

DRAFT FOR CONSIDERATION BY THE HIGHLANDS COUNCIL
AT THE JUNE 12, 2008 COUNCIL MEETING

Highlands Restoration: Water Deficits

Issue Overview

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. Human demand for water, generated by growth, results in depleted aquifers, reduced base flows in streams and reduced safe yields of reservoirs. 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 1960's drought of record hampers public understanding of what would happen during another severe drought.

The northern population centers of the state and the Highlands Region itself rely on surface water reservoirs and aquifers, respectively, 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. Because reservoirs store water from wet periods to sustain demand during dry periods, their effects differ from non-reservoir surface water withdrawals and from ground water withdrawals. The focus of RMP policies and this program is on non-reservoir withdrawals.

Where water is withdrawn and then returned essentially unchanged to the same Highlands waters, water systems are not stressed. Consumptive water uses, where the water is withdrawn and then evaporates (e.g., through irrigation), and depletive water uses, where water is withdrawn and transferred to another subwatershed, are the major causes of stresses because they deplete the water resources within a subwatershed. Where water resources are 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.

Program Summary

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. The RMP 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.

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Consumptive and depletive uses represent a hydrologic “loss” to the system with a corresponding reduction in stream base flows. The analysis compared these consumptive and depletive demand patterns against water availability to see where water resources are being exceeded.

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 RMP prevent increases in net consumptive and depletive uses from that subwatershed so that the deficit is not exacerbated. The RMP also mandates that municipalities, working with utilities and other interested stakeholders, develop a Water Use and Conservation Management Plan. The primary purpose of a Water Use and Conservation 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.

The Highlands restoration water deficit program consist of five discrete tasks:

1. Identify HUC14 subwatersheds that have a deficit of water availability;
2. Verify the net water availability analysis and its associated deficits.
3. Require, as a condition of conformance, development of a Water Use and Conservation Management Plan for conforming municipalities, and especially those whose water supply is located in a deficit subwatershed.
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 Use and Conservation Management Plans at a larger scale.
5. Coordination with NJDEP so that water allocation permits, including transfers of water between subwatersheds where required, support the reduction and elimination of water deficits.

**RMP Policies and
Objectives Addressed**

Objective 2B2c. Estimate Net Water Availability for each HUC14 subwatershed by subtracting from Ground Water Availability an estimate of maximum monthly consumptive and depletive ground water and surface water use (other than from reservoir storage or other supply with a NJDEP approved safe yield). Adjust consumptive and depletive water use to account for the return of wastewater to the same HUC14 subwatershed from which the water originated, or as appropriate, water originating from another HUC14 subwatershed.

Objective 2B2d. Designate Current Deficit Areas as those HUC14 subwatersheds where the Net Water Availability is less than zero.

Objective 2B4c. Establish and implement mandatory stormwater reuse for recreational and other non-agricultural irrigation, as well as other non-potable water purposes to minimize both the volume of stormwater discharges and water withdrawals for these purposes.

Policy 2B5. To require, through Plan Conformance (including through a Water Use and Conservation Plan developed under Objective 2B8c), local development review, and Highlands Project Review, the use of water conservation, recycling and reuse methods (where appropriate) and devices for any redevelopment or development activity, including renovations to existing residential, institutional, commercial or industrial buildings, to minimize consumptive water use tailored to meet the resource protection and other goals for each Zone and considering

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subwatershed-specific conditions and Net Water Availability status.

Objective 2B6a. Areawide Water Quality Management Plans, Wastewater Management Plans or their amendments shall ensure that the proposed service area will not directly or indirectly cause or contribute to a Net Water Availability deficit, and shall be in conformance with any Water Use and Conservation Plan developed under Objective 2B9c.

Objective 2B6b. NJDEP Water Allocation decisions and Highlands Project Reviews shall ensure that any new or increased water allocation permits within the Highlands Region are in conformance with the policies and objectives of the RMP policies and objectives and do not result in significant reductions in safe yields for any water supply facility with an existing water allocation permit and NJDEP-approved safe yield.

Policy 2B8. To require through Plan Conformance, local development review, and Highlands Project Review the efficient and effective use of water availability, the planning for future water needs, the reduction and elimination of water deficits, and the mitigation of new consumptive or depletive use in any Current Deficit Areas or subwatersheds that could become deficit areas based on projected development and water uses, to ensure sustainable water supply, water resource and ecological values in conformance with RMP policies and objectives.

Objective 2B8a. Prevent net increases in consumptive or depletive water uses in Current Water Deficit Areas to prevent exacerbation of and help reduce or eliminate the deficit to ensure sustainable water supply, water resource and ecological values, emphasizing techniques including, but not limited to water reuse, recycling and conservation.

Objective 2B8b. Proposed **new** consumptive or depletive water uses within a Current Deficit Area shall only occur under the auspices of a Water Use and Conservation Management Plan approved under Objective 2B8c or through mitigation of the proposed consumptive or depletive use 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. Where a Water Use and Conservation Management Plan has not been approved:

1. Each project shall achieve mitigation ranging from 125% to 200%, based on the severity of the Current Deficit and the amount of consumptive or depletive water use proposed, and for large consumptive and depletive water uses or high Current Deficits will require achievement of the mitigation prior to initiating the water use;
2. Total consumptive and depletive water uses from any single project and all projects combined are not to exceed the Conditional Water Availability of Objectives 2B3a or 2B3b **for any HUC14 subwatershed**;
3. Mitigation shall be completed by one year of final municipal development approval or prior to initiation of the water use, whichever is later, for any mitigation volumes of less than or equal to 20,000 gallons per day in the Planning Area or 10,000 gallons per day in the Preservation Area. Mitigation may be phased in keeping with project development;
4. Mitigation shall occur prior to initiation of the water use, for water uses

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where the combination of proposed consumptive and depletive water uses and current subwatershed deficit is high, according to a schedule established by the Highlands Council. Mitigation may be phased in keeping with the level of consumptive or depletive water uses;

5. Mitigation for projects not addressed by #3 and #4 above shall occur within a schedule established through local development review and Highlands Project Review. The schedule is to be the shortest feasible time, shall be phased to ensure continuing implementation, and shall not exceed five years from project approval; and
6. Mitigation plans for a project shall include: specific objectives for each mitigation component; monitoring and reporting requirements; methods by which shortfalls in meeting the mitigation objectives shall be addressed through additional action; and be guaranteed through performance bonds.

Objective 2B8c. Water Use and Conservation Management Plans shall be required through municipal Plan Conformance for all subwatersheds to meet the policies and objectives of Goal 2B, to ensure efficient use of water through water conservation and low impact development best management practices, and to avoid the creation of new deficits in Net Water Availability. Where developed for Current Deficit Areas, the plans shall include provisions to reduce or manage consumptive and depletive uses of ground and surface waters as necessary to reduce or eliminate deficits in Net Water Availability, or to ensure continued stream flows to downstream Current Deficit Areas from Existing Constrained Areas, to the maximum extent practicable within each HUC14 subwatershed.

Objective 2B8d. All water users within a Current Deficit Area shall seek funding and opportunities to meet the intent of Objective 2B4b.

Analysis of Net Water Availability

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 affected in a significantly different manner than other resources.

The net water availability analysis was conducted using hydrologic data and annual water use and withdrawal data from the year 2003. The data were gathered primarily from NJDEP databases, with some instances of local input. However, much 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.

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:

1. Estimate the ground water capacity within each HUC14 subwatershed of the Highlands Region;
2. Apply the threshold percentage of the ground water capacity necessary to protect aquatic resource integrity and preserve water supply by minimizing base flow reductions. The thresholds are more stringent in the Protection Zone and least stringent in the Existing Community Zone, but even in the

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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.

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.

Net water availability has been calculated for all 183 HUC14 subwatersheds of the Highlands Region and 114 are in deficit based on 2003 usage data and applicable RMP thresholds.

**Verification of Net
Water Availability**

The Highlands Council shall routinely update and verify the data utilized in 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, including through development of the Water Use and Conservation Management Plans. The Council will also utilize new annual demand data, as the information is reported and available from a variety of sources.

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. The Water Use and Conservation Management Plans will be a major basis for verifying and providing more detail on deficits.

Following confirmation of deficit status, the Highlands Council will continue to monitor deficit areas for two purposes:

- To ensure that future demand patterns are not exacerbating deficits; and
- To evaluate the effectiveness of mitigation measures defined in Water Use and Conservation Management Plans.

**Strategic Approaches to
Mitigating Water
Deficits**

Where water deficits within a subwatershed are identified and validated, affected stakeholders should develop a strategic approach to addressing these shortages. These stakeholders will most often consist of municipalities, through the creation of Water Use and Conservation Management Plans, 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.

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 Use and Conservation Management Plan. Stakeholders shall give highest priority to water use reductions and ground water recharge enhancements within the deficit subwatershed, then to the development of new water supplies within the same subwatershed, and finally to the development of water resources from subwatersheds which are not in deficit. Water use efficiency and conservation are discussed further by a related RMP program (see *The Efficient Use of Water*

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**Development of
Municipal Water Use
and Conservation
Management Plans**

Program). All of these strategies must be detailed and implemented as appropriate and feasible through a Water Use and Conservation Plan.

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).

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 Use and Conservation Management Plan is envisioned as a planning tool for using municipal and utility data to update and verify water availability models, deficit mitigation methods, and implementation alternatives.

Municipalities shall, as a requirement of conformance, be required to implement a Water Use and Conservation Management Plan; this requirement will be especially important for municipalities supplied by, or withdrawing from deficit areas. The Regional Master Plan calls for the Water Use and Conservation Management Plan to develop mitigation and restoration strategies as discussed previously.

The essential components of a Water Use and Conservation Management Plan shall include:

- **Identification of Water Sources and Uses** - To include a water utility profile complete with demand data, service areas, water sources, and wastewater returns.
- **Analysis of Net Water Availability** - 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 (focused especially on stream base flows) as the RMP approach.
- **Mitigation Approach** - To discuss mitigation strategies and a prioritized approach to reducing deficits.
- **Funding Opportunities** - To address financial mechanisms that reflect the strategic approaches adopted in a Water Use and Conservation Plan.
- **Operation and Monitoring** - 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.
- **Deficit Reduction and Elimination Strategy** – 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 Use and Conservation Management Plan must be implemented as a commitment of RMP Plan Conformance.

**Development of HUC14
Water Management**

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

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Strategies

wish to develop the Water Use and Conservation 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 Subwatershed Water Use and Conservation Management Plan would be more appropriate. Additionally, there will be instances where the hydrologic system is sufficiently complex or HUC14 subwatersheds are sufficiently interconnected where development of a multi-subwatershed Water Use and Conservation Management Plan is appropriate.

The mitigation approaches employed at a HUC14 subwatershed or multi-subwatershed level should be based upon the same priorities required of municipal Water Use and Conservation Management Plans: stakeholders shall give water use efficiency and ground water recharge enhancements highest priority, then the development of new internal water supplies, and finally to the development of water resources from areas which are not in deficit.

**Coordination with
NJDEP Water
Allocation Program**

The Regional Master Plan addresses the potential for water use through a combination of land use capacity analysis and the required implementation of Water Use and Conservation 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. Close coordination between the Highlands Council and NJDEP will be necessary to address water uses, and the NJDEP retains final approval authority on any water allocation permits, especially regarding any movement of waters to the Highlands Region from outside the region and any allocation of reservoir safe yields to address Highlands Region deficits. 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:

1. Prior to Plan Conformance, new water allocation permits should not be approved nor existing water allocation permits increased unless the applicant demonstrates that it will not exacerbate a deficit, that the water use will be conducted at the maximum possible efficiency, and that mitigation of increased consumptive and depletive water uses is ensured in accordance with the RMP policies and objectives and the *Efficient Use of Water Program*;
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;
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 a Water Use and Conservation Management Plan, which shall demonstrate mitigation strategies if deficits exist;
4. Subsequent to Plan Conformance, new water allocation permits should be approved only if they comply with the relevant Water Use and Conservation Management Plan.

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The Efficient Use of Water

Issue Overview

Water is a driving force behind many of the goals and policies of the Highlands Act, and protection of water supplies is a critical focus of the Regional Master Plan. Many Highlands Region subwatersheds face shortages of water, as current demands exceed estimated water availability for human and ecological purposes and therefore stress aquatic ecosystems and put human needs in jeopardy during droughts. In addition, non-Highlands municipalities served by Highlands reservoirs and some Highlands municipalities face future constraints on their ability to serve customers as water demands increase through redevelopment and development.

Therefore, it is important that New Jersey obtain the maximum benefit from its Highlands water resources through efficient use and, where feasible and appropriate, beneficial reuse and recycling of water. Water use efficiency has been increasing over the last 20 years, as State and federal requirements for water conserving plumbing fixtures, appliances and irrigation systems affect a greater proportion of total development. Farmers are also becoming more efficient in water use in response to new research and higher energy and chemical costs, moving to drip irrigation and other conserving systems instead of high-pressure broadcast spray systems.

However, both the public utility customer base and irrigated farm acreage are increasing, creating more demands that offset improved water use efficiency. For this reason, while some urban areas have seen declining water sales over time (due to both water conservation and the loss of water-intensive industries), other municipalities have seen significant increases in total water use. Further progress in water use efficiency is needed. Many RMP policies and objectives address this need by encouraging general efficiency in water use, providing higher priority to agricultural water uses that employ best management practices, and calling for the use of water conservation, recycling and beneficial reuse of reclaimed water (among other techniques) to both reduce and eliminate current and future water deficits.

Program Summary

Water use efficiency has three basic emphases. First, water should be used efficiently regardless of water availability. This conservation principle, equivalent to a “good housekeeping” concept, prevents wasteful use of water even when water is plentiful, so that environmental impacts are minimized, infrastructure capacity is not strained, and the water uses do not result in a false sense that new supplies are needed. Low Impact Development (LID) practices, water conserving fixtures and appliances and efficient irrigation practices all are appropriate techniques.

Second, water should be used even more efficiently to reduce existing water deficits in subwatersheds and watersheds. These deficits indicate stresses on the aquatic ecosystems, and often will indicate stresses on ground water yields and downstream water supply facilities and threats to human use during droughts.

Third, water use efficiency should also be enhanced to avoid the need for additional water infrastructure. Delaying the need for new water supply facilities is highly cost-effective; water conservation measures generally cost significantly

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less per million gallons than new reservoirs, treatment facilities or water mains. There is a fourth component that this program does not address, regarding conservation during drought emergencies; NJDEP already addresses this component fully.

Water use efficiency can be achieved in many ways, including:

- Supply-side conservation, such as leak detection and control and improved management of water storage facilities;
- Demand-side conservation, such as improved plumbing fixtures, appliance selection, irrigation controls, modified landscaping that reduces water needs, and use of car washes instead of hand washing;
- Utility rate schedules that encourages customers to make efficient use of water and discourages excessive use;
- Beneficial reuse of reclaimed water within a single building, within a larger development using on-site wastewater treatment, or in a larger setting, where wastewater is treated off-site and then reused on-site; and
- Recycling of water, such as the use of stormwater for irrigation purposes, where no special treatment of the water is required.

**RMP Policies and
Objectives Addressed**

Objective 2B2c. Estimate Net Water Availability for each HUC14 subwatershed by subtracting from Ground Water Availability an estimate of maximum monthly consumptive and depletive ground water and surface water use (other than from reservoir storage or other supply with a NJDEP approved safe yield). Adjust consumptive and depletive water use to account for the return of wastewater to the same HUC14 subwatershed from which the water originated, or as appropriate, water originating from another HUC14 subwatershed.

Objective 2B2f. Modify Net Water Availability in Existing Constrained Areas to be the 2003 consumptive and depletive ground and surface water use plus 5 percent of the Ground Water Capacity (up to the standard thresholds assigned to each Land Use Capability Zone) to ensure continued stream flows to downstream Current Deficit Areas, emphasizing techniques including, but not limited to, water reuse, recycling and conservation.

Policy 2B4. To strictly limit consumptive and depletive water uses to the water availability in each HUC14 subwatershed and to establish priorities for water uses that implement the policies and objectives of the RMP.

Objective 2B4d. The highest priority for agricultural water uses in the Conservation Zone shall be those Preservation Area uses that promote agricultural and horticultural uses and opportunities that are compatible with protection of the Highlands environment, and those Planning Area uses that promote the continuation and expansion of agricultural, horticultural, recreational, and cultural uses and opportunities. Compatible agricultural and horticultural uses shall minimize consumptive water uses through efficiency measures.

Policy 2B5. To require, through Plan Conformance (including through a Water Use and Conservation Plan developed under Objective 2B8c), local development review, and Highlands Project Review, the use of water conservation, recycling

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and reuse methods (where appropriate) and devices for any redevelopment or development activity, including renovations to existing residential, institutional, commercial or industrial buildings, to minimize consumptive water use tailored to meet the resource protection and other goals for each Zone and considering subwatershed-specific conditions and Net Water Availability status.

Policy 2B6. To require through Plan Conformance (including through a Water Use and Conservation Plan developed under Objective 2B8c), local development review, Highlands Project Review, and interagency coordination that proposed public water supply and wastewater service areas, new or increased water allocations and bulk water purchases will not directly or indirectly cause or contribute to a Net Water Availability deficit, and where feasible will help mitigate any existing deficit.

Objective 2B7a. Establish and implement best management practices for recreational, landscape irrigation and other practices through applicable State and federal programs.

Policy 2B8. To require through Plan Conformance, local development review, and Highlands Project Review the efficient and effective use of water availability, the planning for future water needs, the reduction and elimination of water deficits, and the mitigation of new consumptive or depletive use in any Current Deficit Areas or subwatersheds that could become deficit areas based on projected development and water uses, to ensure sustainable water supply, water resource and ecological values in conformance with RMP policies and objectives.

Objective 2B8a. Prevent net increases in consumptive or depletive water uses in Current Water Deficit Areas to prevent exacerbation of and help reduce or eliminate the deficit to ensure sustainable water supply, water resource and ecological values, emphasizing techniques including, but not limited to water reuse, recycling and conservation.

Objective 2B8b. Proposed **new** consumptive or depletive water uses within a Current Deficit Area shall only occur under the auspices of a Water Use and Conservation Management Plan approved under Objective 2B8c or through mitigation of the proposed consumptive or depletive use 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. Where a Water Use and Conservation Management Plan has not been approved:

1. Each project shall achieve mitigation ranging from 125% to 200%, based on the severity of the Current Deficit and the amount of consumptive or depletive water use proposed, and for large consumptive and depletive water uses or high Current Deficits will require achievement of the mitigation prior to initiating the water use;
2. Total consumptive and depletive water uses from any single project and all projects combined are not to exceed the Conditional Water Availability of Objectives 2B3a or 2B3b **for any HUC14 subwatershed**;
3. Mitigation shall be completed by one year of final municipal development approval or prior to initiation of the water use, whichever is later, for any mitigation volumes of less than or equal to 20,000 gallons per day in the

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Planning Area or 10,000 gallons per day in the Preservation Area. Mitigation may be phased in keeping with project development;

4. Mitigation shall occur prior to initiation of the water use, for water uses where the combination of proposed consumptive and depletive water uses and current subwatershed deficit is high, according to a schedule established by the Highlands Council. Mitigation may be phased in keeping with the level of consumptive or depletive water uses;
5. Mitigation for projects not addressed by #3 and #4 above shall occur within a schedule established through local development review and Highlands Project Review. The schedule is to be the shortest feasible time, shall be phased to ensure continuing implementation, and shall not exceed five years from project approval; and
6. Mitigation plans for a project shall include: specific objectives for each mitigation component; monitoring and reporting requirements; methods by which shortfalls in meeting the mitigation objectives shall be addressed through additional action; and be guaranteed through performance bonds.

Objective 2B8c. Water Use and Conservation Management Plans shall be required through municipal Plan Conformance for all subwatersheds to meet the policies and objectives of Goal 2B, to ensure efficient use of water through water conservation and low impact development best management practices, and to avoid the creation of new deficits in Net Water Availability. Where developed for Current Deficit Areas, the plans shall include provisions to reduce or manage consumptive and depletive uses of ground and surface waters as necessary to reduce or eliminate deficits in Net Water Availability, or to ensure continued stream flows to downstream Current Deficit Areas from Existing Constrained Areas, to the maximum extent practicable within each HUC14 subwatershed.

Objective 2B8d. All water users within a Current Deficit Area shall seek funding and opportunities to meet the intent of Objective 2B4b.

Objective 2B8e. Allow water resource transfers between or from Highlands subwatersheds only when there is no other viable alternative and where such transfers would demonstrably not result in impairment of resources in any subwatershed. Potential effects on upstream and downstream subwatersheds should be included in any such evaluation.

Objective 2G5c. Implement agricultural best management practices for water conservation, water reuse, nutrient and pesticide application, animal waste management, environmental restoration, pollution assessment and prevention, and irrigation efficiency in farm operations for the protection of ground and surface water quality.

Objective 2J8a. Require maximized feasible water conservation and recycling or any redevelopment or development activity, including renovations to existing single family residences and commercial/industrial buildings.

Objective 2J8b. Require consideration of and the cost-effective use of recycled or re-used water rather than potable public water for non-potable purposes such as fountains, nonessential uses such as golf courses, certain recreational, commercial, or agricultural uses.

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Objective 6N1d. Minimum requirements for water conservation measures in site layout and structures, including but not limited to water efficient landscaping (including use of native and drought-tolerant plant species), rain collection systems, use of gray water, and water-efficient landscape irrigation.

Objective 7F1h. Ensure that Highlands Act exemption determinations are limited to the activities specifically authorized under the Act. While the construction activities of a single family dwelling may be authorized under an exemption, water conservation requirements, septic maintenance requirements, or any other activities related to the use of that dwelling are not exempt.

**Analysis of Water Use
Efficiency for Public
Water Supplies**

Analyzing the efficiency of water use for public water supplies, for all systems using Highlands water resources both within and outside the Highlands Region, requires an understanding of the customer base, affected land uses, leakage and water loss potential, and other factors. Efficient use rates for suburban areas (in gallons per capita per day, or gpcd) will be different from the rates for urban areas.

The Highlands Council will collaborate with NJDEP to determine existing water use rates for all public community water supply systems using Highlands water, categorize the systems for comparison purposes, and assess the relative efficiency of water uses among common classes of public community water systems.

**Analysis of Water Use
Efficiency for
Agriculture and
Irrigation**

The efficiency of water use by agriculture and other forms of self-supplied irrigation must be assessed based on the type of water need, irrigation practices, weather impacts, etc. The Highlands Council will collaborate with NJDEP, the NJ Department of Agriculture and Rutgers Cooperative Extension Service to determine existing water use rates for all agricultural and other self-supplied irrigation uses using Highlands water, categorize the uses for comparison purposes, and assess the relative efficiency of water uses among common classes of purposes. As these water users will be highly affected by weather, the assessment must include an analysis of how uses vary by season, crop type, year and climate conditions. This analysis will be used, in part, to understand what types of agriculture and horticulture are compatible with Highlands Act objectives in the Preservation Area.

**Identification of Water
Use Efficiency Metrics
and Targets**

The creation of programs and standards for efficient water use requires an identification of appropriate metrics and targets. The Highlands Council will collaborate with NJDEP for all uses, and the NJ Department of Agriculture regarding agricultural uses, to select the most appropriate metrics for water use efficiency, and either regulatory or normative standards (as appropriate for each type of water use) that should be applied. For public community water supply systems, metrics may include per capita water use and water loss ratios by system category. Similar metrics may be applicable to public noncommunity water supply systems as well. For non-potable uses, metrics will focus more on efficiency of meeting plant needs for specific crops during specific weather conditions.

**Implementation of
Water Use Efficiency**

All water uses in the Highlands should be efficient, so that environmental stresses are limited and the ability of water supplies to meet public needs is extended.

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Measures: General

The following general standards apply:

1. Meet all Uniform Construction Code requirements for the use of water conservation fixtures in new or rehabilitated structures;
2. All new and replacement lawn irrigation systems shall meet State requirements for controls based on soil moisture. The Highlands Council shall investigate the need for additional requirements within the Highlands Region;
3. Non-potable irrigation water uses shall ensure that only the necessary amounts of water are used to achieve optimum plant growth, and such uses with existing Water Allocation permits shall be required to increase water use efficiency over the permit life to the maximum extent practicable;
4. New commercial development shall use internal recycling or beneficial reuse of reclaimed water to the maximum extent practicable;
5. New development shall rely on stormwater for irrigation purposes to the maximum extent practicable, including but not limited to LEED-approved methods;
6. Water supply utility rates shall encourage end-user conservation;
7. Water supply utilities shall reduce water losses to the maximum extent practicable, including through application of American Water Works Association/International Water Association water loss analysis methods;
8. Water supply utilities shall provide routine consumer education to conserve water.

**Implementation of
Water Use Efficiency
Measures: Deficit Areas
and Deficit Utilities**

The reduction and elimination of water supply deficits on a subwatershed or watershed basis is addressed by a separate RMP program (see *Highlands Restoration: Water Deficits*) that give highest priority to water use efficiency and ground water recharge enhancements within the deficit area, then to the development of new water supplies within the deficit area, and last to the transfer of water resources from another area. Transfers between and from Highlands subwatersheds are prohibited unless there is no other viable alternative and where such transfers would demonstrably not result in impairment of resources in any subwatershed, including potential effects on upstream and downstream subwatersheds. Transfers from outside of the Highlands Region are allowed, subject to NJDEP approvals. Beneficial water reuse may be used to meet these requirements, provided the reclamation of the water does not adversely affect water resources in its original discharge location. These priorities address both environmental and cost issues.

In all subwatersheds, and especially where current deficit areas exist, the RMP calls for development of a municipal Water Use and Conservation Management Plan. For deficit areas, the plans must determine how the deficit can be alleviated and to the maximum extent possible, eliminated. Such plans may also be developed cooperatively for a subwatershed or multiple subwatersheds. Where a water supply utility faces constraints on its ability to supply consumers due to inadequate transmission mains, treatment facilities or supply sources, the most effective method of avoiding major capital costs is water use efficiency. The same efficiency methods are applicable to both situations.

The following enhanced water use efficiency measures shall be considered, and where feasible and appropriate, included in Water Use and Conservation

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Management Plans or utility water supply plans to eliminate water availability or utility supply deficits, to the extent that they do not cause or exacerbate other environmental harm. Implementation or a firm and bonded commitment for implementation of the selected methods shall be required prior to approval of additional consumptive or depletive water uses or new water supply sources, depending upon the project, the proposed water use and the severity of the current deficit in water availability:

1. Incentive programs, up to and including full payment, for replacement of residential and commercial plumbing fixtures, water-using appliances and lawn irrigation systems with water conservation devices;
2. Incentive programs, up to and including full payment, for modification of residential landscaping to forms that require minimal if any artificial irrigation;
3. Incentive programs, up to and including full payment, for retrofitting of existing development with systems that allow for the beneficial reuse of water within the development;
4. Incentive and cost-share programs for replacement of agricultural irrigation and other water uses with water conservation techniques;
5. Reduction of water losses within water utility systems to the maximum extent that is technologically feasible;
6. Modification of water rates to enhance financial incentives for water conservation by end users;
7. Enhanced consumer education regarding water conservation, including the potential for direct-to-consumer approaches.

**Ensuring
Implementation of
Water Use and
Conservation
Management Plans**

Where a water utility or water user makes a commitment to implementation of water use efficiency in a Current Deficit Area rather than implementing the measures prior to a new consumptive or depletive use, the following requirements shall apply:

1. All implementation measures shall be completed within one year of approval if the consumptive or depletive water use is less than 20,000 gallons per day in the Planning Area or 10,000 gallons per day in the Preservation Area, on average. Implementation may be allowed to occur within a longer time period for larger amounts, up to five years from approval, but may be required to occur prior to initiation of the consumptive or depletive water use under certain circumstances. The Highlands Council shall adopt procedures specifying the basis for implementation schedules, including but not limited to such considerations as the scope of the consumptive or depletive water use, the severity of the existing deficit in water availability, and whether the implementation measure will occur on-site as part of the development project or off-site as mitigation;
2. If the implementing entity is a public agency, the commitment must be in the form of a binding resolution or ordinance of the governing body, and the cost of implementation must be bonded to ensure sufficient resources;
3. If the implementing entity is a private corporation or individual, they must provide bonding to ensure that the commitments are met. A public entity must be named as recipient of the bonds in the event of default by the implementing entity, to be used by the public entity to complete implementation.

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The following GPO section shows the final version of GPOs previously considered by the Highlands Council on May 22, 2008, with highlighted sections indicating proposed changes based on Council discussion.

**CHAPTER IV. GOALS, POLICIES, AND OBJECTIVES
Part 2. Water Resources and Water Utilities**

A fundamental purpose of the Highlands Act is to protect water supplies for human use and ecological sustainability both within and outside of the Highlands Region. The Highlands Regional Master Plan addresses five fundamental issues with regard to water resources in the Highlands Region:

- The availability of water resources for human and ecological use;
- The protection and restoration of water resource availability;
- The protection, restoration, and enhancement of water quality;
- The management of land development patterns and densities to ensure that the carrying capacity of water resources are not exceeded; and
- The cost-effective and efficient provision and use of water utility capacity in a manner that ensures compatibility with the carrying capacity of water resources.

Subpart a. Water Resources Availability

The availability of water for human use is a critical factor in determining the capacity for growth and continued economic vitality for both existing development and agriculture within and outside the Highlands Region. The availability of water for ecological purposes is critical to sustaining the aquatic ecosystems of streams, ponds and lakes in the Highlands Region. The Highlands Regional Master Plan provides a method for identifying the quantity of available water resources in the Highlands Region, which is used to identify areas where water resources are or are not sufficient to support existing human and ecological uses, and to support future uses. Where sufficient water availability exists, the method fairly allocates available water resources among future human uses as shown in the Land Use Capability Zone Map. Where water resources have been stressed, additional planning and mitigation is necessary.

The Goals, Policies and Objectives for water resources availability establish a method for determining available water for human use by each subwatershed (HUC14), of which 183 are in (or partially in) the Highlands Region. Surface water availability from existing reservoir systems are addressed through regulations of NJDEP and a major purpose of the RMP is to protect the safe yields of those reservoir systems by limiting upstream use of ground waters, which has the added benefit of protecting aquatic ecosystems. Ground water availability is determined using stream flow information, with thresholds based upon the predominant Land Use Capability Zone for each subwatershed. Net water availability reflects current uses, and may show surpluses or deficits. For all subwatersheds, municipal Plan Conformance requires development of Water Use and Conservation Plans that will set priorities for the use of available water (where net water availability is positive) and will establish methods to reduce and, where feasible, eliminate deficits where they exist. In all cases, efficient use of water is required to make best use of limited resources. Where deficits exist and a Water Use and Conservation Plan has not yet been adopted, limited amounts of conditional water availability are provided for uses that will be permitted while the deficits are reduced through water conservation and enhanced recharge. The

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amount of mitigation is determined based on the amount of water use proposed and the severity of the current deficit, but is never less than 125 percent; mitigation will be required prior to the water use where either the proposed water use or current deficit is large.

GOAL 2A	PROTECTION OF THE VALUE OF THE HIGHLANDS REGION AS AN “ESSENTIAL SOURCE OF DRINKING WATER, PROVIDING CLEAN AND PLENTIFUL DRINKING WATER FOR ONE-HALF OF THE STATE’S POPULATION” (HIGHLANDS ACT, SECTION 2), ALONG WITH THE ECOLOGICAL VALUES OF CLEAN WATER, THROUGH THE PROTECTION, ENHANCEMENT AND RESTORATION OF WATER RESOURCES QUANTITY, FLOW CHARACTERISTICS AND QUALITY AS FUNDAMENTAL TO ENSURING THAT THERE ARE ADEQUATE WATER SUPPLIES TO SUPPORT THESE NEEDS.
Policy 2A1	To identify and periodically update net water availability and water deficits as a factor in the Land Use Capability Water Availability Map.
Policy 2A2	To ensure that increasing water demands do not exceed Net Water Availability or exacerbate existing deficits of subwatersheds. Net Water Availability is affected at a subwatershed level by location and extent of Land Use Capability Map Zone Map and its status as Current Deficit Area or Existing Constrained Area.
GOAL 2B	PROTECTION, RESTORATION AND ENHANCEMENT OF WATER QUALITY AND QUANTITY OF SURFACE AND GROUND WATERS (SECTIONS 10.B(1) AND 10.C(1)), AND TO DETERMINE “THE AMOUNT AND TYPE OF HUMAN DEVELOPMENT AND ACTIVITY WHICH THE ECOSYSTEM OF THE HIGHLANDS REGION CAN SUSTAIN WHILE STILL MAINTAINING THE OVERALL ECOLOGICAL VALUES THEREOF, WITH SPECIAL REFERENCE TO SURFACE AND GROUND WATER QUALITY AND SUPPLY...” (SECTION 11.A.(1)(A)).
Policy 2B1	To track and consider water availability in local development review and Highlands Project Review.
Policy 2B2	To estimate Net Water Availability on a HUC14 subwatershed basis.
Objective 2B2a	Establish Ground Water Capacity by HUC14 subwatershed by subtracting the subwatershed’s MA7CD10 (minimum average seven day low flow with a return period of ten years, also known as the 7Q10) from the September median stream flow.
Objective 2B2b (from 2B8, 2B9, 2B10)	Establish Ground Water Availability thresholds for application to HUC14 subwatersheds based on the Land Use Capability Zone and watershed resource value, and as modified by status as an Existing Constrained Area. Ground Water Availability shall be determined by multiplying Ground Water Capacity by percentage thresholds specified in the following table that are related to the nature of the environmental resources and conservation objectives of the Plan for each Zone. Ground Water Availability within the Protection Zone and Conservation Zone shall emphasize the integrity of aquatic ecosystems by ensuring that Ground Water Capacity is predominantly reserved for maintenance of stream flows, recognizing the regional significance of these resources; in the Conservation Zone, Ground Water Availability thresholds

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shall also specifically recognize agricultural water needs. Ground Water Availability within Existing Community Zone subwatersheds shall provide for the protection of water supply, water resources and ecological values of the Region.

Ground Water Availability Thresholds As Percentage Of Ground Water Capacity		
Predominant Land Use Capability Zone (or Watershed Value)	Standard Threshold	Existing Constrained Area*
Protection Zone (High)	5%	5%
Conservation Zone (Moderate)	5% non-agricultural 10% agricultural	5% + 2003 Depletive & Consumptive Use (up to Standard Threshold)
Existing Community Zone (Low)	20%	5% + 2003 Depletive & Consumptive Use (up to Standard Threshold)

*Within HUC14 Subwatershed upstream of a Current Deficit Area

Objective 2B2c Estimate Net Water Availability for each HUC14 subwatershed by subtracting from Ground Water Availability an estimate of maximum monthly consumptive and depletive ground water and surface water use (other than from reservoir storage or other supply with a NJDEP approved safe yield). Adjust consumptive and depletive water use to account for the return of wastewater to the same HUC14 subwatershed from which the water originated, or as appropriate, water originating from another HUC14 subwatershed.

Objective 2B2d Designate Current Deficit Areas as those HUC14 subwatersheds where the Net Water Availability is less than zero.

Objective 2B2e Designate Existing Constrained Areas as those HUC14 subwatersheds that have positive Net Water Availability and are upstream of and contributing flow to a Current Deficit Area.

Objective 2B2f
(from 2B8b, 2B9c, 2B10c) Modify Net Water Availability in Existing Constrained Areas to be the 2003 consumptive and depletive ground and surface water use plus 5 percent of the Ground Water Capacity (up to the standard thresholds assigned to each Land Use Capability Zone) to ensure continued stream flows to downstream Current Deficit Areas, emphasizing techniques including, but not limited to, water reuse, recycling and conservation

Policy 2B3 To conditionally provide water availability (Conditional Water Availability) within a Current Deficit Area with appropriate standards regarding its use.

Objective 2B3a A Current Deficit Area subwatershed that is primarily within the Protection Zone or Conservation Zone shall be assigned Conditional Water Availability not to exceed an aggregate of 1 percent of Ground Water Capacity, and will be applied to consumptive and depletive water uses that comply with the mitigation requirement in Objective 2B9b.

Objective 2B3b A Current Deficit Area subwatershed that is primarily within the Existing Community Zone shall be assigned Conditional Water Availability not to exceed an aggregate of 2 percent of Ground Water Capacity, and will be

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Objective 2B3c	applied to consumptive and depletive water uses that comply with the mitigation requirement in Objective 2B9b.
Policy 2B4 (from 2B8, 2B9)	To strictly limit consumptive and depletive water uses to the water availability in each HUC14 subwatershed and to establish priorities for water uses that implement the policies and objectives of the RMP.
Objective 2B4a (from 2B8d, 2B9d, 2B9e)	<p>Give highest priority for the use of non-agricultural Net Water Availability or Conditional Water Availability within Protection Zone and Conservation Zone subwatersheds, through a Water Use and Conservation Plan developed under Objective 2B9c, local development review and Highlands Project review:</p> <ol style="list-style-type: none">1. to address a documented existing or imminent threat to public health and safety from contaminated domestic and other on-site water supplies that is of sufficient scale to justify a public water supply and where no alternative is feasible that would sufficiently assure long-term protection of public health and safety. Such needs shall have highest priority for Net Water Availability;2. to serve a designated Highlands Redevelopment Area;3. to serve a cluster development that complies with Objective 2J4b.4. to serve affordable housing projects where at least 10% of the units are affordable.
Objective 2B4b	The highest priority for use of Net Water Availability or Conditional Water Availability within Existing Community Zone subwatersheds, through a Water Use and Conservation Plan developed under Objective 2B9c, local development review and Highlands Project review to serve documented threats to public health and safety from contaminated water supplies, designated TDR Receiving Zones, infill development, designated Highlands Redevelopment Area, affordable housing projects where at least 10% of the units are affordable, or new areas for development that meet all other requirements of the RMP.
Objective 2B4c	Establish and implement mandatory stormwater reuse for recreational and other non-agricultural irrigation, as well as other non-potable water purposes to minimize both the volume of stormwater discharges and water withdrawals for these purposes.
Objective 2B4d	The highest priority for agricultural water uses in the Conservation Zone shall be those Preservation Area uses that promote agricultural and horticultural uses and opportunities that are compatible with protection of the Highlands environment, and those Planning Area uses that promote the continuation and expansion of agricultural, horticultural, recreational, and cultural uses and opportunities. Compatible agricultural and horticultural uses shall minimize consumptive water uses through efficiency measures.

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Policy 2B6	To require, through Plan Conformance (including , through a Water Use and Conservation Plan developed under Objective 2B9c), local development review, and Highlands Project Review, the use of water conservation, recycling and reuse methods (where appropriate) and devices for any redevelopment or development activity, including renovations to existing residential, institutional, commercial or industrial buildings, to minimize consumptive water use tailored to meet the resource protection and other goals for each Zone and considering subwatershed-specific conditions and Net Water Availability status.
Policy 2B7	To require through Plan Conformance (including through a Water Use and Conservation Plan developed under Objective 2B9c), local development review, Highlands Project Review, and interagency coordination that proposed public water supply and wastewater service areas, new or increased water allocations and bulk water purchases will not directly or indirectly cause or contribute to a Net Water Availability deficit, and where feasible will help mitigate any existing deficit.
Objective 2B7a	Areawide Water Quality Management Plans, Wastewater Management Plans or their amendments shall ensure that the proposed service area will not directly or indirectly cause or contribute to a Net Water Availability deficit, and shall be in conformance with any Water Use and Conservation Plan developed under Objective 2B9c.
Objective 2B7b (from 2B8e, 2B9f, 2B10h)	NJDEP Water Allocation decisions and Highlands Project Reviews shall ensure that any new or increased water allocation permits within the Highlands Region are in conformance with the policies and objectives of the RMP policies and objectives and do not result in significant reductions in safe yields for any water supply facility with an existing water allocation permit and NJDEP-approved safe yield.
Policy 2B8	To ensure through Plan Conformance (including through a Water Use and Conservation Plan developed under Objective 2B9c), local development review, and Highlands Project Review that the use of Net Water Availability and Conditional Water Availability within each subwatershed supports development patterns that are in conformance with RMP policies and objectives.
Objective 2B8a	Establish and implement best management practices for recreational, landscape irrigation and other practices through applicable State and federal programs.
Policy 2B9	To require through Plan Conformance, local development review, and Highlands Project Review the efficient and effective use of water availability, the planning for future water needs, the reduction and elimination of water deficits, and the mitigation of new consumptive or depletive use in any Current Deficit Areas or subwatersheds that could become deficit areas based on projected development and water uses, to ensure sustainable water supply, water resource and ecological values in conformance with RMP policies and objectives.
Objective 2B9a (from 2B8b, 2B9b, 2B10b)	Prevent net increases in consumptive or depletive water uses in Current Water Deficit Areas to prevent exacerbation of and help reduce or eliminate the deficit to ensure sustainable water supply, water resource and ecological values, emphasizing techniques including, but not limited to water reuse, recycling and

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conservation.

Objective 2B9b

Proposed **new** consumptive or depletive water uses within a Current Deficit Area shall only occur under the auspices of a Water Use and Conservation Management Plan approved under Objective 2B9c or through mitigation of the proposed consumptive or depletive use 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. Where a Water Use and Conservation Management Plan has not been approved:

1. Each project shall achieve mitigation ranging from 125% to 200%, based on the severity of the Current Deficit and the amount of consumptive or depletive water use proposed, and for large consumptive and depletive water uses or high Current Deficits will require achievement of the mitigation prior to initiating the water use;
2. Total consumptive and depletive water uses from any single project and all projects combined are not to exceed the Conditional Water Availability of Objectives 2B3a or 2B3b;
3. Mitigation shall be completed by one year of final municipal development approval or prior to initiation of the water use, whichever is later, for any mitigation volumes of less than or equal to 20,000 gallons per day in the Planning Area or 10,000 gallons per day in the Preservation Area. Mitigation may be phased in keeping with project development;
4. Mitigation shall occur prior to initiation of the water use, for water uses where the combination of proposed consumptive and depletive water uses and current subwatershed deficit is high, according to a schedule established by the Highlands Council. Mitigation may be phased in keeping with the level of consumptive or depletive water uses;
5. Mitigation for projects not addressed by #3 and #4 above shall occur within a schedule established through local development review and Highlands Project Review. The schedule is to be the shortest feasible time, shall be phased to ensure continuing implementation, and shall not exceed five years from project approval; and
6. Mitigation plans for a project shall include: specific objectives for each mitigation component; monitoring and reporting requirements; methods by which shortfalls in meeting the mitigation objectives shall be addressed through additional action; and be guaranteed through performance bonds.

Objective 2B9c

Water Use and Conservation Management Plans shall be required through municipal Plan Conformance for all subwatersheds to meet the policies and objectives of Goal 2B, to ensure efficient use of water through water conservation and low impact development best management practices, and to avoid the creation of new deficits in Net Water Availability. Where developed for Current Deficit Areas, the plans shall include provisions to reduce or manage consumptive and depletive uses of ground and surface waters as necessary to reduce or eliminate deficits in Net Water Availability, or to ensure continued stream flows to downstream Current Deficit Areas from Existing Constrained Areas, to the maximum extent practicable within each HUC14 subwatershed.

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Objective 2B9d All water users within a Current Deficit Area shall seek funding and opportunities to meet the intent of Objective 2B4b.

Objective 2B9e Allow water resource transfers between or from Highlands subwatersheds only when there is no other viable alternative and where such transfers would demonstrably not result in impairment of resources in any subwatershed. Potential effects on upstream and downstream subwatersheds should be included in any such evaluation.