regionally significant scenic resources.
- Encourage municipalities and counties to work jointly with neighboring municipalities and counties to conduct the scenic resource inventories on a regional or sub-regional scale.
- Encourage municipalities and counties to include scenic resources in the open space and recreation plan elements of the municipal and county master plan.
- The Council will develop strategies to protect scenic resources including ordinances and review procedures.

Mr. Siemon commented that the steep slope regulations will help to preserve scenic vistas as will protection of the environmentally sensitive areas. Mr. Borden will provide the Council

with the Highlands Act protections for scenic vistas. There was additional discussion about the public comment received, in particular, from Helen Heinrich on this subject and that the nomination procedures were out for public comment currently. Mr. Schrier asked for a revised copy of those procedures. Mr. Alstede commented that this component is subjective and will be difficult to manage.

Chairman Weingart returned to the agenda item with respect to the establishment of the comment period for the RMP. Council members concurred with the proposal to establish a sixty (60) day comment period. Mr. Weingart noted, for example, that assuming the draft is released on or about November 19<sup>th</sup>, the comment period would be open though approximately January 25<sup>th</sup>, 2008.

Chairman Weingart asked for other comments from members.

Debbie Pasquarelli expressed concerns about Council involvement in decisions relating to map changes; further she asked which factors were removed from the map and thought the Council needed to see a table indicating the changes from the first edition of the Lands Abstract.

Ms. Swan handed out a table indicating those changes. The Protection Zone in 2006 had 557,507 acres and now has 469,530 a difference of approximately 16%. The addition of the transportation indicators and updated sewer areas where pipes are in the ground would account for this capturing of areas where there is an existing pattern of development. The Existing Community showed 149,624 acres in 2006 and now shows 146,037 but the Existing Community Constrained Sub-zone in this map shows 32,175 acres and the Lake Community Sub-zone shows 20,698 acres. The total for Existing Community Zone in 2006 was 149,624 acres and is now 198,910 acres with a difference of 33%. The Conservation Zone showed 152,227 acres in 2006 and now 70,284 but shows 120,634 in the environmentally constrained conservation zone a total of 190,918 acres for difference of approximately 25%. Ms. Swan pointed out that the Council should focus on the fact that overall the zone mapping in 2006 showed constrained lands of 557,507 acres and now shows 643,037 acres which means that the environmentally constrained lands are now approximately 75% of the Region where they were shown as 65% in 2006.

Ms. Pasquarelli also commented that the Council had not had enough of a role in the approach staff took with respect to reviewing the public comments and deciding how they should be incorporated in the revised draft regional master plan. Ms. Swan responded that Council members had received a summary of the public comments and that the public comments were accessible both on the members-only website as well as the Highlands website. Further, she explained that a comment response document would be prepared for consideration after the release of the plan when it was clear what changes had been incorporated. Mr. Weingart asked if other members shared the concerns Ms. Pasquarelli had just expressed, and no one responded. Chairman Weingart also noted that the Council will provide a response document although there is no legal requirement for one because adoption of the plan is not a rulemaking.

## **PUBLIC COMMENT**

### **Candy Ashmun**

She noted that her appearance was personal and not representing the Pinelands Commission. She spoke in support of Policy 6B3 but clarified that it should not be characterized as providing municipal flexibility, but rather an adjustment at the local level that was necessary. She discussed the experience in the Pinelands with data having to be adjusted and noted that these adjustments usually had resulted in no net change or very little change.

She also commented on the difficulty of monitoring and testing septic systems and that there were few states that did have programs of that nature. She did mention that Massachusetts and Rhode Island did have those programs as well as the Pinelands area of New Jersey.

She also spoke about the use of “regular septic systems” and discussed the two approaches that the Pinelands had taken: 1) alternative systems, e.g. package plants for grandfathered small lots and villages, and 2) regular systems requiring 3 ½ acres of land. She also noted that there was research available and she thought it would be helpful for the Council to look into that.

### **Julia Somers, NJ Highlands Coalition**

She spoke in support of the environmentally constrained sub-zones. She did not support Policy 6B3 believing that it could be difficult to manage. She did agree with Ms. Ashmun’s view that no net change would be an appropriate approach, but she asked the Council to not lose sight of the cumulative impact on resources.

With respect to Water Supply she advocated for having DEP’s Water Supply Master Plan consistent with the RMP. She continued to be troubled by the net water availability analysis and thought that agriculture had to be part of the solution.

### **Wilma Frey, NJCF**

She asked if the capacity maps shown today would be available on the website. Mr. Borden responded that they would be available shortly. She advocated that the map colors be the same from the first set of capacity maps to the second generation for comparison purpose. She also urged that with respect to the Scenic Resource Protection, the Council look to add other resources, e.g. Highlands Trail, Municipal and Open Space on Green Acres ROSI’s and Preserved Farmland. Ms. Letts commented that not all recreational lands on ROSI’s are scenic.

### **Marion Harris, Morris County Trust for Historic Preservation**

She noted that the riparian areas are the most likely to include archaeological sites and should be examined before streambank restoration. She spoke in support of the new language in the Historic Preservation Program but was concerned about the two types of historic preservation commissions in the state. She advocated for commissions that were not just advisory, but those that had regulatory authority and commented that those individuals interested in this subject were disappearing. She also recommended to the Council that it to do design review for historic sites as there was no municipal or state entity doing that work currently. She also supported guidelines for teardowns and historic transportation infrastructure. She reiterated her previous comments about increasing the inventory of

historic resources by requiring that subject to be addressed by applicants for Council approvals.

**Helen Heinrich, NJ Farm Bureau**

She commented that there are a great many issues with respect to historic and scenic preservation and that these are very subjective issues. She asked that her concerns be shared with Mr. Siemon and it was noted that he was still in attendance. She asked if she should continue to submit comments prior to November 19<sup>th</sup> and Chairman Weingart encouraged her to do so.

Mr. Schrier introduced a motion to adjourn the meeting at 7:03 pm and Ms. Kovach seconded it. All voted to adjourn.

**CERTIFICATION**

I hereby certify that the foregoing is a true copy of the minutes of the meeting of the Highlands Water Protection and Planning Council.

Dated: \_\_\_\_\_

\_\_\_\_\_  
Paula M. Dees, Executive Assistant

historic resources by requiring that subject to be addressed by applicants for Council approvals.

**Helen Heinrich, NJ Farm Bureau**

She commented that there are a great many issues with respect to historic and scenic preservation and that these are very subjective issues. She asked that her concerns be shared with Mr. Siemon and it was noted that he was still in attendance. She asked if she should continue to submit comments prior to November 19<sup>th</sup> and Chairman Weingart encouraged her to do so.

Mr. Schrier introduced a motion to adjourn the meeting at 7:03 pm and Ms. Kovach seconded it. All voted to adjourn.

**CERTIFICATION**

I hereby certify that the foregoing is a true copy of the minutes of the meeting of the Highlands Water Protection and Planning Council.

Dated: December 19, 2007

Paula M. Dees  
Paula M. Dees, Executive Assistant

**TRUE COPY**



JON S. CORZINE  
*Governor*

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
*Chairman*

EILEEN SWAN  
*Executive Director*

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**  
**TECHNICAL REPORT**  
**DEVELOPMENT OF THE LANDS MODEL**  
**OCTOBER 2007**

Version – November 1, 2007

**Introduction**

The following provides an introduction and overview of the development process, data input information, and the utility of the Land Use ANalysis Decision Support (LANDS) model. The LANDS model provides for a comprehensive evaluation of both resource constraints and development opportunity at a regional scale. It addresses the potential for conflict between natural resource protection and economic growth by identifying environmental constraints and capacity limitations of land and infrastructure, and identifying those areas within the Highlands Region that can best support appropriate and varying levels of economic and development activity.

The LANDS model is necessary to address the requirements of the Highlands Water Protection and Planning Act (Highlands Act) and provide regional guidance for the implementation of the policies in the Regional Master Plan. The Highlands Council developed the LANDS model recognizing the range and nature of land throughout the Highlands Region in order to create overlay zones that best represent the requirements of the Highlands Act and the policies of the Plan.

The LANDS model has the ability to represent indicators, capacity, and constraints at a scale of 2,500 square feet (50 ft. x 50 ft.). While it is cartographically impractical to show this level of detail at a regional scale, the finer scale capability of the model will be very useful to the Council, local officials and the public during the Plan Conformance period when identifying environmental constraints and capacity limitations of land and infrastructure. During Plan Conformance, additional information will be available to identify and refine those areas within the Highlands Region that can best support appropriate and varying levels of economic and development activity.

The Council has established three primary overlay zones in the LANDS model. These zones are the Protection Zone, the Conservation Zone, and the Existing Community Zone. These overlay zones distinguish between resource constrained lands, where development will be limited (Protection Zone), and those lands characterized by existing patterns of human development where, dependent on municipal planning, land or capacity constraints, additional growth may or may not be appropriate (Existing Community Zone). The Conservation Zone identifies those areas with a high

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

concentration of agricultural lands and associated woodlands and environmental features, where development potential may exist to the extent it is not limited by available infrastructure to support development, e.g. water availability, the existence of concentrated environmental resources that are easily impaired by development, or the protection of important agricultural resources.

In addition to these three primary overlay zones, the LANDS model identified three sub-zones within the Conservation Zone and the Existing Community Zone which are described below. These constrained areas recognize regionally significant sensitive environmental features where development is subject to stringent limitations on resource protection, consumptive and depletive water use, and degradation of water quality; however, they do not incorporate all environmental constraints and other factors that may be considered during site planning.

**Overlay Zone Designation**

Overlay zones serve to establish an area that addresses distinguishing circumstances or landscape features, and is superimposed over existing municipal zoning. Overlay zones do not replace existing municipal zoning, but rather build upon base zoning by establishing additional standards and criteria, and are intended to provide a means to address issues of special public interest identified in the Highlands Act (e.g. watershed management area, open space preservation, historic preservation, urban enterprise zone) that the underlying base zoning may not otherwise take into consideration.

In the Highlands Region, overlay zones will provide all levels of government (Federal, State, county, and municipal) and the public with an indication of areas where special consideration is required to protect regionally significant resources. Overlay zones also indicate where and how development initiatives may occur based on the ability of areas to accommodate growth. The LANDS model was designed to develop the following overlay zones each with their own purpose, application, and minimum standards as generally discussed below and these will collectively be referred to as overlay designations.

The **Protection Zone (PZ)** consists of high resource value lands that are important to maintaining water quality, water quantity, and sensitive ecological resources and processes. Land acquisition is a priority in the Protection Zone and development activities will be extremely limited; any development will be subject to stringent limitations on consumptive and depletive water use, degradation of water quality, and impacts to environmentally sensitive lands. The LANDS model uses a 75 acre minimum mapping threshold for the delineation of the Protection Zone.

The **Conservation Zone (CZ)** consists of areas with significant agricultural use lands and interspersed with associated woodlands and environmental features that should be preserved when possible. Non-agricultural development activities will be limited in area and intensity due to infrastructure constraints and resource protection goals. The LANDS model uses a 75 acre minimum mapping threshold for the delineation of the Conservation Zone.

The **Conservation Zone – Environmental Constrained Sub-Zone (CZ-EC)** consists of significant environmental features within the Conservation Zone that should be preserved and protected from non-agricultural development. Development activities will be limited and subject to stringent limitations on consumptive and depletive water use, degradation of water quality, and impacts to environmentally sensitive lands. The LANDS model uses a 10 acre minimum mapping threshold for the delineation of the Conservation Zone – Environmentally Constrained Sub-Zone.

The **Existing Community Zone (ECZ)** consists of areas with regionally significant concentrated development signifying existing communities. These areas tend to have limited environmental constraints due to previous development patterns and may have existing infrastructure that can

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

support development and redevelopment provided that such development is compatible with the protection and character of the Highlands environment, at levels that are appropriate to maintain the character of established communities. The LANDS model used a 75 acre minimum mapping threshold for the delineation of the Existing Community Zone.

The **Existing Community Zone – Environmental Constrained Sub-Zone (ECZ-EC)** consists of significant contiguous critical habitat, steep slopes, and forested lands within the Existing Community Zone that should be protected from further fragmentation. They serve as regional habitat “stepping stones” to larger contiguous critical habitat and forested areas. As such, they are not appropriate for significant development. These areas are best served by land preservation and protection. Development is subject to stringent limitations on consumptive and depletive water use, degradation of water quality, and impacts to environmentally sensitive lands. The LANDS model used a 2 acre minimum mapping threshold for the delineation of the Existing Community Zone – Environmentally Constrained Sub-Zone.

The **Lake Community Sub-Zone (LCZ)** consists of patterns of community development around lakes that are within the Existing Community Zone. The LANDS model focuses on lakes 10 acres or greater and delineates this zone as consisting of an area of up to 1,000 feet (depending on the protection focus) from the lake shoreline in order to protect water quality, resource features, shoreline development recreation, scenic quality and community character. A future management area is planned, encompassing the full lake watershed, for protection of the lake water quality. This zone has unique policies to prevent degradation of water quality and watershed pollution, harm to lake ecosystems, and promote natural aesthetic values within the Existing Community Zone. The LANDS model used a 2 acre minimum mapping threshold for the delineation of the Lake Community Sub-Zone.

### **Regional Indicators**

In order to develop the overlay designations in the LANDS model, the Council used the results of both the Resource Assessment and the Smart Growth Component. The Resource Assessment was used to identify lands within the Highlands Region with significant natural and ecological resources. Indicators were used to measure the regional significance of a particular resource, such as prime ground water recharge, watershed condition, open waters and riparian areas, forests, critical habitat, and steep slopes. Areas with significant agricultural lands and important farmland soils were also evaluated. A determination was made as to their quality and regional significance to the Highlands Region.

The Smart Growth Component was used to identify the nature and extent of developed lands that have limited and dispersed environmental and agricultural resources. Areas were identified based upon existing patterns of development with particular emphasis on areas that are currently served by existing water and wastewater infrastructure.

Twenty-one (21) indicators were used to characterize the Highlands Region and to assign the most appropriate overlay designations (see the table *Criteria/Indicators Used in the LANDS model*). Indicators can be categorized into three types: (1) feature based indicators, (2) intensity indicators, and (3) Integrity-based indicators.

*Feature based indicators* capture the location and extent of geographic objects. Preserved farms are an example of a feature based data layer. Many feature based data layers utilized extractions from existing data sets, including but not limited to those compiled by the U.S Census, the NJDEP draft 2002 Land Use Land Cover, or Natural Resources Conservation Service Soil Survey Geographic digital soils coverage.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

*Intensity indicators* were developed using a Highlands mapping approach that calculated the magnitude to which an area in question included a particular feature. Rather than spatially delineating the location of an actual feature or features, these intensity indicators capture the area in which a critical mass of features or combination of features exists. The actual process includes several steps, including: rasterizing input feature based data at a 50 ft. x 50 ft. grid cell size; identifying the critical mass of input features; and yielding a magnitude per unit area, as calculated using a 250 ft. circular search radius. An example of an intensity indicator is the Forest Resource Area, which reflects that portion of the Highlands Region that contains the critical mass of high ecological value forest areas that exhibit the least fragmentation.

*Integrity-based indicators* measure the relative degree of quality of a particular resource. The Riparian Corridor Condition – High is an example of an integrity-based indicator. A Riparian Area integrity value class was assigned to the riparian corridor for each subwatershed based on a cumulative assessment of five indicators (including impervious cover, natural vegetation, water/wetland species, agricultural, and road crossings). The Riparian Corridor Condition – High is an integrity-based data layer that represents areas that exhibit predominantly natural vegetation including high quality habitat for water/wetland dependent species, and a generally low incidence of impervious area, agricultural uses, and/or road crossings.

**LANDS Indicators**

The following table describes the indicators that were used to inform the development of the overlay designations using the LANDS model.

**INDICATORS USED IN THE LANDS MODEL**

<b>Zone</b>	<b>Criteria</b>	<b>Indicator</b>	<b>Indicator Tier</b>	
<b>Protection</b>	Forest Integrity	Forest Area w/in Forest Resource Area	Primary	
		Core Forest > 250 Acres	Secondary	
		Total Forest	Secondary	
	Riparian Corridor	Riparian Corridor Condition - High	Primary	
	Recharge	Prime Ground Water Recharge	Primary	
	Critical Habitat	Critical Habitat - Landscape Rank 3-5 Plus Landscape 2 within Highlands Rank 2-3		Primary
			Vernal Pools + 1000 feet	Primary
		Significant Natural Areas	Primary	
		Preserved Lands	Secondary	
		Lakes >10 Acres	Secondary	
<b>Conservation</b>	Agriculture	Contiguous Farms >250 acres	Primary	
		Agriculture Land Use > 10 acres	Secondary	
		Agriculture Land Use Land Cover	Secondary	
<b>Existing Community</b>	Development Intensity	Core Developed Lands	Primary	
		Moderate Developed Lands	Primary	
		Suburban Fringe Lands	Primary	
		Rural Developed Lands	Secondary	
		Developed Land Use Land Cover	Secondary	
		Land Use Land Cover Anderson Code 1140	Secondary	
	Utilities	Existing Area Served (Potable Water) + 100 feet	Primary	
		Existing Area Served (Highlands Domestic Sewerage Facilities) + 100 feet	Primary	
	Transportation	Transportation Score >= 3	Primary	

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following section fully describes the indicators that were used to inform the development of the overlay designations using the LANDS model.

**I. Protection Indicators:**

1. Total Forest Area w/in Forest Resource Area

The Total Forest Area within the Forest Resource Area is a feature based data layer and is defined as the presence of Total Forest Area within the Forest Resource Area. The Total Forest Area is a feature based data layer that was extracted from the NJDEP 2002 draft Land Use Land Cover data. Total Forest is defined as all upland and wetland forest and scrub/shrub categories (excluding old field). NJDOT roads, buffered by 10 feet, were removed from the file. (p. 43-4, draft Ecosystem Management Technical Report, January 2007). The Forest Resource Area data layer is an intensity indicator that includes high ecological integrity forest areas including those forested areas that express one or more of the forest integrity indicators (p. 49, draft Ecosystem Management Technical Report, January 2007).
2. Core Forest > 250 Acres

Forest Core > 250 refers to the area of a forest patch that is greater than 300 feet from an altered edge, based on the Total Forest Area. The Forest Core Area >250 is a feature based data layer that includes those areas consisting of 250 acres or greater of core forest. (p. 43-4, draft Ecosystem Management Technical Report, January 2007).
3. Total Forest Area

The Total Forest Area is a feature based data layer that was extracted from the NJDEP 2002 draft Land Use Land Cover data. Forest is defined as all upland and wetland forest and scrub/shrub categories (excluding old field). NJDOT roads, buffered by 10 feet, were removed from the file. (p. 43-4, draft Ecosystem Management Technical Report, January 2007)
4. Riparian Corridor Condition - High

Riparian Corridor Condition – High is an integrity-based indicator. A Riparian Area integrity value class was assigned to the riparian corridor for each subwatershed based on the cumulative assessment of 5 indicators (including impervious cover, natural vegetation, water/wetland species, agricultural, and road crossings). The Riparian Corridor Condition represents areas that exhibit predominantly natural vegetation including high quality habitat for water/wetland dependent species, and a generally low incidence of impervious area, agricultural uses, and/or road crossings. (p. 31, draft Ecosystem Management Technical Report, January 2007)

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

5. Prime Ground Water Recharge      The land area that contributes the highest recharge areas that contributes 40% of ground water recharge by volume, under drought conditions. (beginning on p. 14, Water Resources Technical Report, Volume II – Water Use and Availability, January 2007)
  
6. Critical Habitat - Landscape Rank 3-5 Plus Landscape 2 within Highlands Rank 2-3      The Landscape Project values patches of land for wildlife species based on occurrence data and land use type. A landscape rank is assigned to each patch based on species valued for that patch. All Habitat (Landscape Rank 3 - 5), is a feature based data layer that includes habitat with Landscape Ranks 3 through 5 for the following: 1. Federally Listed (Rank 5) – a species listed by USFWS as threatened or endangered; 2. State Endangered (Rank 4) - a species listed on the official endangered wildlife list that the NJDEP promulgates pursuant to the Endangered and Nongame Species of Wildlife Conservation Act of 1973 (ENSCA); 3.State Threatened (Rank 3) - a species designated as “threatened” on the list of nongame wildlife species that the NJDEP promulgates pursuant to ENSCA. (p. 57-8, draft Ecosystem Management Technical Report, January 2007)  
  
NJDEP-ENSP assigned a Highlands Conservation Rank index to each species occurrence based upon how critical the Highlands Region is to the continued existence of the species within the state. The Highlands Conservation Rank feature based data layer utilized in LANDS refers to the following: 1. Critically Significant (Rank 3) – if habitats in the Highlands Region were lost, that species would not exist in the state; 2.Significant (Rank 2) – Highlands Region habitats play a significant role for that species’ existence in the state. (p. 57-8, draft Ecosystem Management Technical Report, January 2007)
  
7. Vernal Pools + 1000 feet      A vernal pool is a confined ephemeral wetland depression that provides important breeding areas for amphibians. The Vernal Pools +1000 feet feature based data layer includes 2005 NJDEP confirmed vernal pool data buffered by 1,000 feet. (p. 66-7, draft Ecosystem Management Technical Report, January 2007)
  
8. Significant Natural Areas      The Significant Natural Area feature based data layer contains sites or areas that constitute outstanding examples of a particular habitat type or geologic formation, or habitat that supports populations of rare or endangered plant species in the Highland Region. The data layer utilized Natural Heritage Priority data and was spatially reviewed for the 95 sites. “Active Use” lands (per the Highlands Land Classification Data Layer Relationship table) and roadway right of ways were removed from this data

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

layer. (p. 62 and 66, draft Ecosystem Management Technical Report, January 2007)

9. Preserved Lands Preserved Lands feature based data layer is based on data collected from the following sources:
- NJDEP Green Acres Program and State-Held Conservation Easements;
  - State Owned, Protected Open Space and Recreation Areas; Preserved farms that have "final approval" from the SADC; National Park Service Water Resources Division;
  - USFWS, Revised Refuge Boundaries;
  - New Jersey Conservation Foundation;
  - The Nature Conservancy; County Open Space;
  - Watershed Lands.

**II. Conservation Indicators:**

1. Contiguous Farms >250 acres The Contiguous Farms >250 data layer is an intensity indicator that represents areas of contiguous farming landscapes. The layer is based upon the following factors: parcels with 10% or greater agricultural uses and 1%+ important farmland soils (unique, local, statewide importance, and prime soils) and preserved farms. Features were buffered by 50 feet to reduce fragmentation and only those areas with 250 or greater contiguous areas were selected. Once the Agricultural Resource Area was established (an intensity indicator that reflects areas in the Region with a prevalence of active farms) those parcels that are outside of the Agricultural Resource Area were deleted. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)
2. Agriculture Land Use > 10 acres The Agricultural Land Uses >10 acres is an intensity indicator that represents the extent of lands that are currently in agricultural use within the Agricultural Resource Area based upon NJDEP 2002 Land Use Land Cover data, with 10 acres as a minimum threshold. Agricultural lands are used primarily for the production of food and fiber and some of the structures associated with this production. Categories include cropland and pastureland, orchards, vineyards, nurseries and horticultural areas, confined feeding operations, and other agriculture. Parcels were identified 10% or more of the parcel was classified as agricultural per Land Use Land Cover. (p. 2-9, draft Sustainable Agriculture Technical Report, January 2007)

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

3. Agriculture Land Use Land Cover      Agriculture Land Use Land Cover is a feature based indicator and is based on the following 2002 NJDEP Land Use Land Cover codes 2100, 2200, 2300, 2400, 2140, and 2150.

**III. Existing Community Indicators**

1. Core Developed Lands      The Core Developed Land is an intensity indicator that is based on the following factors: (1) Areas with an impervious surface of at least 30 percent (as indicated by NJDEP draft Land Use and Cover data) and at least 5 contiguous acres; (2) Existing Areas Served with wastewater, buffered by 10 feet; (3) Population densities of greater than 8 people per acre occurring for at least 10 contiguous acres; (4) Non-residential “waste generating” land uses of at least 5 contiguous acres served by on-site wastewater disposal units.; and (5) “Waste generating” land uses, greater than 50 contiguous acres, but excluding rural residential lands. A spatial analysis was performed in order to identify those areas in the Region that contain a critical mass of core developed features in areas of greater than 75 acres of greater. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
2. Moderate Developed Lands      The Moderate Developed Land is an intensity indicator that includes and extends beyond Core Developed Lands, with the addition of “Active Use” lands, excluding rural residential land (NJDEP Land Use Land Cover code 1140). Actively used lands are listed in the Highlands Land Classification Data Layer Relationship. A spatial analysis was performed in order to identify those areas in the Region that contain a critical mass of moderately developed features of 75 contiguous acres or greater. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
3. Suburban Fringe Lands      The Suburban Fringe Land is an intensity indicator that includes and extends beyond Moderate Developed Lands, by adding rural residential lands. Only those areas that adjoin or are next to a Moderate Developed Lands and exhibited 75 contiguous acres or greater of suburban fringe developed areas were retained in the data layer. Those non-contiguous areas are moved to the Rural Developed Lands layer. (p. 43-5, draft Regional Land Use Conditions and Smart Design Guideline Technical Report, January 2007)
4. Rural Developed Lands      Rural Developed Land is an intensity indicator and is comprised of areas classified as Suburban Fringe Lands, which are isolated and non-contiguous with more intensely developed areas.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

5. Developed Land Use Land Cover      The Developed Land Use Land Cover feature based indicator is base on the following NJDEP Land Use Land Cover codes: 1110, 1120, 1130, 1140, 1150, 1200, 1300, 1500, 1600, 7300, 1211, 1400, 1410, 1419, 1440, 1810, 1462, 1463, 1499, 1710, 1800 and 1804.
  
6. Land Use Land Cover 1140      The Land Use Land Cover feature based indicator is based on NJDEP 2002 Land Use Land Cover and represents single unit residential neighborhoods with areas between 1 acre and up to and including 2 acre lots. Also included are estates or modern subdivisions with large lot sizes providing a density less than or equal to 1 dwelling unit per acre.
  
7. Existing Area Served (Potable Water) + 100 feet      The Utility Analysis delineated areas served with existing water service based upon “public community water supply systems” (PCWS), which may be owned and operated by governmental entities or investor-owned utilities. The Water EAS + 100 is a feature based data layer and was buffered by 100 feet to reduce fragmentation due to roads. (p. 19, draft Utility Capacity Technical Report, January 2007)
  
8. Existing Area Served (Highlands Domestic Sewerage Facilities) + 100 feet      Community infrastructure, wastewater in particular, is based upon the identification of Highlands Domestic Sewerage Facilities, which include publicly-owned and investor-owned domestic wastewater treatment facilities, and provides wastewater treatment to municipalities. The Utility Analysis delineated existing areas served with sewers. The Sewer EAS + 100 is a feature based data layer and was buffered by 100 feet to reduce fragmentation due to roads. (p. 8-9, draft Utility Capacity Technical Report, January 2007)
  
9. Transportation Score >= 3      The Transportation Score >= 3 is an intensity indicator and identifies multimodal opportunities throughout the regional transportation system and is based on the cumulative value of 3 or more points from the following factors:  
  
**Transportation corridors** - Includes developed lands within 1/4 mile of significant US routes, state routes, and specified county routes;  
  
**Interchanges and intersections** - Includes developed lands within 1/2 mile of buffered roadway interchanges and intersections;  
  
**Train station "inner core"** - Includes developed and undeveloped lands within 1/2 mile "inner core" buffer of train

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

stations in or within 1/2 mile of the Highlands Region;

**Train station "outer core"** - Includes developed and undeveloped lands within a 1 mile "outer core" buffer of train stations in or within 1 mile of the Highlands Region;

**Park & rides** - Includes all developed lands within a 1/2 mile buffer from all park and ride locations in or within 1/2 mile of the Highlands Region;

**Bus routes** - Includes all NJ Transit and major private bus carriers in the Highlands Region, which operate daily basis on any of the US, State or County routes used in the analysis.

10. Lakes >10 Acres                      The Lakes > 10 Acres feature based data layer is based on NJDEP 2002 Land Use Land Cover Codes 5200, 5300 and 5420 with 10 acres as a minimum threshold.

**Rationale for Indicators**

Several basic principles were used for the selection of indicators for the LANDS overlay designations:

- Select indicators for the resource, land use and development features that are most directly and richly descriptive of the distinctive character of various Highlands Region landscapes;
- Select the minimum number of indicators that describe the maximum area of the Highlands Region;
- Minimize redundancy of indicators;
- Select indicators that can be used in a presence/absence method.

Thirteen primary indicators were selected based on these principles (see above Table *Indicators used in the LANDS Model*). Six are associated with critical environmental features typical of the least developed areas of the Highlands Region, and therefore best help to delineate the Protection Zone. They relate to the most concentrated forested areas, the highest quality riparian areas, prime ground water recharge areas, habitat for threatened and endangered wildlife species, habitat for species that rely exclusively on the specialized feature of vernal pools, and regionally unique ecological communities. Many other potential indicators were considered, but were not used due to complete or extensive redundancy, weakness of association with Highlands natural resource values, minimal acreage of the resource, or data quality limitations. The six selected indicators focus on the most critical resources in their most critical areas, and respond directly to goals, objectives or requirements of the Highlands Act regarding the preservation of Highlands resources.

Six primary indicators are associated with intensively developed areas, and therefore best help to delineate the Existing Community Zone. They relate contiguous areas of existing development (at core, moderate and suburban landscapes), existing areas served for public water supply and wastewater utilities, and high intensity transportation areas. These indicators respond directly to goals, objectives or requirements of the Highlands Act regarding development, redevelopment, and economic sustainability. As with the Protection Zone indicators, other candidate indicators were

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

rejected due to redundancy, minimal acreage, or data quality limitations. Finally, the most concentrated agricultural landscapes were used as an indicator to help delineate the Conservation Zone. This indicator responds directly to the Highlands Act objectives regarding the maintenance of agricultural lands for agriculture.

The method used in the LANDS model did not weigh the indicators at any point. The lands delineated by these indicators were aggregated separately into each of the three primary zones, and only then were the three resulting areas compared to determine where potential conflicts existed. Rules were then developed to determine which overlay designation should apply in the case of each significant conflict; these rules are described below. In some cases, secondary indicators (see above Table *Indicators used in the LANDS Model*) were used to either resolve a conflict or to assign to an overlay designation to those areas not addressed by the primary indicators. In each case, the secondary indicators were selected because of their relationship to the primary indicator (i.e., addressing a similar resource but not at the same density or intensity as the primary indicator).

It should be noted that the assignment of a land area to an overlay designation according to this method does not directly result in a land use capacity for new development. In each zone, there will be lands that have no capacity for development (e.g., preserved lands, fully developed lands), limited capacity (e.g., environmentally constrained lands), or significant capacity.

### **Testing for Indicators**

The rationale for the use of the above mentioned indicators were independently validated by the use of Artificial Neural Network (ANN) Modeling in order to identify the zone specific indicators most important for differentiating the presence or absence within the Protection, Conservation and Existing Community zones across the Highlands Region. The ANN utilized the 51 indicators in the November 2006 Highlands Draft Regional Master Plan to determine which variables were important for differentiating the presence or absence within a particular zone. For the Protection, Conservation and Existing Community zones, the ANN models helped validate that the indicators in the table *Indicators used in the LANDS Model* were highly characteristic of their corresponding zone.

### **Land Use ANalysis Decision Support System (LANDS)**

The LANDS model used a series of resource indicators and a set of rules, according to which an overlay designation was assigned throughout the Highlands region. The LANDS model can be best described by four basic steps.

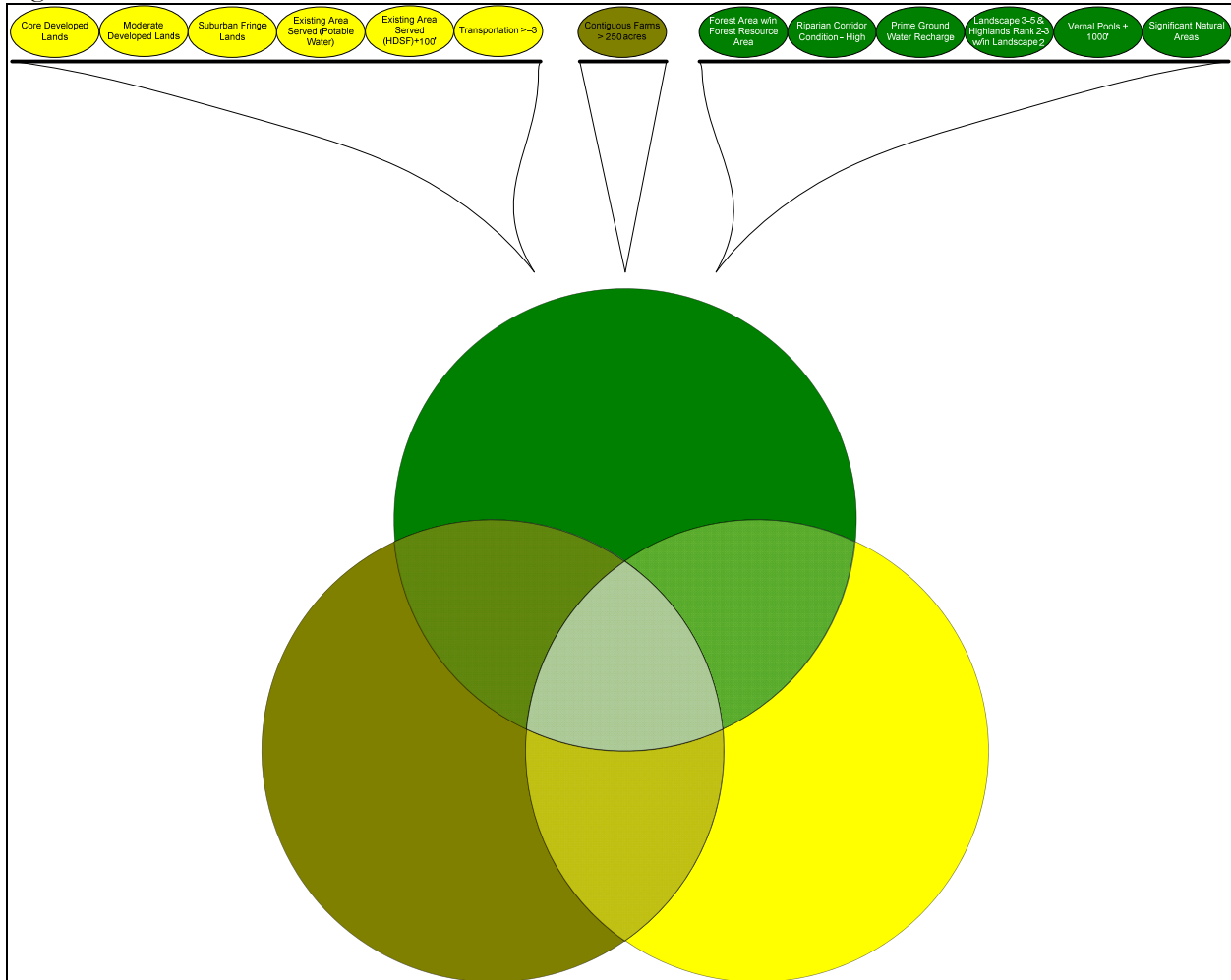
- I. Population of the Model
- II. Zone Development
- III. Conflict Resolution
  - a. Protection Zone / Conservation Zone
  - b. Existing Community Zone / Conservation Zone
  - c. Protection Zone / Existing Community Zone
  - d. Existing Community Zone / Protection Zone / Conservation Zone
  - e. Unclassified Determination
- IV. Lake Community Zone

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**I. Population of the Model**

The LANDS model begins with the input of both primary and secondary indicators. All indicators are listed in the table *Indicators used in the LANDS Model* and are followed by the rationale and testing of these indicators. Primary indicators result in the development of zones only where no conflict is present. A combination of secondary indicators and/or rules is utilized to resolve conflict amongst primary indicators. This is further explained in the Conflict Resolution section. Figure 1 illustrates this step.

Figure 1

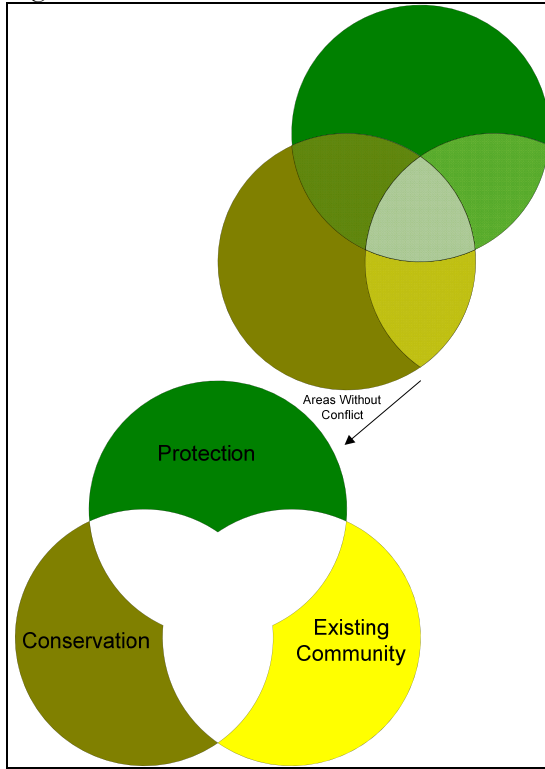


**II. Zone Development**

Primary indicators are attributed with their presence or absence. Where no conflict exists amongst primary indicators, the overlay designations were delineated. LANDS resulted in a majority of the Highlands Region represented in any one of the three primary zones with no conflict between the indicators. These areas form the foundation of the zone designations and are built upon throughout the following steps. The following graphic illustrates the result of Zone Development.

DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL

Figure 2 -



### III. Conflict Resolution

Conflict resolution is rectified in five steps.

- a. Protection Zone/ Conservation Zone
- b. Existing Community Zone / Conservation Zone
- c. Protection Zone / Existing Community Zone
- d. Existing Community Zone / Protection Zone / Conservation Zone
- e. Unclassified Determination

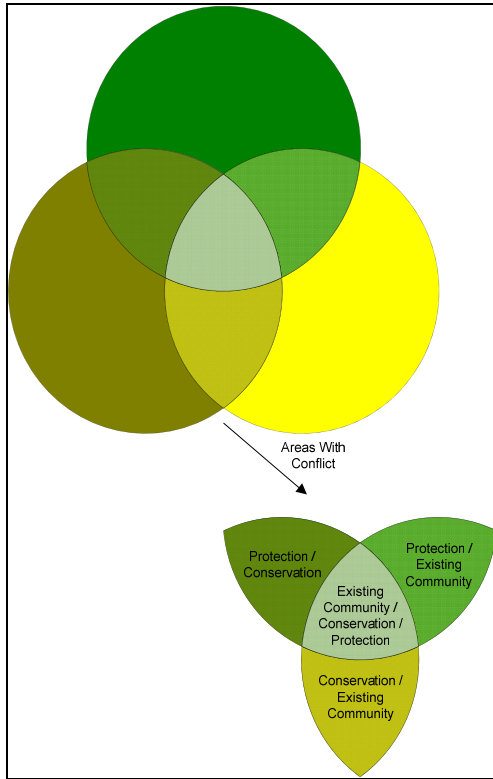
Conflict among the overlay zones is an expected and natural outcome of the LANDS model for two primary reasons. Conflict is the recognition that in, or proximate to, any given overlay zone, features exist which are different. For example, there exist regionally significant forested ridgelines within otherwise altered lands. Conflict areas also exist due in part to the limitation of the spatial base layers that were used. These base layers were developed from a range of scales and various mapping protocols. For example, the NJDEP Land Use Land Cover dataset was developed with a one acre minimum mapping unit and is an interpretation of existing land uses through the use of aerial orthophotography, whereas the Highlands parcels do not have a minimum mapping unit and is an interpretation of locally adopted tax maps.

It should be noted that no one or multiple indicators completely cover the Highlands Region, so cells which are unclassified are addressed later in the LANDS model either by rule, secondary indicator, or a combination of both.

DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL

The following graphic illustrates conflicting zones.

Figure 3 -



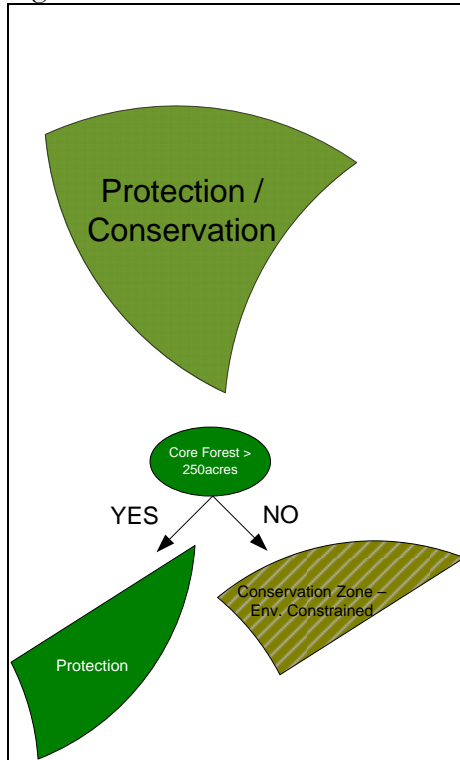
a. **Protection / Conservation Conflict**

1. IF a conflict area has both **Conservation/Protection indicators**, THEN conflict area goes to **Conservation Zone - environmentally constrained sub-zone**, UNLESS area contains **Core Forest > 250 indicator**; THEN conflict area goes to **Protection Zone**.
  - i. This rule provided priority to agricultural resources, but recognizes that the **Contiguous Farms > 250 indicator** includes some high priority forests that should not be in the Conservation Zone.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following graphic illustrates this rule.

Figure 4 – Protection / Conservation Conflict Resolution



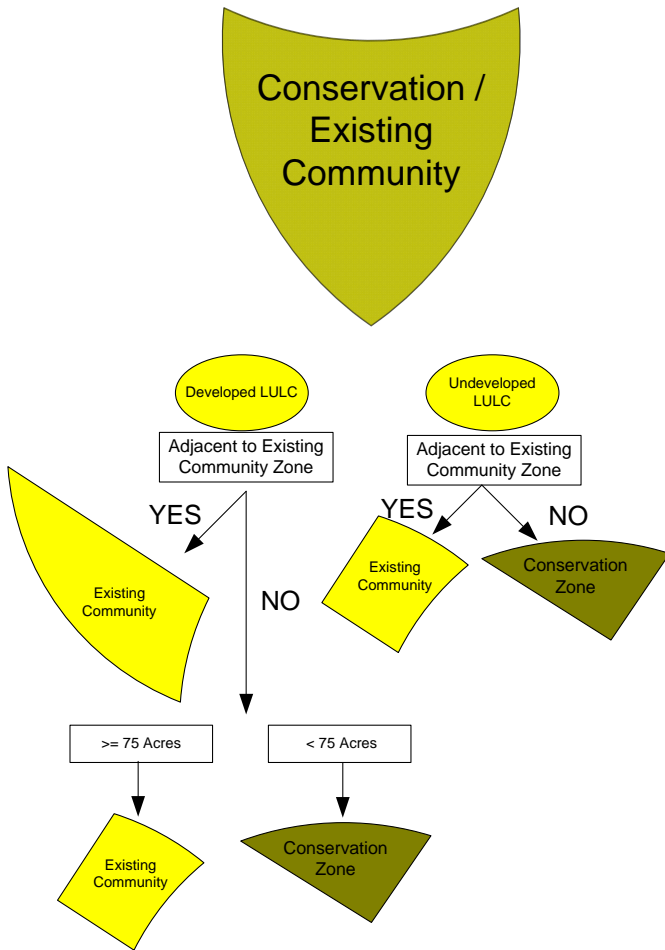
**b. Existing Community / Conservation Conflict**

1. IF conflict area is LULC Developed AND adjacent to Existing Community Zone, THEN conflict area goes to the Existing Community Zone.
2. IF conflict area is LULC Developed > 75 acres, AND not adjacent to Existing Community Zone, THEN conflict area goes to Existing Community Zone.
3. IF conflict area is LULC Developed < 75 acres, AND not adjacent to Existing Community Zone, THEN conflict area goes to Conservation Zone.
4. IF conflict area is undeveloped AND not adjacent to Existing Community Zone, THEN conflict area goes to Conservation Zone.
5. IF conflict area is undeveloped AND adjacent to Conservation Zone, THEN conflict area goes to Conservation Zone.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following graphic illustrates this rule.

Figure 5 – Existing Community / Conservation Conflict Resolution



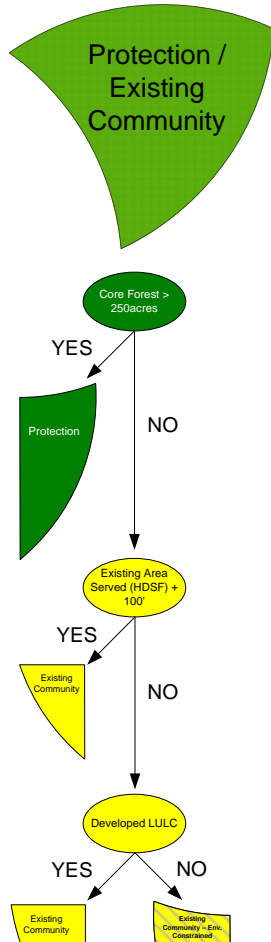
**c. Protection / Existing Community Conflict**

1. IF a conflict area has Protection/Existing Community indicators AND is within the Core Forest >250 acres indicator, THEN conflict area goes to Protection Zone.
2. IF remaining conflict area has Protection/Existing Community indicators AND is within the EAS + 100 (HDSF) indicator, THEN conflict area goes to Existing Community Zone.
  - i. This rule places developed, sewered lands in the Existing Community Zone.
3. IF remaining conflict area has Protection/Existing Community indicators AND is LULC Developed, THEN it goes to Existing Community Zone IF it is not LULC Developed, THEN it goes to Existing Community Zone – Environmentally Constrained sub-zone.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following graphic illustrates this rule.

Figure 6 – Protection / Existing Community Conflict Resolution



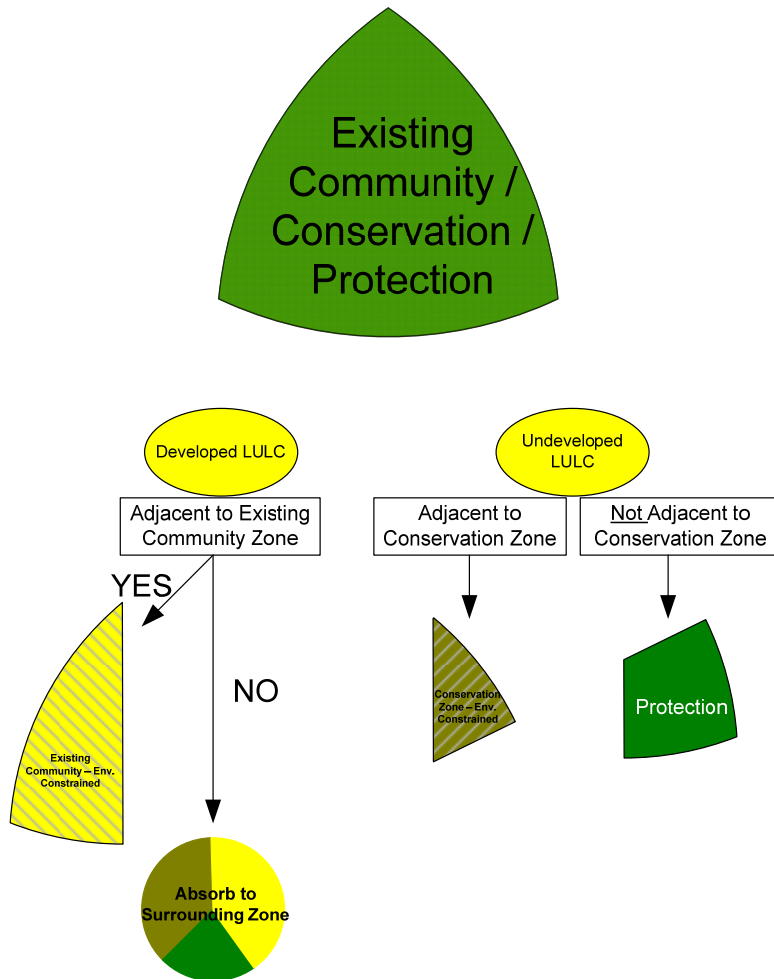
**d. Existing Community / Protection / Conservation Conflict**

1. IF triple conflict area is LULC Developed AND adjacent to Existing Community Zone, THEN conflict area goes to the Existing Community Zone – Environmentally Constrained sub-zone.
2. IF conflict area is undeveloped AND adjacent to Conservation Zone, THEN conflict area goes to Conservation Zone – Environmentally Constrained sub-zone.
3. IF conflict area is undeveloped AND not adjacent to Conservation Zone, THEN conflict area goes to Protection Zone.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following graphic illustrates this rule.

Figure 7 - Existing Community / Protection / Conservation Zone Conflict Resolution



**e. Unclassified Areas**

Once all the conflict areas have been resolved, the unclassified areas need to be assigned an overlay designation. Examples of areas that may not have been classified include water bodies and roads. The following rules are applied to these areas:

- a. IF unclassified area contains the Total Forest Area THEN area goes to Protection Zone.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

- b. IF remaining unclassified area contains Agricultural Area greater than 10 acres within the Agricultural Resource Area (ARA) THEN area goes to Conservation Zone.
- c. IF remaining unclassified area contains Rural Developed Lands THEN area goes to the surrounding zone.
- d. IF remaining unclassified area contains Land Use Land Cover 1140 THEN area goes to the surrounding zone.
- e. IF remaining unclassified area contains Agricultural Land Use Land Cover codes AND is adjacent to Conservation Zone THEN area goes to Conservation Zone.
- f. Remaining unclassified areas are absorbed by their surrounding zone.

**Absorption Process**

The absorption process associates land areas to the overlay designations contiguous to them. This process was primarily used with the unclassified areas and the last stage of conflict resolution between all three Protection, Conservation and Existing Community zones. In the event that an area shares a border with more than one zone a series of steps are carried out to complete the absorption process.

**Unclassified Absorption Process**

1. Any polygon less than 1 acre in size is associated to the zone that it shares the majority of its border with.
2. Unclassified areas that share a major majority with a neighboring zone (greater than or equal to 70%) are associated to that zone.
3. Areas that do not possess a major majority with any contiguous zone are evaluated for the land-use type that exists within the unclassified area.
  - If the unclassified area contains agricultural land uses and shares a portion of its border with the Conservation Zone (CZ) then it is associated to the CZ.
  - If the unclassified area contains developed land uses and shares a portion of its border with the Existing Community Zone (ECZ) then it is associated to the ECZ.
  - If the unclassified area does not contain agricultural or developed land uses and shares a portion of its border with the Protection Zone (PZ) then it is associated to PZ.
4. Any remaining unclassified areas are then associated to the zone that they share a majority of their border with.

**Protection, Conservation, and Existing Community Zone Conflict Absorption Process**

1. All polygons are associated to the zone that it shares the majority of its border with.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**IV. Lake Community Zone**

Once the three primary zones and the two sub-zones (Environmentally Constrained Existing Community and Conservation) were delineated, the Lake Management Areas are overlaid for the development of the Lake Community Zone. The Lake Community Zone consists of patterns of community development around lakes within the Existing Community Zone. The LANDS model utilized lakes 10 acres or greater to delineate Lake Management Areas that extend to a maximum of 1,000 feet from the lake shoreline in order to protect water quality, resource features, shoreline development recreation, scenic quality and community character. The delineation of the Lake Community Zone exclusively includes those areas where the Lake Management Area (1,000 foot buffer) coincides with the Existing Community Zone or the Existing Community Environmentally Constrained sub-zone.



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**Goals, Policies and Objectives: Future Land Use**  
*Version: October 31, 2007*

**PART 6.  
FUTURE LAND USE**

**Introduction**

The future of the Highland Region will be determined in part by the future land use decisions. The Highlands Regional Master Plan establishes a framework for future land use which guides development away from environmentally sensitive lands and agricultural lands. This framework also promotes compact development and redevelopment in or adjacent to existing development areas where adequate public facilities are available to serve new growth and development, provided that such development and redevelopment is compatible with existing land uses and community character.

**Subpart 1  
Regional Guidance**

**GOAL 6A      GUIDE DEVELOPMENT AWAY FROM ENVIRONMENTALLY SENSITIVE AND AGRICULTURAL LANDS AND PROMOTE DEVELOPMENT AND REDEVELOPMENT IN OR ADJACENT TO EXISTING DEVELOPED LANDS.**

**Policy 6A1      To limit, to the maximum extent permitted by law, development and use of undeveloped lands that are critical to protect, restore, or enhance sensitive environmental resources of the Highlands Region, including but not limited to Forests, Critical Habitat, Highlands Open Waters and their buffers, Riparian Areas, Steep Slopes, Prime Ground Water Recharge Areas, and Wellhead Protection Areas.**

**Objective 6A1a      *Identification of lands within the Highlands Region which contain sensitive environmental resources of the Highlands Region.***

- Objective 6A1b*      *The Protection Zone of the Highlands Land Use Capability Map shall include regionally significant environmental resources to the maximum extent feasible.*
- Objective 6A1c*      *Preparation and implementation of standards and criteria governing the use and development of land in Protection Zone.*
- Objective 6A1d*      *Identification of areas within the Conservation Zone and the Existing Community Zone that contain major environmentally sensitive resources and lake communities, designation of such areas as an environmentally constrained sub-zone, and preparation and implementation of standards ensuring that development capacity is directed away from such areas to the maximum extent feasible.*
- Objective 6A1e*      *Prevent the extension or creation of water and wastewater utility services in environmentally constrained sub-zones, except where the creation of such services is necessary to support clustered development that cannot feasibly be located outside the sub-zone or address a documented public health and safety issue due to failing septic systems and will maximize the protection of sensitive environmental resources.*
- Objective 6A1f*      *Preparation and implementation of standards ensuring that development protects environmentally sensitive resources in all Land Use Capability Map Zones and sub-zones.*
- Policy 6A2      To protect and promote agriculture by protecting and enhancing lands within the Highlands Region currently or capable of being used for agricultural purposes and ensuring that lands associated with or adjacent to agricultural lands are not developed in a manner that conflicts with the ongoing agricultural uses.
- Objective 6A2a*      *Identification of Agricultural Resource Areas within the Highlands Region.*
- Objective 6A2b*      *The Conservation Zone of the Land Use Capability Map shall include regionally significant agricultural lands within the Agricultural Resource Areas of the Highlands Region.*
- Objective 6A2c*      *Preparation and implementation of standards and criteria governing the use and development of land in the Conservation Zone to ensure conformance with the relevant policies and objectives.*
- Policy 6A3      To promote compatible growth opportunities that include in-fill development, adaptive re-use, redevelopment, and brownfields redevelopment in existing developed areas.
- Objective 6A3a*      *Identification of existing developed areas within the Highlands Region using the Developed Lands Analysis.*
- Objective 6A3b*      *Designation of existing, extensively developed areas as the Existing*

*Community Zone in the Highlands Land Use Capability Map.*

- Objective 6A3c*      *Preparation and implementation of standards and criteria governing new growth and development activities in the Existing Community Zone to ensure conformance with the relevant policies and objectives.*
- Policy 6A4      To promote land uses which create a sense of place with attractive, walkable neighborhoods that support community connectivity of developed lands and community facilities.
- Objective 6A4a*      *Communities of place with a mix of uses which promote multi-purpose trips, through proximity of neighborhood retail, commercial and entertainment uses to residential land uses that create communities that are largely self-sufficient regarding daily needs.*
- Objective 6A4b*      *Communities of place with a pattern of development which promotes walking and biking.*
- Policy 6A5      To integrate public parks and green spaces into development and redevelopment projects and ensure restoration of impaired natural resources to the extent required by law, at a minimum, and where feasible to a greater extent to maximize long term value of the project.
- Policy 6A6      Provisions and standards relating to regional growth activities which increase the intensity of development shall be discretionary for conforming municipalities and counties.
- Policy 6A7      Regional growth, based on local desire, should identify opportunities to maximize land use intensity while protecting natural features and community character.
- Objective 6A7a*      *Center based development initiatives should be planned within the Existing Community Zone to meet minimum density thresholds of three dwelling units per acre. Higher densities of 5 dwelling units and above are encouraged in areas designated as TDR receiving areas. Attainment of these density thresholds is discretionary, and shall be consistent with the resource and capacity goals and requirements in this plan.*
- Objective 6A7b*      *Development and redevelopment initiatives shall maximize land use intensity provided that it enhances the existing or adjacent community while protecting local and regional natural resources.*
- Policy 6A8      To incorporate smart growth principles and green building design and technology in development and redevelopment initiatives.
- GOAL 6B      USE THE HIGHLANDS LAND USE CAPABILITY MAP AS A FRAMEWORK FOR THE CHARACTER, LOCATION, AND MAGNITUDE OF NEW GROWTH AND DEVELOPMENT IN THE HIGHLANDS REGION.**

**Policy 6B1** To use the Highlands Land Use Capability Map as a geographic framework for land use planning and management within the Highlands Region.

*Objective 6B1a A Highlands Land Use Capability Map based on the most current and available data.*

*Objective 6B1b A Highlands Land Use Capability Map based on a defined methodology which produces replicable outputs.*

*Objective 6B1b A Highlands Land Use Capability Map identifying Protection Zones, Conservation Zones and Existing Community Zones, along with environmentally constrained sub-zones for the Conservation and Existing Community Zones as appropriate.*

**Policy 6B2** To develop a program for RMP Updates for all substantive components of the RMP, based upon the receipt of new, corrected or updated factual information and verification by the Highlands Council, when and where necessary to improve the accuracy of the RMP.

**Policy 6B3** To develop a program allowing the approval of municipal and county Petitions for Map Adjustments for the Land Use Capability Map and other RMP maps, other than the RMP Updates addressed in Policy 6B2. Such Map Adjustments must be supported by a demonstration that they (1) comply with the intent of the Regional Master Plan, (2) are based on municipal or county planning that results in land use patterns and environmental protection that are at least the equal, for the municipality as a whole, as the existing LUCM and Plan policies, (3) support both smart growth and resource preservation, and (4) provide protection of Highlands resources within the municipality or county that exceeds, on a whole, the protection provided by the existing LUCM and Plan policies.



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**

**Water Supply and Wastewater Utility Capacity**

***Version: October 31, 2007***

Two tables are provided with information regarding water utility capacity. One addresses the remaining capacity of wastewater treatment facilities for domestic sewage, and focuses on facilities that serve the Highlands Region and have a capacity of 20,000 gallons per day or greater. The other addresses the remaining capacity of public community water supply systems serving the Highlands Region. The two tables will be linked in GIS to the Existing Areas Served for each facility, so that municipalities will be able to relate available capacity to service areas.

**Highlands Public Community Water Supply Systems**

The Highlands Council's Draft Utility Capacity Technical Report (January 2007) describes the method used to determine remaining capacity for these facilities. In summary, the method:

1. Identified facilities that serve any portion of the Highlands Region, regardless of whether the water treatment facility itself is located within the Region, and their water allocation permit limitations and bulk transfer contracts, in million gallons per month (MGM).
2. Determined the peak monthly demand for each facility for the years 2002-2004.
3. Compared the peak monthly demand to the monthly supply, and determine whether the system has remaining capacity or a deficit. Note that this value is for the entire system, including both Highlands Region and other service areas.
4. Identified the Existing Area Served, both within and outside of the Highlands Region, to determine what portion of the service area is within the Region.

Based on the analysis, only 11 of 61 facilities in the Highlands region have available capacity of greater than 31 MGM, or approximately 1 million gallons per day (MGD). The largest of these by far are the NJ American Water Company divisions (Elizabethtown and Short Hills), which have extensive service areas outside of the Highlands Region and rely primarily on surface water supplies and non-Highlands Region ground water. The remaining top facilities primarily serve the Highlands Region. It should be noted that the method provides conservative values for water availability,

because nearly all Highlands systems (notably excepting the NJ American Water Company systems) are dependent upon aquifers, which will not have the same immediate effects on stream flow as surface water intakes on streams. Further, the demand data used in this analysis are from 2002-2004, and more recent data may show different results. In most cases, demands will have increased over time. Therefore, the addition of further information will likely modify these results over time.

#### Highlands Domestic Sewerage Facilities

The Draft Utility Capacity Technical Report (January 2007) also describes the method used to determine remaining capacity for domestic sewerage facilities. In summary, the method:

1. Identified facilities that serve any portion of the Highlands Region, regardless of whether the treatment facility itself is located within the Region, and their permit or Wastewater Management Plan limitations for flow. The facilities were limited to those serving more than a single property, eliminating non-community, commercial and industrial systems.
2. Identified the Existing Area Served, both within and outside of the Highlands Region, to determine what portion of the service area is within the Region.
3. Determined the maximum three-month discharges for each facility for the years 2002-2004, and pro-rate that amount to the Highlands Region depending on Step 2. The process of pro-rating discharges is necessary in the absence of facility-specific information on wastewater flows from each portion of their service area. More detailed information could modify the results.
4. Compared the Highlands portion of the discharge flow against the Highlands portion of the permitted capacity and determine whether the facility is in deficit or has remaining capacity.

Based on this analysis, many of the Highlands facilities have at least some remaining capacity, with a total of 15.31 MGD for those facilities. Nine facilities show either no capacity or deficits. The facilities with remaining capacity mostly have less than 0.4 MGD remaining, but five facilities (Parsippany-Troy Hills, Hanover, Musconetcong, Morris-Butterworth and Phillipsburg) show greater than 1 MGD remaining capacity. However, Musconetcong is reported to have fully obligated its remaining capacity to address areas with failing septic systems, and data are lacking on obligations and commitments from most other facilities. Therefore, actual remaining capacity is likely to be less than in the table. Further, the discharge data used in this analysis are from 2002-2004, and more recent data may show different results.

Highlands Public Water Supply Systems:  
Available Water Supply Capacity

PUBLIC COMMUNITY WATER SYSTEM	MONTHLY SUPPLY [allocation & bulk purchase] (MGM)	MAXIMUM MONTHLY DEMAND (MGM)	AVAILABLE CAPACITY (MGM)
ELIZABETHTOWN WATER COMPANY	6761.5	5741.976	1019.524
NJ AMERICAN WATER COMPANY (SHORT HILLS)	2065.2	1669.552	395.648
SOUTHEAST MORRIS COUNTY MUA	452	282.1	169.9
BUTLER WATER DEPARTMENT	124	51.181	72.819
RINGWOOD WATER DEPARTMENT	102	39.901	62.099
PARSIPPANY-TROY HILLS WATER DEPARTMENT	343.86	296.477	47.383
MINE HILL TOWNSHIP WATER DEPARTMENT	60	13.02	46.98
SPARTA TOWNSHIP WATER (SUMMIT LAKE) Hardyston Twp., Highland, Lake Mohawk, Greentree, Sunset Lakes,	103.2	57.66	45.54
PEQUANNOCK TOWNSHIP WATER DEPARTMENT	137	93.7	43.3
OAKLAND WATER DEPARTMENT	124	81.612	42.388
CONSUMERS NJ WATER COMPANY (AQUA NJ WATER COMPANY- PHILLIPSBURG)	178	143.354	34.646
BOONTON WATER DEPARTMENT	61.7	32.457	29.243
HACKETTSTOWN MUA (WITH DIAMOND HILL)	123.7	96.125	27.575
MCMUA	200	176.7	23.3
CLINTON WATER DEPARTMENT	88	65.41	22.59
WANAUKE WATER DEPARTMENT	62	40.3	21.7
POMPTON LAKES MUA	60	43.741	16.259
ROXBURY WATER COMPANY	55	38.75	16.25
ROCKAWAY TOWNSHIP WATER DEPARTMENT	71.5	57.35	14.15
DENVILLE TOWNSHIP WATER DEPARTMENT	77	63.55	13.45
BLOOMINGDALE WATER DEPARTMENT	31	34.751	12.183
MOUNT OLIVE TWP WATER DEPARTMENT (entire system)	55	43.025	11.975
WASHINGTON TOWNSHIP MUA (HAGER, Schooley Mtn)	35	23.436	11.564
DOVER WATER DEPARTMENT	112	100.812	11.188
NJ AMERICAN WATER COMPANY BELVIDERE SYSTEM	28.5	17.988	10.512
STANHOPE WATER DEPARTMENT	22.32	12.896	9.424
KINNELON WATER DEPARTMENT	23.25	13.919	9.331
NJ AMERICAN WATER COMPANY - (Washington, Mansfield and Oxford Systems)	57.88	49.001	8.879
BOONTON TWP WATER DEPARTMENT	9.3	0.93	8.37
ROXBURY TOWNSHIP WATER DEPARTMENT (EVERGREEN)	35	0.496	6.494
FRANKLIN BORO BOARD OF PUBLIC WORKS	18	11.656	6.344
NETCONG WATER DEPARTMENT	18	11.687	6.313
Hardyston Twp MUA Forr System	11.37	5.13	6.24
MONTVILLE TOWNSHIP MUA	134	127.875	6.125
MAHWAH WATER DEPARTMENT	174.15	168.203	5.947
OGDENSBURG WATER DEPARTMENT	12	7.13	4.87
HIGH BRIDGE WATER DEPARTMENT	19.13	14.446	4.684
MOUNT ARLINGTON SERVICE COMPANY, INCORPORATED (MOUNT ARLINGTON BOROUGH- KADEL AND MAIN)	15.5	11.094	4.406
RIVERDALE BORO WATER DEPARTMENT	12.4	8.215	4.185
UNITED WATER VERNON VALLEY INCORPORATED	20.5	16.377	4.123
MILFORD WATER DEPARTMENT	10	5.89	4.11
ROCKAWAY BORO WATER DEPARTMENT	44.4	40.3	4.1
HAMBURG BOARD OF PUBLIC WORKS	16	12.059	3.941
HAMPTON BOROUGH WATER DEPARTMENT	6.6	3.72	2.88
ALPHA MUNICIPAL WATER WORKS	13	10.178	2.822
MOUNTAIN LAKES WATER DEPARTMENT	30	27.962	2.038
GLEN GARDNER WATER DEPARTMENT	6.2	4.5942	1.6058
INDEPENDENCE MUA (HIGHLANDS DIVISION)	2.59	1.43	1.16
VERNON WATER COMPANY	3.1	1.984	1.116
RANDOLPH TOWNSHIP MUNICIPAL UTILITIES AUTHORITY	84	83.08	0.92
NJ AMERICAN WATER COMPANY (Mount Olive System)	3.1	2.387	0.713
ALLAMUCHY TWP WATER & SEWER (District #2) and Allamuchy Water District #1	15.5	14.853	0.647
CONSUMERS NJ WATER COMPANY CALIFON	3.1	2.48	0.62
FAYSON LAKE WATER COMPANY INCORPORATED	11	10.385	0.615
BLOOMSBURY WATER DEPARTMENT	4.65	4.53	0.12
PASSAIC VALLEY WATER COMMISSION (HIGH CREST)	3.1	3.15	-0.05
CHESTER BORO WATER UTILITY	3.1	4.371	-1.271
WEST MILFORD TWP MUA (entire system)	21.5	23.9258	-2.4258
HOPATCONG WATER DEPARTMENT	18.91	23.746	-4.836
JEFFERSON TOWNSHIP MUA WATER UTILITY- Milton System	37	0.93	-5.81
WHARTON WATER DEPARTMENT	40.3	56.978	-16.678

Wastewater Capacity

NJPDES	Facility Name	Discharge Type	Portion of Facility Located within Highlands	Total Permitted Capacity (MGD)	Highlands Portion of Permitted Capacity (MGD)	Total MAX3MO Discharge (MGD)	Highlands Portion of MAX3MO (MGD)	Current Available Highlands Capacity (MGD)
NJ0024970	Parsippany-Troy Hills SA	SW	0.85	16.00	13.60	13.03	11.08	2.52
NJ0024902	Hanover STP	SW	0.98	4.61	4.52	2.26	2.21	2.30
NJ0027821	Musconetcong SA*	SW	1.00	4.30	4.30	2.40	2.40	1.90
NJ0024911	Butterworth	SW	1.00	3.30	3.30	2.25	2.25	1.05
NJ0024716	Phillipsburg STP	SW	1.00	3.50	3.50	2.49	2.49	1.01
NJ0053350	Upper Walkill	SW	0.95	3.00	2.85	2.08	1.97	0.88
NJ0021369	Hackettstown WPCF	SW	1.00	3.39	3.39	2.68	2.68	0.71
NJ0024813	NW Bergen County MUA	SW	0.21	15.00	3.15	11.71	2.46	0.69
NJ0024929	Woodland	SW	0.93	2.00	1.86	1.31	1.22	0.64
NJ0033995	Environmental Disposal Corporation	SW	1.00	2.10	2.10	1.49	1.49	0.61
NJ0020389	Town of Clinton WTP	SW	0.99	2.03	2.01	1.43	1.42	0.59
NJ0021113	Washington Borough WTF	SW	1.00	1.50	1.50	0.97	0.97	0.53
NJ0029386	Two Bridges Sewerage Authority	SW	0.54	7.50	4.05	6.54	3.53	0.52
NJ0022845	Harrison Brook STP	SW	1.00	2.50	2.50	2.13	2.13	0.37
NJ0020605	Allamuchy Township MUA	SW	1.00	0.60	0.60	0.35	0.35	0.25
NJ0022349	Rockaway Valley Regional Sewerage Authority	SW	1.00	12.00	12.00	11.87	11.87	0.13
NJ0027685	West Milford Twp MUA - Highview	SW	1.00	0.21	0.21	0.09	0.09	0.12
NJ0035114	Warren County MUA - Belvidere	SW	1.00	0.50	0.50	0.39	0.39	0.11
NJ0053759	Wanaque Valley RSA	SW	1.00	1.25	1.25	1.14	1.14	0.11
NJ0021890	Milford STP	SW	1.00	0.40	0.40	0.30	0.30	0.10
NJ0023698	Pompton Lakes MUA	SW	1.00	1.20	1.20	1.11	1.11	0.09
NJ0021954	Mt Olive Twp - Clover Hill STP	SW	1.00	0.50	0.50	0.41	0.41	0.09
NJ0035483	Warren County MUA - Oxford	SW	1.00	0.50	0.50	0.42	0.42	0.08
NJ0109061	Long Valley Village Wastewater Treatment	SW	1.00	0.24	0.24	0.17	0.17	0.08
NJ0133558	Jefferson Village	GW	1.00	0.13	0.13	0.05	0.05	0.07
NJ0099538	Mount Olive Village Sewerage Company	GW > 20K	1.00	0.33	0.33	0.27	0.27	0.06
NJ0098922	Readington-Lebanon SA	SW	0.14	1.20	0.17	0.75	0.11	0.06
NJ0027677	West Milford Twp MUA- Olde Milford	SW	1.00	0.17	0.17	0.14	0.14	0.03
NJ0022675	Ajax Terrace WPCP	SW	1.00	2.00	2.00	1.97	1.97	0.03
NJ0026174	West Milford Twp MUA - Crescent Park STP	SW	1.00	0.06	0.06	0.04	0.04	0.02
NJ0024864	Somerset Raritan Valley SA	SW	0.01	24.30	0.24	21.98	0.22	0.02
NJ0025496	Morristown	SW	1.00	3.45	3.45	3.43	3.43	0.02
NJ0054101	Chester Borough	GW > 20K	1.00	0.08	0.08	0.07	0.07	0.01
NJ0022683	Skyview WPCP	SW	1.00	0.08	0.08	0.08	0.08	0.00
NJ0026867	Jefferson Twp - White Rock	SW	1.00	0.13	0.13	0.14	0.14	(0.01)
NJ0055956	Tewksbury Twp	GW > 20K	1.00	0.03	0.03	0.04	0.04	(0.01)
NJ0022781	Valley Rd Sewer Co - Pottersville STP	SW	1.00	0.05	0.05	0.06	0.06	(0.01)
NJ0028541	West Milford Twp MUA - Birchill	SW	1.00	0.02	0.02	0.03	0.03	(0.01)
NJ0027669	West Milford Twp MUA - Awosting	SW	1.00	0.05	0.05	0.09	0.09	(0.04)
NJ0021334	Mendham Boro	SW	1.00	0.40	0.40	0.48	0.48	(0.08)
NJ0023493	Schooley's Mountain WTP	SW	1.00	0.50	0.50	0.67	0.67	(0.17)
NJ0026387	Borough of Bernardsville	SW	1.00	0.50	0.50	0.71	0.71	(0.21)

HIGHLANDS DOMESTIC SEWERAGE FACILITIES --  
AVAILABLE WASTEWATER CAPACITY

NJDOES	Facility Name	Discharge Type	Portion of Facility Located within Highlands	Total Permitted Capacity (MGD)	Highlands Portion of Permitted Capacity (MGD)	Total MAXIMO Discharge (MGD)	Highlands Portion of MAXIMO (MGD)	Current Available Highlands Capacity (MGD)
NJ024970	Passaic-Two Hills SA	SW	0.85	16.00	13.60	13.03	11.08	2.52
NJ024902	Hanover STP	SW	0.98	4.61	4.52	2.26	2.21	2.30
NJ027821	Mineconecong SA*	SW	1.00	4.50	4.50	2.40	2.40	1.90
NJ024911	Barnesboro	SW	1.00	3.30	3.30	2.25	2.25	1.05
NJ024716	Phillipsburg STP	SW	1.00	3.50	3.50	2.49	2.49	1.01
NJ025350	Upper Walkill	SW	0.95	3.00	2.85	2.08	1.97	0.88
NJ021509	Hickstown WPCP	SW	1.00	3.39	3.39	2.68	2.68	0.71
NJ024813	NW Bergen County MUA	SW	0.21	15.00	3.15	11.71	2.46	0.69
NJ024929	Woodland	SW	0.93	2.00	1.86	1.31	1.22	0.64
NJ015995	Lawsonstonal Regional Corporation	SW	1.00	2.10	2.10	1.49	1.49	0.61
NJ020389	Town of Clinton WTP	SW	0.99	2.03	2.01	1.43	1.42	0.59
NJ021113	Washington Borough WTP	SW	1.00	1.50	1.50	0.97	0.97	0.53
NJ029386	Two Beddes Sewerage Authority	SW	0.54	7.50	4.05	6.54	3.53	0.52
NJ022845	Harrison Brook STP	SW	1.00	2.90	2.90	2.13	2.13	0.37
NJ020603	Alamanchy Township MUA	SW	1.00	0.60	0.60	0.35	0.35	0.23
NJ022349	Rockaway Valley Regional Sewerage Authority	SW	1.00	12.00	12.00	11.87	11.87	0.13
NJ021688	West Milford Twp MUA - Highway	SW	1.00	0.21	0.21	0.09	0.09	0.12
NJ035114	Warren County MUA - Babcock	SW	1.00	0.50	0.50	0.39	0.39	0.11
NJ053759	Wanaque Valley RSA	SW	1.00	1.25	1.25	1.34	1.14	0.11
NJ021891	Milford STP	SW	1.00	0.40	0.40	0.30	0.30	0.10
NJ025698	Pompton Lakes MUA	SW	1.00	1.20	1.20	1.11	1.11	0.09
NJ021954	Mt Olive Twp - Clover Hill STP	SW	1.00	0.50	0.50	0.41	0.41	0.09
NJ035483	Warren County MUA - Oxford	SW	1.00	0.50	0.50	0.42	0.42	0.08
NJ010661	Long Valley Village Wastewater Treatment	SW	1.00	0.24	0.24	0.17	0.17	0.08
NJ013358	Jefferson Village	GW	1.00	0.13	0.13	0.05	0.05	0.07
NJ009938	Mount Olive Village Sewerage Company	GW > 20K	1.00	0.33	0.33	0.27	0.27	0.06
NJ009922	Randolph Lebanon SA	SW	0.14	1.20	0.17	0.73	0.11	0.06
NJ027677	West Milford Twp MUA - Olds Milford	SW	1.00	0.17	0.17	0.14	0.14	0.03
NJ022675	Aux Terrace WPCP	SW	1.00	2.00	2.00	1.97	1.97	0.03
NJ026174	West Milford Twp MUA - Crescent Park STP	SW	1.00	0.06	0.06	0.04	0.04	0.02
NJ024864	Scotchertown Valley SA	SW	0.01	24.50	0.24	21.08	0.22	0.02
NJ023496	Bloomtown	SW	1.00	3.43	3.43	3.43	3.43	0.02
NJ054101	Chester Borough	GW > 20K	1.00	0.08	0.08	0.07	0.07	0.01
NJ022683	Salmon WPCP	SW	1.00	0.08	0.08	0.08	0.08	0.00
NJ022687	Jefferson Twp - White Rock	SW	1.00	0.13	0.13	0.14	0.14	(0.01)
NJ053956	Teckshane Twp	GW > 20K	1.00	0.03	0.03	0.04	0.04	(0.01)
NJ025781	Valley Mill Sewer Co - Pomerville STP	SW	1.00	0.05	0.05	0.06	0.06	(0.01)
NJ028541	West Milford Twp MUA - Birchall	SW	1.00	0.02	0.02	0.03	0.03	(0.01)
NJ027669	West Milford Twp MUA - Avozing	SW	1.00	0.05	0.05	0.09	0.09	(0.04)
NJ021334	Middletown	SW	1.00	0.40	0.40	0.48	0.48	(0.08)
NJ023493	Schooley's Mountain WTP	SW	1.00	0.50	0.50	0.67	0.67	(0.17)
NJ026387	Borough of Bernardsville	SW	1.00	0.50	0.50	0.71	0.71	(0.21)
<b>TOTAL</b>				<b>121.61</b>	<b>78.41</b>	<b>99.98</b>	<b>63.11</b>	<b>15.31</b>

1.0-2.52 MGD  
 0.5-0.99 MGD  
 0.1-0.49 MGD  
 0.01-0.09 MGD  
 ( ) No capacity  
 \*All available capacity committed to address failing septic systems



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**

**Calculation of Net Water Availability**

***Version: October 31, 2007***

The attached table displays the net water availability calculated for each subwatershed in the Highlands Region. The net water availability analysis was performed at a HUC14 subwatershed level to determine three important components:

1. the sustainability of water resources (*ground water capacity*);
2. the water that is “available” for human use (*ground water availability*); and
3. the remaining water after current consumptive and depletive uses are deducted (*net water availability*).

All water values reported in the table are expressed as million gallons per day (MGD). Ground water capacity was calculated using the Low Flow Margin of Safety as documented in Volume 2 of the “Draft Water Resources Technical Report” and the September 6 “Policy Issues for Council Discussion.” The NJDEP is using the same method in updating the NJ Statewide Water Supply Plan. However, some of that water must be reserved to maintain stream flows for aquatic ecology and downstream users. In the Protection and Conservation Zones, the allowable threshold is 5% for potable or non-agricultural uses. For agricultural uses within a Conservation Zone, the threshold is 10%. In the Existing Community Zone, the threshold is 20%. The value for the Conservation Zone was modified from the November 2006 draft RMP analysis (10% for all uses) based on the revised Goals, Policies and Objectives of the RMP as discussed in the September 6 “Policy Issues for Council Discussion”.

After ground water availability has been calculated, existing consumptive/depletive uses were estimated using 2003 NJDEP permit data and estimates for domestic well and septic system use. Consumptive/depletive uses are those uses that are not returned to the subwatershed by a discharge back into ground or a stream. The analysis compared these consumptive/depletive uses against ground water availability. This difference is called net water availability. Where existing uses exceeded ground water availability, the net water availability is a deficit (red negative value in the

table). Based on policies in the RMP, these deficits also trigger constraints on subwatersheds upstream of the deficit by reducing their ground water availability to 5% more than the existing consumptive/depletive uses or the default threshold for the Zone, whichever is lower.

The RMP restricts additional uses in deficit subwatershed. The RMP conditionally allows an additional 1% of ground water availability in the Protection Zone and Conservation Zone, and 2% in the Existing Community Zone. However, these uses are conditional upon applicants providing demonstration of 125% mitigation of any proposed consumptive/depletive uses using ground water recharge and other water conservation measures; the RMP policies also require municipalities to determine how deficits can be reduced and eliminated in a Water Management Plan.

Agricultural net water availability is shown as the final three columns. As stated previously, it is only available for agricultural uses in a Conservation Zone subwatershed.

### Highlands Region Water Availability by HUC-14 Subwatershed

SW_NAME	HUC14	GW Capacity		Non-Ag Net Availability			AG Net Availability		
		Ground Water Capacity (MGD)	Ground Water Availability (MGD)	TOTAL Consumptive/ Depletive Uses (MGD)	Net Water Availability (MGD)	Conditionally Available Water for C/D Uses (MGD)	Agriculture Ground Water Availability (Conservation Zone) (MGD)	Agriculture Consumptive/ Depletive Uses (MGD)	Agriculture Net Water Availability <sup>1</sup> (MGD)
Wallkill R/Lake Mohawk(above Sparta Sta)	02020007010010	1.8112	0.091	0.8176	(0.7270)	0.0181			0.0000
Wallkill R (Ogdensburg to SpartaStation)	02020007010020	0.7733	0.039	0.3243	(0.2857)	0.0077			0.0000
Franklin Pond Creek	02020007010030	0.7942	0.040	0.0890	(0.0493)	0.0079			0.0000
Wallkill R(Hamburg SW Bdy to Ogdensburg)	02020007010040	2.2850	0.114	0.8683	(0.7540)	0.0228			0.0000
Hardistonville tribs	02020007010050	0.5678	0.028	0.2563	(0.2279)	0.0057			0.0000
Beaver Run	02020007010060	0.2457	0.012	0.0045	0.0078	0.0000			0.0000
Wallkill R(Martins Rd to Hamburg SW Bdy)	02020007010070	1.2091	0.060	0.7800	(0.7195)	0.0121			0.0000
Papakating Creek (below Pellettown)	02020007020070	0.0000	0.000	0.0000	0.0000	0.0000			0.0000
Wallkill R(41d13m30s to Martins Road)	02020007030010	0.5639	0.028	0.0687	(0.0405)	0.0056			0.0000
Wallkill River(Owens gage to 41d13m30s)	02020007030030	0.3063	0.015	0.0190	(0.0037)	0.0031			0.0000
Wallkill River(stateline to Owens gage)	02020007030040	0.3155	0.016	0.0181	(0.0023)	0.0032			0.0000
Black Ck(above/incl G.Gorge Resort trib)	02020007040010	0.9765	0.049	0.5455	(0.4967)	0.0098			0.0000
Black Creek (below G. Gorge Resort trib)	02020007040020	2.6968	0.135	0.3110	(0.1762)	0.0270			0.0000
Pochuck Ck/Glenwood Lk & northern trib	02020007040030	0.6533	0.033	0.0382	(0.0055)	0.0065			0.0000
Highland Lake/Wawayanda Lake	02020007040040	0.6889	0.034	0.0376	(0.0031)	0.0069			0.0000
Wawayanda Creek & tribs	02020007040050	2.0770	0.104	0.0978	0.0061	0.0000			0.0000
Long House Creek/Upper Greenwood Lake	02020007040060	1.1663	0.058	0.0488	0.0095	0.0000			0.0000
Passaic R Upr (above Osborn Mills)	02030103010010	2.2177	0.111	0.6888	(0.5779)	0.0222			0.0000
Primrose Brook	02030103010020	1.1520	0.058	0.0631	(0.0055)	0.0115			0.0000
Great Brook (above Green Village Rd)	02030103010030	1.2621	0.252	1.1941	(0.9417)	0.0252			0.0000
Loantaka Brook	02030103010040	0.6098	0.122	0.5074	(0.3855)	0.0122			0.0000
Great Brook (below Green Village Rd)	02030103010050	0.7572	0.038	0.0194	0.0185	0.0000			0.0000
Black Brook (Great Swamp NWR)	02030103010060	0.3049	0.015	0.0204	(0.0052)	0.0030			0.0000
Passaic R Upr (Dead R to Osborn Mills)	02030103010070	1.0137	0.203	0.0431	0.1597	0.0000			0.0000
Dead River (above Harrisons Brook)	02030103010080	1.4357	0.287	0.0226	0.2645	0.0000			0.0000
Harrisons Brook	02030103010090	0.5997	0.120	0.0112	0.1088	0.0000			0.0000
Dead River (below Harrisons Brook)	02030103010100	0.2950	0.015	0.0099	0.0048	0.0000			0.0000
Passaic R Upr (Plainfield Rd to Dead R)	02030103010110	0.0000	0.000	0.0000	0.0000	0.0000			0.0000
Passaic R Upr (Pine Bk br to Rockaway)	02030103010180	0.0513	0.010	0.0906	(0.0803)	0.0010			0.0000
Whippany R (above road at 74d 33m)	02030103020010	1.3090	0.065	0.0279	0.0376	0.0000			0.0000
Whippany R (Wash. Valley Rd to 74d 33m)	02030103020020	1.3562	0.068	0.0131	0.0547	0.0000			0.0000
Greystone / Watnong Mtn tribs	02030103020030	1.8874	0.377	0.0036	0.0944	0.0000			0.0000
Whippany R(Lk Pocahontas to Wash Val Rd)	02030103020040	0.9261	0.185	0.1110	0.0463	0.0000			0.0000
Whippany R (Malapardis to Lk Pocahontas)	02030103020050	1.0544	0.211	0.0419	0.0527	0.0000			0.0000
Malapardis Brook	02030103020060	0.6271	0.125	5.9221	(5.7967)	0.0125			0.0000
Black Brook (Hanover)	02030103020070	0.6843	0.137	1.4534	(1.3085)	0.0137			0.0000
Troy Brook (above Reynolds Ave)	02030103020080	1.8286	0.366	7.4743	(7.1086)	0.0366			0.0000
Troy Brook (below Reynolds Ave)	02030103020090	0.6813	0.034	1.8027	(1.7686)	0.0068	0.070		0.0681
Whippany R (Rockaway R to Malapardis Bk)	02030103020100	0.3263	0.065	0.2932	(0.2279)	0.0065			0.0000
Russia Brook (above Milton)	02030103030010	2.3210	0.116	0.3080	(0.1919)	0.0232			0.0000

### Highlands Region Water Availability by HUC-14 Subwatershed

SW_NAME	HUC14	GW Capacity		Non-Ag Net Availability			AG Net Availability		
		Ground Water Capacity (MGD)	Ground Water Availability (MGD)	TOTAL Consumptive/ Depletive Uses (MGD)	Net Water Availability (MGD)	Conditionally Available Water for C/D Uses (MGD)	Agriculture Ground Water Availability (Conservation Zone) (MGD)	Agriculture Consumptive/ Depletive Uses (MGD)	Agriculture Net Water Availability <sup>1</sup> (MGD)
Russia Brook (below Milton)	02030103030020	0.7516	0.038	0.1189	(0.0813)	0.0075			0.0000
Rockaway R (above Longwood Lake outlet)	02030103030030	1.0369	0.052	0.3657	(0.3139)	0.0104			0.0000
Rockaway R (Stephens Bk to Longwood Lk)	02030103030040	1.0808	0.054	0.0647	(0.0107)	0.0108			0.0000
Green Pond Brook (above Burnt Meadow Bk)	02030103030050	1.7922	0.090	0.0254	0.0642	0.0000			0.0000
Green Pond Brook (below Burnt Meadow Bk)	02030103030060	1.0256	0.051	0.7587	(0.7075)	0.0103			0.0000
Rockaway R (74d 33m 30s to Stephens Bk)	02030103030070	1.6148	0.323	4.3815	(4.0586)	0.0323			0.0000
Mill Brook (Morris Co)	02030103030080	0.7925	0.158	0.0354	0.0396	0.0000			0.0000
Rockaway R (BM 534 brdg to 74d 33m 30s)	02030103030090	1.0810	0.216	1.1617	(0.9455)	0.0216			0.0000
Hibernia Brook	02030103030100	1.2721	0.064	0.0268	0.0368	0.0000			0.0000
Beaver Brook (Morris County)	02030103030110	2.4029	0.120	2.6197	(2.4996)	0.0240			0.0000
Den Brook	02030103030120	1.5077	0.302	0.0275	0.0754	0.0000			0.0000
Stony Brook (Boonton)	02030103030130	1.4585	0.073	0.2447	(0.1718)	0.0146			0.0000
Rockaway R (Stony Brook to BM 534 brdg)	02030103030140	0.8356	0.167	2.1216	(1.9545)	0.0167		0.1306	(0.1306)
Rockaway R (Boonton dam to Stony Brook)	02030103030150	0.9074	0.181	0.0212	0.0454	0.0000			0.0000
Montville tribs.	02030103030160	1.6402	0.082	0.0646	0.0174	0.0000		0.0194	(0.0194)
Rockaway R (Passaic R to Boonton dam)	02030103030170	1.3573	0.271	0.0285	0.0679	0.0000			0.0000
Passaic R Upr (Pompton R to Pine Bk)	02030103040010	0.4546	0.023	0.0463	(0.0235)	0.0045			0.0000
Pequannock R (above Stockholm/Vernon Rd)	02030103050010	0.6235	0.031	0.0301	0.0010	0.0000			0.0000
Pacock Brook	02030103050020	0.9600	0.048	0.0425	0.0055	0.0000			0.0000
Pequannock R (above OakRidge Res outlet)	02030103050030	1.5853	0.079	0.0513	0.0279	0.0000			0.0000
Clinton Reservoir/Mossmans Brook	02030103050040	2.1373	0.107	0.0811	0.0258	0.0000			0.0000
Pequannock R (Charlotteburg to OakRidge)	02030103050050	3.6690	0.183	0.3604	(0.1769)	0.0367			0.0000
Pequannock R(Macopin gage to Charl'brg)	02030103050060	1.1297	0.056	0.0580	(0.0015)	0.0113			0.0000
Stone House Brook	02030103050070	1.0341	0.052	0.5217	(0.4700)	0.0103			0.0000
Pequannock R (below Macopin gage)	02030103050080	2.6525	0.133	1.7820	(1.6494)	0.0265			0.0000
Belcher Creek (above Pinecliff Lake)	02030103070010	0.7595	0.038	0.1215	(0.0835)	0.0076			0.0000
Belcher Creek (Pinecliff Lake & below)	02030103070020	1.2982	0.065	0.0760	(0.0110)	0.0130			0.0000
Wanaque R/Greenwood Lk(aboveMonks gage)	02030103070030	2.1429	0.107	0.1136	(0.0065)	0.0214			0.0000
West Brook/Burnt Meadow Brook	02030103070040	1.5835	0.079	0.0856	(0.0064)	0.0158			0.0000
Wanaque Reservoir (below Monks gage)	02030103070050	3.2083	0.160	0.3492	(0.1888)	0.0321			0.0000
Meadow Brook/High Mountain Brook	02030103070060	0.7716	0.039	0.6814	(0.6428)	0.0077			0.0000
Wanaque R/Posts Bk (below reservoir)	02030103070070	1.6727	0.084	0.4301	(0.3465)	0.0167			0.0000
Ramapo R (above 74d 11m 00s)	02030103100010	0.7708	0.039	1.7370	(1.6985)	0.0077			0.0000
Masonicus Brook	02030103100020	0.3561	0.071	0.5233	(0.4521)	0.0071			0.0000
Ramapo R (above Fyke Bk to 74d 11m 00s)	02030103100030	0.8504	0.043	2.7781	(2.7356)	0.0085			0.0000
Ramapo R (Bear Swamp Bk thru Fyke Bk)	02030103100040	0.1689	0.008	0.0119	(0.0034)	0.0017			0.0000
Ramapo R (Crystal Lk br to BearSwamp Bk)	02030103100050	0.9139	0.046	3.0268	(2.9811)	0.0091			0.0000
Crystal Lake/Pond Brook	02030103100060	0.5172	0.103	0.4421	(0.3357)	0.0103			0.0000
Ramapo R (below Crystal Lake bridge)	02030103100070	0.8189	0.041	0.1746	(0.1337)	0.0082			0.0000
Lincoln Park tribs (Pompton River)	02030103110010	1.1967	0.060	2.3816	(2.3217)	0.0120		0.0697	(0.0507)
Pompton River	02030103110020	0.4753	0.095	0.0148	0.0802	0.0000		0.0479	(0.0107)

### Highlands Region Water Availability by HUC-14 Subwatershed

SW_NAME	HUC14	GW Capacity		Non-Ag Net Availability			AG Net Availability		
		Ground Water Capacity (MGD)	Ground Water Availability (MGD)	TOTAL Consumptive/ Depletive Uses (MGD)	Net Water Availability (MGD)	Conditionally Available Water for C/D Uses (MGD)	Agriculture Ground Water Availability (Conservation Zone) (MGD)	Agriculture Consumptive/ Depletive Uses (MGD)	Agriculture Net Water Availability <sup>1</sup> (MGD)
Hohokus Bk (above Godwin Ave)	02030103140010	0.4349	0.087	0.0807	0.0063	0.0000			0.0000
Hohokus Bk(Pennington Ave to Godwin Ave)	02030103140020	0.2899	0.058	0.4356	(0.3776)	0.0058			0.0000
Saddle River (above Rt 17)	02030103140040	0.1076	0.022	0.1553	(0.1338)	0.0022			0.0000
Drakes Brook (above Eyland Ave)	02030105010010	1.8452	0.092	0.1238	(0.0316)	0.0185			0.0000
Drakes Brook (below Eyland Ave)	02030105010020	1.6170	0.323	0.6267	(0.3033)	0.0323			0.0000
Raritan River SB(above Rt 46)	02030105010030	1.3315	0.067	0.4232	(0.3567)	0.0133			0.0000
Raritan River SB(74d 44m 15s to Rt 46)	02030105010040	1.7642	0.088	0.4325	(0.3443)	0.0176			0.0000
Raritan R SB(LongValley br to 74d44m15s)	02030105010050	3.9936	0.200	0.3095	(0.1099)	0.0399			0.0000
Raritan R SB(Califon br to Long Valley)	02030105010060	3.2737	0.164	0.1451	0.0186	0.0000		0.0090	(0.0090)
Raritan R SB(StoneMill gage to Califon)	02030105010070	1.5442	0.077	0.0773	(0.0000)	0.0154			0.0000
Raritan R SB(Spruce Run-StoneMill gage)	02030105010080	0.6805	0.136	0.2513	(0.1152)	0.0136			0.0000
Spruce Run (above Glen Gardner)	02030105020010	2.1600	0.108	0.1886	(0.0806)	0.0216			0.0000
Spruce Run (Reservior to Glen Gardner)	02030105020020	0.4799	0.024	0.0720	(0.0480)	0.0048			0.0000
Mulhockaway Creek	02030105020030	2.5176	0.126	0.0549	0.0710	0.0000			0.0000
Spruce Run Reservior / Willoughby Brook	02030105020040	2.1108	0.106	0.5891	(0.4835)	0.0211			0.0000
Beaver Brook (Clinton)	02030105020050	1.2327	0.062	1.6194	(1.5577)	0.0123	0.123		0.1233
Cakepoulin Creek	02030105020060	0.7214	0.036	0.0150	0.0210	0.0000	0.223	0.1913	0.0104
Raritan R SB(River Rd to Spruce Run)	02030105020070	1.1304	0.226	0.0269	0.1992	0.0000			0.0000
Raritan R SB(Prescott Bk to River Rd)	02030105020080	0.7876	0.158	0.0626	0.0949	0.0000			0.0000
Prescott Brook / Round Valley Reservior	02030105020090	1.4798	0.074	0.0384	0.0356	0.0000			0.0000
Pleasant Run	02030105040020	0.0102	0.001	0.0006	(0.0001)	0.0001	0.207		0.0010
Holland Brook	02030105040030	0.0017	0.000	0.0004	(0.0003)	0.0000			0.0000
Lamington R (above Rt 10)	02030105050010	1.2275	0.245	0.4470	(0.2015)	0.0245			0.0000
Lamington R (Hillside Rd to Rt 10)	02030105050020	3.4283	0.171	1.1296	(0.9582)	0.0343			0.0000
Lamington R (Furnace Rd to Hillside Rd)	02030105050030	1.0973	0.055	0.2196	(0.1648)	0.0110	0.110	0.0124	0.0974
Lamington R(Pottersville gage-FurnaceRd)	02030105050040	2.7669	0.138	0.1443	(0.0060)	0.0277		0.0167	(0.0167)
Pottersville trib (Lamington River)	02030105050050	0.9838	0.049	0.0211	0.0281	0.0000			0.0000
Cold Brook	02030105050060	1.4496	0.072	0.0233	0.0492	0.0000	0.145	0.0106	0.1344
Lamington R(HallsBrRd-Pottersville gage)	02030105050070	3.1167	0.156	0.4838	(0.3280)	0.0312	0.333		0.3117
Rockaway Ck (above McCrea Mills)	02030105050080	3.9790	0.199	0.0724	0.1266	0.0000	0.403	0.0051	0.3929
Rockaway Ck (RockawaySB to McCrea Mills)	02030105050090	0.5245	0.026	0.0117	0.0145	0.0000			0.0000
Rockaway Ck SB	02030105050100	1.6583	0.332	0.1701	0.0829	0.0000			0.0000
Lamington R (below Halls Bridge Rd)	02030105050110	0.5596	0.028	0.0672	(0.0392)	0.0056			0.0000
Raritan R NB (above/incl India Bk)	02030105060010	1.6055	0.080	0.2044	(0.1241)	0.0161	0.161		0.1606
Burnett Brook (above Old Mill Rd)	02030105060020	1.7913	0.090	0.0364	0.0532	0.0000	0.179		0.1791
Raritan R NB(incl McVickers to India Bk)	02030105060030	2.3095	0.115	0.1265	(0.0110)	0.0231			0.0000
Raritan R NB(Peapack Bk to McVickers Bk)	02030105060040	1.3183	0.066	0.0424	0.0235	0.0000			0.0000
Peapack Brook (above/incl Gladstone Bk)	02030105060050	1.2732	0.064	0.0388	0.0249	0.0000			0.0000
Peapack Brook (below Gladstone Brook)	02030105060060	1.0430	0.052	0.1403	(0.0882)	0.0104	0.104		0.1043
Raritan R NB(incl Mine Bk to Peapack Bk)	02030105060070	1.8594	0.372	0.1331	0.0930	0.0000			0.0000
Middle Brook (NB Raritan River)	02030105060080	1.4922	0.075	0.0197	0.0549	0.0000	0.149		0.1492
Raritan R NB (Lamington R to Mine Bk)	02030105060090	1.8374	0.092	0.0165	0.0754	0.0000	0.184		0.1837

### Highlands Region Water Availability by HUC-14 Subwatershed

SW_NAME	HUC14	GW Capacity		Non-Ag Net Availability			AG Net Availability		
		Ground Water Capacity (MGD)	Ground Water Availability (MGD)	TOTAL Consumptive/ Depletive Uses (MGD)	Net Water Availability (MGD)	Conditionally Available Water for C/D Uses (MGD)	Agriculture Ground Water Availability (Conservation Zone) (MGD)	Agriculture Consumptive/ Depletive Uses (MGD)	Agriculture Net Water Availability <sup>1</sup> (MGD)
Raritan R NB (Rt 28 to Lamington R)	02030105070010	0.6456	0.032	0.0920	(0.0597)	0.0065	0.169		0.0646
Middle Brook EB	02030105120050	0.0340	0.007	0.0023	0.0045	0.0000			0.0000
Middle Brook WB	02030105120060	0.1328	0.007	0.0169	(0.0103)	0.0013			0.0000
Lafayette Swamp tribs	02040105040040	0.0149	0.001	0.0003	0.0005	0.0000			0.0000
Sparta Junction tribs	02040105040050	2.0154	0.101	0.9033	(0.8025)	0.0202			0.0000
Paulins Kill (above Rt 15)	02040105040060	0.0065	0.000	0.0004	(0.0001)	0.0001	0.292	0.0488	0.0005
Paulins Kill (Blairstown to Stillwater)	02040105050010	1.0762	0.054	0.0520	0.0018	0.0000			0.0000
Delawanna Creek (incl UDRV)	02040105060020	0.3615	0.018	0.0198	(0.0018)	0.0036			0.0000
Lake Lenape trib	02040105070010	0.1551	0.008	0.0531	(0.0453)	0.0016			0.0000
New Wawayanda Lake/Andover Pond trib	02040105070020	0.5454	0.027	0.0652	(0.0379)	0.0055			0.0000
Pequest River (above Brighton)	02040105070030	0.8016	0.040	0.0183	0.0218	0.0000			0.0000
Pequest River (Trout Brook to Brighton)	02040105070040	1.9964	0.100	0.0260	0.0738	0.0000	0.204		0.1996
Trout Brook/Lake Tranquility	02040105070050	1.4398	0.072	0.0212	0.0508	0.0000			0.0000
Pequest R (below Bear Swamp to Trout Bk)	02040105070060	0.6083	0.030	0.2422	(0.2118)	0.0061		0.2507	(0.2507)
Bear Brook (Sussex/Warren Co)	02040105080010	0.7644	0.038	0.0534	(0.0152)	0.0076	0.124		0.0764
Bear Creek	02040105080020	1.7750	0.089	0.0185	0.0702	0.0000			0.0000
Pequest R (Drag Strip--below Bear Swamp)	02040105090010	1.1591	0.058	0.0379	0.0201	0.0000		0.3825	(0.3825)
Pequest R (Cemetery Road to Drag Strip)	02040105090020	1.2841	0.064	0.0251	0.0391	0.0000		0.1635	(0.1635)
Pequest R (Furnace Bk to Cemetery Road)	02040105090030	1.4983	0.075	0.5846	(0.5097)	0.0150			0.0000
Mountain Lake Brook	02040105090040	0.8329	0.042	0.0297	0.0119	0.0000			0.0000
Furnace Brook	02040105090050	1.0869	0.054	0.2691	(0.2148)	0.0109			0.0000
Pequest R (below Furnace Brook)	02040105090060	1.4525	0.073	0.0555	0.0171	0.0000			0.0000
Union Church trib	02040105100010	1.2701	0.064	0.0178	0.0457	0.0000			0.0000
Honey Run	02040105100020	0.2778	0.014	0.0180	(0.0041)	0.0028		0.0013	(0.0008)
Beaver Brook (above Hope Village)	02040105100030	1.1930	0.060	0.0181	0.0415	0.0000			0.0000
Beaver Brook (below Hope Village)	02040105100040	1.2653	0.063	0.0245	0.0388	0.0000		0.0084	(0.0078)
Pophandusing Brook	02040105110010	0.2510	0.013	0.4336	(0.4211)	0.0025	0.025		0.0251
Buckhorn Creek (incl UDRV)	02040105110020	2.5288	0.126	0.0837	0.0428	0.0000	0.253		0.2529
UDRV tribs (Rt 22 to Buckhorn Ck)	02040105110030	1.2309	0.062	5.8074	(5.7458)	0.0123	0.124		0.1231
Lopatcong Creek (above Rt 57)	02040105120010	1.1010	0.055	0.2617	(0.2066)	0.0110			0.0000
Lopatcong Creek (below Rt 57) incl UDRV	02040105120020	2.3181	0.464	0.0713	0.3923	0.0000			0.0000
Pohatcong Creek (above Rt 31)	02040105140010	1.5989	0.080	0.0656	0.0143	0.0000		0.0002	(0.0002)
Pohatcong Ck (Brass Castle Ck to Rt 31)	02040105140020	2.0971	0.105	0.3054	(0.2006)	0.0210			0.0000
Pohatcong Ck (Edison Rd-Brass Castle Ck)	02040105140030	1.6887	0.084	0.0232	0.0613	0.0000	0.169		0.1689
Merrill Creek	02040105140040	1.2158	0.061	0.0161	0.0447	0.0000			0.0000
Pohatcong Ck (Merrill Ck to Edison Rd)	02040105140050	0.9852	0.049	0.0163	0.0330	0.0000	0.099		0.0985
Pohatcong Ck (Springtown to Merrill Ck)	02040105140060	1.1851	0.059	0.0217	0.0375	0.0000	0.119		0.1185
Pohatcong Ck(below Springtown) incl UDRV	02040105140070	0.7924	0.040	0.2862	(0.2466)	0.0079	0.079		0.0792
Weldon Brook/Beaver Brook	02040105150010	0.3794	0.019	0.0412	(0.0222)	0.0038			0.0000
Lake Hopatcong	02040105150020	2.7060	0.541	1.5268	(0.9856)	0.0541			0.0000
Musconetcong R (Wills Bk to LkHopatcong)	02040105150030	0.7257	0.145	0.4590	(0.3139)	0.0145			0.0000
Lubbers Run (above/incl Dallis Pond)	02040105150040	1.0269	0.051	0.4528	(0.4015)	0.0103			0.0000

### Highlands Region Water Availability by HUC-14 Subwatershed

SW_NAME	HUC14	GW Capacity		Non-Ag Net Availability			AG Net Availability		
		Ground Water Capacity (MGD)	Ground Water Availability (MGD)	TOTAL Consumptive/ Depletive Uses (MGD)	Net Water Availability (MGD)	Conditionally Available Water for C/D Uses (MGD)	Agriculture Ground Water Availability (Conservation Zone) (MGD)	Agriculture Consumptive/ Depletive Uses (MGD)	Agriculture Net Water Availability <sup>1</sup> (MGD)
Lubbers Run (below Dallis Pond)	02040105150050	1.2957	0.065	0.0622	0.0025	0.0000			0.0000
Cranberry Lake / Jefferson Lake & tribs	02040105150060	0.5393	0.027	0.0198	0.0072	0.0000			0.0000
Musconetcong R(Waterloo to/incl WillsBk)	02040105150070	1.0588	0.053	0.3698	(0.3165)	0.0106			0.0000
Musconetcong R (SaxtonFalls to Waterloo)	02040105150080	1.2355	0.062	0.0468	0.0149	0.0000			0.0000
Mine Brook (Morris Co)	02040105150090	0.1230	0.006	0.0692	(0.0631)	0.0012			0.0000
Musconetcong R (Trout Bk to SaxtonFalls)	02040105150100	1.5667	0.078	1.2209	(1.1426)	0.0157		0.0023	(0.0023)
Musconetcong R (Hances Bk thru Trout Bk)	02040105160010	2.9534	0.148	0.3568	(0.2091)	0.0295			0.0000
Musconetcong R (Changewater to HancesBk)	02040105160020	3.8812	0.194	0.1150	0.0790	0.0000		0.0051	(0.0051)
Musconetcong R (Rt 31 to Changewater)	02040105160030	1.7505	0.088	0.6968	(0.6093)	0.0175	0.175		0.1751
Musconetcong R (75d 00m to Rt 31)	02040105160040	0.9955	0.050	0.1178	(0.0680)	0.0100	0.100		0.0995
Musconetcong R (I-78 to 75d 00m)	02040105160050	2.7663	0.138	0.0442	0.0735	0.0000	0.277		0.2766
Musconetcong R (Warren Glen to I-78)	02040105160060	0.9672	0.048	0.2138	(0.1654)	0.0097			0.0000
Musconetcong R (below Warren Glen)	02040105160070	0.9834	0.049	1.0326	(0.9834)	0.0098			0.0000
Holland Twp (Hakihokake to Musconetcong)	02040105170010	0.7436	0.037	0.0246	0.0126	0.0000		0.0147	(0.0146)
Hakihokake Creek	02040105170020	2.8906	0.145	0.2611	(0.1166)	0.0289			0.0000
Harihokake Creek (and to Hakihokake Ck)	02040105170030	1.1578	0.058	0.2525	(0.1947)	0.0116	0.116		0.1158
Nishisakawick Creek (above 40d 33m)	02040105170040	1.2693	0.063	0.0239	0.0396	0.0000	0.128		0.1269
Nishisakawick Creek (below 40d 33m)	02040105170050	0.3451	0.017	0.0384	(0.0211)	0.0035	0.127		0.0345

Note: Highlighted HUC14s have Net Water Availability corrected based on applied Existing Constraint Area threshold



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**REVISED DRAFT: CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**  
**WATER RESOURCES TECHNICAL REPORT ADDENDUM**  
**VOLUME I – WATERSHED AND WATER QUALITY**  
**NOVEMBER 2007**  
***Septic System Densities for the Highlands Region***

Version - October 31, 2007

Septic system density is one of various factors used in determining the land use capability of areas in the Highlands Region. The goals, policies and requirements of the Highlands Act provide guidance on Regional Master Plan approaches relating to septic system density; they are prescriptive regarding the Preservation Area but general regarding the Planning Area. The Highlands Council seeks to achieve two related policy objectives – to restrict the potential for increased risks to human health from ground water that exceeds 10 milligrams per liter (mg/L) of nitrates (e.g., septic system plumes), and to restrict increased human health and ecologic impacts from other pollutants that are associated with nitrates – using the following approach:

1. Use the New Jersey Department of Environmental Protection's (NJDEP) Preservation Area rules at N.J.A.C. 7:38-1 et seq. for septic system density within that area. These nitrate targets are based on statutory requirements for nondegradation, and are supported by further analysis using statistical models.
2. Within the Planning Area, the NJDEP nitrate dilution model should be used with the standard factors for nitrate loading per residential household (or commercial equivalent), but using 2002 drought ground water recharge for each HUC14 subwatershed. The Planning Area median is approximately 9.4 inches per year.
3. The nitrate dilution models should be applied as a default approach only to the privately-owned, undeveloped, non-preserved lands (referred herein as developable lands) within each subwatershed. The following nitrate targets are proposed for the Planning Area. Actual septic system yields will vary by HUC14 subwatershed based on estimated HUC14 recharge; examples are provided here for information purposes:
  - a. Existing Community Zone – **2 mg/L** (NJDEP proposed Statewide threshold). As an example, using the median recharge and a development site of 30 acres, this target results in a septic system yield of 3 units, reflecting a median density of 9.4 acres per septic system. This does not affect existing areas served by sewer or the approved expansion of these facilities.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

- b. Conservation Zone – **1.87 mg/L\*** (estimated median concentration for the Conservation Zone). As an example, using the median recharge and developable lands of 105 acres, this target results in a septic system yield of 10 units, reflecting a median density of 10.0 acres per septic system.
  - c. Protection Zone – **0.72 mg/L\*** (estimated median concentration for the Protection Zone). As an example, using the median recharge and developable lands of 105 acres, this target results in a septic system yield of 4 units, reflecting a median density of 26.1 acres per septic system.
  - d. Clustered Development – **10.0 mg/L** (NJDEP proposed Statewide threshold). Applied to the developed portion of the cluster, with application of the relevant Highlands Zone target to the entire project area (i.e., both the developed and undeveloped, preserved portions). As an example, for a 105 acre development project in the Conservation Zone, and using the median recharge, the density within the cluster itself would be no greater than one septic system per 1.9 acres per septic system, with the septic system yield for the full site still being 10 units as described above. Clustering to a higher density would require the use of community-based wastewater systems, not septic systems.
4. As an alternative approach to Step 3, municipalities may choose to include preserved lands in the analysis of septic system yields for the Conservation and Protection Zone as an alternative to the approach above if allowed by NJDEP pursuant to the Water Quality Management Planning Rules at N.J.A.C. 7:15 and where: (1) the municipality demonstrates that including the septic system yields from the preserved lands results in a development density and pattern that is not greater than that allowed by existing zoning and is compatible with the pattern of development associated with the affected Zone; and (2) the municipality implements or causes to be implemented (by development applicants benefiting from the increased septic system yields either directly or through contribution to an implementation fund) agricultural management practices that will reduce nitrate loadings to the same HUC14 subwatershed by:
    - a. at least the same amount as the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is lower than the relevant Conservation or Protection Zone median concentration, or
    - b. at least equal to double the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is higher than the relevant Conservation or Protection Zone median concentration.
  5. Septic system yield in the Existing Community Zone will be determined on a project-specific basis, as most development in the zone will be either sewered or exempt. In the Conservation and Protection Zone, the RMP will provide septic system yields by zone in each HUC14 subwatershed; municipalities will be able to direct the appropriate locations for such development through the Plan Conformance process, within the constraints of other RMP policies.
  6. Designated redevelopment sites, brownfields and lakes communities that use septic systems in both the Preservation and Planning Areas are most probably impaired and will require water quality restoration, in coordination with NJDEP; in general they should be protected from further degradation.

\*The median nitrate values by Zone have been revised based on the Land Use Capability Map (LUCM) zones developed for the November 2007 Draft RMP.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**Technical and Policy Discussion on Septic System Density**

**General Findings**

The following findings provide the basis for the Highlands Council's septic system policies:

1. The goals and objectives of the Highlands Act require protection of designated water uses (including both human and ecological uses) in all areas of the Highlands Region. Protection can range from natural quality to strict nondegradation to a range of antidegradation approaches. Restoration is for areas that violate standards, and enhancement is appropriate for areas where waters currently meet standards but can be improved through better land use management or pollution control practices.
2. Septic system density is a useful indicator for the water quality impacts of development in areas that lack community sewer systems. Nitrate concentration is a useful surrogate for the many pollutants discharged by properly functioning septic systems. It is critical to note that addressing nitrates alone will not necessarily address the other related contaminants, requiring the use of conservative assumptions.
3. Septic system density controls are useful for regional planning purposes but do not address site-specific or even neighborhood water quality issues. The risk of localized impacts is reduced as septic system densities are reduced, but risks will still exist due to site layout, local geological conditions, well construction, etc. Guidance to municipalities on these issues would be valuable in reducing site-specific risks.
4. Allowable septic system densities for new development should be tailored to each LUCM zone, recognize the legislative distinction between the Preservation and Planning Areas, and address issues such as lakes communities, brownfields and redevelopment sites where a combination of restoration and alternative treatment technology may be appropriate.
5. Allowable septic system densities should be calculated using nitrate dilution models, using NJDEP's factors for nitrate loads from septic systems.
6. Recharge by HUC14 subwatershed should be used as the basis for nitrate dilution, consistent with other RMP analyses. Drought ground water recharge should be used as a conservative factor to address nitrate impacts in smaller watersheds, headwaters areas and aquifers with limited storage capacity, all of which are common in the Highlands Region. Recharge values should be based on 2002 land use/land cover, as the data most closely related to the 2004 adoption of the Highlands Act and the most recent information available to the Council.
7. The models should be applied to privately owned, undeveloped, non-preserved areas only; municipalities may be allowed to use alternative septic system yield methods if allowed by NJDEP regulation, but subject to special conditions for protection of existing zoning and Highlands ground water quality.
8. The nitrate target for the Conservation Zone in the Planning Area should recognize that existing nitrate concentrations are elevated in significant part by agricultural practices. There is an opportunity for water quality enhancement through more thorough implementation of agricultural best management practices (BMPs).
9. The nitrate target for the Protection Zone in the Planning Area should recognize that existing low nitrate concentrations reflect minimal agriculture and development land uses. The impacts of additional development will be more difficult to offset through improvements to existing land management practices.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**Highlands Act Goals**

The Highlands Act includes a goal for the protection, enhancement and restoration of water quality. It then establishes specific regulatory approaches for the Preservation Area, including an objective of nondegradation for ground water regarding new septic systems, using dilution associated with “deep aquifer recharge” and allowing only standard septic system designs. This policy resulted in the 88 and 25 acre septic system densities for forested and non-forested Preservation Area lands, respectively. The Act does not provide specific approaches for the Planning Area.

Therefore, the most appropriate source of guidance regarding the requirement to “protect, enhance and restore” water quality comes from the New Jersey Water Quality Planning Act, which authorizes NJDEP to establish water quality standards for both ground and surface waters. The meaning of the three terms is important to understanding how the regulations work.

**“Restore”** is the easiest – where waters violate water quality standards, their quality must be improved to the point where they at least meet the water quality criteria established to protect designated water uses such as drinking water, fishing, swimming and ecosystems. The Highlands Region includes areas of both localized and wider scale contamination where restoration would be appropriate, ranging from the effects of intensive agriculture, to the impacts of communities with many septic systems on small lots, to areas of industrial contamination.

**“Enhance”** is also fairly clear but less used for regulatory purposes – it means improving water quality even where the waters currently meet all standards. The laws do not provide a direct mechanism for doing so, but some regulatory programs (e.g., uniform requirements for secondary treatment of sanitary sewage, industrial treatment standards, municipal stormwater permits) enhance water quality. Voluntary efforts (e.g., agricultural improvement cost-share programs, public education) or indirect efforts (e.g., where efforts to control one contaminant achieve improvements for a non-targeted contaminant) also enhance water quality.

**“Protect”** is the most variable in meaning, but is a critical focus of water pollution control programs. Existing regulations, case law and legislative history at both the state and federal level make clear that “protect” covers a wide range of policies, from natural quality (no non-natural pollutant loadings of any type) to nondegradation (no reduction in water quality from a baseline condition) to various levels of antidegradation (allowing some level of reduction in water quality but never beyond the water quality criteria and always controlled to protect public interests). What becomes clear from historic use is that “protect” refers to the protection of water uses ranging from highly sensitive ecosystems that tolerate no degradation, to other water uses that will tolerate some limited degradation under some situations.

Given that the Highlands Act clearly calls for the RMP to identify areas appropriate for new development, redevelopment or sustainable agricultural uses, application of one or more “antidegradation” policies will be more appropriate for those areas of the Highlands. Conversely, areas where no existing or future development will exist are appropriate for “natural quality” policies. Areas where water quality already violates water quality standards should be targeted for restoration, not further degradation. This policy does not necessarily prohibit any new pollutant loads (though it can), but rather might require mitigation or offsets of existing pollutant loads. All areas are appropriate for water quality enhancement where feasible within the goals and objectives of the Highlands Act, such as improved management of existing land uses and stormwater systems.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**Rationale for Using Septic System Density**

Septic system density controls are commonly used in New Jersey and elsewhere as a method of minimizing the potential for contamination of ground water. Discharges of effluent to ground water have the potential to damage the quality of aquifers, reducing their utility as drinking water supplies. They also can damage surface water quality, through the flow of contaminated ground water to natural discharge points as springs, seeps or stream baseflow.

It should be noted that septic system density is one indicator of the potential for such impacts, but is not the sole cause of aquifer or stream contamination from discharges to ground water. Lawn and home care create the potential for nutrients (fertilizer) and pesticides (herbicides, insecticides and fungicides) to reach ground water. Agricultural applications have a similar potential. Finally, commercial or industrial discharges to ground water can include contaminants of concern. However, the commercial and industrial discharges are directly regulated by NJDEP, while the discharges of septic systems, lawn care and agricultural applications are not.

Septic system density is closely associated with lawns and homes, and so septic system density is a good indicator of the impacts of non-sewered residential development. Agricultural and sewer development impacts are not closely associated with septic systems, and therefore must be addressed as separate policies.

**Selection of an Indicator Contaminant**

Septic systems can discharge a wide range of contaminants to ground water, including bacteria, viruses, organic materials, household chemicals, pharmaceutical products, and various nutrients. The septic systems are designed to treat organic matter and bacteria, but not other contaminants that are less easily treated. NJDEP's septic system design standards are primarily focused on ensuring that septic system effluent does not clog the distribution box or leaching field, does not migrate to the land surface and cause a direct public health threat, and does have sufficient contact time within the leaching field to reduce bacterial pathogens. The standards also ensure that septic system leaching fields are at least 100 feet from any neighboring well.

The question is what contaminant to use as an indicator. NJDEP has determined through a variety of rules and rule proposals (including the Highlands Preservation Area Rules at N.J.A.C. 7:38) that nitrates are the best indicator to use for septic system density. Nitrates are stable in ground water, can travel long distances within the septic system plume, are a commonly measured contaminant with inexpensive analytical methods, and have been shown to have a good association with other contaminants (i.e., where the other contaminants are found, nitrate levels tend to be elevated above natural levels). Further, nitrate modeling has been used for decades at the municipal, county, regional and State level both in New Jersey and elsewhere. The Highlands Council also uses nitrates in the Highlands Regional Master Plan. It is important, though, to recognize that nitrates are used as an indicator, and are not the only contaminant of concern.

**Natural Levels, Anthropogenic Impacts, Current Watershed Levels**

The Highlands Council with assistance from the United States Geological Survey (USGS), analyzed current nitrate levels in the Highlands Region, based on the same dataset provided to NJDEP for its Highlands Rules. The estimated median nitrate concentration for undeveloped areas in the Highlands Region is 0.1 mg/L, which is essentially equivalent to natural concentrations.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The Highlands Council used a statistical analysis of nitrate levels and land use to estimate the median nitrate concentrations for each of the HUC14 subwatersheds in the Highlands Region. The estimated subwatershed median values range from 0.17 to 3.69 mg/L, with 0.83 mg/L as a regional median and nearly all HUC14 subwatersheds having a median below 2.0 mg/L. For HUC14 subwatersheds where either the Conservation Zone or Protection Zone predominates, the zone median concentrations are 1.87 mg/L and 0.72 mg/L, respectively (see charts at the end). The elevated nitrate concentrations were most frequently associated with agricultural lands uses, urban development and septic systems. The statistical relationship with septic system density is sufficiently strong to use for analysis.

It is important to note that these are medians – every HUC14 subwatershed will have actual values ranging from natural or near-natural concentrations to the 35-40 mg/L concentrations typical of septic system plumes, and may even have higher concentrations in some places. Some percentage of the total ground water volume already exceeds the nitrate criterion of 10 mg/L – typical of septic system plumes and intensive agriculture. Regional analyses cannot substitute for site-specific information when siting new wells, etc. (This issue is addressed in a separate RMP policy.) The primary use of nitrate dilution models is as a basis for policy making regarding new septic system densities or for targeting restoration needs. The first question, then, is not whether any ground water will exceed that level, but to what extent it will do so. The second question, addressed below, is what constitutes an acceptable threshold.

### **Types of Nitrate Targets**

Four types of nitrate targets (i.e., the target concentration that nitrate in the ground water should not exceed) were investigated for use in the RMP. One of them is inappropriate – site-specific fate and transport modeling, which is used for industrial discharge analysis and major remedial efforts. Two others require additional work and have not been proven as useable concepts – defining an allowable incremental change in concentration, and defining an allowable statistical change in concentration. Accordingly, the Highlands Council determined to use target concentrations at this time, with variations based on the LUCM zone involved.

Target Concentration is common in regulations such as NJDEP's Ground Water Quality Standards (N.J.A.C. 7:9C) or proposed Water Quality Management Planning rules (N.J.A.C. 7:15), where a specific concentration is established as the maximum permissible level. For septic systems, this approach relies on mass balance equations such as nitrate dilution models. This method is useful because it treats all similar waters alike. It also can be used to define a maximum tolerable concentration. Subwatersheds that exceed the threshold can be targeted for enhancement. The policy issue here is what allowable concentration is appropriate in a target area. Given that the policy is applied to developable parcels, it should be noted that the median HUC14 nitrate levels, even in build-out conditions, generally would be less than the allowable concentration because some lands (e.g., preserved open space) will not have septic systems. The exception to this generalization will occur where existing septic systems are at much higher densities than the RMP allows for new development. The nitrate targets can be established based on medians by HUC14 subwatershed, LUCM zone, Planning or Preservation Area, or the entire Highlands Region.

### **Plumes, In-ground Treatment, and Dilution**

Ground water contaminants tend to move in plumes from their source to their discharge point in surface waters or wells. Plumes tend to be more concentrated if the source is localized or

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

concentrated, the movement of ground water is smoother (causing less spreading of the contaminants away from the main plume), or the distance from the source to the discharge point is shorter.

Natural soil and subsurface conditions will result in some attenuation or treatment of ground water contaminants. The contaminants may be broken down into other substances by bacteria or chemical action, they may be bound to soil particles (adsorption) or drawn into organic or other matter (absorption), or they may move into the atmosphere through plants (transpiration) or evaporation.

These processes of plume movement and attenuation address the “fate and transport” of the contaminants. For major ground water contamination cases, such as Superfund or Spill Fund sites, enormous and expensive efforts go into mapping and modeling these processes to help predict the plume’s potential impacts and determine what remedial approach may be most appropriate. However, the cost of monitoring or modeling the actual movement of septic system plumes at any level, from local to regional, is far beyond available funds. Therefore, simplified models are routinely used that make assumptions appropriate for determining allowable septic system densities. These models are all variations on a theme, but basically compare nitrate loadings to available dilution over a large area. The variations relate to the loading assumptions, the available dilution and the size of the area in question. Dilution cannot be directly measured, and therefore is estimated through the use of recharge analyses. Nitrate dilution models, such as those for the Pinelands Comprehensive Management Plan, have survived many court challenges. However, it must be noted that such models cannot predict the actual nitrate concentrations at any one point, such as a downgradient well that may or may not be within the actual plume of a septic system.

The nitrate dilution model approach is used for septic system density calculations, based on specific nitrate targets.

**Nitrate Dilution Modeling Variables**

Pollutant loadings to ground water vary over time for several reasons. Loadings will vary based on housing occupancy, the type of treatment technology, and system maintenance. Other loadings associated with residences will also vary based on lawn size, condition and chemical applications.

Loading assumptions require consideration of three major factors:

- Concentration and loading of nitrates emanating from septic systems – In general, the literature supports the Council’s use of 35 to 40 mg/L nitrates emanating from septic systems. NJDEP used this average to generate an annual loading of 10 pounds nitrates per person.
- Household size – Given that regional models cover households of many different sizes, a single value is usually selected to represent average household size, with some models rounding up to a somewhat higher level to ensure that the septic system density will still be valid even if household size increases marginally. In addition, the use of a higher household size offsets the potential for nitrate loadings from other sources, such as lawn fertilizers, that may exist in the same area. The Council is proposing to use this latter approach, at four persons per household as used by the NJDEP Highlands Rules.

REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL

- Other nitrate sources associated with the household – Some models include lawn care contributions to the nitrate loadings, but others do not because (unlike nitrates from human sewage) such nitrate loadings can be changed by management approaches. NJDEP did not include other contributions explicitly, but did include a number of conservative assumptions that reduced the need to include a new contribution to the model, including the use of four persons per household, as discussed above. The Council determined that the conservative factors in the model should be used to account for these loadings. Educational programs and other management approaches should be used to reduce such loadings over time.

The second major factor, dilution, is critical to the model. Several alternatives can be considered in determining dilution for the model:

- Scale of impact – Some ground water systems are small in scale, providing mostly baseflow to headwaters streams and little recharge to significant aquifers. Others are very large, providing both baseflow and major aquifer recharge. Smaller systems are much more sensitive to periodic changes in loadings and dilution. Dilution is critical to the use of nitrate dilution models. The Council determined that dilution should be based upon ground water recharge by HUC14 subwatershed. This is appropriate and feasible given technical analyses performed for the RMP, and the fact that other aspects of the RMP (e.g., water availability) are also based on HUC14 analyses.
- Dilution from properties not using septic systems – Where used on a broad scale, such as a municipality or watershed, some models incorporate dilution from properties that may be in public ownership, sewer development, or otherwise protected from later development with septic systems. The Council determined that, as a default approach, the development yields for septic systems should be based only on privately-owned, undeveloped, non-preserved lands in septic system areas of the HUC14 subwatershed, for three reasons:
  - Public lands are often purchased for the purpose of environmental protection, and downgradient private property owners should not receive an equity benefit from that public expenditure;
  - Sewered development will still contribute ground water contaminants, including from more concentrated lawn care activities, and it is impossible to accurately measure that impact; and
  - Where the protected lands are agricultural, there is a significant potential for ground water contaminant loads that are not associated with septic systems.

However, as discussed below, an alternative approach for septic system yield analysis may be used if allowed by NJDEP regulations, but with special conditions for the Highlands Region.

- Climate factors – Climate, as seen in annual precipitation patterns, has a direct impact on recharge potential. In New Jersey, the two most commonly used factors for climate have been annual average rainfall (used in the original NJGS GSR-32 method) and drought rainfall from the 1961-1966 drought of record (used in the NJDEP Highlands Rules). Drought recharge is used to estimate actual aquifer recharge, which cannot be directly measured. Annual average recharge includes shallow recharge that moves more quickly to surface waters, and does not ever enter deeper ground water systems (aquifers). The recharge from the 1960's drought is estimated at approximately two-thirds of the annual average rainfall. The drought period was determined by an analysis of precipitation records,

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

and is regarded as beginning on May 1961 (Jeffrey Hoffman, personal communication, 26 October 2007). The choice between these two climate factors is closely related to the scale of impact issue described above. A multi-year drought is likely to result in more concentrated septic system plumes in small ground water systems, where there is less potential for ground water storage from pre-drought periods. The Highlands Region, with its many headwaters, subwatersheds and hard rock formations with limited ground water storage capacity, will be more prone to such effects than, say, New Jersey's Coastal Plain watersheds. Most of the larger aquifers and watersheds are in areas served by public sewerage. NJDEP's septic system basis and background document for the Highlands Rules demonstrated that the GSR-32 method, when modified to incorporate climate factors based on 1960's drought conditions, provided recharge estimates that corresponded very well to another method (the Posten method) of estimating long-term (deep) aquifer recharge. The Highlands Council has determined that drought recharge should be used based upon 2002 land use/land cover. The use of 2002 data is appropriate, as it is the most recent available and is also close to the 2004 adoption date of the Highlands Act. The regional median for drought ground water recharge based on 2002 land use/land cover is 9.4 inches/year.

### **Policy Options for Nitrate Targets**

There are many options and considerations for selecting nitrate targets, which in turn will affect the allowable or recommended septic system densities. The options discussed here are all constrained by scientific information. For instance, it is not feasible to set a nitrate target for septic systems that is lower than natural levels. Further, if an area is to have agricultural or developed land uses, natural levels cannot be maintained and therefore are not a feasible target; any introduction of contaminants to natural quality waters will elevate the average concentration above natural levels. As another example, it is not possible to have a policy for septic system density where no ground water may have a site-specific concentration greater than 10 mg/L, as septic system plumes routinely have much higher concentrations. However, given the constraints imposed by science and logic, there are several considerations:

- Applicability – Thresholds have different purposes. The NJDEP Highlands Rules address site-by-site regulation of development, where each development has to meet the standards. The proposed Water Quality Management Planning Rules, on the other hand, are focused on septic system density at the watershed level, with variations allowed for clustering and for different zoned densities within the broader area, as long as the average allowable density is not exceeded. The Highlands RMP septic system densities are more analogous to the WQMP rules. The Council is proposing that the RMP as a default policy provide average septic system densities for privately-owned, undeveloped, non-preserved portions of HUC14 subwatersheds, which may be apportioned within the target area through the municipal Plan Conformance process. However, the NJDEP is considering a policy that would provide an optional, alternative approach to septic system yield analysis. This alternative approach could be used within the Planning Area, with special Highlands conditions, as follows:
  - Municipalities may choose to include preserved lands in the analysis of septic system yields for the Conservation and Protection Zone as an alternative to the approach above if allowed by NJDEP pursuant to the Water Quality Management Planning Rules at NJAC 7:15 and where: (1) the municipality demonstrates that including the septic system yields from the preserved lands results in a development density and pattern that is not greater than that allowed by existing zoning and is compatible with

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

the pattern of development associated with the affected Zone; and (2) the municipality implements or causes to be implemented (by development applicants benefiting from the increased septic system yields either directly or through contribution to an implementation fund) agricultural management practices that will reduce nitrate loadings to the same HUC14 subwatershed by:

- at least the same amount as the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is lower than the relevant Conservation or Protection Zone median concentration, or
  - at least equal to double the estimated septic system loadings from the additional density where the HUC14 subwatershed median nitrate concentration is higher than the relevant Conservation or Protection Zone median concentration.
- Nitrate Targets – Targets of natural water quality (no anthropogenic contaminants at all), nondegradation (no increase in contaminant concentration) and antidegradation (controlled allowance for a limited increase in contaminant concentration but not beyond water quality criteria) all could be applicable to parts of the Highlands Region. Antidegradation policies at the State, regional and local levels include:
    - the Highlands Rules (N.J.A.C. 7:38) apply the regional median nitrate quality for forested or non-forested lands, weighted as appropriate to the development site in question, as the nitrate target for individual projects;
    - the Pinelands CMP uses 2 mg/L for the Protection Area (which correlates to a minimum lot size of 3.2 acres) and a target of 0.17 mg/L for the Preservation Area, which correlates to an average lot size of 23 acres;
    - the current Ground Water Quality Standards (N.J.A.C. 7:9C) antidegradation policy generally results in a nitrate target of 5.2 to 5.4 mg/L using a method devised for regulated point sources but applied to septic systems; it is applied as a municipal or sub-municipal average through either NJDEP or municipal rules;
    - the Reality Improvement Act certification by NJDEP (for developments of 50 units or more), requires that each development meet 5.2 mg/L as an average;
    - the proposed Ground Water Quality Standards (N.J.A.C. 7:9C) and Water Quality Management Planning Rules (N.J.A.C. 7:15) both include a nitrate threshold of 2 mg/L to be applied either by project (GWQS) or by watershed (WQMP);
    - the proposed Water Quality Management Planning Rules (N.J.A.C. 7:15) includes a nitrate threshold of 10 mg/L to be applied to the developed portion of proposed cluster developments. Note that rule proposal requires that the full area of the cluster development (both the developed and preserved lands) meet the 2 mg/L nitrate target.

The Highlands RMP should not have a nitrate target greater than 2 mg/L (other than for clusters), for consistency with the two proposed NJDEP rules. It should be noted that any introduction of new nitrate loadings, such as septic systems, into any area will increase the average concentration of nitrates unless mitigation or enhancement occurs within the target area.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

NJDEP’s Highlands Preservation Area Rules allow for very limited additional septic systems on the assumption, among other things, that nitrate loadings from existing and past land uses are declining over time, resulting in an offset to minor additional loadings. It should be noted that a policy requiring that “new development not increase average nitrate concentrations” is a nondegradation policy – no new loadings would be allowed unless full mitigation is provided.

- Areal Scale of Threshold – The RMP policy or policies can be applied at different areal scales, including HUC11 watershed (as proposed by NJDEP in the WQMP Rules), the HUC14 subwatershed (using the USGS analyses), LUCM zone or municipality. Any of the multi-municipality scales could be disaggregated to the affected municipalities or zones. Given that the RMP has analyses to the HUC14 level, this scale is most appropriate for septic system densities, with further disaggregation as necessary. The Council proposes the use of HUC14 subwatersheds, disaggregated to LUCM zone and then to municipality as needed.
- Mitigation Requirements – As alluded to above, it may be appropriate to require that additional loadings in some areas be offset by reduced loadings within the same site or target area. A major policy question is whether mitigation credits should be allowed for reduction of loadings from an illegal source or one that is not using best management practices. For instance, should the development of a poorly managed farm provide mitigation for the septic systems of a new development? Mitigation requirements, if used, should be based on mitigation from the loadings that would exist if the mitigated sources were both legal and managed according to normally accepted BMPs. The Council determined not to use this approach due to excessive uncertainty and complexity.
- Restoration – USGS modeling indicates that the higher nitrate concentrations of HUC14 subwatersheds in the Conservation Zone are primarily related to agricultural land uses. Cooperative efforts in such subwatersheds will be critical in offsetting any increased impacts of development on septic systems. Other restoration opportunities may exist in lake communities and other dense developments using septic systems, where transition to community wastewater systems (e.g., Hopatcong Borough) would reduce loadings. The Council proposes that restoration through improved management practices and the retrofit or elimination of densely placed septic systems be explored and implemented as feasible.

Given these considerations, the following table discusses potential nitrate targets and policies for various areas within the Highlands Region. Note that there is some overlap in areas, but this overlap occurs deliberately to fully inform the discussion. In addition, the Highlands Act specifically treats the Preservation Area and the Planning Area distinctly. While the delineation of the various LUCM zones in the Regional Master Plan is “blind to the line,” the policies for septic system density must recognize that the two areas have different legislative requirements.

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

<b>Septic System Density Policy Options by RMP Area</b> (Grey Shading Indicates Recommended Approach)			
<b>RMP Area</b>	<b>Natural Quality</b> (no non-natural pollutant loadings)	<b>Nondegradation</b> (no reduction in water quality)	<b>Antidegradation</b> (allow some quality reduction but not beyond water quality criteria)
<b>Existing Community Zone (Planning Area)</b>	Inappropriate to a developed area	Sewers assumed for new development. Restoration should apply where GWQS violated	Development with sewers; if septic systems used, meet WQMP rule provisions for 2 mg/L average nitrates for each development project
<b>Conservation Zone (Planning Area)</b>	Inappropriate to an area of major agricultural use	Inappropriate to an area of major agricultural use. Restoration should apply where GWQS violated	Septic system density based on a Nitrate Dilution Target calculated as 1.87 mg/L (the Zone median concentration)
<b>Protection Zone (Planning Area)</b>	Inappropriate to an area with significant human land uses	Inappropriate for the Planning Area	Septic system density based on a Nitrate Dilution Target calculated as 0.72 mg/L (the Zone median concentration)
<b>Clustered Development (Planning Area)</b>	Inappropriate to an area with significant human land uses	Inappropriate to an area with significant human land uses	Septic system density for the cluster development area based on a Nitrate Dilution Target calculated as 10.0 mg/L, with application of the relevant Zone target to the entire cluster development project area
<b>Existing Community Zone (Preservation Area)</b>	Inappropriate to a developed area	NJDEP Highlands Rules – either modified nondegradation method for septic systems, or sewered as infill	Inappropriate to Preservation Area
<b>Conservation Zone (Preservation Area)</b>	Inappropriate to an area of major agricultural use	NJDEP Highlands Rules – modified nondegradation method	Inappropriate to Preservation Area
<b>Protection Zone (Preservation Area)</b>	NJDEP rules apply	NJDEP Highlands Rules – modified nondegradation method	Inappropriate to Preservation Area
<b>Lakes Community Zone (Planning Area)</b>	Inappropriate to a developed area	If reliant on septic systems, average nitrate levels probably exceed 10 mg/L. This policy applicable, plus restoration efforts.	Inappropriate for area that either is sewered or already exceeds GWQS for nitrates based on existing loadings

**REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

<b>Septic System Density Policy Options by RMP Area</b> (Grey Shading Indicates Recommended Approach)			
<b>RMP Area</b>	<b>Natural Quality</b> (no non-natural pollutant loadings)	<b>Nondegradation</b> (no reduction in water quality)	<b>Antidegradation</b> (allow some quality reduction but not beyond water quality criteria)
<b>Lakes Community (Preservation Area)</b>	Inappropriate to a developed area	If zone on septic systems, average nitrate levels probably exceed GWQS. This policy applicable, plus restoration efforts.	Inappropriate for area that either is sewered or already exceeds GWQS for nitrates based on existing loadings
<b>Brownfields or Redevelopment Area (Planning Area)</b>	Inappropriate to a developed or contaminated area	Inappropriate to nature of area, unless GWQS exceeded, requiring remedial work as part of redevelopment plan	Apply policy from Existing Community Zone (Planning Area)
<b>Brownfields or Redevelopment Area (Preservation Area)</b>	Inappropriate to a developed or contaminated area	Appropriate policy given Highlands Act policies. Coordination with NJDEP required.	Inappropriate to Preservation Area

**Median Lot Sizes for Planning Area Nitrate Targets**

The recommended nitrate targets have been used to calculate median lot sizes for the various target concentrations discussed above, using the median drought ground water recharge for the Planning Area, and then for each Protection Zone and Conservation Zone area in each HUC14 subwatershed in the Planning Area. The actual median lot sizes vary by HUC14 subwatershed based on drought ground water recharge differences. For each HUC14 subwatershed, the relevant median lot size was multiplied by the acreage available for new septic system development in both the Conservation and Protection Zones. In the final step, the septic system yield for each Zone in each HUC14 subwatershed is apportioned among the municipalities that share that subwatershed, proportional to developable acreage within each municipality.

**Median Results for Recommended Nitrate Targets, in  
Average Acres per Septic System**

<b>Nitrate Target</b>	<b>0.72 mg/L</b> (acres/septic system)	<b>1.87 mg/L</b> (acres/septic system)	<b>2.0 mg/L</b> (acres/septic system)	<b>10.0 mg/L</b> (acres/septic system)
<b>Basis</b>	Median for Protection Zone (Planning Area)	Median for Conservation Zone (Planning Area)	NJDEP Proposed WQMP Rule (Watershed)	NJDEP Proposed WQMP Rule (Cluster Area)
<b>Median</b>	26.1	10.0	9.4	1.9

**Policy Options for Model Variables and Treatment Technology**

Although models are simplifications of the real world, they can provide reasonably accurate predictions that can be used to help formulate appropriate decisions and management policies.

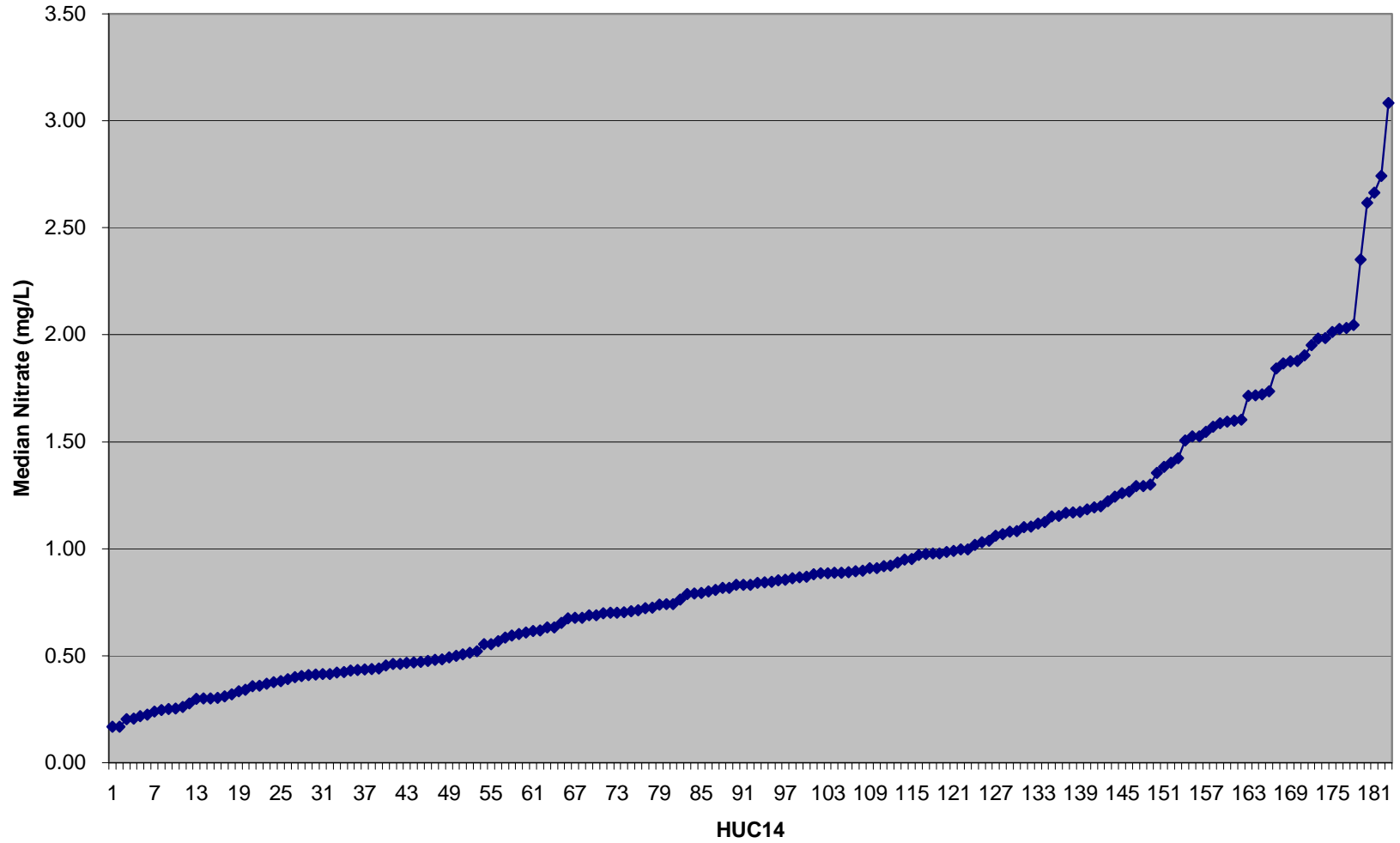
REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL

What should happen regarding septic system density if someone proposes to modify the basic assumptions? There are two major variables that can be affected: dilution and nitrate loadings.

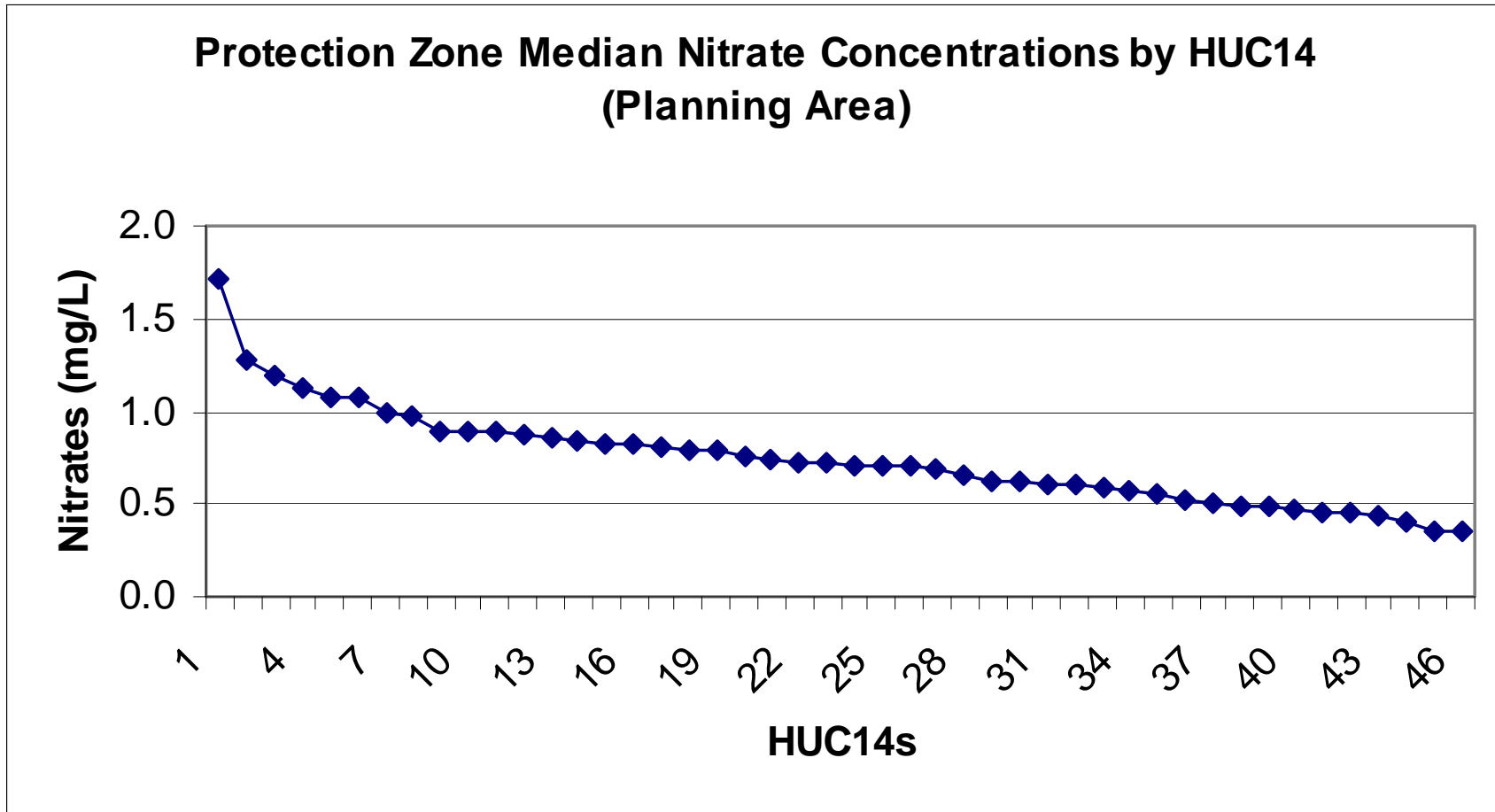
- Dilution – A development could propose to increase recharge well beyond previously existing levels as a method to increase dilution and therefore increase septic system density. Many technical questions arise, such as whether the increased recharge would occur during the drought periods of concern, whether there is ground water storage capacity, whether ground water mounding would damage nearby structures or flood basements, etc. We anticipate few situations where this option would be feasible. Further, any regional analysis assumes that some areas have higher and lower recharge rates. Using site-specific analyses or methods to change a regional antidegradation policy is inappropriate. Accordingly, the Council determined not to use this approach.
- Nitrate Loadings – A development in the Planning Area could propose to provide advanced septic system designs or communal treatment systems to provide better nitrate treatment. (Neither of these options is allowed in the Preservation Area, per the Highlands Act. NJDEP can only allow standard septic system designs, and a communal system would be considered an extension of public wastewater capacity.) Should the development yield (total units allowed) be changed? The Council proposes that the RMP not allow for such increases for three reasons. First, both options require more sophisticated management to ensure that the systems retain their treatment capacity. Second, better treatment of nitrates does not ensure better treatment of other contaminants of concern. It is critical to remember that nitrates were selected as an indicator, not as the sole contaminant of concern. Third, like public sewerage, community systems are regulated more stringently by NJDEP than septic systems, and nitrate dilution modeling for septic systems is not applicable or appropriate.

REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL

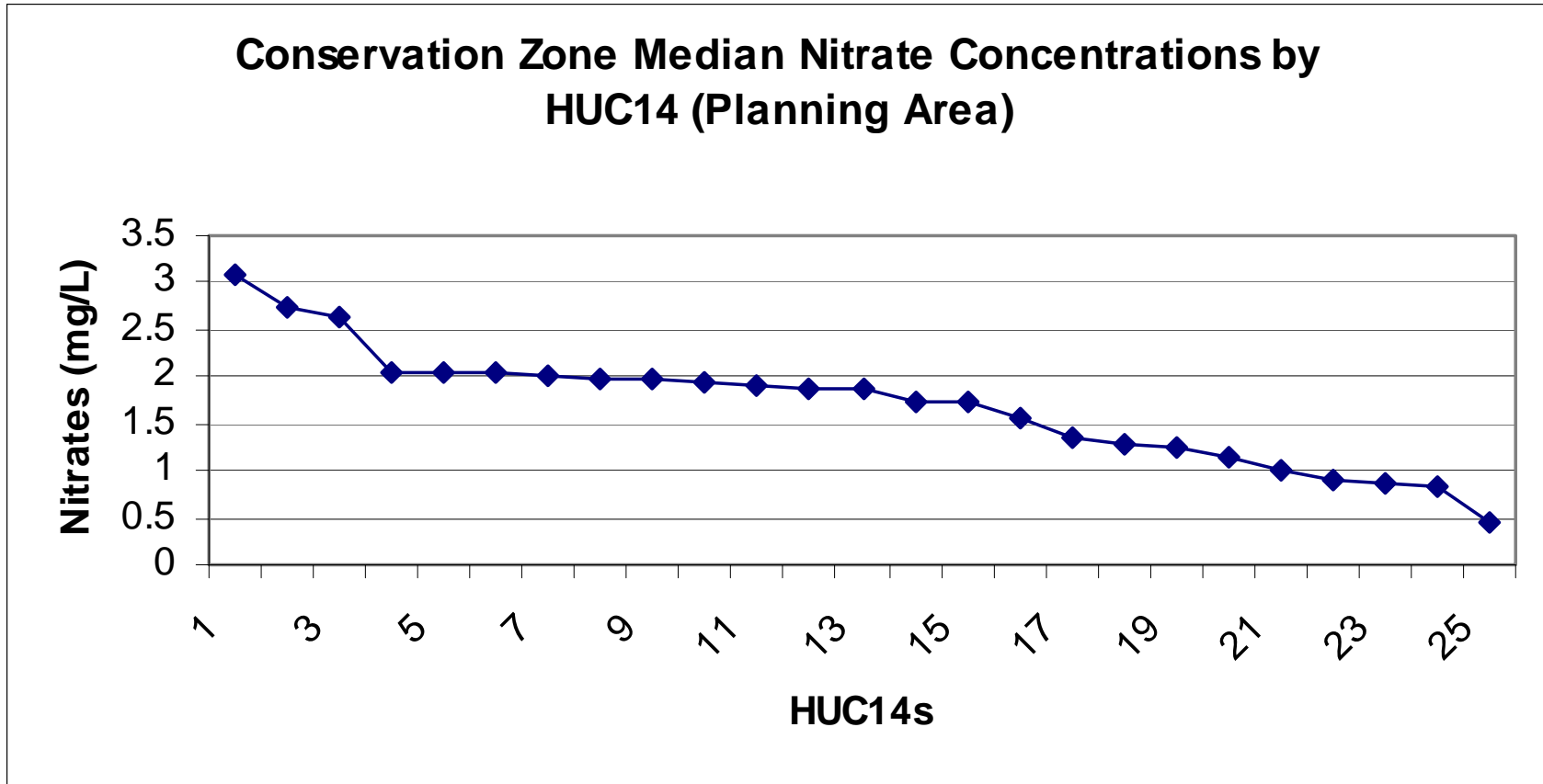
**Median NO3 by HUC14**



REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL



REVISED DRAFT – CONSIDERED AT THE OCTOBER 18, 2007  
MEETING OF THE HIGHLANDS COUNCIL



### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatersheds (Default Method)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030105020060	Cahepoulin Creek	1001	ALEXANDRIA TOWNSHIP	1143.8	0.0	95.3	0.0	95.3	496
02040105170020	Hakihokake Creek	1001	ALEXANDRIA TOWNSHIP	263.3	1.2	21.4	0.0	21.4	
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1001	ALEXANDRIA TOWNSHIP	2044.0	130.5	179.3	4.4	183.7	
02040105170040	Nishisakawick Creek (above 40d 33m)	1001	ALEXANDRIA TOWNSHIP	1693.1	23.9	146.0	0.8	146.7	
02040105170050	Nishisakawick Creek (below 40d 33m)	1001	ALEXANDRIA TOWNSHIP	625.7	4.2	49.7	0.1	49.8	
02040105160050	Musconetcong R (I-78 to 75d 00m)	1002	BETHLEHEM TOWNSHIP	150.9	0.3	14.2	0.0	14.2	14
02030105020070	Raritan R SB(River Rd to Spruce Run)	1005	CLINTON TOWN	0.0	58.0	0.0	2.1	2.1	2
02030105020050	Beaver Brook (Clinton)	1006	CLINTON TOWNSHIP	450.3	96.3	45.0	3.7	48.8	297
02030105020070	Raritan R SB(River Rd to Spruce Run)	1006	CLINTON TOWNSHIP	27.0	0.0	2.6	0.0	2.6	
02030105020080	Raritan R SB(Prescott Bk to River Rd)	1006	CLINTON TOWNSHIP	778.3	85.9	81.9	3.5	85.4	
02030105020090	Prescott Brook / Round Valley Reservoir	1006	CLINTON TOWNSHIP	148.2	187.8	15.9	7.8	23.8	
02030105050080	Rockaway Ck (above McCreas Mills)	1006	CLINTON TOWNSHIP	94.3	10.1	10.8	0.4	11.3	
02030105050090	Rockaway Ck (RockawaySB to McCreas Mills)	1006	CLINTON TOWNSHIP	80.9	2.0	7.8	0.1	7.8	
02030105050100	Rockaway Ck SB	1006	CLINTON TOWNSHIP	1066.0	312.9	105.5	11.9	117.4	
02040105160040	Musconetcong R (75d 00m to Rt 31)	1013	HAMPTON BOROUGH	78.7	0.1	7.8	0.0	7.8	7
02040105160070	Musconetcong R (below Warren Glen)	1015	HOLLAND TOWNSHIP	492.4	146.2	35.7	4.1	39.8	293
02040105170010	Holland Twp (Hakihokake to Musconetcong)	1015	HOLLAND TOWNSHIP	438.6	648.9	33.2	18.9	52.1	
02040105170020	Hakihokake Creek	1015	HOLLAND TOWNSHIP	1771.7	368.6	144.0	11.5	155.5	
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1015	HOLLAND TOWNSHIP	504.9	54.9	44.3	1.8	46.1	
02030105050100	Rockaway Ck SB	1018	LEBANON BOROUGH	18.6	14.4	1.8	0.5	2.4	2
02040105170020	Hakihokake Creek	1020	MILFORD BOROUGH	9.4	76.8	0.8	2.4	3.2	5
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1020	MILFORD BOROUGH	30.1	0.0	2.6	0.0	2.6	
02030105050060	Cold Brook	1024	TEWKSBURY TOWNSHIP	1167.7	12.3	119.1	0.5	119.6	280
02030105050070	Lamington R (HallsBrRd-Pottersville gage)	1024	TEWKSBURY TOWNSHIP	780.1	598.1	79.6	23.5	103.1	
02030105050080	Rockaway Ck (above McCreas Mills)	1024	TEWKSBURY TOWNSHIP	378.7	14.5	43.5	0.6	44.2	
02030105050090	Rockaway Ck (RockawaySB to McCreas Mills)	1024	TEWKSBURY TOWNSHIP	5.7	358.0	0.6	13.3	13.8	
02030105020040	Spruce Run Reservoir / Willoughby Brook	1025	UNION TOWNSHIP	1.8	32.7	0.2	1.4	1.6	32
02030105020060	Cahepoulin Creek	1025	UNION TOWNSHIP	215.2	0.0	17.9	0.0	17.9	
02030105020070	Raritan R SB(River Rd to Spruce Run)	1025	UNION TOWNSHIP	104.1	71.2	9.9	2.6	12.5	
02030103030130	Stony Brook (Boonton)	1402	BOONTON TOWNSHIP	0.0	642.2	0.0	26.5	26.5	35
02030103030140	Rockaway R (Stony Brook to BM 534 brdg)	1402	BOONTON TOWNSHIP	0.0	57.9	0.0	2.1	2.1	
02030103030150	Rockaway R (Boonton dam to Stony Brook)	1402	BOONTON TOWNSHIP	0.0	81.1	0.0	2.9	2.9	
02030103030160	Montville tribs.	1402	BOONTON TOWNSHIP	0.0	120.7	0.0	4.4	4.4	
02030105060020	Burnett Brook (above Old Mill Rd)	1407	CHESTER TOWNSHIP	0.0	163.6	0.0	7.4	7.4	8
02030105060030	Raritan R NB(incl McVickers to India Bk)	1407	CHESTER TOWNSHIP	0.0	29.6	0.0	1.3	1.3	
02030103030110	Beaver Brook (Morris County)	1408	DENVILLE TOWNSHIP	0.0	66.8	0.0	2.8	2.8	
02030103030140	Rockaway R (Stony Brook to BM 534 brdg)	1408	DENVILLE TOWNSHIP	0.0	127.3	0.0	4.7	4.7	7
02030103020070	Black Brook (Hanover)	1412	HANOVER TOWNSHIP	0.0	322.6	0.0	8.8	8.8	8
02030103010010	Passaic R Upr (above Osborn Mills)	1413	HARDING TOWNSHIP	0.0	111.2	0.0	4.8	4.8	100
02030103010020	Primrose Brook	1413	HARDING TOWNSHIP	28.5	198.5	3.5	9.3	12.8	
02030103010030	Great Brook (above Green Village Rd)	1413	HARDING TOWNSHIP	573.1	143.5	57.9	5.6	63.5	
02030103010040	Loantaka Brook	1413	HARDING TOWNSHIP	44.2	8.9	4.0	0.3	4.3	
02030103010050	Great Brook (below Green Village Rd)	1413	HARDING TOWNSHIP	103.5	67.7	12.0	3.0	15.1	
02040105150020	Lake Hopatcong	1414	JEFFERSON TOWNSHIP	0.0	64.1	0.0	2.3	2.3	2
02030103110010	Lincoln Park tribs (Pompton River)	1415	KINNELON BOROUGH	0.0	46.1	0.0	1.7	1.7	1
02030103010010	Passaic R Upr (above Osborn Mills)	1418	MENDHAM BOROUGH	99.5	0.2	11.2	0.0	11.2	49
02030105060030	Raritan R NB(incl McVickers to India Bk)	1418	MENDHAM BOROUGH	218.6	318.2	24.8	13.9	38.7	
02030103010010	Passaic R Upr (above Osborn Mills)	1419	MENDHAM TOWNSHIP	147.7	118.3	16.6	5.1	21.7	77
02030103020010	Whippany R (above road at 74d 33m)	1419	MENDHAM TOWNSHIP	0.0	55.1	0.0	2.5	2.5	
02030103020020	Whippany R (Wash. Valley Rd to 74d 33m)	1419	MENDHAM TOWNSHIP	0.0	97.5	0.0	4.5	4.5	
02030105060010	Raritan R NB (above/incl India Bk)	1419	MENDHAM TOWNSHIP	0.0	77.6	0.0	3.3	3.3	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatersheds (Default Method)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030105060020	Burnett Brook (above Old Mill Rd)	1419	MENDHAM TOWNSHIP	0.0	23.3	0.0	1.0	1.0	
02030105060030	Raritan R NB(incl McVickers to India Bk)	1419	MENDHAM TOWNSHIP	42.1	302.0	4.8	13.2	18.0	
02030105060040	Raritan R NB(Peapack Bk to McVickers Bk)	1419	MENDHAM TOWNSHIP	83.8	159.0	9.3	6.8	16.1	
02030105060050	Peapack Brook (above/incl Gladstone Bk)	1419	MENDHAM TOWNSHIP	57.5	93.4	6.2	3.9	10.2	
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1420	MINE HILL TOWNSHIP	0.0	228.9	0.0	8.5	8.5	12
02030105050010	Lamington R (above Rt 10)	1420	MINE HILL TOWNSHIP	0.0	115.6	0.0	4.3	4.3	
02030103030160	Montville tribs.	1421	MONTVILLE TOWNSHIP	0.0	114.4	0.0	4.1	4.1	10
02030103030170	Rockaway R (Passaic R to Boonton dam)	1421	MONTVILLE TOWNSHIP	0.0	34.1	0.0	1.0	1.0	
02030103040010	Passaic R Upr (Pompton R to Pine Bk)	1421	MONTVILLE TOWNSHIP	0.0	102.9	0.0	3.3	3.3	
02030103110010	Lincoln Park tribs (Pompton River)	1421	MONTVILLE TOWNSHIP	0.0	67.1	0.0	2.4	2.4	
02030103010030	Great Brook (above Green Village Rd)	1422	MORRIS TOWNSHIP	2.6	42.8	0.3	1.7	1.9	23
02030103020020	Whippany R (Wash. Valley Rd to 74d 33m)	1422	MORRIS TOWNSHIP	0.0	423.8	0.0	19.4	19.4	
02030103020040	Whippany R(Lk Pocahontas to Wash Val Rd)	1422	MORRIS TOWNSHIP	0.0	45.5	0.0	1.7	1.7	
02030105010010	Drakes Brook (above Eyland Ave)	1426	MOUNT ARLINGTON BOROUGH	0.0	35.0	0.0	1.4	1.4	8
02030105050010	Lamington R (above Rt 10)	1426	MOUNT ARLINGTON BOROUGH	0.0	151.4	0.0	5.7	5.7	
02040105150020	Lake Hopatcong	1426	MOUNT ARLINGTON BOROUGH	0.0	29.3	0.0	1.0	1.0	
02030105010020	Drakes Brook (below Eyland Ave)	1427	MOUNT OLIVE TOWNSHIP	0.0	52.9	0.0	1.9	1.9	13
02030105010030	Raritan River SB(above Rt 46)	1427	MOUNT OLIVE TOWNSHIP	0.0	39.0	0.0	1.5	1.5	
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1427	MOUNT OLIVE TOWNSHIP	0.0	46.6	0.0	1.7	1.7	
02040105150070	Musconetcong R(Waterloo to/incl WillsBk)	1427	MOUNT OLIVE TOWNSHIP	0.0	209.1	0.0	7.5	7.5	
02040105150080	Musconetcong R (SaxtonFalls to Waterloo)	1427	MOUNT OLIVE TOWNSHIP	0.0	23.4	0.0	1.0	1.0	
02030103020080	Troy Brook (above Reynolds Ave)	1429	PARSIPPANY-TROY HILLS TOWNSHIP	0.0	143.8	0.0	4.4	4.4	7
02030103020090	Troy Brook (below Reynolds Ave)	1429	PARSIPPANY-TROY HILLS TOWNSHIP	0.0	96.8	0.0	3.1	3.1	
02030103050080	Pequannock R (below Macopin gage)	1431	PEQUANNOCK TOWNSHIP	0.0	73.2	0.0	2.9	2.9	3
02030103100070	Ramapo R (below Crystal Lake bridge)	1431	PEQUANNOCK TOWNSHIP	0.0	26.8	0.0	1.0	1.0	
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1432	RANDOLPH TOWNSHIP	0.0	133.2	0.0	5.0	5.0	18
02030105050020	Lamington R (Hillside Rd to Rt 10)	1432	RANDOLPH TOWNSHIP	0.0	60.1	0.0	2.6	2.6	
02030105060010	Raritan R NB (above/incl India Bk)	1432	RANDOLPH TOWNSHIP	0.0	180.6	0.0	7.7	7.7	
02030105060020	Burnett Brook (above Old Mill Rd)	1432	RANDOLPH TOWNSHIP	0.0	77.3	0.0	3.5	3.5	
02030103050080	Pequannock R (below Macopin gage)	1433	RIVERDALE BOROUGH	0.0	140.2	0.0	5.5	5.5	5
02030103030060	Green Pond Brook (below Burnt Meadow Bk)	1435	ROCKAWAY TOWNSHIP	0.0	144.2	0.0	5.4	5.4	15
02030103030110	Beaver Brook (Morris County)	1435	ROCKAWAY TOWNSHIP	0.0	94.1	0.0	3.9	3.9	
02030103030130	Stony Brook (Boonton)	1435	ROCKAWAY TOWNSHIP	0.0	155.5	0.0	6.4	6.4	
02030103030040	Rockaway R (Stephens Bk to Longwood Lk)	1436	ROXBURY TOWNSHIP	0.0	29.8	0.0	1.2	1.2	39
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1436	ROXBURY TOWNSHIP	0.0	114.4	0.0	4.3	4.3	
02030105010010	Drakes Brook (above Eyland Ave)	1436	ROXBURY TOWNSHIP	0.0	324.5	0.0	12.6	12.6	
02030105050010	Lamington R (above Rt 10)	1436	ROXBURY TOWNSHIP	0.0	252.9	0.0	9.5	9.5	
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1436	ROXBURY TOWNSHIP	0.0	296.8	0.0	10.6	10.6	
02040105150070	Musconetcong R(Waterloo to/incl WillsBk)	1436	ROXBURY TOWNSHIP	0.0	46.0	0.0	1.7	1.7	
02030105010050	Raritan R SB(LongValley br to 74d44m15s)	1438	WASHINGTON TOWNSHIP	14.7	0.0	1.6	0.0	1.6	56
02030105010060	Raritan R SB(Califon br to Long Valley)	1438	WASHINGTON TOWNSHIP	0.0	31.6	0.0	1.4	1.4	
02030105050040	Lamington R(Pottersville gage-FurnaceRd)	1438	WASHINGTON TOWNSHIP	320.0	8.7	37.2	0.4	37.6	
02030105050070	Lamington R(HallsBrRd-Pottersville gage)	1438	WASHINGTON TOWNSHIP	108.7	1.7	11.1	0.1	11.2	
02040105150100	Musconetcong R (Trout Bk to SaxtonFalls)	1438	WASHINGTON TOWNSHIP	0.0	32.2	0.0	1.2	1.2	
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	1438	WASHINGTON TOWNSHIP	0.0	79.4	0.0	3.1	3.1	
02030103070070	Wanaque R/Posts Bk (below reservior)	1613	WANAQUE BOROUGH	0.0	91.9	0.0	3.9	3.9	3
02030105050050	Pottersville trib (Lamington River)	1801	BEDMINSTER TOWNSHIP	105.0	0.0	12.1	0.0	12.1	616
02030105050070	Lamington R(HallsBrRd-Pottersville gage)	1801	BEDMINSTER TOWNSHIP	2019.5	8.5	206.1	0.3	206.4	
02030105050110	Lamington R (below Halls Bridge Rd)	1801	BEDMINSTER TOWNSHIP	223.8	139.1	19.3	4.6	23.9	
02030105060060	Peapack Brook (below Gladstone Brook)	1801	BEDMINSTER TOWNSHIP	41.4	20.0	4.2	0.8	5.0	
02030105060080	Middle Brook (NB Raritan River)	1801	BEDMINSTER TOWNSHIP	2563.8	66.1	239.6	2.4	242.0	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatersheds (Default Method)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1801	BEDMINSTER TOWNSHIP	960.9	28.8	80.1	0.9	81.0	
02030105070010	Raritan R NB (Rt 28 to Lamington R)	1801	BEDMINSTER TOWNSHIP	535.7	106.6	43.2	3.3	46.5	
02030103010010	Passaic R Upr (above Osborn Mills)	1802	BERNARDS TOWNSHIP	0.0	34.0	0.0	1.5	1.5	25
02030103010080	Dead River (above Harrison's Brook)	1802	BERNARDS TOWNSHIP	0.0	476.2	0.0	15.6	15.6	
02030103010100	Dead River (below Harrison's Brook)	1802	BERNARDS TOWNSHIP	0.0	110.2	0.0	3.6	3.6	
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1802	BERNARDS TOWNSHIP	0.0	48.9	0.0	1.6	1.6	
02030105070010	Raritan R NB (Rt 28 to Lamington R)	1802	BERNARDS TOWNSHIP	0.0	38.7	0.0	1.2	1.2	
02030105120060	Middle Brook WB	1802	BERNARDS TOWNSHIP	0.0	64.7	0.0	2.1	2.1	
02030103010010	Passaic R Upr (above Osborn Mills)	1803	BERNARDSVILLE BOROUGH	78.7	94.5	8.8	4.1	12.9	70
02030105060040	Raritan R NB (Peapack Bk to McVickers Bk)	1803	BERNARDSVILLE BOROUGH	279.2	314.4	31.0	13.4	44.4	
02030105060070	Raritan R NB (incl Mine Bk to Peapack Bk)	1803	BERNARDSVILLE BOROUGH	1.3	339.0	0.1	13.3	13.5	
02030103010080	Dead River (above Harrison's Brook)	1807	FAR HILLS BOROUGH	18.9	36.2	1.6	1.2	2.8	74
02030105060040	Raritan R NB (Peapack Bk to McVickers Bk)	1807	FAR HILLS BOROUGH	367.7	37.1	40.9	1.6	42.4	
02030105060070	Raritan R NB (incl Mine Bk to Peapack Bk)	1807	FAR HILLS BOROUGH	216.5	19.5	22.1	0.8	22.9	
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1807	FAR HILLS BOROUGH	75.4	0.6	6.3	0.0	6.3	
02030105060040	Raritan R NB (Peapack Bk to McVickers Bk)	1815	PEAPACK GLADSTONE BOROUGH	307.7	219.1	34.2	9.3	43.5	92
02030105060060	Peapack Brook (below Gladstone Brook)	1815	PEAPACK GLADSTONE BOROUGH	404.3	79.4	40.8	3.1	43.9	
02030105060080	Middle Brook (NB Raritan River)	1815	PEAPACK GLADSTONE BOROUGH	45.7	16.8	4.3	0.6	4.9	
02040105150050	Lubbers Run (below Dallis Pond)	1904	BYRAM TOWNSHIP	0.0	52.8	0.0	2.0	2.0	2
02020007010040	Walkkill R (Hamburg SW Bdy to Ogdensburg)	1906	FRANKLIN BOROUGH	383.3	351.7	37.9	13.4	51.4	51
02040105070020	New Wawayanda Lake/Andover Pond trib	1908	GREEN TOWNSHIP	19.8	7.6	1.8	0.3	2.1	292
02040105070030	Pequest River (above Brighton)	1908	GREEN TOWNSHIP	574.3	360.3	49.5	11.9	61.4	
02040105070040	Pequest River (Trout Brook to Brighton)	1908	GREEN TOWNSHIP	971.3	263.3	87.5	9.1	96.6	
02040105070050	Trout Brook/Lake Tranquility	1908	GREEN TOWNSHIP	526.0	533.0	51.1	19.9	71.0	
02040105080010	Bear Brook (Sussex/Warren Co)	1908	GREEN TOWNSHIP	705.4	39.2	59.3	1.3	60.6	
02040105080020	Bear Creek	1908	GREEN TOWNSHIP	10.7	3.9	1.0	0.1	1.1	
02020007010070	Walkkill R (Martins Rd to Hamburg SW Bdy)	1909	HAMBURG BOROUGH	2.6	23.0	0.3	0.9	1.1	1
02020007010040	Walkkill R (Hamburg SW Bdy to Ogdensburg)	1911	HARDYSTON TOWNSHIP	1054.5	241.6	104.4	9.2	113.6	288
02020007010050	Hardistonville tribs	1911	HARDYSTON TOWNSHIP	116.6	7.6	12.7	0.3	13.0	
02020007010060	Beaver Run	1911	HARDYSTON TOWNSHIP	438.3	58.3	42.6	2.2	44.7	
02020007010070	Walkkill R (Martins Rd to Hamburg SW Bdy)	1911	HARDYSTON TOWNSHIP	828.7	833.4	82.1	31.6	113.6	
02020007040010	Black Ck (above/incl G. Gorge Resort trib)	1911	HARDYSTON TOWNSHIP	28.1	26.6	2.9	1.1	4.0	
02040105150020	Lake Hopatcong	1912	HOPATCONG BOROUGH	0.0	248.5	0.0	8.8	8.8	34
02040105150030	Musconetcong R (Wills Bk to Lk Hopatcong)	1912	HOPATCONG BOROUGH	0.0	181.0	0.0	6.5	6.5	
02040105150040	Lubbers Run (above/incl Dallis Pond)	1912	HOPATCONG BOROUGH	0.0	111.2	0.0	4.2	4.2	
02040105150050	Lubbers Run (below Dallis Pond)	1912	HOPATCONG BOROUGH	0.0	381.2	0.0	14.7	14.7	
02020007010020	Walkkill R (Ogdensburg to Sparta Station)	1916	OGDENSBURG BOROUGH	0.0	140.4	0.0	5.4	5.4	8
02020007010040	Walkkill R (Hamburg SW Bdy to Ogdensburg)	1916	OGDENSBURG BOROUGH	0.0	73.2	0.0	2.8	2.8	
02020007010010	Walkkill R/Lake Mohawk (above Sparta Sta)	1918	SPARTA TOWNSHIP	0.0	805.4	0.0	29.4	29.4	175
02020007010020	Walkkill R (Ogdensburg to Sparta Station)	1918	SPARTA TOWNSHIP	0.0	185.4	0.0	7.1	7.1	
02020007010040	Walkkill R (Hamburg SW Bdy to Ogdensburg)	1918	SPARTA TOWNSHIP	434.9	313.5	43.1	12.0	55.0	
02040105040040	Lafayette Swamp tribs	1918	SPARTA TOWNSHIP	36.3	0.0	3.2	0.0	3.2	
02040105040050	Sparta Junction tribs	1918	SPARTA TOWNSHIP	418.4	970.2	37.4	33.5	70.8	
02040105070020	New Wawayanda Lake/Andover Pond trib	1918	SPARTA TOWNSHIP	0.0	222.1	0.0	7.8	7.8	
02040105150040	Lubbers Run (above/incl Dallis Pond)	1918	SPARTA TOWNSHIP	0.0	61.5	0.0	2.3	2.3	
02040105150030	Musconetcong R (Wills Bk to Lk Hopatcong)	1919	STANHOPE BOROUGH	0.0	85.0	0.0	3.0	3.0	6
02040105150070	Musconetcong R (Waterloo to/incl Wills Bk)	1919	STANHOPE BOROUGH	0.0	88.8	0.0	3.2	3.2	
02020007010070	Walkkill R (Martins Rd to Hamburg SW Bdy)	1922	VERNON TOWNSHIP	0.0	35.8	0.0	1.4	1.4	182
02020007030010	Walkkill R (41d13m30s to Martins Road)	1922	VERNON TOWNSHIP	1.0	511.9	0.1	19.2	19.3	
02020007030030	Walkkill River (Owens gage to 41d13m30s)	1922	VERNON TOWNSHIP	36.2	148.5	3.6	5.6	9.2	
02020007030040	Walkkill River (stateline to Owens gage)	1922	VERNON TOWNSHIP	147.3	0.0	14.9	0.0	14.9	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatersheds (Default Method)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02020007040010	Black Ck(above/incl G.Gorge Resort trib)	1922	VERNON TOWNSHIP	117.9	360.9	12.3	14.5	26.8	
02020007040020	Black Creek (below G. Gorge Resort trib)	1922	VERNON TOWNSHIP	618.8	957.8	69.5	41.6	111.2	
02040105070040	Pequest River (Trout Brook to Brighton)	2101	ALLAMUCHY TOWNSHIP	242.3	1.2	21.8	0.0	21.9	110
02040105070050	Trout Brook/Lake Tranquility	2101	ALLAMUCHY TOWNSHIP	2.6	107.6	0.2	4.0	4.3	
02040105070060	Pequest R (below Bear Swamp to Trout Bk)	2101	ALLAMUCHY TOWNSHIP	88.3	107.1	7.7	3.6	11.4	
02040105080020	Bear Creek	2101	ALLAMUCHY TOWNSHIP	786.5	3.1	70.2	0.1	70.3	
02040105090020	Pequest R (Cemetery Road to Drag Strip)	2101	ALLAMUCHY TOWNSHIP	0.0	62.2	0.0	2.4	2.4	
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2102	ALPHA BOROUGH	21.0	0.0	1.5	0.0	1.5	12
02040105140070	Pohatcong Ck(below Springtown) incl UDRV	2102	ALPHA BOROUGH	141.0	53.7	9.3	1.4	10.7	
02040105140030	Pohatcong Ck (Edison Rd-Brass Castle Ck)	2105	FRANKLIN TOWNSHIP	1234.9	518.0	106.5	17.2	123.6	480
02040105140050	Pohatcong Ck (Merrill Ck to Edison Rd)	2105	FRANKLIN TOWNSHIP	1354.7	305.1	114.8	9.9	124.7	
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2105	FRANKLIN TOWNSHIP	48.7	0.0	3.6	0.0	3.6	
02040105160040	Musconetcong R (75d 00m to Rt 31)	2105	FRANKLIN TOWNSHIP	229.3	119.4	22.7	4.6	27.3	
02040105160050	Musconetcong R (I-78 to 75d 00m)	2105	FRANKLIN TOWNSHIP	1762.7	149.9	166.3	5.4	171.7	
02040105160060	Musconetcong R (Warren Glen to I-78)	2105	FRANKLIN TOWNSHIP	310.3	139.5	25.6	4.4	30.1	
02040105050010	Paulins Kill (Blairstown to Stillwater)	2106	FRELINGHUYSEN TOWNSHIP	1303.0	765.3	111.4	25.3	136.6	452
02040105080010	Bear Brook (Sussex/Warren Co)	2106	FRELINGHUYSEN TOWNSHIP	338.0	87.6	28.4	2.8	31.2	
02040105080020	Bear Creek	2106	FRELINGHUYSEN TOWNSHIP	998.4	633.5	89.1	21.8	111.0	
02040105100010	Union Church trib	2106	FRELINGHUYSEN TOWNSHIP	945.4	369.7	86.7	13.0	99.8	
02040105100030	Beaver Brook (above Hope Village)	2106	FRELINGHUYSEN TOWNSHIP	750.5	227.1	66.4	7.7	74.2	
02040105120010	Lopatcong Creek (above Rt 57)	2107	GREENWICH TOWNSHIP	12.6	0.0	1.0	0.0	1.0	188
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2107	GREENWICH TOWNSHIP	179.3	0.0	10.7	0.0	10.7	
02040105140040	Merrill Creek	2107	GREENWICH TOWNSHIP	356.0	0.0	30.4	0.0	30.4	
02040105140050	Pohatcong Ck (Merrill Ck to Edison Rd)	2107	GREENWICH TOWNSHIP	463.8	0.0	39.3	0.0	39.3	
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2107	GREENWICH TOWNSHIP	1407.6	6.4	102.7	0.2	102.9	
02040105160060	Musconetcong R (Warren Glen to I-78)	2107	GREENWICH TOWNSHIP	47.9	10.6	4.0	0.3	4.3	
02040105150100	Musconetcong R (Trout Bk to SaxtonFalls)	2108	HACKETTSTOWN TOWN	0.0	67.1	0.0	2.6	2.6	6
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	2108	HACKETTSTOWN TOWN	0.0	104.5	0.0	4.1	4.1	
02040105110020	Buckhorn Creek (incl UDRV)	2110	HARMONY TOWNSHIP	1356.9	16.0	116.0	0.5	116.5	265
02040105110030	UDRV tribs (Rt 22 to Buckhorn Ck)	2110	HARMONY TOWNSHIP	1593.2	201.8	118.0	5.8	123.8	
02040105120010	Lopatcong Creek (above Rt 57)	2110	HARMONY TOWNSHIP	305.7	0.0	25.1	0.0	25.1	
02040105100010	Union Church trib	2111	HOPE TOWNSHIP	359.8	204.1	33.0	7.2	40.2	425
02040105100020	Honey Run	2111	HOPE TOWNSHIP	1631.4	732.7	149.7	25.9	175.6	
02040105100030	Beaver Brook (above Hope Village)	2111	HOPE TOWNSHIP	880.7	699.8	77.9	23.9	101.8	
02040105100040	Beaver Brook (below Hope Village)	2111	HOPE TOWNSHIP	1121.7	165.7	102.0	5.8	107.8	
02040105070060	Pequest R (below Bear Swamp to Trout Bk)	2112	INDEPENDENCE TOWNSHIP	82.1	179.1	7.2	6.1	13.3	236
02040105090010	Pequest R (Drag Strip--below Bear Swamp)	2112	INDEPENDENCE TOWNSHIP	1091.6	656.1	104.0	24.1	128.1	
02040105090020	Pequest R (Cemetery Road to Drag Strip)	2112	INDEPENDENCE TOWNSHIP	781.2	471.9	77.3	18.0	95.4	
02040105090010	Pequest R (Drag Strip--below Bear Swamp)	2114	LIBERTY TOWNSHIP	289.3	1.6	27.5	0.1	27.6	27
02040105120010	Lopatcong Creek (above Rt 57)	2115	LOPATCONG TOWNSHIP	147.5	16.4	12.1	0.5	12.6	33
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2115	LOPATCONG TOWNSHIP	350.9	0.0	20.9	0.0	20.9	
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	2116	MANSFIELD TOWNSHIP	536.9	3.8	54.8	0.2	54.9	215
02040105160020	Musconetcong R (Changewater to HancesBk)	2116	MANSFIELD TOWNSHIP	1353.5	109.1	150.4	4.7	155.0	
02040105160030	Musconetcong R (Rt 31 to Changewater)	2116	MANSFIELD TOWNSHIP	49.8	6.6	4.9	0.2	5.1	
02040105090050	Furnace Brook	2117	OXFORD TOWNSHIP	269.0	33.2	25.6	1.2	26.8	50
02040105090060	Pequest R (below Furnace Brook)	2117	OXFORD TOWNSHIP	197.8	121.9	17.5	4.1	21.6	
02040105110010	Pophandusing Brook	2117	OXFORD TOWNSHIP	1.5	67.9	0.1	2.3	2.4	
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2119	PHILLIPSBURG TOWN	29.0	20.9	1.7	0.5	2.2	2
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2120	POHATCONG TOWNSHIP	323.8	0.0	19.3	0.0	19.3	21
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2120	POHATCONG TOWNSHIP	14.4	0.0	1.1	0.0	1.1	
02040105140070	Pohatcong Ck(below Springtown) incl UDRV	2120	POHATCONG TOWNSHIP	18.1	0.0	1.2	0.0	1.2	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatersheds (Default Method)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02040105140020	Pohatcong Ck (Brass Castle Ck to Rt 31)	2121	WASHINGTON BOROUGH	0.0	70.0	0.0	2.4	2.4	2
02040105140020	Pohatcong Ck (Brass Castle Ck to Rt 31)	2122	WASHINGTON TOWNSHIP	128.8	177.8	11.6	6.2	17.8	211
02040105140030	Pohatcong Ck (Edison Rd-Brass Castle Ck)	2122	WASHINGTON TOWNSHIP	21.5	27.5	1.9	0.9	2.8	
02040105160020	Musconetcong R (Changewater to HancesBk)	2122	WASHINGTON TOWNSHIP	172.5	4.3	19.2	0.2	19.3	
02040105160030	Musconetcong R (Rt 31 to Changewater)	2122	WASHINGTON TOWNSHIP	1246.8	263.7	122.2	10.0	132.2	
02040105160040	Musconetcong R (75d 00m to Rt 31)	2122	WASHINGTON TOWNSHIP	336.3	148.9	33.3	5.7	39.0	
02040105060020	Delawanna Creek (incl UDRV)	2123	WHITE TOWNSHIP	72.7	670.8	6.5	23.1	29.6	350
02040105090040	Mountain Lake Brook	2123	WHITE TOWNSHIP	217.8	59.4	21.1	2.2	23.4	
02040105090060	Pequest R (below Furnace Brook)	2123	WHITE TOWNSHIP	855.8	70.4	75.7	2.4	78.1	
02040105100040	Beaver Brook (below Hope Village)	2123	WHITE TOWNSHIP	757.4	30.1	68.9	1.1	69.9	
02040105110010	Pophandusing Brook	2123	WHITE TOWNSHIP	634.3	24.1	56.1	0.8	57.0	
02040105110020	Buckhorn Creek (incl UDRV)	2123	WHITE TOWNSHIP	1070.7	18.2	91.5	0.6	92.1	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatershed (Alternative Method Including Yield from Preserved Lands)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030103100050	Ramapo R (Crystal Lk br to BearSwamp Bk)	0242	OAKLAND BOROUGH	0.0	148.0	0.0	7.1	7.1	7
02030105020060	Cakepoulin Creek	1001	ALEXANDRIA TOWNSHIP	1143.8	0.0	95.3	0.0	95.3	598
02040105170020	Hakihokake Creek	1001	ALEXANDRIA TOWNSHIP	263.3	1.2	21.4	0.0	21.4	
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1001	ALEXANDRIA TOWNSHIP	2793.2	130.6	245.0	4.4	249.4	
02040105170040	Nishisakawick Creek (above 40d 33m)	1001	ALEXANDRIA TOWNSHIP	1999.6	23.9	172.4	0.8	173.2	
02040105170050	Nishisakawick Creek (below 40d 33m)	1001	ALEXANDRIA TOWNSHIP	740.0	4.2	58.7	0.1	58.9	
02040105160050	Musconetcong R (I-78 to 75d 00m)	1002	BETHLEHEM TOWNSHIP	780.5	0.3	73.6	0.0	73.6	73
02030105020070	Raritan R SB(River Rd to Spruce Run)	1005	CLINTON TOWN	0.0	58.0	0.0	2.1	2.1	2
02030105020050	Beaver Brook (Clinton)	1006	CLINTON TOWNSHIP	502.5	155.7	50.3	6.0	56.3	366
02030105020070	Raritan R SB(River Rd to Spruce Run)	1006	CLINTON TOWNSHIP	27.0	1.1	2.6	0.0	2.6	
02030105020080	Raritan R SB(Prescott Bk to River Rd)	1006	CLINTON TOWNSHIP	778.3	152.4	81.9	6.2	88.1	
02030105020090	Prescott Brook / Round Valley Reservoir	1006	CLINTON TOWNSHIP	651.3	191.1	70.0	8.0	78.0	
02030105050080	Rockaway Ck (above McCreas Mills)	1006	CLINTON TOWNSHIP	94.3	10.1	10.8	0.4	11.3	
02030105050090	Rockaway Ck (RockawaySB to McCreas Mills)	1006	CLINTON TOWNSHIP	80.9	2.0	7.8	0.1	7.8	
02030105050100	Rockaway Ck SB	1006	CLINTON TOWNSHIP	1119.8	313.1	110.9	11.9	122.8	
02040105160040	Musconetcong R (75d 00m to Rt 31)	1013	HAMPTON BOROUGH	78.7	0.1	7.8	0.0	7.8	7
02040105160070	Musconetcong R (below Warren Glen)	1015	HOLLAND TOWNSHIP	492.4	146.2	35.7	4.1	39.8	334
02040105170010	Holland Twp (Hakihokake to Musconetcong)	1015	HOLLAND TOWNSHIP	656.4	664.6	49.7	19.4	69.1	
02040105170020	Hakihokake Creek	1015	HOLLAND TOWNSHIP	1954.4	369.9	158.9	11.5	170.4	
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1015	HOLLAND TOWNSHIP	613.3	54.9	53.8	1.8	55.6	
02030105050100	Rockaway Ck SB	1018	LEBANON BOROUGH	32.1	14.4	3.2	0.5	3.7	3
02040105170020	Hakihokake Creek	1020	MILFORD BOROUGH	9.4	76.8	0.8	2.4	3.2	5
02040105170030	Harihokake Creek (and to Hakihokake Ck)	1020	MILFORD BOROUGH	30.1	0.0	2.6	0.0	2.6	
02030105050060	Cold Brook	1024	TEWKSBURY TOWNSHIP	1211.8	12.3	123.7	0.5	124.1	312
02030105050070	Lamington R(HallsBrRd-Pottersville gage)	1024	TEWKSBURY TOWNSHIP	916.4	598.1	93.5	23.5	117.0	
02030105050080	Rockaway Ck (above McCreas Mills)	1024	TEWKSBURY TOWNSHIP	491.1	14.9	56.4	0.7	57.1	
02030105050090	Rockaway Ck (RockawaySB to McCreas Mills)	1024	TEWKSBURY TOWNSHIP	5.7	358.0	0.6	13.3	13.8	
02030105020040	Spruce Run Reservoir / Willoughby Brook	1025	UNION TOWNSHIP	1.8	32.7	0.2	1.4	1.6	39
02030105020060	Cakepoulin Creek	1025	UNION TOWNSHIP	308.9	0.0	25.7	0.0	25.7	
02030105020070	Raritan R SB(River Rd to Spruce Run)	1025	UNION TOWNSHIP	104.1	71.2	9.9	2.6	12.5	
02030103030130	Stony Brook (Boonton)	1402	BOONTON TOWNSHIP	0.0	642.2	0.0	26.5	26.5	35
02030103030140	Rockaway R (Stony Brook to BM 534 brdg)	1402	BOONTON TOWNSHIP	0.0	57.9	0.0	2.1	2.1	
02030103030150	Rockaway R (Boonton dam to Stony Brook)	1402	BOONTON TOWNSHIP	0.0	81.1	0.0	2.9	2.9	
02030103030160	Montville tribs	1402	BOONTON TOWNSHIP	0.0	120.7	0.0	4.4	4.4	
02030105050030	Lamington R (Furnace Rd to Hillside Rd)	1406	CHESTER BOROUGH	0.0	45.5	0.0	2.0	2.0	1
02030105060020	Burnett Brook (above Old Mill Rd)	1407	CHESTER TOWNSHIP	0.0	163.6	0.0	7.4	7.4	8
02030105060030	Raritan R NB(incl McVickers to India Bk)	1407	CHESTER TOWNSHIP	0.0	29.6	0.0	1.3	1.3	
02030103030110	Beaver Brook (Morris County)	1408	DENVILLE TOWNSHIP	0.0	66.8	0.0	2.8	2.8	7
02030103030140	Rockaway R (Stony Brook to BM 534 brdg)	1408	DENVILLE TOWNSHIP	0.0	127.3	0.0	4.7	4.7	
02030103020070	Black Brook (Hanover)	1412	HANOVER TOWNSHIP	0.0	322.6	0.0	8.8	8.8	8
02030103010010	Passaic R Upr (above Osborn Mills)	1413	HARDING TOWNSHIP	0.0	119.9	0.0	5.2	5.2	118
02030103010020	Primrose Brook	1413	HARDING TOWNSHIP	115.9	198.9	14.1	9.3	23.4	
02030103010030	Great Brook (above Green Village Rd)	1413	HARDING TOWNSHIP	632.5	143.5	63.9	5.6	69.5	
02030103010040	Loantaka Brook	1413	HARDING TOWNSHIP	44.2	8.9	4.0	0.3	4.3	
02030103010050	Great Brook (below Green Village Rd)	1413	HARDING TOWNSHIP	115.0	68.4	13.4	3.1	16.4	
02040105150020	Lake Hopatcong	1414	JEFFERSON TOWNSHIP	0.0	64.1	0.0	2.3	2.3	2
02030103110010	Lincoln Park tribs (Pompton River)	1415	KINNELON BOROUGH	0.0	50.3	0.0	1.8	1.8	1
02030103010010	Passaic R Upr (above Osborn Mills)	1418	MENDHAM BOROUGH	99.5	0.2	11.2	0.0	11.2	49
02030105060030	Raritan R NB(incl McVickers to India Bk)	1418	MENDHAM BOROUGH	218.6	318.2	24.8	13.9	38.7	
02030103010010	Passaic R Upr (above Osborn Mills)	1419	MENDHAM TOWNSHIP	147.7	118.3	16.6	5.1	21.7	106
02030103020010	Whippary R (above road at 74d 33m)	1419	MENDHAM TOWNSHIP	0.0	629.9	0.0	28.8	28.8	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatershed (Alternative Method Including Yield from Preserved Lands)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030103020020	Whippany R (Wash. Valley Rd to 74d 33m)	1419	MENDHAM TOWNSHIP	0.0	97.5	0.0	4.5	4.5	
02030105060010	Raritan R NB (above/incl India Bk)	1419	MENDHAM TOWNSHIP	0.0	81.1	0.0	3.4	3.4	
02030105060020	Burnett Brook (above Old Mill Rd)	1419	MENDHAM TOWNSHIP	0.0	23.3	0.0	1.0	1.0	
02030105060030	Raritan R NB(incl McVickers to India Bk)	1419	MENDHAM TOWNSHIP	42.1	355.7	4.8	15.5	20.3	
02030105060040	Raritan R NB(Peapack Bk to McVickers Bk)	1419	MENDHAM TOWNSHIP	83.8	160.4	9.3	6.8	16.1	
02030105060050	Peapack Brook (above/incl Gladstone Bk)	1419	MENDHAM TOWNSHIP	57.5	93.4	6.2	3.9	10.2	
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1420	MINE HILL TOWNSHIP	0.0	228.9	0.0	8.5	8.5	12
02030105050010	Lamington R (above Rt 10)	1420	MINE HILL TOWNSHIP	0.0	115.6	0.0	4.3	4.3	
02030103030160	Montville tribs.	1421	MONTVILLE TOWNSHIP	0.0	114.4	0.0	4.1	4.1	11
02030103030170	Rockaway R (Passaic R to Boonton dam)	1421	MONTVILLE TOWNSHIP	0.0	34.1	0.0	1.0	1.0	
02030103040010	Passaic R Upr (Pompton R to Pine Bk)	1421	MONTVILLE TOWNSHIP	0.0	106.6	0.0	3.4	3.4	
02030103110010	Lincoln Park tribs (Pompton River)	1421	MONTVILLE TOWNSHIP	0.0	67.1	0.0	2.4	2.4	
02030103010030	Great Brook (above Green Village Rd)	1422	MORRIS TOWNSHIP	2.6	42.8	0.3	1.7	1.9	23
02030103020020	Whippany R (Wash. Valley Rd to 74d 33m)	1422	MORRIS TOWNSHIP	0.0	423.8	0.0	19.4	19.4	
02030103020040	Whippany R(Lk Pocahontas to Wash Val Rd)	1422	MORRIS TOWNSHIP	0.0	45.5	0.0	1.7	1.7	
02030105010010	Drakes Brook (above Eyland Ave)	1426	MOUNT ARLINGTON BOROUGH	0.0	35.0	0.0	1.4	1.4	8
02030105050010	Lamington R (above Rt 10)	1426	MOUNT ARLINGTON BOROUGH	0.0	151.4	0.0	5.7	5.7	
02040105150020	Lake Hopatcong	1426	MOUNT ARLINGTON BOROUGH	0.0	29.3	0.0	1.0	1.0	
02030105010020	Drakes Brook (below Eyland Ave)	1427	MOUNT OLIVE TOWNSHIP	0.0	52.9	0.0	1.9	1.9	13
02030105010030	Raritan River SB(above Rt 46)	1427	MOUNT OLIVE TOWNSHIP	0.0	39.0	0.0	1.5	1.5	
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1427	MOUNT OLIVE TOWNSHIP	0.0	46.6	0.0	1.7	1.7	
02040105150070	Musconetcong R(Waterloo to/incl WillsBk)	1427	MOUNT OLIVE TOWNSHIP	0.0	209.1	0.0	7.5	7.5	
02040105150080	Musconetcong R (SaxtonFalls to Waterloo)	1427	MOUNT OLIVE TOWNSHIP	0.0	23.4	0.0	1.0	1.0	
02030103020080	Troy Brook (above Reynolds Ave)	1429	PARSIPPANY-TROY HILLS TOWNSHIP	0.0	143.8	0.0	4.4	4.4	7
02030103020090	Troy Brook (below Reynolds Ave)	1429	PARSIPPANY-TROY HILLS TOWNSHIP	0.0	99.4	0.0	3.2	3.2	
02030103050080	Pequanock R (below Macopin gage)	1431	PEQUANNOCK TOWNSHIP	0.0	73.2	0.0	2.9	2.9	3
02030103100070	Ramapo R (below Crystal Lake bridge)	1431	PEQUANNOCK TOWNSHIP	0.0	26.8	0.0	1.0	1.0	
02030103020010	Whippany R (above road at 74d 33m)	1432	RANDOLPH TOWNSHIP	0.0	321.0	0.0	14.7	14.7	35
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1432	RANDOLPH TOWNSHIP	0.0	133.2	0.0	5.0	5.0	
02030105050020	Lamington R (Hillside Rd to Rt 10)	1432	RANDOLPH TOWNSHIP	0.0	67.8	0.0	2.9	2.9	
02030105060010	Raritan R NB (above/incl India Bk)	1432	RANDOLPH TOWNSHIP	0.0	192.3	0.0	8.1	8.1	
02030105060020	Burnett Brook (above Old Mill Rd)	1432	RANDOLPH TOWNSHIP	0.0	100.4	0.0	4.5	4.5	
02030103050080	Pequanock R (below Macopin gage)	1433	RIVERDALE BOROUGH	0.0	140.2	0.0	5.5	5.5	5
02030103030060	Green Pond Brook (below Burnt Meadow Bk)	1435	ROCKAWAY TOWNSHIP	0.0	144.2	0.0	5.4	5.4	16
02030103030110	Beaver Brook (Morris County)	1435	ROCKAWAY TOWNSHIP	0.0	97.1	0.0	4.0	4.0	
02030103030130	Stony Brook (Boonton)	1435	ROCKAWAY TOWNSHIP	0.0	164.6	0.0	6.8	6.8	
02030103030040	Rockaway R (Stephens Bk to Longwood Lk)	1436	ROXBURY TOWNSHIP	0.0	29.8	0.0	1.2	1.2	39
02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	1436	ROXBURY TOWNSHIP	0.0	114.4	0.0	4.3	4.3	
02030105010010	Drakes Brook (above Eyland Ave)	1436	ROXBURY TOWNSHIP	0.0	324.5	0.0	12.6	12.6	
02030105050010	Lamington R (above Rt 10)	1436	ROXBURY TOWNSHIP	0.0	252.9	0.0	9.5	9.5	
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1436	ROXBURY TOWNSHIP	0.0	296.8	0.0	10.6	10.6	
02040105150070	Musconetcong R(Waterloo to/incl WillsBk)	1436	ROXBURY TOWNSHIP	0.0	46.0	0.0	1.7	1.7	
02030105010050	Raritan R SB(LongValley br to 74d44m15s)	1438	WASHINGTON TOWNSHIP	204.5	2.5	22.7	0.1	22.8	102
02030105010060	Raritan R SB(Callifon br to Long Valley)	1438	WASHINGTON TOWNSHIP	7.5	31.6	0.9	1.4	2.3	
02030105050030	Lamington R (Furnace Rd to Hillside Rd)	1438	WASHINGTON TOWNSHIP	0.0	67.9	0.0	2.9	2.9	
02030105050040	Lamington R(Pottersville gage-FurnaceRd)	1438	WASHINGTON TOWNSHIP	504.8	8.7	58.7	0.4	59.1	
02030105050070	Lamington R(HallsBrRd-Pottersville gage)	1438	WASHINGTON TOWNSHIP	108.7	1.7	11.1	0.1	11.2	
02040105150100	Musconetcong R (Trout Bk to SaxtonFalls)	1438	WASHINGTON TOWNSHIP	0.0	32.2	0.0	1.2	1.2	
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	1438	WASHINGTON TOWNSHIP	0.0	79.4	0.0	3.1	3.1	
02030103070070	Wanaque R/Posts Bk (below reservoir)	1613	WANAQUE BOROUGH	0.0	94.8	0.0	4.0	4.0	4
02030105050050	Pottersville trib (Lamington River)	1801	BEDMINSTER TOWNSHIP	136.9	0.0	15.7	0.0	15.7	713

**Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatershed  
(Alternative Method Including Yield from Preserved Lands)**

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02030105050070	Lamington R(HallsBrRd-Pottersville gage)	1801	BEDMINSTER TOWNSHIP	2302.7	154.0	235.0	6.0	241.0	
02030105050110	Lamington R (below Halls Bridge Rd)	1801	BEDMINSTER TOWNSHIP	324.7	353.7	28.0	11.7	39.7	
02030105060060	Peapack Brook (below Gladstone Brook)	1801	BEDMINSTER TOWNSHIP	41.4	20.0	4.2	0.8	5.0	
02030105060080	Middle Brook (NB Raritan River)	1801	BEDMINSTER TOWNSHIP	2641.3	71.8	246.9	2.6	249.4	
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1801	BEDMINSTER TOWNSHIP	1343.1	28.8	111.9	0.9	112.8	
02030105070010	Raritan R NB (Rt 28 to Lamington R)	1801	BEDMINSTER TOWNSHIP	572.7	117.3	46.2	3.6	49.8	
02030103010010	Passaic R Upr (above Osborn Mills)	1802	BERNARDS TOWNSHIP	0.0	34.0	0.0	1.5	1.5	25
02030103010080	Dead River (above Harrison's Brook)	1802	BERNARDS TOWNSHIP	0.0	476.2	0.0	15.6	15.6	
02030103010100	Dead River (below Harrison's Brook)	1802	BERNARDS TOWNSHIP	0.0	110.2	0.0	3.6	3.6	
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1802	BERNARDS TOWNSHIP	0.0	48.9	0.0	1.6	1.6	
02030105070010	Raritan R NB (Rt 28 to Lamington R)	1802	BERNARDS TOWNSHIP	0.0	38.7	0.0	1.2	1.2	
02030105120060	Middle Brook WB	1802	BERNARDS TOWNSHIP	0.0	66.6	0.0	2.1	2.1	
02030103010010	Passaic R Upr (above Osborn Mills)	1803	BERNARDSVILLE BOROUGH	78.7	94.5	8.8	4.1	12.9	71
02030105060040	Raritan R NB(Peapack Bk to McVickers Bk)	1803	BERNARDSVILLE BOROUGH	279.2	319.8	31.0	13.6	44.6	
02030105060070	Raritan R NB(incl Mine Bk to Peapack Bk)	1803	BERNARDSVILLE BOROUGH	1.3	339.0	0.1	13.3	13.5	
02030103010080	Dead River (above Harrison's Brook)	1807	FAR HILLS BOROUGH	18.9	36.2	1.6	1.2	2.8	74
02030105060040	Raritan R NB(Peapack Bk to McVickers Bk)	1807	FAR HILLS BOROUGH	367.7	37.1	40.9	1.6	42.4	
02030105060070	Raritan R NB(incl Mine Bk to Peapack Bk)	1807	FAR HILLS BOROUGH	216.5	19.5	22.1	0.8	22.9	
02030105060090	Raritan R NB (Lamington R to Mine Bk)	1807	FAR HILLS BOROUGH	75.4	0.6	6.3	0.0	6.3	
02030105060040	Raritan R NB(Peapack Bk to McVickers Bk)	1815	PEAPACK GLADSTONE BOROUGH	307.7	219.1	34.2	9.3	43.5	92
02030105060060	Peapack Brook (below Gladstone Brook)	1815	PEAPACK GLADSTONE BOROUGH	404.3	79.4	40.8	3.1	43.9	
02030105060080	Middle Brook (NB Raritan River)	1815	PEAPACK GLADSTONE BOROUGH	45.7	16.8	4.3	0.6	4.9	
02040105150050	Lubbers Run (below Dallis Pond)	1904	BYRAM TOWNSHIP	0.0	52.8	0.0	2.0	2.0	2
02020007010040	Wallkill R(Hamburg SW Bdy to Ogdensburg)	1906	FRANKLIN BOROUGH	383.3	351.7	37.9	13.4	51.4	51
02040105070020	New Wawayanda Lake/Andover Pond trib	1908	GREEN TOWNSHIP	19.8	11.2	1.8	0.4	2.2	339
02040105070030	Pequest River (above Brighton)	1908	GREEN TOWNSHIP	574.3	381.1	49.5	12.6	62.1	
02040105070040	Pequest River (Trout Brook to Brighton)	1908	GREEN TOWNSHIP	1292.9	326.8	116.5	11.3	127.8	
02040105070050	Trout Brook/Lake Tranquility	1908	GREEN TOWNSHIP	580.2	533.0	56.3	19.9	76.2	
02040105080010	Bear Brook (Sussex/Warren Co)	1908	GREEN TOWNSHIP	823.4	39.2	69.2	1.3	70.5	
02040105080020	Bear Creek	1908	GREEN TOWNSHIP	10.7	3.9	1.0	0.1	1.1	
02020007010070	Wallkill R(Martins Rd to Hamburg SW Bdy)	1909	HAMBURG BOROUGH	2.6	23.0	0.3	0.9	1.1	1
02020007010040	Wallkill R(Hamburg SW Bdy to Ogdensburg)	1911	HARDYSTON TOWNSHIP	1054.5	246.7	104.4	9.4	113.8	289
02020007010050	Hardistonville tribs	1911	HARDYSTON TOWNSHIP	116.6	7.6	12.7	0.3	13.0	
02020007010060	Beaver Run	1911	HARDYSTON TOWNSHIP	438.3	58.3	42.6	2.2	44.7	
02020007010070	Wallkill R(Martins Rd to Hamburg SW Bdy)	1911	HARDYSTON TOWNSHIP	828.7	833.4	82.1	31.6	113.6	
02020007040010	Black Ck(above/incl G.Gorge Resort trib)	1911	HARDYSTON TOWNSHIP	28.1	26.6	2.9	1.1	4.0	
02040105150020	Lake Hopatcong	1912	HOPATCONG BOROUGH	0.0	248.5	0.0	8.8	8.8	34
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1912	HOPATCONG BOROUGH	0.0	181.0	0.0	6.5	6.5	
02040105150040	Lubbers Run (above/incl Dallis Pond)	1912	HOPATCONG BOROUGH	0.0	111.2	0.0	4.2	4.2	
02040105150050	Lubbers Run (below Dallis Pond)	1912	HOPATCONG BOROUGH	0.0	381.2	0.0	14.7	14.7	
02020007010020	Wallkill R (Ogdensburg to SpartaStation)	1916	OGDENSBURG BOROUGH	0.0	140.4	0.0	5.4	5.4	8
02020007010040	Wallkill R(Hamburg SW Bdy to Ogdensburg)	1916	OGDENSBURG BOROUGH	0.0	73.2	0.0	2.8	2.8	
02020007010010	Wallkill R/Lake Mohawk(above Sparta Sta)	1918	SPARTA TOWNSHIP	0.0	805.4	0.0	29.4	29.4	184
02020007010020	Wallkill R (Ogdensburg to SpartaStation)	1918	SPARTA TOWNSHIP	0.0	193.2	0.0	7.4	7.4	
02020007010040	Wallkill R(Hamburg SW Bdy to Ogdensburg)	1918	SPARTA TOWNSHIP	512.5	313.5	50.7	12.0	62.7	
02040105040040	Lafayette Swamp tribs	1918	SPARTA TOWNSHIP	41.2	0.0	3.6	0.0	3.6	
02040105040050	Sparta Junction tribs	1918	SPARTA TOWNSHIP	418.4	970.2	37.4	33.5	70.8	
02040105070020	New Wawayanda Lake/Andover Pond trib	1918	SPARTA TOWNSHIP	0.0	222.1	0.0	7.8	7.8	
02040105150040	Lubbers Run (above/incl Dallis Pond)	1918	SPARTA TOWNSHIP	0.0	61.5	0.0	2.3	2.3	
02040105150030	Musconetcong R (Wills Bk to LkHopatcong)	1919	STANHOPE BOROUGH	0.0	85.0	0.0	3.0	3.0	6
02040105150070	Musconetcong R(Waterloo to/incl WillsBk)	1919	STANHOPE BOROUGH	0.0	88.8	0.0	3.2	3.2	

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatershed (Alternative Method Including Yield from Preserved Lands)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02020007010070	Walkkill R(Martins Rd to Hamburg SW Bdy)	1922	VERNON TOWNSHIP	0.0	35.8	0.0	1.4	1.4	183
02020007030010	Walkkill R(41d13m30s to Martins Road)	1922	VERNON TOWNSHIP	1.0	511.9	0.1	19.2	19.3	
02020007030030	Walkkill River(Owens gage to 41d13m30s)	1922	VERNON TOWNSHIP	36.2	148.5	3.6	5.6	9.2	
02020007030040	Walkkill River(stateline to Owens gage)	1922	VERNON TOWNSHIP	147.3	0.0	14.9	0.0	14.9	
02020007040010	Black Ck(above/incl G.Gorge Resort trib)	1922	VERNON TOWNSHIP	117.9	360.9	12.3	14.5	26.8	
02020007040020	Black Creek (below G. Gorge Resort trib)	1922	VERNON TOWNSHIP	618.8	972.9	69.5	42.3	111.8	
02040105070040	Pequest River (Trout Brook to Brighton)	2101	ALLAMUCHY TOWNSHIP	943.4	1.2	85.0	0.0	85.0	274
02040105070050	Trout Brook/Lake Tranquility	2101	ALLAMUCHY TOWNSHIP	187.3	152.3	18.2	5.7	23.9	
02040105070060	Pequest R (below Bear Swamp to Trout Bk)	2101	ALLAMUCHY TOWNSHIP	509.4	346.3	44.7	11.7	56.4	
02040105080020	Bear Creek	2101	ALLAMUCHY TOWNSHIP	1188.6	29.1	106.1	1.0	107.1	
02040105090020	Pequest R (Cemetery Road to Drag Strip)	2101	ALLAMUCHY TOWNSHIP	0.0	62.2	0.0	2.4	2.4	
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2102	ALPHA BOROUGH	53.2	0.0	3.2	0.0	3.2	19
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2102	ALPHA BOROUGH	22.4	0.0	1.6	0.0	1.6	
02040105140070	Pohatcong Ck(below Springtown) incl UDRV	2102	ALPHA BOROUGH	194.4	53.7	12.9	1.4	14.2	
02040105090060	Pequest R (below Furnace Brook)	2103	BELVIDERE TOWN	3.1	24.0	0.3	0.8	1.1	1
02040105140030	Pohatcong Ck (Edison Rd-Brass Castle Ck)	2105	FRANKLIN TOWNSHIP	1300.4	518.0	112.1	17.2	129.3	605
02040105140050	Pohatcong Ck (Merrill Ck to Edison Rd)	2105	FRANKLIN TOWNSHIP	1354.8	306.9	114.8	10.0	124.8	
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2105	FRANKLIN TOWNSHIP	67.3	0.0	4.9	0.0	4.9	
02040105160040	Musconetcong R (75d 00m to Rt 31)	2105	FRANKLIN TOWNSHIP	411.7	119.4	40.8	4.6	45.3	
02040105160050	Musconetcong R (I-78 to 75d 00m)	2105	FRANKLIN TOWNSHIP	2668.1	191.2	251.7	6.9	258.6	
02040105160060	Musconetcong R (Warren Glen to I-78)	2105	FRANKLIN TOWNSHIP	448.6	158.0	37.1	5.0	42.1	
02040105050010	Paulins Kill (Blairstown to Stillwater)	2106	FRELINGHUYSEN TOWNSHIP	1490.6	765.8	127.4	25.3	152.7	554
02040105080010	Bear Brook (Sussex/Warren Co)	2106	FRELINGHUYSEN TOWNSHIP	452.7	87.6	38.0	2.8	40.9	
02040105080020	Bear Creek	2106	FRELINGHUYSEN TOWNSHIP	1235.8	667.8	110.3	23.0	133.4	
02040105100010	Union Church trib	2106	FRELINGHUYSEN TOWNSHIP	1398.4	412.1	128.3	14.5	142.8	
02040105100030	Beaver Brook (above Hope Village)	2106	FRELINGHUYSEN TOWNSHIP	869.2	227.1	76.9	7.7	84.7	
02040105120010	Lopatcong Creek (above Rt 57)	2107	GREENWICH TOWNSHIP	12.6	0.0	1.0	0.0	1.0	218
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2107	GREENWICH TOWNSHIP	328.9	0.0	19.6	0.0	19.6	
02040105140040	Merrill Creek	2107	GREENWICH TOWNSHIP	367.2	0.0	31.4	0.0	31.4	
02040105140050	Pohatcong Ck (Merrill Ck to Edison Rd)	2107	GREENWICH TOWNSHIP	547.9	0.0	46.4	0.0	46.4	
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2107	GREENWICH TOWNSHIP	1572.4	6.4	114.8	0.2	115.0	
02040105160060	Musconetcong R (Warren Glen to I-78)	2107	GREENWICH TOWNSHIP	55.5	10.6	4.6	0.3	4.9	
02040105150100	Musconetcong R (Trout Bk to Saxton Falls)	2108	HACKETTSTOWN TOWN	0.0	67.1	0.0	2.6	2.6	6
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	2108	HACKETTSTOWN TOWN	0.0	104.5	0.0	4.1	4.1	
02040105110020	Buckhorn Creek (incl UDRV)	2110	HARMONY TOWNSHIP	1661.5	16.0	142.0	0.5	142.5	314
02040105110030	UDRV tribs (Rt 22 to Buckhorn Ck)	2110	HARMONY TOWNSHIP	1909.5	201.8	141.4	5.8	147.2	
02040105120010	Lopatcong Creek (above Rt 57)	2110	HARMONY TOWNSHIP	305.7	0.0	25.1	0.0	25.1	
02040105100010	Union Church trib	2111	HOPE TOWNSHIP	359.8	204.1	33.0	7.2	40.2	451
02040105100020	Honey Run	2111	HOPE TOWNSHIP	1727.3	781.9	158.5	27.6	186.1	
02040105100030	Beaver Brook (above Hope Village)	2111	HOPE TOWNSHIP	908.9	699.8	80.4	23.9	104.3	
02040105100040	Beaver Brook (below Hope Village)	2111	HOPE TOWNSHIP	1261.3	165.7	114.7	5.8	120.5	
02040105070060	Pequest R (below Bear Swamp to Trout Bk)	2112	INDEPENDENCE TOWNSHIP	82.1	179.1	7.2	6.1	13.3	265
02040105090010	Pequest R (Drag Strip--below Bear Swamp)	2112	INDEPENDENCE TOWNSHIP	1189.4	656.3	113.3	24.1	137.4	
02040105090020	Pequest R (Cemetery Road to Drag Strip)	2112	INDEPENDENCE TOWNSHIP	981.2	471.9	97.1	18.0	115.2	
02040105090010	Pequest R (Drag Strip--below Bear Swamp)	2114	LIBERTY TOWNSHIP	289.3	1.6	27.5	0.1	27.6	27
02040105120010	Lopatcong Creek (above Rt 57)	2115	LOPATCONG TOWNSHIP	147.5	16.4	12.1	0.5	12.6	33
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2115	LOPATCONG TOWNSHIP	350.9	0.0	20.9	0.0	20.9	
02040105160010	Musconetcong R (Hances Bk thru Trout Bk)	2116	MANSFIELD TOWNSHIP	664.4	3.8	67.8	0.2	67.9	257
02040105160020	Musconetcong R (Changewater to HancesBk)	2116	MANSFIELD TOWNSHIP	1613.5	109.1	179.3	4.7	183.9	
02040105160030	Musconetcong R (Rt 31 to Changewater)	2116	MANSFIELD TOWNSHIP	49.8	6.6	4.9	0.2	5.1	
02040105090050	Furnace Brook	2117	OXFORD TOWNSHIP	269.0	33.2	25.6	1.2	26.8	50

### Highlands Planning Area Septic System Yields for the Protection and Conservation Zones by Municipality and HUC14 Subwatershed (Alternative Method Including Yield from Preserved Lands)

HUC14	HUC14 Name	Municipality Number	Municipality Name	Total Undeveloped and Underdeveloped Available Septic CZ Area (acres)	Total Undeveloped and Underdeveloped Available Septic PZ Area (acres)	Number of Allowable Septic Systems CZ	Number of Allowable Septic Systems PZ	Total Allowable Septic Systems CZ and PZ	Municipal Total Allowable Septic Systems CZ and PZ
02040105090060	Pequest R (below Furnace Brook)	2117	OXFORD TOWNSHIP	197.8	121.9	17.5	4.1	21.6	
02040105110010	Pophandusing Brook	2117	OXFORD TOWNSHIP	1.5	67.9	0.1	2.3	2.4	
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2119	PHILLIPSBURG TOWN	29.0	20.9	1.7	0.5	2.2	2
02040105120020	Lopatcong Creek (below Rt 57) incl UDRV	2120	POHATCONG TOWNSHIP	323.8	0.0	19.3	0.0	19.3	21
02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	2120	POHATCONG TOWNSHIP	14.4	0.0	1.1	0.0	1.1	
02040105140070	Pohatcong Ck(below Springtown) incl UDRV	2120	POHATCONG TOWNSHIP	18.1	0.0	1.2	0.0	1.2	
02040105140020	Pohatcong Ck (Brass Castle Ck to Rt 31)	2121	WASHINGTON BOROUGH	0.0	70.0	0.0	2.4	2.4	2
02040105140020	Pohatcong Ck (Brass Castle Ck to Rt 31)	2122	WASHINGTON TOWNSHIP	130.8	177.8	11.8	6.2	18.0	260
02040105140030	Pohatcong Ck (Edison Rd-Brass Castle Ck)	2122	WASHINGTON TOWNSHIP	21.5	27.5	1.9	0.9	2.8	
02040105160020	Musconetcong R (Changewater to HancesBk)	2122	WASHINGTON TOWNSHIP	172.5	4.3	19.2	0.2	19.3	
02040105160030	Musconetcong R (Rt 31 to Changewater)	2122	WASHINGTON TOWNSHIP	1635.2	263.7	160.3	10.0	170.3	
02040105160040	Musconetcong R (75d 00m to Rt 31)	2122	WASHINGTON TOWNSHIP	452.6	148.9	44.8	5.7	50.5	
02040105060020	Delawanna Creek (incl UDRV)	2123	WHITE TOWNSHIP	72.7	670.8	6.5	23.1	29.6	370
02040105090040	Mountain Lake Brook	2123	WHITE TOWNSHIP	217.8	59.4	21.1	2.2	23.4	
02040105090060	Pequest R (below Furnace Brook)	2123	WHITE TOWNSHIP	953.5	70.4	84.4	2.4	86.8	
02040105100040	Beaver Brook (below Hope Village)	2123	WHITE TOWNSHIP	764.0	30.1	69.5	1.1	70.5	
02040105110010	Pophandusing Brook	2123	WHITE TOWNSHIP	760.4	24.2	67.3	0.8	68.1	
02040105110020	Buckhorn Creek (incl UDRV)	2123	WHITE TOWNSHIP	1070.7	18.2	91.5	0.6	92.1	



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Carbonate Rock (Karst) Topography**  
**Version: October 31, 2007**

<p><b>Issue Overview</b></p>	<p>Karst is a type of land surface, or topography, that is formed at the surface of carbonate rock formations when water dissolves the rock over time. This process causes surface depressions and the development of such features as sinkholes, sinking streams, enlarged bedrock fractures, caves, and underground streams. Sinking streams and sinkholes direct surface water runoff into karst aquifers with little or no attenuation of any transported contaminants. Stormwater basins, septic system leaching fields and sewers may also contribute contaminants directly to ground water through karst features. In addition to ground water concerns, communities in karst areas must contend with safety concerns as sinkholes can have damaging effects to large manmade objects. The Highlands Region has several large areas with carbonate rock formations, usually river valleys such as the Musconetcong, South Branch Raritan and Lamington, and karst features exist in some – but not all – of these areas.</p>
<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 1.6.1.1</b> To map areas of the Highlands Region that are underlain by carbonate rocks to define a Carbonate Rock Area.  <b>Policy 1.6.1.2</b> To identify and delineate land areas that drain surface water into the Carbonate Rock Area, as changes in the quantity, quality and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area.  <b>Policy 1.6.1.3</b> To establish and maintain an inventory of karst features in the Highlands Region.  <b>Policy 1.6.1.4</b> To ensure that municipalities in, or draining to, the Carbonate Rock Area protect public health and safety and the quality of ground waters from inappropriate land uses and pollutant discharges.  <b>Objective 1.6.1.4.1</b> Identification of critical requirements for development ordinances to be adopted by municipalities, with technical guidance.  <b>Objective 1.6.1.4.2</b> Applications for site plan or subdivision approval will include a multi-phased geotechnical site investigation (e.g., test borings, test pits, etc.) to locate any potential karst features and potential hazards to public health and safety, structures and ground water quality.  <b>Objective 1.6.1.4.3</b> Municipal and Highlands Council development reviews and requirements shall ensure that all potential hazards to public health and safety, structures and</p>

	<p><i>ground water quality are fully addressed and mitigated in the construction plans and subsequent approval process, with the maximum emphasis on nonstructural measures, including, but not limited to, avoidance of modifications to the karst features.</i></p> <p><b>Objective 1.6.1.4.4</b> <i>Public works projects, including but not limited to water supply, sewerage, stormwater and transportation facilities, shall be constructed and maintained such that the potential for damage from karst features and the contamination of ground water are avoided.</i></p>
<p><b>Program Summary</b></p>	<p>Implementation of a Carbonate Rock Program is necessary to address the potential problems that are common to karst areas. The program is not intended to restrict development yields, but rather to provide for the adoption of a site assessment and design process for karst areas that allows applicants, municipalities, and the Council to identify any karst concerns at a site and to incorporate appropriate design features in order to minimize future sinkhole (or other karst feature) formation, damage to development, and the potential for ground water contamination.</p> <p>The Highlands Council has utilized existing New Jersey Geologic Survey and United States Geological Survey data to map those areas of the Highlands Region that are underlain by carbonate rocks. These areas collectively are referred to as the Carbonate Rock Area. Since changes in the quantity, quality, and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area, lands that drain surface water into the Area will be delineated by the Council using LiDAR topographic analyses or other topographic data where LiDAR data are not available. Development ordinances will be adopted by municipalities within affected land areas that will serve to protect public health and safety from potential hazards common to karst areas.</p>
<p><b>Identification of Critical Requirements for Development Ordinances</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council will identify critical requirements for development ordinances to be adopted by municipalities that have land areas that are within or drain to the Carbonate Rock Area. Given that the best design solution to karst-related problems is dependant upon the actual subsurface conditions below a particular area, the preparation of a one-design-fits-all-requirement for the entire Region is not appropriate. Performance standards provide flexibility regarding the specific actions to be taken to achieve local goals. Municipalities will adopt development ordinances and performance standards that are consistent with the critical requirements identified by the Council.</p>
<p><b>Development of Carbonate Rock Area Guidance Manual</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council will develop a technical guidance manual for use by municipalities that have land areas that are within or drain to the Carbonate Rock Area. The guidance will contain requirements for a multi-phased geotechnical study to locate any potential karst features and potential hazards to public health and safety, structures, and ground water quality. The required multi-stage investigation will allow the applicant, as well as the municipality and Council, to predict problems and to estimate the associated costs based upon a growing body of knowledge for the area in question. The initial phase of work will be accomplished relatively inexpensively, yet the applicant can develop preliminary costs and evaluate the feasibility of the development along with the municipality and the Council. An existing guidance manual, developed by the North Jersey Resource Conservation &amp; Development Council, will be used as one basis for the Council's work.</p>

	The Council will also provide guidance to municipalities regarding development of strategies with respect to public works projects in lands that are within or drain to the Carbonate Rock Area.
<b><i>Establishment and Maintenance of Karst Inventory</i></b>	<b>Program Description</b> The Highlands Council, working with municipalities during the site plan and subdivision approval process, will establish and maintain an inventory of karst features that are found in the Highlands Region.



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Restoration of Streams and Riparian Areas**  
**Version: October 31, 2007**

<p><b>Issue Overview</b></p>	<p>Streams transport floodwater, stormwater and suspended materials, support aquatic ecosystems, protect fish and wildlife habitat, and provide recreation opportunities and aesthetic beauty. Riparian areas moderate fluctuations in water temperature, help maintain ground water recharge and stream base flow, stabilize stream banks, and provide flood storage areas. During high flow or overland runoff events, riparian areas reduce erosion and sediment loads to surface water and remove excess nutrients and contaminants from flood water. Riparian areas also provide habitat for a variety of wildlife and support terrestrial and aquatic food webs through deposition of woody debris.</p> <p>Stream and riparian area quality and function are influenced by intensity and type of land use. Anthropogenic disturbance to these systems disrupt the transport, storage, and quality of water that is critical to ecological functions. Land use change, increased impervious surfaces, and riparian vegetation removal decrease infiltration capacity within riparian areas, increase overland storm or flood water runoff, erode stream banks, alter stream profile, degrade water quality, alter stream flow regime, and damage aquatic fish and benthic communities.</p> <p>The Highland Act requires that the Regional Management Plan protect, enhance, and restore the Region’s waters. To meet this goal, several RMP policies and objectives address the requirement for preventing disturbance to high quality systems, and for restoring the Region’s streams and riparian areas.</p>
<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 1.2.1.4.</b> Highlands Open Waters shall include a protection buffer of 300 feet from the edge of the Highlands Open Water feature. All development shall comply with buffer standards which provide for the protection of Highlands Open Waters reviewed on a site-specific basis during site plan or subdivision.</p> <p><b>Objective 1.2.1.4.6.</b> <i>Implementation of a Stream Corridor Protection/Restoration plan and Low Impact Development Best Management Practices for any development activity proposed within a Highlands Open Water buffer.</i></p> <p><b>Policy 1.2.1.5.</b> Protect the integrity of the Riparian Areas through the application of project review standards during site plan review.</p> <p><b>Objective 1.2.1.5.2.</b> <i>Limit alterations to existing natural vegetation or increases in impervious area within High and Moderate Integrity Riparian Areas to the minimum extent feasible in areas</i></p>

	<p>beyond the Highlands Open Water buffer requirements; protect the water quality of adjacent Highlands Open Water; and maintain or restore habitat value of the Riparian Area.</p> <p><b>Policy 1.2.1.6.</b> All development in a Protection Zone and Conservation Zone shall comply with standards to protect and enhance Highlands Open Waters and Riparian Areas.</p> <p><b>Objective 1.2.1.6.4.</b> Require identification and implementation of opportunities where the restoration and enhancement of previously impaired Highlands Open Waters or Riparian Areas are feasible and appropriate as mitigation to any allowable adjustment or revision to Highlands Open Water or Riparian Area protection buffer requirements.</p> <p><b>Policy 1.2.1.7.</b> All development in a Planned Community Zone shall comply with standards which will protect and enhance Highlands Open Waters and Riparian Areas.</p> <p><b>Objective 1.2.7.3.</b> Require identification and implementation of opportunities where the restoration and enhancement of previously impaired Highlands Open Waters or Riparian Areas are feasible and appropriate as mitigation to any allowable adjustment or revision to Highlands Open Water or Riparian Area protection buffer requirements.</p> <p><b>Objective 1.2.1.8.2.</b> Identify opportunities for and implement Highlands Open Waters and Riparian Area restoration practices on public and private lands that give priority to ecological and watershed protection measures.</p>
<p><b>Program Summary</b></p>	<p>The Highlands Regional Master Plan focuses on several areas of action to address the need to protect, restore and enhance Highlands Open Waters and Riparian Areas. The Stream Restoration Program will promote consistent standards for the protection, restoration and acquisition of important waters and riparian areas of the Highlands Region. The program will include guidance for the restoration of degraded streams and riparian areas.</p>
<p><b>Stream and Riparian Assessment</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council guidance for assessing stream corridor and riparian area condition will provide a comprehensive methodology for utilization of a variety of structural, biological, hydrologic, and water quality components to value or “score” specific stream reaches and riparian areas.</p> <p>Assessed stream and riparian area value or “score” will dictate both the prioritization for preservation of lands draining to high quality streams and riparian areas and the extent and type of restoration required for impaired streams and riparian areas</p>
<p><b>Development of Stream Restoration Guidance</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council will develop technical guidance for use by municipalities for the restoration of impaired streams. Highlands Council guidance for stream restoration may include goals and design guidelines for restoration of channel profile, flood control, sediment control, improved drainage, bank stabilization, improvement of aquatic habitat, and restoration of the ecological functions and processes of a stream and its adjacent riparian area and floodplain. Existing guidance manuals, <i>Stream Restoration Design</i>, developed by the Natural Resources Conservation Service, and <i>Stream Corridor Restoration</i>, developed by the Federal Interagency Stream Corridor Restoration Working Group, will be used as two examples for the Council’s work.</p>

<p><b><i>Development of Riparian Restoration Guidance</i></b></p>	<p><b>Program Description</b>                  The Highlands Council will develop or adapt technical guidance for use by municipalities for the restoration of impaired riparian areas. Highlands Council guidance for stream restoration may include goals and design guidelines for restoration of riparian vegetation, improvement of riparian wildlife habitat, increased riparian buffer width, reduction of impervious surface coverage, and restoration of the ecological functions and processes of a riparian area with its adjacent stream and upland terrestrial habitat. <i>Stream Corridor Restoration</i>, developed by the Federal Interagency Stream Corridor Restoration Working Group will be used as one example for the Council's work.</p>
<p><b><i>Implementation of Stream and Riparian Area Restoration Projects</i></b></p>	<p><b>Program Description</b>                  The Highlands Council will encourage restoration of streams and riparian areas by public and private landowners, government agencies, non-profit organizations and other interested parties wherever feasible. Opportunities for restoration include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Redevelopment projects in areas containing previously degraded streams and riparian areas;</li> <li>• Transportation projects where restoration of previously degraded streams and riparian areas can be cost-effectively incorporated into the capital project;</li> <li>• Implementation of Watershed Restoration Plans approved by the NJ Department of Environmental Protection;</li> <li>• Park development capital projects, where restoration of prior damage can be cost-effectively incorporated into the capital project.</li> </ul>



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Historic Resource Protection**  
***Version: October 31, 2007***

<b>Issue Overview</b>	<p>The Highlands is home to many and varied historic, archaeological and cultural treasures, and the Highlands Act requires that the Regional Master Plan include measures in both the Preservation and Planning Areas to preserve historic sites and other historic resources. With a long history dating back at least 11,000 years to the first Native American settlements, the area has figured prominently in the history of both the State and the country. Rich in valuable resources, the Region has attracted human settlement for thousands of years and been the site of changing technology and anthropology. The Highlands' character is indelibly marked by its history and benefits from vestiges of earlier days. These resources contribute to the community's character, its economic vitality, its potential for heritage tourism, and its sense of place and time. Their protection and enhancement can continue to support these important characteristics of the Highlands into the future.</p> <p>The Highlands' historic, archaeological and cultural resources have been treated differently from town to town and county to county within the Region. In some communities these resources are appreciated, utilized and incorporated into the fabric of daily life. In other instances they are not identified and so opportunities to protect or rehabilitate are lost.</p> <p>Although the State Historic Preservation Office, the New Jersey Historic Trust, and the Office of Smart Growth may offer technical and funding assistance, there is no comprehensive program in place to encourage local agencies to proactively identify, protect and enhance their historic, archaeological and cultural resources. Many localities are not aware of all of the resources that exist within their borders and may lack access to programs geared toward protection and enhancement of these resources, as well as the methods that can turn these resources into meaningful contributors to the economic health of the community.</p>
-----------------------	--

<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 4.1.1.</b> To maintain and periodically update the Highlands Region Historic and Cultural Resources Inventory.</p> <p><i><b>Objective 4.1.1.1.</b> Encourage municipalities and counties to include a historic, cultural and archaeological survey(s) as part of the Historic Preservation Plan element of their master plans.</i></p> <p><b>Policy 4.1.2.</b> To provide a process whereby resources may be nominated, considered, and included in the Highlands Historic and Cultural Resources Inventory.</p> <p><b>Policy 4.1.3.</b> To ensure that human development does not adversely affect the character or value of resources which are listed on the Highlands Historic and Cultural Resource Inventory to the maximum extent practicable.</p> <p><b>Policy 4.1.4.</b> To require that the impact of proposed human development on the historic and cultural resources of the Highlands Region be addressed during site plan or subdivision review and approval.</p> <p><i><b>Objective 4.1.4.1.</b> All applications for site plan or subdivision approval shall include identification of any cultural, historic or archaeological resources in the Highlands Region which are listed on the Highlands Historic and Cultural Resource Inventory and may be affected by the proposed development.</i></p> <p><i><b>Objective 4.1.4.2.</b> All development which affects identified cultural, historic or archaeological resources shall comply with minimum standards for the preservation of the affected resources.</i></p> <p><b>Policy 4.1.5.</b> To use the Secretary of the Interior’s Standards for the Treatment of Historic Properties as the standard for municipal historic and cultural preservation review and include, at a minimum, the preservation and re-use of historic structures.</p> <p><b>Policy 4.1.6.</b> To coordinate the Highlands Council’s activities with regard to the historic and cultural resources with the New Jersey Historic Trust and the State Historic Preservation Office.</p> <p><b>Policy 4.1.7.</b> To promote historic and cultural heritage tourism in the Highlands Region.</p>
<p><b>Program Summary</b></p>	<p>The program is designed to identify where historic, archaeological and cultural resources exist within the Highlands Region and to provide guidance and support to local government entities in managing and protecting the resources within their borders.</p>
<p><b>Identification of Historic, Archaeological and Cultural Resources</b></p>	<p><b>Program Description</b></p> <p>Municipalities are encouraged to use a range of methods to identify the historic, archaeological and cultural resources within their communities. They should require all development reviews to include identification of any relevant resources as part of their applications. Planning work sessions and checklists should include historic, archaeological and cultural resources as a review component. Sensitive treatment of existing resources and commitment to minimal negative impacts should be the standard for decision-making.</p> <p>Municipalities and counties shall, as a requirement of conformance, include within their master plan a Historic Preservation Plan element that identifies the location and significance of known historic, archaeological and cultural resources within their borders and the immediate surrounding area, using</p>

	<p>accepted State or federal definitions of such resources. They should whenever appropriate conduct historic, archaeological and cultural survey(s) and include these as part of the Historic Preservation Plan element. Historic, archaeological and cultural resources that are identified through surveys, preservation plans and development plans shall be provided to the Highlands Council and reviewed and evaluated for inclusion in the Highlands Region Historic and Cultural Resources Inventory. A procedure for conducting the reviews and evaluations shall be developed in coordination with the State Historic Preservation Office.</p>
<p><b><i>Protection and Management of Historic Resources</i></b></p>	<p><b>Program Description</b> Municipalities will be encouraged to:</p> <ul style="list-style-type: none"> <li>• establish a Historic Preservation Commission or similar entity to provide advice on all land development applications and land planning decisions;</li> <li>• adopt ordinances, zoning rules, development regulations and programs that protect the integrity of historic, archaeological and cultural resources and the integrity of their surroundings, and to address potential reuse and rehabilitation of historic structures and;</li> <li>• adopt guidelines and/or regulations , where appropriate to address the issue of teardowns, particularly in older, established lake communities (see the Lake Community Program) and historic downtown areas and residential neighborhoods.</li> </ul> <p>In addition, both municipal and county governments will be encouraged and supported in advocating innovative methods to facilitate historic preservation within their communities, including easements and heritage tourism. (Heritage tourism opportunities will be developed as part of the economic vitality program.)</p> <p>Municipal and county governments shall, as a requirement of conformance, impose a development review condition that all development proposals that may affect historic, archaeological or cultural resources shall demonstrate how such impacts will be minimized.</p> <p>Counties shall, as a requirement of conformance, address historic transportation infrastructure within their county master plan and encourage them to develop a program to preserve the integrity of historic bridges that are part of their transportation system. (See the Transportation Program.)</p>
<p><b><i>Education and Outreach</i></b></p>	<p><b>Program Description</b> The Highlands Council will develop a historic preservation manual to provide guidance, technical assistance and information on potential funding sources for use by local government, non-profit and preservation entities. The manual will include strategies for promoting historic, archaeological and cultural resources as part of the economic vitality of the Highlands. Heritage tourism programs will be promoted as a component of the historic preservation program and the economic vitality of the Highlands. (See heritage tourism opportunities in the Economic Vitality Program.)</p>



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Scenic Resource Protection**  
***Version: October 31, 2007***

<p><b>Issue Overview</b></p>	<p>Protecting scenic resources and maintaining the visual integrity and scenic beauty of noteworthy viewsheds and natural and cultural features of significance in the Highlands Region is a goal of the Highlands Act and the Regional Master Plan. The essential character of the Highlands is intrinsically tied to the physical environment and how one element relates to another. The scenic character of the Highlands will be a major contributor to the Region’s success as a recreation and tourism destination and its ability to generate economic activity in the form of agri-tourism, eco-tourism and heritage tourism. Preservation of that essential character can best be accomplished through a comprehensive approach to scenic resource protection. Other than a few scenic resource ordinances and even less scenic resource inventories, there has been no comprehensive attempt to address the issue of scenic resource protection in the Highlands Region.</p>
<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 4.2.1.</b> To maintain and periodically update the Highlands Scenic Resources Inventory.  <b>Policy 4.2.2.</b> To provide a process whereby regionally significant resources may be nominated, considered and included in the Highlands Scenic Resources Inventory.  <b>Policy 4.2.3.</b> To ensure that human development does not adversely affect the character or value of resources which are listed on the Highlands Scenic Resources Inventory.  <b>Policy 4.2.4.</b> To establish minimum standards to ensure that Highlands Scenic Resources are not impaired by new human development.  <b>Policy 4.2.5.</b> To require that the impact of proposed human development on the scenic resources of the Highlands Region be addressed during site plan or subdivision review and approval.  <i><b>Objective 4.2.5.1.</b> All applications for site plan or subdivision approval shall include identification of any scenic resources in the Highlands Region which are listed on the Highlands Scenic Resources Inventory and may be affected by the proposed development.</i>  <i><b>Objective 4.2.5.2.</b> All development which affects identified scenic resources shall comply with minimum standards for the preservation of the affected resources.</i></p>

<p><b>Program Summary</b></p>	<p>The program establishes a procedure for identifying regionally significant scenic resources within the Highlands Region and provides methods to preserve these vistas, byways, ridgelines, cultural landscapes and natural features. The program provides for input from local government entities as well as public participation.</p>
<p><i>Inventory of Highlands Scenic Resources</i></p>	<p><b>Program Description</b></p> <ul style="list-style-type: none"> <li>• Baseline Inventory – Having identified 131 potential scenic resources, the Highlands Council will evaluate the initial baseline sites, refine the list and seek to add to it through additional nominations.</li> <li>• The Council will establish procedures for nomination, evaluation and inventory of Highlands regionally significant scenic resources. (See the draft Procedures which have been posted on the Council’s website for public comment.)</li> <li>• The Council will establish guidelines for the preparation of the scenic resource inventory, including modifications to the baseline inventory of 131 potential scenic resources.</li> <li>• Encourage municipalities and counties to conduct scenic resource inventories and relate them to their recreation and open space planning.</li> <li>• Encourage municipalities and counties to work jointly with neighboring municipalities and counties to conduct the scenic resource inventories on a regional or sub-regional scale.</li> <li>• Encourage municipalities and counties to include scenic resources in the open space and recreation plan elements of the municipal and county master plan.</li> </ul>
<p><i>Scenic Resource Protection Mechanisms</i></p>	<p><b>Program Description</b></p> <ul style="list-style-type: none"> <li>• The Council will develop strategies to protect scenic ridgelines, including the identification of key provisions for a Ridgeline Protection Ordinance.</li> <li>• The Council will identify key provisions for scenic resource protection ordinances for use and adoption by municipal and county governments, either as part of Plan Conformance or through independent exercise of municipal and county authority.</li> <li>• The Council will develop review procedures for consideration of scenic resources during site plan and subdivision review.</li> <li>• Municipalities and counties shall be encouraged to develop a Scenic Resources Management Plan for their jurisdictions or sub-regions.</li> <li>• The Highlands Council will prepare a scenic resource protection model ordinance to serve as a template for use by the municipalities in drafting and adopting a local scenic resource protection ordinance.</li> <li>• The Highlands Council will prepare guidelines to assist municipalities in drafting and implementation of scenic resource protection measures in the community.</li> <li>• Relate scenic resource protection strategies and priorities to the open space and recreation component of the master plan and the expansion of recreation facilities.</li> </ul>



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**  
**RMP Program: Redevelopment**  
***Version: October 31, 2007***

<p><b><i>Issue Overview</i></b></p>	<p>The Regional Master Plan strives to accommodate regional growth and development needs primarily through the reuse and redevelopment of previously developed areas, including brownfields, greyfields, and underutilized sites. These areas generally have access to existing utility and transportation infrastructure and often are located in or near existing communities. As they have already been developed, these sites will have comparably fewer environmental constraints than undeveloped areas and the reuse of developed lands conserves natural resources and maximizes infrastructure investments. However, not all such sites are in locations conducive to redevelopment, especially where redevelopment could harm surrounding environmentally sensitive resources.</p> <p>Redevelopment is a strategy to achieve sustainable development in the Highlands. However, redevelopment projects may face more hurdles than the development of greenfields (undeveloped land). Complicating factors may include project financing, ownership and title issues, the regulatory process, legal requirements, remediation, and the demolition/adaptive reuse and rebuilding of land improvements. For this reason, the Highlands Council strives to maximize opportunities for redevelopment in appropriate locations by serving as an advocate for redevelopment in the Highlands Region and by providing technical resources, planning assistance, and agency coordination to municipalities, counties, land owners, and non-profit organizations who are interested in pursuing redevelopment.</p>
<p><b><i>RMP Policies and Objectives Addressed</i></b></p>	<p>GOAL 6.5.1 Accommodation of regional growth and development needs through the reuse and redevelopment of previously developed areas, including brownfields, greyfields, and underutilized sites.</p> <p>GOAL 6.5.2. Occurrence of residential, commercial, and industrial development, redevelopment and economic growth in developed areas in locations with limited environmental constraints, access to existing utility and transportation infrastructure, and existing communities.</p> <p>Policy 6.5.2.1. To encourage redevelopment of brownfields, greyfields, and other previously developed areas in a manner consistent with the goals, and requirements of the Plan.</p>

	<p><i>Objective 6.5.2.1.1. Establish a Highlands Interagency Team to support and expedite redevelopment and development activities that conform to the Plan.</i></p> <p><i>Objective 6.5.2.1.2. Encourage and support the use of planning and financing tools that are available through state agencies and programs.</i></p> <p>Policy 6.5.2.2. To maintain a Developed Land Inventory to encourage opportunities for land development, redevelopment and economic growth, where appropriate.</p> <p><i>Objective 6.5.2.2.1. A parcel based inventory of lands in the Highlands Region that are developed, vacant (adjacent to developed), economically underutilized, oversized residential lots, and contaminated sites, to serve as a tool for identifying and marketing sites.</i></p> <p>GOAL 6.5.4. Protection and enhancement of Highlands’ resources through the decontamination of contaminated sites in the region.</p> <p>Policy 6.5.4.1. Encourage and support the restoration and redevelopment or open space use of contaminated areas.</p>
<p><b>Program Summary</b></p>	<p>The Highlands Redevelopment Program helps interested parties, municipalities, counties, state, and federal agencies understand where redevelopment opportunities are targeted by the RMP, and how to achieve redevelopment within each RMP zone and in the Planning and Preservation Areas. Redevelopment is a tool that will help achieve residential, retail, service, office, and industrial needs and achieve general economic sustainability in the Region.</p> <p>Redevelopment in the Highlands is a process used to rebuild, restore, or enhance a previously developed area that is appropriate for economic investment and community development in accordance with the smart growth component of the RMP. Redevelopment activities may include the removal and replacement, adaptive reuse or infill of structures within areas which are surrounded by development or substantially developed, or conversion of similar sites to open space uses where appropriate.</p> <p>Redevelopment activities may take place in previously developed areas and greyfields. Greyfield sites usually contain industrial or commercial facilities exhibiting signs of abandonment or underutilization in areas with existing infrastructure, but without evidence or expectation of contamination. These areas are often declining and underutilized strip shopping areas. In the Preservation Area, previously developed areas must have 70% or greater impervious surfaces to be considered for approval by the Highlands Council.</p> <p>Redevelopment activities may also take place on brownfield sites, which are defined as any former or current commercial or industrial site that is currently vacant or underutilized and on which there has been or there is suspected to have been, a discharge or contaminant that meets the designation of a brownfield site pursuant to N.J.A.C. 7:38-6.6. In many cases, brownfield restoration and redevelopment ends with new development. In some cases, it may be more appropriate to consider a “brownfield to greenfield” conversion, which is a project that results in the restoration of contaminated sites into open space and conservation projects, rather than residential or commercial structures. It is also important to implement and enhance, where appropriate, remediation standards and practices that support the restoration of contaminated sites and the associated Highlands resources that may be impaired.</p> <p>In New Jersey, the phrase “area in need of redevelopment” refers to a different process established through the Local Redevelopment and Housing Law (“LRHL”), N.J.S.A. 40A:12A-1 et seq.. This law establishes the process by which municipalities commence redevelopment as a public purpose. While the Highlands Act and the</p>

	<p>RMP refer to “redevelopment” activities, the term in this context is not intended to, nor should it be interpreted to indicate the redevelopment process pursuant to the LRHL. Depending upon the nature of the project, municipalities may decide to utilize the process established by LRHL or may find that it is not necessary.</p>
<p><b>Preservation Area Redevelopment</b></p>	<p><b>Program Description:</b>          In the Preservation Area, land development is required to be in accordance with the enhanced environmental standards of the Highlands Water Protection and Planning Act Rules (N.J.A.C 7:38-6.6) adopted by the New Jersey Department of Environmental Protection (NJDEP). NJDEP grants waivers from the Highlands rules on a case-by-case basis for several scenarios, including redevelopment in previously developed areas and brownfields. In order to qualify for a waiver from the Highlands rules, a proposed redevelopment site must be designated as appropriate for development by the Highlands Council. Only those projects that satisfy both Highlands Council’s redevelopment criteria and NJDEP’s waiver criteria may be approved.</p> <p><b>Greyfields Redevelopment Approval</b> - In order to initiate redevelopment activities on previously developed lands with 70% impervious surfaces in the Preservation Area, the general process is as follows:</p> <ol style="list-style-type: none"> <li>1. The Highlands Council must approve the designation of a redevelopment site, which must have at least 70% impervious coverage and be appropriate for redevelopment. This approval process is called the Highlands Redevelopment Site Approval Process and can be initiated by any county, municipality, property owner, or designated agent. The Highlands Redevelopment Site Approval Process results in an approval, an approval with conditions, or the denial of an application requesting designation of a Highlands Redevelopment Area. In cases where the Highlands Council determines that a proposed Highlands Redevelopment Area is appropriate for redevelopment, the final determination may include specific conditions to restrict any activities on the site.</li> <li>2. The NJDEP must review the proposed redevelopment project and issue a Highlands Preservation Area Approval (“HPAA”) with waiver if all necessary requirements are satisfied. A HPAA is a permit to conduct regulated activities in the Perseveration Area and includes a review of the project to determine that it is compliant with all provisions of the Highlands Act.</li> </ol> <p><b>Brownfields Redevelopment Approval</b> - Redevelopment of a brownfield site requires a three step process:</p> <ol style="list-style-type: none"> <li>1. A site must be designated by the NJDEP as a Highlands brownfield. In accordance with N.J.A.C. 7:38-6.6, there are three tracks under which a site may be designated as a Highlands Brownfield, provided that the contamination onsite is not the result of a current or previous agricultural use:             <ul style="list-style-type: none"> <li>• Track One addresses sanitary landfill sites;</li> <li>• Track Two addresses former or current commercial or industrial sites for which:                 <ol style="list-style-type: none"> <li>i. Prior to the issuance of a No Further Action (NFA) letter, a remedial action report was completed confirming the presence of contamination onsite, and documenting the current or previous use as a commercial or industrial site;</li> <li>ii. The NJDEP has issued an NFA letter for the entire site for which the</li> </ol> </li> </ul> </li> </ol>

	<p>brownfield designation is sought as of July 1, 1993, or later; and</p> <p>iii. No discharge of a contaminant has occurred on the site since the date of the NFA letter.</p> <ul style="list-style-type: none"> <li>• Track Three addresses former or current commercial or industrial sites with suspected or confirmed onsite contamination that have not yet received a No Further Action letter.</li> </ul> <p>In order to receive a brownfields designation from the NJDEP, a Highlands Resource Area Determination (“HRAD”) must be completed. An HRAD identifies and/or verifies the location of any Highlands resource area features. The HRAD is not a permit, but rather a process intended to confirm the presence, absence, or location of a Highlands resource area on a site as well as its boundary. On-site remediation may begin, where appropriate, and it must be conducted in accordance with the NJDEP’s Technical Requirements for Site Remediation (N.J.A.C. 7:26E).</p> <ol style="list-style-type: none"> <li>2. The Highlands Council must identify a brownfield location as appropriate for redevelopment, through the Highlands Redevelopment Site Approval Process.</li> <li>3. Finally, the DEP reviews the proposed redevelopment project and grants a Highlands Preservation Area Approval (“HPAA”) with waiver if all necessary requirements are satisfied.</li> </ol> <p>For further program details, refer to the Highlands Redevelopment Site Approval Process and N.J.A.C. 7:38.</p>
<p><b><i>Planning Area Redevelopment</i></b></p>	<p><b>Program Description:</b></p> <p>In the Planning Area, redevelopment opportunities exist in accordance with the RMP overlay zone where the proposed project is located. In the <b>Existing Community Zone</b>, opportunities include sites that meet the Preservation Area redevelopment criteria, greyfields, and previously developed lands in locations with water, wastewater, and transportation capacity, <u>and</u> that are appropriate for increased land use intensity or conversion to greenfields. Redevelopment is encouraged where appropriate in the Existing Community Zone. Infringement on environmentally sensitive areas will be limited through application of RMP policies. Conforming municipalities initiating redevelopment activities in accordance with the RMP do not require any specific approval from the Highlands Council.</p> <p>In the <b>Conservation and Protection Zones</b>, redevelopment activities are permitted when they meet the Preservation Area redevelopment criteria, or are greyfield sites in locations with water, wastewater, and transportation capacity, <u>and</u> are appropriate for increased land use intensity or conversion to greenfields. In the Conservation and Protection Zone, Highlands Council approval of a site(s) is required, and approval may be granted as part of the Conformance process or in accordance with the Highlands Redevelopment Site Approval Process.</p>
<p><b><i>Developed Lands Analysis</i></b></p>	<p><b>Program Description:</b></p> <p>The Highlands Council analyzed developed areas and characterized them by their potential for enhanced growth opportunities. It is a parcel based inventory of lands that are developed, vacant (adjacent to developed), economically underutilized, oversized residential lots, and sites with existing initiatives that suggest the potential for development and redevelopment activities. Additional land data include contaminated sites and non-operating landfills with evidence of ground water contamination. All information will be maintained and updated, as necessary. Not all</p>

	<p>of the identified sites will be appropriate for redevelopment, depending on the potential impact of redevelopment activities on sensitive environmental resources, the pattern of development, etc. The Developed Land Inventory represents a rough estimate of the maximum development potential, part of which will not be realized due to other local and regional policy constraints, land character, market conditions, etc.</p> <p>The Developed Land Inventory is parcel based and will be used to identify sites with potential for redevelopment and will be the basis for monitoring completed redevelopment projects. In Conformance, municipalities and counties are required to review and comment on the existing inventory, and suggest additions and deletions as necessary.</p>
<p><b>Redevelopment Site Design Standards</b></p>	<p><b>Program Description:</b>  Site development standards will be provided for all projects, including redevelopment projects. The site standards will guide and control development and redevelopment in the Region. The site standards are intended to provide protection of natural resources, environmentally sensitive areas, open space and agricultural lands, and to enhance and reflect community character. This will be achieved in part by providing flexibility for site requirements that are incompatible with smart growth principles. Examples of flexibility include but are not limited to the reduction of minimum setbacks, the modification of uniform road frontage requirements, and the increase in maximum permitted height.</p> <p>In order to achieve both resource protection goals and remedial requirements, the Highlands Council will determine if enhanced standards for remediation activities will be required. The evaluation of site design and development for contaminated properties will require interagency coordination and will continue to be refined in support of RMP policies.</p> <p>Refer to the <i>Smart Growth Program</i> for additional information.</p>
<p><b>General Assistance for Eligible Projects – Agency Coordination</b></p>	<p><b>Program Description:</b>  The Highlands Council will seek to streamline the redevelopment process by establishing a Highlands Interagency Team to support and expedite redevelopment and development activities that are consistent with RMP policies. The Highlands Interagency Team will assist municipalities, counties, and interested parties in redevelopment initiatives that restore and enhance natural features and enhance the built environment. The Interagency Team will be comprised of relevant state agencies who will informally review projects with a problem-solving approach.</p>
<p><b>General Assistance for Eligible Projects – Technical Assistance</b></p>	<p><b>Program Description:</b>  The Council will also provide technical assistance in the overall redevelopment process. Technical assistance and support is available for the following activities:</p> <ul style="list-style-type: none"> <li>▪ Technical assistance with the Highlands Redevelopment Site Approval Process;</li> <li>▪ Technical assistance with economic improvement issues through the Economic and Fiscal Vitality Program, which covers available programs which enhance economic health and vitality of the Highlands Region;</li> <li>▪ GIS data, including but not limited to: RMP and municipal zoning, parcel layer data, Highlands natural resource location, open space, water resources, utilities, and impervious surfaces;</li> <li>▪ Information for those looking to acquire funding through existing resources. Currently, state and federal agency programs offer a variety of grant, loan, and</li> </ul>

	<p>technical assistance programs for the planning and implementation of development and redevelopment projects. While available programs and technical assistance may change over time, examples of programs and technical assistance that may be useful for a project in the Highlands Region include;</p> <ul style="list-style-type: none"> <li>▪ New Jersey Office of Smart Growth’s smart future planning grant program, which offers planning grants to municipalities, counties and non-profit agencies;</li> <li>▪ New Jersey Economic Development Authority’s real estate development programs and bond financing;</li> <li>▪ NJ Economic Development Authority and the NJDEP administer the Hazardous Discharge Site Remediation loan and grant programs, which awards funds for the investigation and remediation work on contaminated sites;</li> <li>▪ New Jersey Environmental Infrastructure Trust’s low-cost financing for projects (including brownfield remediation) that protect and improve water resources; and</li> <li>▪ Natural Resource Damages Liability Protection for Developers provides liability protection for non-responsible developers against natural resource damage claims.</li> </ul>
<p><b><i>General Assistance for Eligible Projects – Highlands Planning Grants</i></b></p>	<p><b>Program Description:</b>                  Highlands Council discretionary planning grants are intended to initiate important elements of the RMP through planning studies on targeted issues. The grant program serves as a mechanism to implement the goals and policies of the RMP. Sample projects that may be eligible include planning for brownfield and greyfield redevelopment, town center/transit village development, and local and regional economic development strategies.</p> <p>The <i>Plan Conformance Program</i> contains information on Highlands Council funding opportunities relating to the implementation of the RMP.</p>
<p><b><i>General Assistance for Eligible Projects – Education and Outreach</i></b></p>	<p><b>Program Description:</b>                  The Highlands Council will support education and technical training programs for municipal officials and interested organizations for innovative/alternative development and redevelopment initiatives. These programs will support stakeholder understanding of balancing resource protection/restoration with redevelopment initiatives that contribute to making communities of place with a mix of uses.</p> <p>(See <i>Municipal Education and Outreach Program</i> for further details.)</p>

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**DRAFT**  
**TECHNICAL MEMORANDUM**  
**ENHANCED GROWTH TOOL**

**Version - October 30, 2007**

**Introduction:**

Enhanced growth opportunities is a term used to describe areas in the Highlands Region that demonstrate potential viability for growth and redevelopment based on regional and local land and development characteristics. The purpose of the Enhanced Growth Tool is to have a mechanism to identify the realm of parcels that are vacant or economically underutilized or oversized single family residential lots, or have local conditions that represent opportunities for future development or redevelopment. Parcels are also evaluated based on their proximity to transportation and transit infrastructure and whether they are located in areas appropriate for economic growth and development. The tool characterizes largely contiguous developed areas (as defined by the Highlands Developed Lands layer, including Core, Moderate, and Suburban Fringe developed landscapes) for potential opportunities using a set of assumptions and GIS data. The Enhanced Growth tool may support the identification of TDR receiving areas and the Highlands build out analysis. The methodology used to develop the Enhanced Growth Tool was designed based on analyses that have been completed by other city, regional, and state planning organizations and were tailored to the Highlands Region.

The Enhanced Growth Tool is intended to give a rough estimate of the location and number of parcels and acres in each municipality that may have potential for development and redevelopment. The Enhanced Growth Tool does not incorporate issues of utility capacity or some resource or environmental constraints. The findings of the tool will serve as baseline data that will be supplemented and enhanced with local planning knowledge during Conformance. It is meant to serve as a tool to assist in long-term planning evaluations and in support of local housing and development.

**Analysis Steps:**

The Enhanced Growth Tool analysis consists of the following steps:

**Step 1: Parcel data attribution:**

1. 2007 MOD4 data;
2. Highlands Composite and Base Zoning;
3. Percentage within Highlands Developed Lands, including Core, Moderate and Suburban Fringe Developed Lands;
4. Percentage within Preservation Area/Planning Area;
5. Percentage environmentally constrained (as included in Table 1);
6. Percentage Baseline Transportation and Transit indicator and within 1 mile radius of train stations; and
7. Identify those parcels that are:
  - a. Open space;
  - b. Residential condominium community;

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

Table 1: Enhance Growth Tool Resource Constraint Layers

RESOURCE CONSTRAINTS		
GIS LAYER	CATEGORY	SCENARIO A
STREAMS	HIGHLANDS WATER	300 FT
	SPECIAL WATER	300 FT
	EXCEPTIONAL WATER	150 FT
	INTERMEDIATE WATER	75 FT
WATER BODIES	HIGHLANDS WATER	300 FT
	SPECIAL WATER	300 FT
	EXCEPTIONAL WATER	150 FT
	INTERMEDIATE WATER	75 FT
WETLANDS	HIGHLANDS WATER	300 FT
	SPECIAL WATER	300 FT
	EXCEPTIONAL WATER	150 FT
	INTERMEDIATE WATER	75 FT
OPEN SPACE	PROTECTED LANDS	EXCLUDE
	PRESERVED FARMS	EXCLUDE
SLOPES	UNDEVELOPED	> 20%

**Step 2:** Identify parcels that fall into the 6 indicators, as discussed below, including:

- Vacant Indicator;
- Refill Indicator;
- Oversized Single Family Residential Lot Indicator;
- State Designated Center Indicator;
- Local Conditions Indicator; and
- Baseline Transportation and Transit Indicator.

**A. Vacant Indicator** includes vacant parcels in the Planning Area and may provide viable infill opportunities.

- Those parcels with a MOD4 property class of 1 (vacant), 3B (farm qualified), or both 1 and 3B within the Developed Lands layer were identified;
  - Parcels with additional MOD4 property class records did not meet the criteria for the vacant indicator. For example, a parcel with property class 1 and 4A would have been excluded.
- Parcels identified as condos or open space were excluded;
  - Note that every effort was made to exclude residential condos from the dataset. This was done through Access queries, parcel data as a visual aid, and aerial photo interpretation.
- After considering environmental constraints, those parcels with at least 0.5 unconstrained acres were included; and

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

- It was noted in the database if vacant parcels had also been identified as a Highlands Act Exemption.

**B. Refill Indicator** consists of parcels that are considered to be economically underutilized, and as such are assumed to have potential for redevelopment. A literature review revealed the use of the improvement to land ratio as an indicator of economic productivity. “An improvement-to-land ratio of 1:1 or less constitutes strong evidence of underutilization and always should be investigated further.” (The Redevelopment Handbook, Slachetka, and Roberts. 2003).

The literary review also indicated that various thresholds were utilized to identify economically underutilized parcels. A survey of approaches by other land planning agencies to developing criteria for assessing economically underutilized lands indicated that “the actually thresholds for what constituted ‘redevelopability’...varied considerably, reflecting differences in policy, local markets, and professional judgment.” (Monitoring Land Supply with Geographic Information Systems, Moudon and Hubner. 2000) For this analysis, parcels with an improvement to land value of between zero and 0.5 (the improvement value was less than 50% of the value of the land) were identified for residential and non-residential land uses. (Values were rounded to the second place.)

- Those Property Class 2 (residential) with an improvement-to-land values of less than 0.5 and within the Developed Land layer were identified;
  - In those instances where there are multiple records for Property Class 2, the record was excluded.
- Those Property Class 4A (commercial), 4B (Industrial), and 4C (Apartment) parcels and with an improvement-to-land values of less than 0.5 were identified throughout the region;
  - In those instances where there are multiple records for Property Class 4A, 4B, or 4C for a parcel, the land and improvement values were aggregated.
- Those parcels with no land value or no improvement value were excluded;
- Parcels identified as being condos or preserved open space were excluded; and
- Environmental constraints were not considered in this layer; the assumption was that these are existing developed parcels.

Refill parcels are considered economically underutilized in the Enhanced Growth Tool. In Conformance discussions, additional areas may also be found to be appropriate for redevelopment. For example, an area may have primarily economically viable parcels (according to the

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

improvement to land ratio), but surrounding conditions may suggest opportunity.

**C. Oversized Single Family Residential Lot Indicator** is comprised of those parcels with existing development on an oversized residential lot in the Planning Area. For example, a 10 acre parcel with one existing structure, in an area that zoning allows 1 unit per 5 acres, could potentially accommodate another structure based on existing zoning. The method for estimating oversized parcels is based on the approach presented in “Estimating and Analyzing Land Supply and Development Capacity: The Case of Southeast Seattle,” and assumes that partially utilized lands are “single family zoned parcels with existing structures on lots large enough to be subdivided.... Parcels qualify as infillable lots if the lot size is equal to or more than 2 times the minimum lot size requirement of the zone.” (Lincoln Institute of Land Policy working paper, 2001. “Estimating and Analyzing Land Supply and Development Capacity: The Case of Southeast Seattle”).

In order to identify those oversized residential parcels, the following steps were taken:

- Those single family residentially zoned parcels within the Developed Lands layer that were twice as large as the minimum lot size allowed by zoning were identified;
  - Single family residentially zoned records were identified if they were MOD4 Property Class 2 (residential) AND if zoned for single family residential (Highlands composite zones Estate Residential, High Density Residential, Low Density Residential, Medium Density Residential, Resource Residential, Rural Residential, Suburban Residential) they were selected.
  - Those parcels with more than one associated composite zone were identified, and appropriate composite zone information was attributed to the corresponding portion of the lot (i.e., the parcel was spatially split according to zoning).
- Parcels with multiple MOD4 records were excluded;
- Parcels identified as being condos or preserved open space were excluded; and
- Constrained land (see Figure 1) was removed from the identified oversized lot parcels. The parcel remained in the dataset if the remaining unconstrained land was still greater than twice the minimum lot size.

It should be noted that there may be overlap in the definition of vacant, refill, and oversized single family residential lot indicators. For example, a parcel may fit the criteria of both refill and an oversized single family

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

residential lot. In order to avoid “double counting” of these parcels and associated acres, the following order was used assign a final indicator:

- Vacant;
- Refill; and
- Oversized Single Family Residential Lots.

**D. Designated Center Indicator** consists of State Designated Centers that are contained within the boundary of Highlands Developed Lands (Core, Moderate, and Suburban Fringe lands).

**E. Local Conditions Indicator** consists of those parcels within the target areas of existing initiatives that suggest the potential for redevelopment and includes the following layers:

- Existing Redevelopment Initiatives;
- Urban Enterprise Zone; and
- Foreign Trade Zone (developed portion only).

**F. Baseline Transportation and Transit Indicator** is a data layer that identified and ranked areas based on proximity to roadway interchanges and intersections, train stations, park & rides, and bus routes. The Baseline Transportation and Transit indicator was used in the development of the Land Use Capability Map, and is used in this analysis at a parcel level. The Baseline Transportation and Transit Indicator was not used as a stand alone indicator, but was used to inform the ranking of other indicators.

- Parcels that fell (20% or greater) within the Baseline Transportation and Transit area were identified; and
- In addition to the Baseline Transportation and Transit indicator, parcels that were located within one mile of a rail station were identified.

**Step 3:** Rank parcels according to indicators based on a set of rules to represent enhanced growth opportunities. See Table 2 for the Enhanced Growth Tool scoring system.

Rules:

1. Parcels that have been identified as vacant, refill, or oversized single family residential lots all receive 1 point;
2. Parcels that have been identified as local conditions receive 1 point;
3. Parcels identified as vacant, refill, oversized single family residential, and/or local conditions receive an additional 1 point if they are within a Designated Center; and
4. The Baseline Transportation and Transit indicators give additional points to identified parcels. Baseline Transportation and Transit parcels receive 1 point, while those that have been identified as falling within 1 mile of a rail station receive 2 points.

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

The following table illustrates the various scenarios by which a parcel may be identified and scored. Points are assigned to a parcel based on the presence of the various indicators. The scoring system represents a range of values from 1 to 5.

Table 2: Enhanced Growth Tool scoring system.

Total Score	Vacant, Refill, or Oversized SF Residential	Local Conditions	Designated Center	Baseline Transportation/Transit	1 Mile of Train Station
1	1				
		1			
2	1	1			
	1		1		
	1			1	
		1	1		
		1		1	
3	1	1	1		
	1	1		1	
	1		1	1	
	1				2
		1	1	1	
		1			2
4	1	1	1	1	
	1	1			2
	1		1		2
		1	1		2
	1		1		2
5	1	1	1		2

Those parcels with a score of 2 or more are considered to be regionally significant opportunities in the Enhanced Growth Tool. The assumption is that no single factor was sufficient evidence of enhanced growth opportunity; for example, a parcel that was identified as vacant would only fulfill the final criteria if it was also located near a transportation and transit rich area or was located within a designated redevelopment area.

**Step 4: Quality assurance:**

In order to test the quality of the data, the following steps were taken:

1. Aerial photo interpretation was used throughout the analysis to verify findings;
2. The steps used to assign indicators were confirmed in the dataset; and
3. The methodology and assumptions were verified and documented by the project team throughout the process.

**Examples:**

See Figures 1 – 4 for examples of parcels identified using the Enhanced Growth Tool.

DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL

Figure 1:



Figure 1 shows a portion of a traditional urban center. The neighborhood, with designated redevelopment areas and multi-modal transportation connections is a logical place to consider infill initiatives.

Figure 2:



Figure 2 shows a commercial corridor intersection. The Enhanced Growth tool identified these parcels as economically underutilized within a transportation rich area. Opportunities may exist for retrofitting the area by condensing the existing parking and infilling with additional development.

DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL

Figure 3:



Figure 3 shows several commercial parcels bordering a residential neighborhood. The Enhanced Growth tool identified these parcels as economically underutilized and located within a transportation rich Urban Enterprise Zone.

Figure 4:

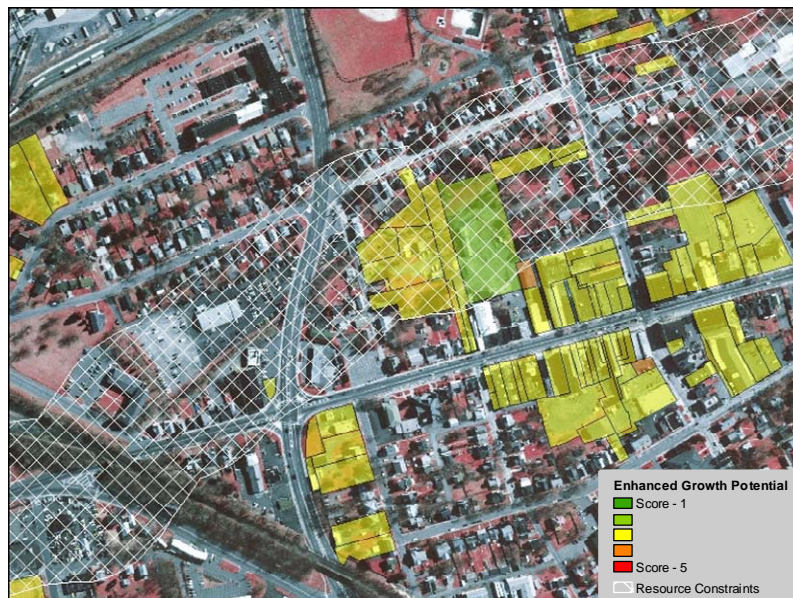


Figure 4 shows a traditional downtown with a designated redevelopment area. Some developed parcels fall within the Highlands Open Waters buffer area. Opportunities for stream restoration and enhancement exist through the redevelopment initiative.

DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL

**Bibliography:**

1. Growth Management Program, Washington State Community, Trade and Economic Development, and Local Government Division. *Buildable Lands Program Guidelines*. 2000.
2. Knaap, G. Moore, T. (2000) *Land Supply and Infrastructure Capacity Monitoring for Smart Urban Growth*. Lincoln Institute of Land Policy.
3. Landis, J., Hood, H. (2005) *The Future of Infill Housing in California: Opportunities, Potential, Feasibility and Demand. Volume One: Study Overview*. Institute of Urban and Regional Development, University of California, Berkley.
4. Lincoln Institute of Land Policy, National Center for Smart Growth Research and Education, and Maryland Department of Planning. (2005) *Estimating Residential Development Capacity. A Guidebook for Analysis and Implementation in Maryland*.
5. Moudon, A, Hubner, M. (Ed) (2000) *Monitoring Land Supply with Geographic Information Systems Theory, Practice, and Parcel-Based Approaches*. John Wiley & Sons, Inc.
6. Moudon, A. *Estimating and Analyzing Land Supply and Development Capacity: The Case of Southeast Seattle*. 2001. Lincoln Institute of Land Policy.
7. Sandoval, J., Landis, J. (2006) *Estimating the Housing Infill Capacity of the Bay Area*. Institute of Urban and Regional Development, University of California, Berkley.
8. Slachetka, S., Roberts, D. (2003) *The Redevelopment Handbook, A Guide to Rebuilding New Jersey's Communities*.
9. Zhang, J., O'Neil, R., Van Abs, D. (undated) *Development, Redevelopment and the Protection of Critical Environmental Areas. Opportunities for Watershed Protection and Economic Growth in New Jersey's Urban and Suburban Watersheds*. New Jersey Water Supply Authority.



JON S. CORZINE  
Governor

**State of New Jersey**  
Highlands Water Protection and Planning Council  
100 North Road (Route 513)  
Chester, New Jersey 07930-2322  
(908) 879-6737  
(908) 879-4205 (fax)  
www.highlands.state.nj.us



JOHN R. WEINGART  
Chairman

EILEEN SWAN  
Executive Director

**DRAFT – FOR CONSIDERATION AT THE NOVEMBER 1, 2007  
MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Highlands Restoration: Water Deficits**  
***Version: October 31, 2007***

<p><b>Issue Overview</b></p>	<p>Sustaining the Highlands Region’s water resources is a matter of statewide importance. Increases in human population and changes in land use threaten those water resources by contributing to over-withdrawal of ground water and surface water systems, and a reduction of recharge rates. Growth patterns that deplete aquifers reduce base flows in streams and reduce safe yields of reservoirs. In short, the protection of base flow is critical to maintaining viable aquatic ecosystems and protecting potable water supplies, particularly during periods of drought. Recent droughts, which resulted in historically low stream flows and rapid depletion of reservoir capacity, provide clear evidence that water resources of the Highlands, while large in scale, are also nearing or beyond their capacity. The lapse of four decades since the drought of record hampers public understanding of what would happen during another severe drought.</p> <p>The northern population centers of the state and the Highlands Region itself rely on surface water reservoirs and ground water aquifers, both of which are replenished by waters originating in the Highlands. Given these demands on Highlands water resources, there is a fundamental need to ensure adequate water supplies within the Region and outside the Region while also protecting its important ecological and riparian integrity.</p> <p>Where water supplies are being stressed, management strategies are necessary to reduce and where feasible eliminate deficits, and to ensure that supplies are not depleted further. These strategies should also endeavor, wherever possible, to mitigate existing water demands and ensure that future demands are only granted upon the condition of reduction of water deficits.</p>
<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 2.1.2.4.</b> To require the development and implementation of Water Management Plans to address any Current Deficit Areas or subwatershed that could become deficit areas based on projected development and water uses, to ensure sustainable water supply, water resource, and ecological value.</p>

	<p><b>Objective 2.1.2.4.1.</b> <i>Water Management Plans shall include provisions to reduce consumptive and depletive uses of ground and surface waters as necessary to reduce or prevent deficits in Net Water Availability; or to ensure continued stream flows to downstream Current Deficit Areas from Existing Constrained Areas, to the extent practicable within each zone.</i></p> <p><b>Objective 2.1.2.4.1.</b> <i>Proposed increases in water use, including consumptive or depletive water uses, within a Current Deficit Area or Existing Constrained Area shall provide mitigation equal to 125% of the proposed new consumptive or depletive water uses within the same HUC14 subwatershed through: a permanent reduction of existing consumptive and depletive water uses; ground water recharge in excess of the requirements of N.J.A.C. 7:8 (Stormwater Management Rules); or other permanent means.</i></p> <p><b>Objective 2.1.2.4.2</b> <i>All water users within a Current Deficit Area or Existing Constrained Area shall seek funding and opportunities to prevent exacerbation of and help reduce or eliminate existing deficits to ensure sustainable water supply, water resource and ecological values, emphasizing techniques including, but not limited to water reuse, recycling and conservation.</i></p>
<p><b>Program Summary</b></p>	<p>In order to address the requirements and goals of the Highlands Act, the Highlands Council conducted a net water availability analysis, at a HUC14 subwatershed level, to determine the amount of water required to protect aquatic ecological integrity and the amount that is “available” for consumptive and depletive uses. This analysis is at a more local scale than used by the NJ Department of Environmental Protection for its Statewide Water Supply Plan (i.e., HUC11 watersheds), as the Highlands Council is addressing a much smaller area. NJDEP intends to incorporate the Highlands Region analysis in its work to the maximum extent feasible. It also uses more stringent constraints on human water uses, in furtherance of Highlands Act requirements for the protection of the Region’s water resources and aquatic ecosystems.</p> <p>Consumptive and depletive uses are those uses that are not returned to the subwatershed by a discharge back into ground or a stream. They represent a hydrologic “loss” to the system with a corresponding reduction in base flows. The analysis compared these consumptive and depletive demand patterns against water availability to see where water resources are being exceeded.</p> <p>Where a subwatershed’s water use was determined to exceed its availability, it was deemed to be in deficit. The Goals, Policies, and Objectives of the Regional Master Plan (RMP) restrict additional consumptive and depletive uses from that subwatershed so that the deficit is not exacerbated. The RMP also mandates that municipalities, utilities, and other interested stakeholder develop a Water Management Plan. The primary purpose of a Water Management Plan is to reduce and where feasible eliminate deficits; the plan can identify appropriate management strategies that can help ameliorate such water deficits or potential impacts on water supply source areas.</p> <p>The Highlands restoration water deficit program consist of five discrete tasks:</p> <ol style="list-style-type: none"> <li>1. Identify HUC14 subwatershed that have a deficit of water availability;</li> <li>2. Verify the net water availability analysis and its associated deficits.</li> <li>3. Require, as a condition of conformance, development of a Water</li> </ol>

	<p>Management Plan for those municipalities or stakeholders whose water supply is located in a deficit subwatershed.</p> <ol style="list-style-type: none"> <li>4. For complex systems or where the development of deficit reduction plans for multiple subwatersheds is more appropriate, collaborate with NJDEP and affected interests to develop Water Management Plans at a larger scale.</li> <li>5. Coordination with NJDEP so that water allocation permits support the reduction and elimination of water deficits.</li> </ol>
<p><b>Analysis of Net Water Availability</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council conducted a net water availability analysis in the RMP to assess the sustainability of Highlands water resources. Reservoir supplies with approved safe yields were assessed separate from ground water and other surface water supplies, as reservoirs provide storage against drought conditions and therefore are affective in a significantly different manner than other resources.</p> <p>The net water availability analysis was conducted using hydrologic data and annual water use and withdrawal data ranging from years 2000-2005. The data were gathered primarily from NJDEP databases, with some instances of local input. However, much of the information regarding water supply utilities, their service areas, and zone usage rates exists as local knowledge. Enhancing the data in the availability analysis will be a critical component of the water deficit program to ensure the sustainability of water resources.</p> <p>The net water availability analysis is described in the RMP's Water Resources Technical Report. In summary, the analysis consists of the following basic steps:</p> <ol style="list-style-type: none"> <li>1. Estimate the ground water capacity within each HUC14 subwatershed of the Highlands Region;</li> <li>2. Determine the threshold percentage of the ground water capacity is necessary to protect aquatic resource integrity and preserve water supply. The thresholds are more stringent in the Protection Zone and least stringent in the Existing Community Zone, but even in the latter case is somewhat more stringent than the NJDEP statewide threshold. Each threshold is multiplied by the ground water capacity; the product is called ground water availability.</li> <li>3. Compare existing water uses and their associated consumptive/depletive volumes against the ground water availability. The difference is called net water availability; where consumptive and depletive water exceed the available water resources, those subwatersheds are deemed in deficit.</li> </ol> <p>Net water availability has been calculated for all 183 HUC14 subwatersheds of the Highlands Region. 110 of these are in deficit, based on the RMP thresholds.</p>
<p><b>Verification of Net Water</b></p>	<p><b>Program Description</b></p> <p>The Highlands Council will continually update and verify the data utilized in</p>

<p><b>Availability</b></p>	<p>its capacity assessments. Through the conformance process with municipalities and counties, the Council will obtain local-scale information about water use and water supply from local governments and utilities. The Council will also utilize new annual demand data, as the information is reported and available from a variety of sources.</p> <p>As a more refined understanding of regional and local water resources is developed, the Council will be able to update and verify the net water availability analysis. This process will allow the Council to validate its analytical tools and determine whether initial estimates are correct. Utilizing this information, the Council can evaluate whether each subwatershed is correctly assessed and reevaluate its status as necessary.</p> <p>Following confirmation of deficit status, the Highlands Council will continue to monitor deficit areas for two purposes:</p> <ul style="list-style-type: none"> <li>• To ensure that future demand patterns are representative of previous annual data and not exacerbating deficits; and</li> <li>• To evaluate the effectiveness of mitigation measures defined in Water Management Plans.</li> </ul>
<p><b>Strategic Approaches to Mitigating Water Deficits</b></p>	<p><b>Program Description</b></p> <p>Where water deficits within a subwatershed are identified and validated, affected stakeholders will develop a strategic approach to addressing these shortages. These stakeholders will most often consist of municipalities, but may also include water supply utilities, wastewater systems, surrounding municipalities, and counties. Any proposed measures should be prioritized upon feasibility, effectiveness, environmental benefits, and funding issues.</p> <p>Municipal conformance shall include consideration of the availability and viability of water supplies for future development. They should not assume that water will be available, absent a clear demonstration within a Water Management Plan. Stakeholders shall give highest priority to water use efficiency and ground water recharge enhancements within the deficit subwatershed, then to the development of new internal water supplies, and finally to the development of water resources from areas which are not in deficit. Water use efficiency and conservation are discussed further by a related RMP program (see <i>Water Use Efficiency Program</i>). All of these strategies must be detailed and implemented as appropriate and feasible through a Water Management Plan.</p>
<p><b>Development of Municipal Water Management Plans</b></p>	<p><b>Program Description</b></p> <p>Municipalities can rely upon numerous tools for planning at the local level: municipal and county master plans, the State Development and Redevelopment Plan, and wastewater management plans (WMPs).</p> <p>Wastewater management plans require examination of current and future growth patterns to ensure that growth does not exceed the assimilative capacity of surface and ground waters for wastewater treatment. The intent, as with other sound planning practices, is to ensure that carrying capacity and land use are properly integrated. Similar in concept to a WMP, a Water Management Plan is envisioned as a planning tool for using municipal and</p>

	<p>utility data to update and verify water availability models, deficit mitigation methods, and implementation alternatives.</p> <p>Municipalities supplied by, or withdrawing from deficit areas shall, as a requirement of conformance, be required to implement a Water Management Plan. The Regional Master Plan calls for the Water Management Plan to develop mitigation and restoration strategies as discussed previously.</p> <p>The essential components of a Water Management Plan shall include</p> <ul style="list-style-type: none"> <li>• <b>Identification of Water Sources and Uses</b> - To include a water utility profile complete with demand data, service areas, water sources, and wastewater returns.</li> <li>• <b>Analysis of Net Water Availability</b> - To validate or modify prior results using new data regarding consumptive and depletive water uses and the movement of water with HUC14 subwatersheds, leading to more current and defensible net water availability results. The use of more sophisticated water models can also be proposed, but must be at least as protective of the water regime as the Highlands Council approach.</li> <li>• <b>Mitigation Approach</b> - To discuss mitigation strategies and a prioritized approach to reducing deficits.</li> <li>• <b>Funding Opportunities</b> - To address financial mechanisms that reflect the strategic approaches adopted in a water management plan.</li> <li>• <b>Operation and Monitoring</b> - To conduct ongoing monitoring of uses and validation of mitigation. In these cases, affected entities could include counties or multiple affected municipalities at this scale.</li> <li>• <b>Deficit Reduction and Elimination Strategy</b> – To describe, based on the prior analyses, the selected strategies for deficit reduction and elimination, including responsible parties, schedules, funding commitments, etc. The strategies in the Water Management Plan must be implemented as a commitment of RMP Plan Conformance.</li> </ul>
<p><b>Development of HUC14 Water Management Strategies</b></p>	<p><b>Program Description</b></p> <p>There will be instances when a deficit subwatershed is a source to multiple municipalities – even if one or more municipality is not located in the subwatershed. There may also be instances where a larger planning entity may wish to develop the Water Management Plan. These entities could include a large water purveyor, county government, or the Highlands Council itself if municipalities are unwilling or unable to develop such a plan. Therefore, the development of a HUC14 Water Management Plan would be more appropriate. Additionally, there will be instances where the hydrologic system is sufficient complex or HUC14 subwatersheds are sufficiently interconnected where development of a multi-subwatershed Water Management Plan is appropriate.</p> <p>The mitigation approaches employed at a HUC14 subwatershed or multi-subwatershed level should be based upon the same priorities required of municipal Water Management Plans: stakeholders shall give water use efficiency and ground water recharge enhancements highest priority , then the</p>

	development of new internal water supplies, and finally to the development of water resources from areas which are not in deficit.
<p><b>Coordination with NJDEP Water Allocation Program</b></p>	<p><b>Program Description</b></p> <p>The Regional Master Plan affects the potential for water use through a combination of land use capacity analysis and the required implementation of Water Management Plans. However, NJDEP’s Water Allocation Program is statutorily tasked with the actual allocation of water resources to those who wish to withdraw more than 100,000 gallons per day in the Planning Area and 50,000 gallons per day in the Preservation Area. To ensure that water resource deficits in HUC14 subwatersheds are not exacerbated and over time are reduced or eliminated, the NJDEP should, to the extent feasible under law, modify water allocation permits in the following manner:</p> <ol style="list-style-type: none"> <li>1. Prior to Plan Conformance, new water allocation permits should not be approved nor existing water allocation permits increased unless the applicant demonstrates to NJDEP that it will not exacerbate a deficit, that the water use will be conducted at the maximum possible efficiency, and that 125% mitigation of increased consumptive and depletive water uses is ensured in accordance with the RMP policies and objectives and the <i>Water Use Efficiency Program</i>;</li> <li>2. Prior to Plan Conformance, existing water allocation permits should be reviewed upon renewal and modified as necessary to limit the allocation to reasonably anticipated future needs, as constrained through improved water use efficiency, so that the allocation is limited to the minimum possible consumptive and depletive uses;</li> <li>3. Subsequent to Plan Conformance, existing water allocation permits should be reviewed upon renewal and modified as necessary to reflect the reasonably anticipated future needs based on conformance with the RMP and implementation of the relevant Water Management Plan;</li> <li>4. Subsequent to Plan Conformance, new water allocation permits should be approved only if they comply with the relevant Water Management Plan.</li> </ol>