4.4.D. DEC TECHNICAL AND OPERATIONAL SERIES (TOGS) 2.1.3 "PRIMARY AND PRINCIPAL AQUIFER DETERMINATIONS", AND "FINAL UPSTATE NEW YORK GROUNDWATER MANAGEMENT PLAN" PAGES IV-16 THROUGH IV-22
FINAL
Upstate New York Groundwater Management Program

May 1987
Contamination that enters groundwater within the water supply well-head area will eventually reach the pumping well. Where they can be identified with reasonable accuracy, water supply well-head areas merit the highest level of protection. In their own self interest, all municipal and other community water supplies should have their well-head areas defined.

For sizable public water supplies, the importance of water supply protection is sufficient to justify mandating the definition of well-head areas as a condition of Public Water Supply Permits. A reasonable size cut-off for such a requirement might be a water supply system that supplies 100,000 gallons per day, which is sufficient to supply approximately 1,000 people. It is believed that this requirement could be imposed using existing statutory authority.

The degree of accuracy, and therefore the complexity of hydrogeological investigation and/or analysis appropriate for defining well-head areas would vary considerably depending on local circumstances. For small supplies located in sparsely developed areas, a very inexpensive and approximate analysis might be sufficient. For larger supplies in more heavily developed areas, considerably greater effort may be justified to more accurately define the well-head area.

C. PRIMARY AND PRINCIPAL AQUIFERS

As reviewed in Chapter I, the groundwater resource in New York State is not uniform in quantity, quality, or economic value. There are wide variations in groundwater availability ranging from highly permeable, high yielding aquifer systems which underlie relatively limited geographic areas, to large geographic areas of relatively impermeable soils and low yielding groundwater resources. There are also wide variations in the degree of groundwater use; the presence of readily available alternative sources of water supply; and the presence of threats (e.g., urban development, point or nonpoint sources of contamination, overpumpage) to the resources.

Figure IV-2 (next page) illustrates the major patterns of groundwater availability and use.

The patterns of groundwater availability, use, and concomitant susceptibility to potential threats have led to the definition of three basic types of areas for which different degrees of management attention are appropriate. They are:

- Primary Water Supply Aquifers (black on map)
- Principal Aquifers (gray on map)
- Other areas (white on map)
1. Primary Water Supply Aquifer Areas

Primary Water Supply Aquifers are highly productive aquifers presently being utilized as sources of water supply by major municipal water supply systems.

Long Island is the largest of the primary aquifer areas. An extensive and highly complex aquifer system underlies all of Long Island including portions of New York City. This aquifer system is the sole source of water supply for roughly three million people, about half of the total groundwater dependent population in the State. It is subject to extreme land-use development pressure and to documented threats from synthetic organics and a variety of other contaminants.

Long Island is a special case because it is larger and more complex than any other groundwater dependent area in the State. It currently receives and must continue to receive the highest level of program commitment and the most complex level of management. It is the subject of a separate program report, the Long Island Groundwater Management Program.
The "primary" aquifers which have been identified in the upstate area provide the sole or primary source of water supply for several upstate urban communities. They are listed in Table I-3 on page I-9. Several currently have documented groundwater contamination problems. They are differentiated from other known or potentially high-yielding aquifers in the upstate area because they are more heavily used and because they are generally subject to the more intense contamination threats commonly associated with urban and industrial development. They merit intensive management focus because of these characteristics. Examples of management actions appropriate for the primary aquifers include:

- Mapping of aquifers and critical recharge areas so that everyone -- the individual private citizen, local government, and State regulatory agencies -- will be more aware of the potential effects their actions may have on these critical groundwater supplies.

- Special regulatory policies and/or controls for facilities such as landfills, petroleum bulk storage facilities, major wastewater dischargers, and major users of toxic and hazardous chemicals.

- Use of local land use control powers as well as environmental impact review processes such as SEQR to prevent adverse impacts of new development on groundwater.

Where aquifers are the sole or primary source of drinking water for an area, the locality can petition for USEPA "sole source" designation under provisions of the Federal Safe Drinking Water Act. Federally funded actions in such areas are subject to special project review procedures to protect groundwater. To date, three areas (Long Island, including Nassau and Suffolk Counties plus the Boroughs of Brooklyn and Queens within New York City, the area between Binghamton and Waverly along the Susquehanna River and the Schenectady area along the Mohawk River) have been designated within New York State.

Long Island is a true "sole source" aquifer in that it has no other feasible source of water supply than groundwater. In the upstate area, all of the "primary" areas could be considered strong candidates for sole source designation under the Federal law since they are the primary sources of water for concentrated urban populations.

The designation of sole source aquifers is entirely a Federal responsibility. New York State has no direct role in the process other than to comment to USEPA as the sole source petition is being considered. There is no mechanism to ensure that federal sole source designations will, in all instances, be consistent with the State's groundwater management objectives. However, DEC will support the designation of primary aquifers as sole source aquifers where there are petitions originating at the local level.
2. **Principal Aquifers**

Principal aquifers are formations known to be highly productive or deposits whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal water supply systems at the present time. Some water supply development has taken place in some of these areas but it is generally not as intensive as in the primary areas. These areas can be viewed as the Primary Water Supply Aquifers of the future. However, the potential yield of many of these areas has not been fully evaluated. The principal aquifers will generally require a less intensive management focus than the primary aquifers.

3. **Other Areas**

The "other" (unshaded) areas shown on Figure IV-2 are generally characterized by tight, relatively impermeable soils such as clay and dense glacial till. These areas typically yield only very limited quantities of water.

Although some isolated locations of significant groundwater yield and use may occur in these areas, they are generally suitable only for relatively scattered individual household supplies.

These areas will continue to receive the regulatory coverage already afforded by existing regulatory programs. Where significant categories of problems occurring in these areas can be identified on a generic basis, State agencies will seek to respond effectively through public education and technical information transfer.

D. **CRITERIA FOR DEFINING "PRINCIPAL" AQUIFERS**

Not all areas within New York State have been intensively evaluated and mapped with regard to groundwater resource availability. On the contrary, information in many areas of the State is sketchy. Figure IV-2 is a generalized representation of surficial aquifers for illustrative purposes only, and is based on limited current knowledge.

The concept of "primary" and "principal" aquifers used in this report is based on the pattern of unconsolidated water table aquifers in the State. Confined unconsolidated aquifer systems do not fall within the definition of these terms. Likewise, bedrock aquifers are not considered primary or principal aquifers, although in some cases they are vulnerable to contamination from the overlying land surface.

Where a bedrock aquifer is capable of yielding significant quantities of potable water and is vulnerable to contamination from the land surface over the aquifer, it clearly merits protection equal to that afforded a surficial aquifer of comparable yield. However, bedrock aquifers are often overlain by impermeable soils. The concept of using stringent regulatory policies within the land area over the aquifer does not always apply in the same manner as it would to surficial aquifers. Thus, regulatory objectives for areas overlying
bedrock aquifers must be based on a specific case-by-case evaluation of the local hydrogeology.

When an unconsolidated water table aquifer is ultimately proven capable of providing significant quantities of water to wells, the aquifer should then be considered a high yielding "principal" aquifer regardless of whether it is shown on a published map. In the discussion above, the definitions of primary, principal and other areas have been qualitative. However, there will be situations where quantitative criteria may be necessary to determine whether a specific location is considered to be within a principal aquifer area.

The most recent and most complete Statewide map of groundwater aquifers in New York State is the U.S. Geological Survey Open File Report 82-437 entitled "Availability of Water from Aquifers in Upstate New York," by Kantrowitz and Snavely. This report uses ten (10) gallons per minute as the minimum well yield boundary condition of surficial (i.e., unconsolidated) geologic deposits which might fall within the meaning of "principal" aquifer as used herein. However, this one criteria is not sufficient to fully establish whether the overall productive capability of the aquifer is sufficient to consider the aquifer a principal aquifer. Guidelines for determining whether an aquifer is a principal aquifer are:

- **Aquifer Area**: a minimum of five (5) to ten (10) square miles of contiguous area.

- **Aquifer Thickness**: the saturated thickness should average at least twenty (20) feet through most of the area with some areas at least fifty (50) feet thick.

- **Well Yields**: individual well yields should be 50 gpm or more from sizable areas (two square miles or greater).

These are general guidelines and cannot be rigidly applied. However, the general level of water resource capability suggested by these guidelines should be met.

DEC will establish procedures to determine whether an aquifer is a "principal" aquifer where there is significant uncertainty about a particular site and where the application of regulatory policies requires resolution of the issue.

E. **ADDITIONAL CATEGORIES OF MANAGEMENT CONCENTRATION**

Water supply well-head areas plus the three categories of "primary," "principal" and "other" areas provide the basic structure for geographical targeting of groundwater management emphasis. Several other types of areas can be used to provide further tailoring of programs to the characteristics of specific localities. These include:
- Identified critical recharge areas within primary aquifer areas.
- Identified special groundwater management areas within primary aquifer areas.
- Other areas hydrogeologically tributary to primary or principal aquifer areas.

1. Critical Recharge Areas

"Critical recharge areas" are defined as land surface areas through which relatively large volumes of water are recharged directly to an aquifer. Typically, this includes areas of highly permeable surficial soils which directly overlie portions of primary and principal aquifer areas.

Where critical recharge areas can be identified within primary water supply aquifer areas, they should be considered for special protective measures.

2. Other Special Management Areas

Other categories of areas within the primary water supply aquifer areas which can be identified for program focus include:

- Areas of high quality recharge where the land surface is currently undeveloped and there is an opportunity to protect recharge quality by controlling future development;

- Areas containing concentrations of industrial and commercial activities which commonly store and use hazardous chemicals and therefore may be of priority for special regulatory attention;

- Areas of potential overpumpage, which may require special quantity management programs.

These categories allow for tailoring of programs within the primary water supply aquifer areas to provide special focus on unique management opportunities or needs.

3. Other Areas Hydrogeologically Tributary to Primary or Principal Aquifer Areas

Many of the most important, high-yielding aquifer systems in the upstate New York area consist of highly permeable deposits within river valleys. In many instances:

- the aquifer can be affected by direct runoff from the often steep and relatively impermeable adjacent valley walls;
the aquifer is hydrologically interconnected with surface streams. Where groundwater pumpage exceeds local recharge, water can infiltrate from the stream into the aquifer.

Where wells are located immediately adjacent to the watercourse, large portions of the groundwater pumped may represent direct infiltration from the surface stream. Management actions such as upgrading of the stream's best usage classification to reflect this relationship may be appropriate in these circumstances.

The extent of tributary areas which should receive priority management focus will depend heavily on the specific local circumstances in each aquifer area. In general, intensive management focus should be limited to immediately adjacent tributary areas and will only be necessary where there are substantial identified threats within those areas.

F. USE OF GEOGRAPHIC TARGETING

The categories of geographic areas discussed in this section provide the basis for focusing groundwater management activities to emphasize protection of those resources which are the most important and the most vulnerable.

Table IV-1 is the format through which appropriate geographically targeted management policies will be displayed for several of the major regulatory program areas covered in subsequent sections of this Chapter.

The seven categories of geographic areas are listed in the left-hand column. The fundamental priority sequence is well-head, primary, principal, and other. The additional categories listed may not apply in all local situations, and could shift in priority depending on local circumstances. The two blank columns are for identifying the appropriate program policies for (a) existing facilities, and (b) proposed new facilities.

As a general rule, the appropriate program actions will be more stringent for higher priority geographic areas, and more stringent for proposed new facilities than for existing facilities.

Table IV-1 could be used to identify a total of fourteen (14) separate and distinct regulatory actions (i.e., one corresponding to each "box" in the table). This will not be the case in actual practice. More typically, each regulatory "action" will apply to several of the geographic categories within the framework. This will become evident to the reader on examination of this Table as it is actually used in subsequent sections of this report.

IV-22