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MEETING OF SMART GROWTH AND
ECONOMIC DEVELOPMENT COMMITTEE
OF THE HIGHLANDS COUNCIL

RMP Component:	**Smart Growth**
Technical Report:	**Utility Capacity Assessment**
Council Committees:	**Smart Growth and Economic Development**
Memorandum Title:	**Water Supply and Wastewater Treatment Utility Infrastructure Assessment Approach**
Date:	**April 25, 2006**

I. Introduction

This technical memorandum focuses on the current infrastructure for providing community water supply and wastewater services to Highlands' municipalities, existing plans for extension of such infrastructure, and broad constraints on such extensions.

The Highlands Regional Master Plan ("RMP") will focus on community infrastructure, as these systems are what facilitate or constrain development patterns. Industrial facilities, isolated non-community systems and private water and wastewater systems do not have the potential for inducing or supporting growth. For water supplies, these systems are regulated by the New Jersey Department of Environmental protection ("NJDEP") as "public community water supply systems," which may be owned and operated by governmental entities (either as municipal operations or utility authorities) or investor-owned utilities (e.g., New Jersey American Water Company, Roxbury Water Company).

For wastewater services, these systems are regulated by NJDEP as domestic treatment works, treating predominantly residential wastewater (though some systems also handle limited industrial effluent). These systems may be owned and operated by governmental entities or investor-owned utilities. There are few investor-owned sewer utilities in the Highlands, the largest being the Environmental Disposal Corporation system that serves parts of northern Somerset County.

This memorandum explains the methods used to compile water and wastewater infrastructure data from NJDEP, various utilities, counties, and other studies on behalf of the Highlands Council.

II. Highlands Act Provisions Related to Utility Capacity

The Highlands Act specifically addresses utility infrastructure in several ways, including a requirement that the NJDEP Highlands Preservation Area Rules place strict controls on public water and sewerage expansions in the Preservation Area, with extensions only being allowed under very specific circumstances.

Even where infrastructure expansion is allowed, wastewater treatment plant expansions cannot result in water quality degradation and water allocations may not result in the reduction of stream base flow; both non-degradation policies that must be reflected in the Regional Master Plan.

The Highlands Act also includes specific expectations regarding water utility infrastructure in the planning process. As part of the Smart Growth Component, the Council must assess opportunities for appropriate development, redevelopment, and economic growth, and a transfer of development rights

program, to include consideration of public investment priorities. Infrastructure investments, economic development, revitalization, housing, transportation, energy resources, waste management, recycling, and other factors are to be considered.

The land use capability map must identify existing developed areas capable of sustaining redevelopment activities and investment; undeveloped areas in the planning area, which are not significantly constrained by environmental limitations such as steep slopes, wetlands, or dense forests, are not prime agricultural areas, and are located near or adjacent to existing development and infrastructure, that could be developed; and transportation, water, wastewater, and power infrastructure that would support or limit development and redevelopment in the planning area. The land use capability map will also identify special critical environmental areas and other critical natural resource lands where development should be constrained or avoided.

This analysis shall also provide proposed densities for development, redevelopment, or voluntary receiving zones for the transfer of development rights; and identify potential voluntary receiving zones in the planning area for the transfer of development rights through the appropriate expansion of infrastructure or the modified uses of existing infrastructure. The legislative intent clearly anticipates the use of existing infrastructure, and the limited expansion of infrastructure, to serve appropriate development areas, including TDR receiving areas.

Utility Infrastructure Information Needs

1) Public Water Supply System Utilities

Public community water supply systems are defined as those with more than 15 service connections or 25 customers who are year-round users of the water supply. There are many such systems in the Highlands, with service areas ranging in size from mobile home parks to multiple municipalities. They are all regulated by the NJDEP under the Safe Drinking Water Act. Some of these water supply systems withdraw enough water from either ground or surface water supplies (100,000 gallons per day ("gpd") in the Planning Area or 50,000 gpd in the Preservation Area) that they also are regulated through the NJDEP water allocation program. NJDEP collects information on the utilities, treatment and water supply capacity, and treated and delivered flows.

Public community water supply systems are the water supply systems that can legally provide water supply to residential development and therefore have the greatest potential for inducing or supporting growth, assuming the facilities and their water sources have available capacity. On-site supply systems for industry, commercial buildings, schools and other facilities are common in the Highlands, but these have little if any capacity for serving other utility needs, and therefore were not considered part of the water supply infrastructure.

a) Existing Areas Served

Planning for future water supply service areas requires knowing the current area served, which in this case means those areas currently served by "in the ground" infrastructure rather than planned facilities. Very little information on existing service areas was readily available – franchise areas are more

commonly mapped and (unlike wastewater systems) there is no mandate for mapping of water supply service areas for public review.

Several methods were used to compile data on the existing service areas. Some water supply systems had computer-based mapping (CAD or GIS) available and provided them to the Highlands Council. In other cases, prior planning work had identified service areas using a combination of billing records, hydrant locations and line data. In many cases, local knowledge and information was tapped. Hatch Mott MacDonald compiled the available information and met with water utility personnel as necessary to complete this work effort.

b) Current and Planned Service Areas

For investor-owned utilities, the franchise area granted by a municipality is the broadest possible form of a "current and planned service area" – essentially the area anticipated to be served at build-out, based on local planning from before enactment of the Highlands Act. However, there may be parts of the franchise area that are not appropriate for service, due to a variety of limitations to serve as growth receiving areas. For municipal systems, the municipal master plan might include a designated "current/planned service area", but there is no requirement to map planned service areas for water supply systems. A combination of mapped service areas from the various water supply utility systems was used to develop a map of current and planned service areas.

c) Effects of Highlands Act on Planned Service Areas in the Preservation Area

In the Highlands Planning Area, the Highlands Act had no immediate impact on water supply service areas. In the Preservation Area, the Highlands Act prohibits water supply infrastructure expansions except for exempt development, redevelopment and public health concerns.[1] For purposes of the RMP, it is that water supply service areas in the Preservation Area are equivalent to the existing (in the ground) areas served.

d) Non-Highlands Service Areas

Highlands water supply systems may extend beyond the Highlands Area boundaries (e.g., Southeast Morris Municipal Utility Authority, New Jersey American Water Company), and non-Highlands water supply sources may have the capacity to provide water to Highlands Area municipalities (e.g., New Jersey American Water Company). Therefore, it is important to understand where these service areas overlap. To minimize the additional data gathering effort, the RMP will rely on available data, namely a NJDEP GIS product, to represent non-Highlands water supply service areas.

[1] Section 41 specifies that NJDEP "shall limit or prohibit the construction of new public water systems or the extension of existing public water systems to serve development in the Highlands preservation area as defined in section 3 of P.L.2004, c. 120 (C.13:20-3), except in the case of a demonstrated need to protect public health and safety, and except to serve development in the Highlands preservation area that is exempt from the provisions of P.L.2004, c. 120 (C.13:20-1 et al.) pursuant to subsection a. of section 30 of P.L.2004, c. 120 (C.13:20-28)).

e) Water Sources and Limitations

Available information on well and surface water withdrawal locations has been compiled in order to understand the impacts of water supply systems on water supply sources. It is possible to overlay the existing service areas with well locations and topography, for example, to have a rough idea of service zones and interconnections and gain an understanding of the capacity of the utility's water delivery system.

It is also necessary to understand the cross-connections between the natural resource constraints and engineered or regulated utility capacity limitations, i.e., identify the aquifers used as a water supply resource (and the aquifer's dependable yield, which is a matter of how much water can be pumped on a sustainable basis) and the reservoirs (and their safe yields, the sustainable water volume that can be taken from the surface water source) on which the water systems depend. Both quantitative and qualitative limits should be described where possible, to understand the potential limitations on both existing uses and future expansions.

The resource constraints can eventually be correlated with the utility capacity limitations by overlaying the current and planned service areas with their ground and surface water resource supply sources on mapped watersheds (HUC-11) and subwatersheds (HUC-14). By doing this, it is possible to understand the interaction of resource constraints and utility capacity in the overall scheme of water use, including which water supply systems export water and serve as water sources for other sub-watersheds and which are importing water from other sub-watersheds. This information is critical for translating the NJ Geological Survey's water tracking system ("NJWaTr"), which is based on HUC-11 watersheds, to a subwatershed scale. Information related to these issues, to be included in the Water Resources Technical Report, will be critical for understanding utility capacity as well, as those results begin with the water resource and then assess the impacts of use on the resource.

f) System Capacities and Water Allocations

Each public community water supply system has been constructed to provide drinking water to its existing and anticipated customers during both normal and peak flows. The water utility inventory compiles information on the capabilities of the system to provide treated drinking water that meets NJDEP requirements. Two different types of limits exist to system capacity – the physical infrastructure (e.g., pumps, treatment plants, storage) and NJDEP water allocation permits.

The physical infrastructure defines the limits for water delivery that are inherent to the system, while the NJDEP water allocation permits define the limits for water delivery that are inherent to the water resources (e.g., aquifer, reservoir system). In addition to water allocations that a system may have, the total system capacity may include contracted supplies from other water systems, which are supported by their own water allocation permits.

g) System Demands

Each system has a unique pattern of water demands, which are reflected in daily peaks, monthly peaks, seasonal peaks, annual demands and rolling averages. A focus on annual demands is not

sufficient, as various kinds of peak demands place stresses on system limits (physical infrastructure) and resource limits (allocation permits). Information on daily peaks is not reported to NJDEP and is more relevant to internal management than resource stresses; therefore, the system inventory includes monthly demands for the years 2000 through 2004, and an estimate of total customer connections in the year 2004. These data were provided by NJDEP.

h) Seasonal Peaking Factors

Summer demand for water tends to be highest, and is especially critical for impact assessment regarding surface water supplies. To understand the relationship of "normal" demands to peak demands, the inventory includes the peak three month demands (M3M, or maximum three contiguous months). To simplify the analysis, the monthly figures on delivered water were totaled for all systems, from 2000 through 2004, and the M3M for all systems was determined. Those three months were used as the M3M period for each utility.

i) System Commitments

Public community water supply system demands, as measured, will not reflect all demands for which the system is committed. There are two types of legal commitments that are not reflected in actual sales/delivered water. First, the system may have committed to supplying water to new development or redevelopment that is not yet "on line." Second, the system may be a regional supplier of water to other public community water supply systems, with contractual commitments for future supplies that exceed current levels. The first type of commitment is less flexible than the second, but both have been documented to the extent that data are available. Because the commitments to new development are frequently changing, and because the availability of municipal "shares" of remaining capacity may be more or less flexible, further detail will be needed for some of these systems.

j) Water Losses

Every public community water supply system will have a difference between the quantity of water that leaves the treatment system and the quantity of water that is actually billed to customers. Losses can occur in water mains, service connections, lateral lines, and non-billed uses such as fire fighting and water main flushing. The larger the system, the smaller the total percent loss should be, but small to moderate systems often will use 15% as a reasonable threshold for losses. The system inventory includes a rough sense of system losses between treatment facility and customers, and actions being taken to mitigate these losses.

Estimates of Water Utility Capacity

Based on the information described above, the net available capacity for any public community water supply system is derived by taking the total system capacity (the lower volume of water resulting from either the actual physical infrastructure capacity or from the volumes allowed for in the water allocation permit plus any additional water provided through contractual commitments with other suppliers) minus actual use and commitments.

The critical result of this analysis will be a comparison of net utility capacity (essentially, how much capacity the water utility believes it has available for future development) to net available water (from the Water Resource Technical Report). The analysis will allow the Council to identify areas where:

- Both utility and water resource capacity exist to support future development if no other constraints exist and the area is deemed appropriate for development in the Regional Master Plan,

- Water resource capacity exists but utility capacity does not, so that there is the potential for increases in utility capacity if needed to support future development if deemed appropriate,

- Water resource capacity does not exist and utility capacity does, indicating that the nominal utility capacity may never be fully utilized as a result of resource constraints, or

- Neither water resource capacity nor utility capacity exists, indicating an area that is highly constrained for future development.

Source Water Protection Issues

The New Jersey Statewide Water Supply Plan points out that protection of existing water supplies will be as or more important than the identification and creation of new supplies for supporting a strong economy in New Jersey. NJDEP has developed a Source Water Area Report for each public community water supply system, identifying the source water area (either surface water watershed or wellhead protection area) and potential issues for source water quality. The reports identify where there is a significant potential for future water pollution issues, such that more focused and rigorous source water protection activities are needed.

2) Domestic Wastewater Utilities

Domestic Treatment Works ("DTWs") are those wastewater treatment systems that serve more than one individual residential customer and treat primarily human sewage wastes. These systems are distinct from industrial treatment works (which treat primarily industrial process wastes from individual manufacturing sites) and Individual Subsurface Disposal Systems ("ISSDS", also known as septic systems, which handle sewage from individual homes).

DTWs include municipal and regional sewerage systems that are publicly-owned, similar systems that are investor-owned, and private systems that provide sewage treatment for apartment complexes, mobile home parks, and cluster developments.

These classes of DTW were selected for study in this report because these are the wastewater treatment systems that can legally provide sewage services to residential development and therefore have the greatest potential for inducing and supporting growth, assuming that the facilities have or could have capacity.

On-site sewage systems for industry, commercial buildings, schools and other institutional facilities are common in the Highlands, but these have little if any capacity beyond their property boundaries, and were not considered part of the wastewater infrastructure.

a) Existing Areas Served

In developing the RMP, it is critical to know what areas are currently served by "in the ground" wastewater collection systems, as a basis for planning. Several methods were used to compile the existing areas served. Some systems had computer-based mapping (CAD or GIS) available. In other cases, prior planning work had identified existing areas served using a combination of billing records, and line data.

b) Current and Planned Service Areas

NJDEP requires the identification of current and planned service areas in wastewater management plans. Most of these plans are out of date. However, the maps and/or descriptions provided in the wastewater management plans are the only approved sewer service areas, no matter how old they might be. In 2005, NJDEP proposed to replace all paper maps of sewer service areas with a GIS-based compilation, and has been working with local interests and others to upgrade the map. Available information on current and planned service areas has been compiled as necessary to identify technical changes needed to the draft NJDEP map.

c) Effects of the Highlands Act on Planned Service Areas in the Preservation Area

NJDEP has identified reductions in planned service areas in the Preservation Area. The Highlands Act requires, with limited exceptions, the deletion of any planned service areas that lack current in the ground service from the wastewater management plans.

d) Non-Highlands Service Areas

Highlands wastewater treatment plants may serve collection systems that extend beyond the Highlands Area boundaries and non-Highlands wastewater treatment plants may have the capacity to provide wastewater services to Highlands Area municipalities (e.g., Sussex County Municipal Utilities Authority). Therefore, it is important to understand these service area overlaps. To minimize the additional data gathering effort, the NJDEP map of sewer service areas was used to represent non-Highlands sewer service areas.

e) Treatment Systems, Discharge Locations and Receiving Water Limitations

The system inventory developed includes information regarding various aspects of the Domestic Treatment Works. The NJDEP database on NJPDES permits serviced as the basis for identifying facilities, which are subcategorized as Discharges to Surface Water ("DSW") and Discharges to Ground Water ("DGW"). The inventory also includes general information on the nature of the treatment system and of the receiving waters.

f) Affected Watersheds and Subwatersheds

By overlaying the existing and planned service areas on mapped watersheds ("HUC-11") and subwatersheds ("HUC-14"), it is possible to understand treatment plants receive wastewater from other subwatersheds. This information is critical for refining the New Jersey Geological Survey's water tracking system, which is based on watersheds, to a subwatershed scale.

g) System Capacity

Each DTW system has been constructed to provide wastewater services to its existing and anticipated customers year round and under any flow conditions. These flows change within the day and over the year. The system inventory compiles information on the capabilities of the system to treat wastewater to levels that meet all NJDEP requirements.

Two different types of limits exist to system capacity – the physical infrastructure (pumps, treatment plants) and NJDEP permit and approval limits (e.g., NJPDES, Treatment Works Approvals, Wastewater Management Plans). The physical infrastructure defines the limits for wastewater treatment that are inherent to the system, while the NJDEP permits and approvals define the limits for effluent discharge that are inherent to the receiving water.

In some cases, a system may receive wastewater from other wastewater collection systems under contract. In other cases, a system may have no actual treatment capacity, but rather is a "sending system" that flows to another system where treatment actually takes place. In either case, the treatment capacity of the ultimate receiving system is the critical point of information.

h) System Demands

As with water supplies, each treatment system has a unique pattern of wastewater demands, which are reflected in daily peaks, monthly peaks, seasonal peaks, annual demands and rolling averages. A focus on annual demands is not sufficient, as various kinds of peak demands place stresses on system limits (e.g., physical infrastructure) and resource limits (as identified in NJDEP permits). Flow rates are less affected by changes in water use (unlike water supply, which is affected heavily by outside water use in the summer season), but will be affected by infiltration and inflow during wet weather events. Information on daily peaks is not reported to NJDEP and is more relevant to internal management than resource stresses. Monthly peaks are important for discharges to surface water; therefore, the system inventory includes monthly demands for the years 2000 through 2004, and an estimate of total customer connections in the year 2004. Both monthly demands and annual average demands are important for discharges to ground water; the annual average demands are readily derived from the monthly data.

i) Seasonal Peaking Factors

Seasonality is less of an issue for wastewater systems than for water supply, but there still is significant value in assessing peak flows against system capacity. For this reason, the system inventory identifies the maximum three-month demands ("M3M", or maximum three contiguous months). To simply the analysis, the monthly figures on treated wastewater were totaled for all

systems, from 2000 through 2004, and the M3M for all systems was determined. Those three months were used as the M3M period for each utility.

j) System Commitments

Wastewater system demands, as measured, will not reflect all demands for which the system is committed. There are two types of legal commitments that are not reflected in actual wastewater flows. First, the system may have committed to accepting wastewater from new development or redevelopment that is not yet "on line." These commitments may be tracked by contracts or Treatment Works Approvals from NJDEP.

Second, the system may have agreements to accept wastewater from a member municipality or other wastewater collection systems, with contractual commitments for future treatment that exceed current levels. The first type of commitment is less flexible than the second, but both must be documented. The RMP will document information on each type of commitment to the extent possible, focusing on the major systems.

k) Infiltration and Inflow

Infiltration and Inflow ("I&I") is a measure of the wastewater reaching a treatment plant that is not derived from customers, but rather is from either leakage or non-metered flows into the wastewater collection system. The RMP will include an analysis of wastewater flows regionally to identify a time period where flows could be considered to have minimal I&I, as a point of comparison to the M3M flows. September 2005 was selected as the base period; this month had minimal rainfall, was preceded by three months with minimal rainfall, and yet had no water conservation requirements in place that could have constrained customer water use. I&I are estimated by comparing the September 2005 flows against the maximum three-month period. The greater the difference, the more potential there may be for creating capacity through I&I reductions. A more detailed analysis will be needed to address such issues, including costs, cost-effectiveness, impacts on treatment efficiencies, etc. Due to the complexity of such analyses, it will be appropriate to focus this effort on systems where capacity is desired but lacking to handle future development or redevelopment.

l) Available Wastewater Capacity

Each wastewater system will have more than one assessment of available capacity. Initially, the permitted capacity will be compared to the maximum three-month flow. Where there is an indication of available capacity, the next step is to determine whether that capacity is legally unavailable due to recent effluent quality violations (significant noncompliance), court orders, etc.

Where the available capacity is not constrained by legal actions, then questions must be answered as to whether member municipalities have contractual rights to the remaining flow for development that has not been approved or received Treatment Works Approvals (TWAs).

m) Constraints on Future Wastewater Capacity

This report will not include a detailed analysis of constraints on the potential for increasing capacity of wastewater systems due to time constraints. However, it is important to have at least a rough sense of the financial, receiving water or physical constraints on system growth. Financial constraints are generally defined based on the cost of wastewater treatment relative to household income. Water resource constraints are related to the availability of assimilative capacity in the receiving water for additional effluent discharges. Physical constraints can include site limitations for infrastructure construction. Where available capacity is inadequate for future demands that are deemed desirable by the Regional Master Plan, further analysis will be required on these issues.

n) Potential Wastewater Utility Demands Due to Pre-existing or Approved Development in the Preservation Area

Included in the discussion above were points regarding commitments for approved development that are not reflected in existing water supply system or wastewater treatment system demands. In addition to those flows that are documented by the relevant utility, there are potential flows that may be indeterminate at this time. Two circumstances are discussed here regarding the Preservation Area, both of which are specifically addressed by the Highlands Act.

The Highlands Act specifically exempts certain developments that had a combination of municipal and State approvals, and allows the creation or extension of public water and wastewater systems for such developments where the local approvals permitted public infrastructure (instead of relying on septic systems and domestic wells). In addition, the Highlands Act exempts certain kinds of developments, most importantly redevelopment areas and the construction of a single family home on a pre-existing lot. In some cases, these new homes will be capable of tying into water utility infrastructure that is already available in the neighborhood, but the Highlands Act does not allow for extension of water utility infrastructure in the Preservation Area to serve these single-lot, single home projects.

Some older communities and neighborhoods in the Highlands, including many that started as lake communities with summer homes, are now full-time residential areas with very small lots, septic systems and domestic wells. Such situations pose the potential for lake contamination (including algal blooms and beach contamination) and well contamination. The RMP will seek to identify such areas. It will be possible to compare areas of dense development (using the 2002 Land Use/Land Cover and parcel data) with existing water supply and wastewater service areas. Areas of greatest concern would be those with dense development and no sewer service, and especially such areas where there is no community water supply. Such situations may require, over time, the replacement septic systems with community wastewater systems.