March 16, 2006

Mr. Bruce Berg
CONCORD ASSOCIATES, LP.
115 Stevens Avenue
Valhalla, NY 10595

RE: Report
Hydrogeologic Evaluation &
Preliminary Water Supply
The Concord Resort
Town of Thompson, NY

Dear Mr. Berg:

CA RICH CONSULTANTS, INC. (CAR) of Plainview, NY provides this Report entitled: Hydrogeologic Evaluation & Preliminary Water Supply for the above-captioned Concord Resort Development Plan. This Report has been prepared in accordance with our Agreement as authorized on February 6, 2006.

Should you have any questions, please do not hesitate to contact us.

Respectfully submitted,

CA RICH CONSULTANTS, INC.

Richard J. Izzo, C.P.G.
Associate

Stephen J. Osmundsen, P.E.
Senior Engineer

Charles A. Rich
President

RJI:SJO:CAR:tk
Attachments

cc: Henry Zabatta, Concord Associates L.P.
John Saccardi, Saccardi & Schiff
Tony Bonagura, Divney Tung Schwalbe, LLP

HYDROGEOLOGIC EVALUATION
&
PRELIMINARY WATER SUPPLY

CONCORD RESORT PLAN PROPOSAL
TOWN OF THOMPSON, NY

March 2006

Prepared For:

CONCORD ASSOCIATES, LP.
115 Stevens Avenue
Valhalla, NY 10595

Prepared by:

CA RICH CONSULTANTS, INC.
17 Dupont Street
Plainview, NY 11803

TABLE OF CONTENTS

HYDROGEOLOGIC EVALUATION
&
PRELIMINARY WATER SUPPLY

THE CONCORD RESORT PLAN PROPOSAL
TOWN OF THOMPSON, NY

EXECUTIVE SUMMARY

The most productive aquifers within the 1700-acre Concord Resort property are potential Pleistocene sand & gravel ('stratified drift' valley-fill deposits) mapped within the central valley area, and underlying buried fractured Paleozoic bedrock. Aquifer pumping test information is extremely limited. However, based upon regional information, screened & cased wells completed in sand & gravel may yield in excess of 100 gallons per minute (gpm), whereas deeper rock wells may produce yields on the order of about 30-40 gpm. At present, the most widely exploited water-bearing unit is bedrock because it is the most commonly available aquifer.

The property is situated within an approximate 11-square mile rural subwatershed within the Delaware River Basin. Groundwater recharge within this entire subwatershed is estimated to average approximately 4.2 million gallons per day. The existing water use from pumped well water withdrawals, combined with the volume of groundwater underflow estimated to replenish 'spring-fed' Lake Kiamesha, situated immediately next to the property, is estimated to average about 500,000 gallons per day. This volume represents approximately 12% of subwatershed recharge. The water demand to satisfy the Plan at full build-out will represent about 33% of the average groundwater recharge leaving a recharge balance of 66% for other users. Based upon the above assumptions, an independent water system utilizing potential groundwater resources may be developed across the Concord Resort site.

A site-specific groundwater exploration and development program will be performed along with design and implementation of a suitable water resource management plan to parallel the anticipated phased development of this project over several years. The approach to the eventual full-scale water system will be systematic – achieved through development of a series of relatively small groundwater systems to respond to local point-of-use water demands. Each localized public community or non-community water system will be an independent system. Successive systems will be subject to requisite Site Plan Reviews and all applicable rules and regulations. At present, twelve likely test well exploration sites are identified for further on-site exploration. Pending test results, selected wells may be eventually converted into permanent wells, or well fields.

The estimated average water demand for the proposed project is 1,400,000 gallons per day (gpd). The peak hourly demand is estimated at 180,000 gallons per hour (gph) and requisite storage for fire protection and demand requirements is 1,500,000 gallons.

1.0 INTRODUCTION

1.1 General

CA RICH CONSULTANTS, INC. ("CA RICH") of Plainview, NY presents the following Hydrogeologic Report summarizing an initial evaluation of existing water resources, groundwater availability, and water supply potential for the "Concord Resort" development plan.

The scope of work was initiated in two phases, Phase I Project Initiation, and Phase II Decision Development. The purpose and objectives of this evaluation are outlined in Section 1.2. Further investigation involving site-specific groundwater exploration and demonstration work to establish design of the water system will be performed in subsequently-phased activities subject to the review and approval of concerned parties.

This water Report is prepared for its anticipated inclusion in the subject Draft Environmental Impact Statement (DEIS) prepared by others pursuant to SEQRA requirements. It is understood that the purpose of the DEIS is to satisfy certain environmental information needs deemed necessary and appropriate for Amendments to the Zoning Map and Zoning Code (for a zone overlay) and for Approval of a Comprehensive Development Plan subject to review and approval by the Lead Agency: the Town of Thompson.

1.2 Purpose and Objectives

The purpose and objectives of this Hydrogeologic Evaluation and Preliminary Water Supply Report are fourfold: 1) review certain subsurface conditions prevailing within the drainage basin surrounding the Concord Resort property, 2) derive a preliminary generalized hydrologic water balance for the subwatershed, 3) assess and understand pre-existing pumpage and water sources at and in proximity to the Concord Resort property, and 4) develop a preferred conceptual approach, if determined feasible, to the design of a preliminary water supply system to meet the projected water demand for the project. The results of this investigation serve as the basis for further exploration of subsurface conditions to facilitate a requisite demonstration that sufficient potable groundwater resources can be provided on a safe-sustained basis without causing detrimental impacts to any neighboring water users.

The next phase of work will enable informed decisions regarding projected water needs, preliminary water system design and well head and water treatment specifications and storage recommendations determined necessary to meet the average daily demand, hourly peak flow demand, and requisite fire demand requirements of various parts of the development plan. It is understood that the design and development of any new and independent water systems to satisfy the overall water demand of the plan will need to consider that full-plan build-out will occur over time in response to market conditions. As such, any water system, or series of localized smaller water systems that are contemplated and that will eventually be interconnected, will need to be designed and developed in a systematic fashion over time with each subsequent system installation or expansion subject to the Site Plan Approval review process.

1.3 Site Description

The Concord Resort property is situated directly east and southeast of Kiamesha Lake in the Town of Thompson, just north of the Village of Monticello, NY. The property comprises approximately 1,735 acres of contiguous rural land between NYS Route 17 (between Rt. 17 Quickway Exit Nos. 107 & 105) to the south, and Kiamesha Lake Road (Rt. 109) to the north.

The site is improved with two active 18-hole and one 9-hole golf courses, a 42-room golf resort, and the prominent, but vacant, former 1,500-room Concord Hotel. There are a variety of other improvements such as various support facilities, several pre-existing detached homes, and seasonal camp bungalows, some additional outparcels, and wooded lands and ponds. The central interior north-south trending lower-lying portion of the property is used for golf course purposes. The land to the east and west of the golf courses rises up gradually to afford rural views.

On-site, access and service is provided by three roads: Concord Road to the west (off of Route 42 leading into the Village of Monticello), Chalet Road to the north and east (off of Route 109 to the north), and Thompsonville Road to the south (bisecting the property in a northeast/southwest direction between Monticello and Thompsonville). There is also a concentration of several houses and bungalows in the vicinity of the intersection of Thompsonville Rd. & Chalet Rd. on the site's eastern upland side.

For purposes of this discussion, the existing property consists of unimproved woodlands in the higher upland areas, and golf course and some mapped NYSDEC wetland areas in the lower-lying areas. The principal drainage feature is Kiamesha Creek, a first-order stream that drains the property as well as its subwatershed basin area comprised of several square miles of additional rural lands to the north. The property and its subwatershed are illustrated on Figure 1.

1.4 Project Water Demand

The full-scale Concord Resort proposal consists of a planned mixed-use development with 3,000 new single-family and detached residential units, approximately 625,000 square feet of destination and other retail uses, approximately 400,000 square feet of convention center and back of house support use, a country club and a 500-room hotel/spa.

Based upon the projected land use outlined above, an estimate of the average day water demand for this project is 1.4 million gallons per day (DEIS Site Utility Report prepared by Divney, Tung, Schwalbe, LLP). To satisfy this project water demand, it is anticipated that, similar to present-day practices within the surrounding area, a sustainable supply of potable water will be derived through available on-site groundwater resources. Because both surface water and groundwater resources occur locally, it is important to understand their hydrogeologic interrelationships to manage system withdrawals efficiently with minimal disturbance to the water balance equilibrium.

The golf course irrigation demand on-site may be approximately 3-5 million gallons per month (equivalent to a daily 24-hr. average of 70-100 gallons per minute, gpm) during the active golfing season between April through October. This water is derived from on-site surface water sources – including one holding pond which is supplied with permitted effluent discharge from the Town of Thompson’s Kiamesha Lake Sewer Treatment Plant since other ponds and Kiamesha Creek may not be necessarily reliable during prolonged dry or drought conditions.

1.5 Conceptual Approach to Water Supply

To satisfy water demand at full build-out, the conceptual water system anticipates the utilization of several, newly-developed and eventually interconnected, well field sites as new community water sources to service the various areas of the development plan. The balance of any further requisite demand, as well as the provision of any additional emergency backup supply, may be supplemented/augmented by imported water from an existing water purveyor(s) in the area. Such service may originate from a combination of pre-existing and/or newly-developed adjacent groundwater and/or surface water reserves pending several considerations including system capacity and infrastructure requirements.

Should it be determined that water main interconnection(s) to one or more off-site system(s) is desirable, then a possible option such as the future negotiation of a newly-formed water district and/or an inter-municipal water agreement with the Town of Thompson and, say, the Village of Monticello water system, could be considered. For example, interest in the further consideration of such a potential arrangement is acknowledged by concerned parties.

The projected build-out of the plan is to be completed in a series of sequential phases (responsive to market demand over the course of several years). As such, based upon an assessment of the current situation, development of the preliminary water supply system will progress systematically as a series of small new community systems in accordance with demonstrated potential to satisfy sufficient and sustainable water demands in specific land use development parcels across the property. During build-out, as the smaller planned systems are brought on-line, at some point, they will be interconnected into an overall water system larger in size and capacity.

Initially, new or augmented water system development will be centered at or near the point-of-use in response to phased development priorities. Each successively-developed well field (centers of groundwater pumpage) will be tested for its localized 'safe sustained yield' and any potential groundwater interference effects with pre-existing pumpage. These well fields are then tied-in (interconnected) to the larger existing, or newly-added, adjacent water sources on an as-needed (NYSDEC-permitted) basis; and as deemed prudent in the given situation, in conformance with all applicable regulations.

A detailed review of the feasibility and impacts (if any) of safely withdrawing 1.4 mgd from a combination of both surface water and groundwater resources within the subwatershed is limited due to the exiguous database in this rural area. As such, discussion describing the full-scale water system must remain conceptual at this time. It is based upon collection and review of readily available and reasonably ascertainable area-wide hydrogeologic information, along with selected interviews with local water system management professionals knowledgeable of the capacities of their own water systems in the area. However, as new information is developed and site-specific subsurface groundwater conditions are better understood, and related infrastructure information is further developed, evolving water system capacity criteria will be reviewed and a recommended technical approach for each of the phased developments of the water system(s) will be refined – and possibly subject to further interpretation and revision.

2.0 TOPOGRAPHY & GEOLOGY

2.1 Topography

United States Geologic Survey topographic quadrangle maps (USGS 1966, Monticello) and local site-specific surveys indicate that site lands range in elevation from 1,200 ft. above mean sea level (a.k.a. National Geodetic Vertical Datum of 1929) along the most eastern boundary near Thompsonville up to 1,555 feet above mean sea level (MSL) in the vicinity of the site's northwest corner (near Route 42) providing an overall topographic relief site-wide of about 350 feet. The highest on-site elevation in the undulating upland area east of Chalet Road is just to the northeast of the intersection of Thompsonville Rd and Chalet Rd at about 1,500 ft. MSL (Ed. Note: the elevation of the intersection is 1,437 ft. MSL). Across the narrow valley and up the west side of the site, the highest elevation occurs just south of the former gas station property along Concord Road at 1,551 ft. MSL.

The topographic elevation of Kiamesha Creek where it enters the property is 1,370 ft. MSL. This Creek then flows downstream eastward and northward through the golf courses for at least 2.5 miles, where it then bends to the east near the northeast property boundary (just south of Route 109; aka Kiamesha Lake Road). In this general area, the Creek elevation is at about 1,230 ft. MSL. Consequently, the fall in streambed elevation from the upstream inflow point, where streamflow enters the site near Route 17, on down to its general northernmost downstream point near Route 109, is 140 feet, which when spread over the stream's reach is equivalent to a 'fall' of about 56 ft/mile.

Most of the mid-central lower-lying property along the narrow Kiamesha Creek stream valley is relatively flat (having 0 to 5 percent slopes) with the upland areas having between 10 percent and 20 percent slopes.

There are several prominent golf course irrigation ponds/water hazards flanking Thompsonville Road (in the south-central part of the property). The elevation of the surface water in these ponds reflects the elevation of the water table within the unconsolidated uppermost valley-fill soil deposits in proximity to these ponds (assuming unconfined aquifer conditions). Here, pond elevations are at about 1,340 ft. MSL.

2.2 Geology

2.2.1 Surficial Geology

The surficial geology throughout Sullivan County and more specifically, at the Concord Resort and its environs, is primarily composed of unconsolidated glacial sediments of Pleistocene age (Soren 1961). These deposits are chiefly characterized as glacial till (an unstratified, poorly-sorted, mixture of clay, silt, sand, gravel, cobbles & boulders) and glacial outwash (well-stratified, well sorted, sands and gravels). The latter deposits are more predominant in occurrence, thickness, and areal extent within major stream valleys (for example, South Fallsburg) while the former are more prevalent in upland areas and in areas where stream valleys do not exist.

Till is considered a poor aquifer material as the unstratified nature of the materials does not afford the primary permeability and uniform porosity characteristics preferred to produce sustainable yields of ground water to wells. However, certain till deposits have been found sufficient for lower yield applications such as certain single-family residential domestic wells. Conversely, glacial outwash is considered an excellent aquifer material where present in sufficient thickness and lateral extent. Fully-saturated, stratified sand & gravel glacial outwash deposits are capable of producing reliably higher yields to properly designed, screened-and-cased wells.

On-site, the unconsolidated deposits within the Kiamesha Creek stream valley are mapped as potentially-significant water-bearing sediments (Soren 1961; EHC 1988). However, this on-site water resource potential has not yet been sufficiently investigated or documented.

According to Julian Soren's 1961 Sullivan County Report, stratified drift deposits occurring within major regional stream valleys having thicknesses of between 75 & 100 feet *"..are not uncommon"*. In relatively smaller stream valleys (such as the Kiamesha Creek stream valley), the expected thickness of the uppermost glacially-derived deposits varies and will likely be less, perhaps more on the order of 10 to 50 feet, or 30 feet on average. The approximate geographic location of these potential deposits is mapped on Figure 2 although there is insufficient information to characterize their thicknesses.

The potential glacial 'valley fill' deposits mapped on Figure 2 could cover an on-site geographic area of roughly 500-700 acres. If one conservatively assumes that 50% of such deposits (approx. 250 acres) occurs as fully-saturated, homogeneous stratified drift with an average 30 ft. thickness, and a 7-ft average depth to water, then such a unit might represent a potential volume of saturated sand and gravel on the order of 250 million cubic feet. Sand and gravel has a specific yield of approximately 20%. Therefore, about 375 million gallons should be available. However, even with the best spaced well array, probably about half of this water calculated as specific yield could ever be pumped. Therefore, the amount of water stored in the sand and gravel on-site is conservatively estimated to be about 200 million gallons. Such pumpage must be properly managed to prevent potentially undesirable or deleterious water level drawdown and/or water quality problems. This scenario is postulated to demonstrate that should such a potential volume of stratified drift be found, it could represent a significant, valuable, and sustainable source of localized water supply for the project.

2.2.2 Bedrock Geology

The buried bedrock underlying the property is classified as Upper Devonian Age sedimentary rocks of the West Falls Group, Upper Walton Formation (NYSMSS 1970).

According to the Geologic Map of New York State, a buried geologic contact may occur beneath the property. A contact zone marks the stratigraphic separation or break in the historically continuous deposition of these sedimentary rocks. In short, the contact marks the separation of the upper Walton from the Lower Walton Formations. The older, deeper rocks of the Lower Walton are characterized as *"an interbedded marine sequence of medium-grey siltstones, sandstone, and thin shales, overlain by an interbedded continental (non-marine) sequence consisting chiefly of red and gray-green shale, fine to coarse sandstone, and fine quartz-pebble conglomerate"* (Soren, 1961). From a water prospecting perspective, it is important to recognize that the structural bedding planes of the bedrock dip gently to the southwest.

The bedrock beneath the Concord Resort property does not exhibit the primary permeability and porosity features attributable to unconsolidated sands & gravels. Instead, the occurrence and abundance of groundwater resources within this bedrock is largely dependent upon the presence, size, concentration, and interconnection of saturated secondary permeability features including structurally-controlled faults, joints, fractures and bedding planes within the rock.

Some smaller bedrock fracture systems are often highly localized. These may occasionally be reflected on the natural land surface by pronounced topographic features. Larger groups of fractures or potential faults or fault zones may be interconnected and indicative of regional structural bedrock lineaments that tend to traverse a much larger regional area (several thousands of feet in length, etc.). Lineaments, when known, usually characterize areas of a series of mappable faults trending in a preferred compass orientation that correlate with each other.

CA RICH reviewed topographic information and aerial photography, and inspected selected bedrock outcrops in the area, and in doing so, concluded the possible occurrence of one major northwest-southeast trending structural lineament along the axis of three major lakes: Anawana Lake, Baileys Lake & Kiamesha Lake. Another smaller secondary lineament may also occur trending generally in a northeast-southwest orientation along the Kiamesha Creek stream valley through the property. The approximate locations and orientation of these two suspect lineaments are mapped on Figure 3.

3.0 HYDROGEOLOGY

3.1 Surface Water

Kiamesha Creek is the principal northward flowing perennial stream flowing through the central portion of the property with a stream course at least 2-3 miles in length through the central part of the site. There are three second-order tributary streams draining into this Creek at their confluence near Thompsonville Rd. & Route 17. The presence of this confluence is indicative of the possible occurrence of a relatively thicker suite of underlying saturated unconsolidated deposits within this area and such deposits (as discussed in Section 2.2.1, above) may be productive for water-bearing, as well as aquifer recharge purposes.

At the confluence, one of the two streams draining into Kiamesha Creek is from Stackhouse Pond off-site to the west, which in turn, is hydrologically connected to outflows from Baileys Lake and Anawana Lake (1,440 ft. MSL) further upstream to the north. The second tributary joining Kiamesha Creek is called Tannery Brook, which flows down from the south with its headwater area situated within the eastern part of the Village of Monticello (south of Route 17). Nearby this confluence, there is also a State-permitted piped effluent discharge from the Town of Thompson’s Kiamesha Lake Sewer Treatment Plant.

Finally, there is a third, intermittent tributary feeding into Kiamesha Creek that is surface outflow (and underflow) from Kiamesha Lake (1384 ft. MSL). Kiamesha Lake (also called Lake Kiamesha) is a locally prominent 150-acre 'spring-fed' lake serving as an existing long-established reliable source of public water supply immediately west of the property. The northwestern boundary of the Concord Resort property has about 2,500 feet of waterfrontage on Kiamesha Lake.

Kiamesha Creek flows northeast through the property with its eventual discharge into Sheldrake Stream, which ultimately discharges into the Neversink River off to the east. The Creek is not part of the protected NYC Watershed System. Base flow in the Creek is not gauged. As such, regular flow measurements recording seasonal changes in streamflow are unavailable.

For purposes of estimating a hydrologic budget (water balance) to identify any potentially significant impacts to existing water resources caused by plan improvements, the area of general study has been defined as those lands comprising the immediate local subwatershed area surrounding the site. This area has been delineated by CA RICH hydrogeologists and is referred herein as the Kiamesha Creek Subwatershed area ('KCS'). The KCS, approximately 11 square miles in size, is situated within the much larger regional Delaware River Drainage Basin. The approximate extent and generalized configuration of the KCS is depicted on Figure 1.

There are ten surface water features present within the KCS (excluding Kiamesha Creek). Of these, there are four named lakes identified from north to south as Anawana Lake, Frazer Lake, Baileys Lake, and Kiamesha Lake. Most of the surface water drainage from all four lakes converge as surface flow that drains into Kiamesha Creek flowing through the Concord Resort property. This surface water flow regime is illustrated on Figure 4.

3.2 Ground Water

Available groundwater resources occur within two subsurface systems. The uppermost system (as described in Section 2.2.1) occurs as saturated and permeable portions of any surficial unconsolidated outwash and till deposits, where present. The second deeper and thicker, fractured bedrock system consists of saturated portions of interconnected fractures, faults and joint plane systems occurring within the underlying competent bedrock. Where stratified drift occurs upon (over) underlying fractured bedrock, the two 'aquifers' may or may not be in hydrologic communication.

The storage capacity of a fractured bedrock aquifer system varies and it is difficult to predict long-term safe sustained well yields. The converse is true with wells drilled into sufficient thicknesses of stratified drift (outwash). Throughout Sullivan County, well yields have historically been measured to vary from a low of 2-10 gallons per minute (gpm) up to as much as 120 gpm (Soren, 1961). Recent groundwater exploration and testing directly within the KCS indicate well yields ranging as high as 250 gpm in close proximity to a lake (Continental Placer, 2003). However, in the latter case, it is probable that such high well yield is due principally to induced infiltration from the lake.

3.3 Groundwater Flow

The water table represents the uppermost, unconfined surface of fully-saturated aquifer materials. A potentiometric surface represents aquifer water levels under confined or artesian conditions. The elevation of this surface is dependent upon the water-transmitting properties of the consolidated bedrock aquifer materials, their thicknesses and areal extent, and the location of natural recharge and discharge points. The configuration of this surface, once mapped, can be used to determine the horizontal or lateral direction and rate, or groundwater velocity, of shallow groundwater flow under natural conditions.

The elevation and configuration of the water table or potentiometric surface on the property is not available due to the absence of water level elevation data collected from a sufficient number of wells. In the absence of local water level data from wells, and utilizing an assumed vertical fall for Kiamesha Creek of 140 feet, and a corresponding water table slope within the unconfined valley fill deposits that could be expected to mirror Creek topography, the hydraulic gradient for the natural water table (from south to north) may be approximately 0.01 ft/ft.

Groundwater flow paths within the deeper fractured bedrock aquifer, unlike flow within the shallower unconsolidated glacial deposits, are controlled by the occurrence, density, geometry and frequency of interconnected fully or partially-saturated bedrock fractures, indicative of secondary permeability and porosity characteristics. Because fractures within the buried bedrock are not fully-saturated uniformly, the direction of flow in this type of hydrogeologic environment is often difficult to predict locally. However, flow typically follows paths of least resistance such as zones of greatest fracture faulting or joint density.

The predominant directional trend of bedrock fractures occurring in this portion of the subwatershed is north/south. Unless there are influencing circumstances such as a zone of groundwater capture caused by a large scale pumping center, it is presumed that the natural direction of deeper groundwater flow conforms to the geologic trend of the bedrock fracture system.

3.4 Aquifer Recharge Areas

Recharge to a stratified drift aquifer generally comes from rainfall directly over the aquifer itself. The on-site streams and wetland areas such as Kiamesha Creek, represent areas of groundwater discharge, surface water impoundments, or areas of low infiltration.

A stream that receives groundwater underflow is referred to as a gaining stream. Kiamesha Creek could act to recharge the aquifer if sustained groundwater pumpage exceeds groundwater underflow into the stream (base flow), thus changing the Creek from a gaining stream (i.e. one that captures groundwater discharge) into a losing stream (one that contributes to groundwater recharge). This phenomenon may impact streamflow stage during periods of lower than average rainfall.

The locations of bedrock aquifer recharge areas are not defined. On-site, bedrock aquifer recharge areas are commonly associated with areas of fractured bedrock outcrop as well as the higher elevation areas of the property that may be indicative of shallow or near surface bedrock occurrences. Exposed bedrock outcrop areas are most likely localized sources of rainwater infiltration down into the bedrock aquifer.

An additional complication is rock type. At the site, the hilly areas typically represent bedrock that has been more resistant to erosion in geologic time such as sandstones and conglomerates. The valley areas, by contrast, are typically indicative of softer shale rock that has been more susceptible to erosion over geologic time. In this case, it may not be possible to correlate bedrock aquifer recharge areas simply with rock outcrop exposures on higher ground. Downward percolating rainfall recharging stratified drift deposits in valley-fill areas may also serve to recharge the deeper, underlying fractured bedrock aquifer as well.

4.0 HYDROLOGIC BUDGET

4.1 Water Resources

The overall circulation of water from the earth's surface and groundwater up through the atmosphere, and returned back down to the earth as precipitation, and finally back to either continental surface water and/or groundwater, denotes the hydrologic cycle.

An estimate of the amount of water entering or leaving the groundwater reservoir within the subwatershed and the amount stored in the reservoir is an indication of the total amount of groundwater that is available. In general terms, of the total precipitation, which falls on a specific subwatershed in this region, approximately half is consumed through the joint processes of evaporation and transpiration (plant uptake). This joint process is referred to as evapotranspiration. The remaining portion is generally divided between surface runoff (to lakes and wetland areas) and groundwater recharge.

Natural hydrologic systems are normally in a state of equilibrium. Therefore, for the purposes of calculating the hydrologic budget for the Kiamesha Creek Subwatershed (KCS), we assume that groundwater recharge is balanced by an equal amount of groundwater discharge. Consequently, any approximation of the amount of water recharging the stratified drift and/or fractured bedrock aquifer on-site is directly proportional to the percentage of precipitation represented by groundwater recharge as expressed in the following equation:

$$P = Rs + Rg + ET$$

where:

P = annual precipitation

Rs = direct surface runoff

Rg = groundwater recharge

ET = evapotranspiration

The hydrologic budget for the 11-square mile Kiamesha Creek Subwatershed, based upon reasonably available reference data, and our professional experience in this area of New York State, is summarized below:

	INCHES/YEAR	GALLONS PER DAY (gpd)
ANNUAL PRECIPITATION	50	26,185,328
ANNUAL RUNOFF	25	13,092,664
Groundwater Recharge	8	4,189,652
Surface Water Runoff	17	8,903,012
ANNUAL EVAPOTRANSPIRATION	25	13,092,664

These numerical values are based upon a mean annual precipitation of approximately 50 inches (NOAA 2002), half of which is lost, chiefly, through the process of evapotranspiration. The region has a humid continental climate with long winters, short summers, and abundant rainfall with average monthly rainfall fairly evenly distributed throughout the year. The turf growing season (golf courses) generally lasts from the middle of April to early October. This is the time of year when evapotranspiration losses are greatest. The period of greatest recharge in the KCS is in late Autumn and early Spring.

The rate of groundwater recharge within the subwatershed is approximately 8 inches annually. This figure, the equivalent of approximately 1.5 billion gallons per year (or 4.2 million gallons per day (mgd) for the approximately 11-square mile subwatershed, is conservative in that it considers periods of both above average as well as below average rainfall (periods of drought).

4.2 Water Usage

4.2.1 Existing Public Water Supply Systems

There are two prominent public water systems supplying water to two centers of population around the Concord Resort within this part of the Town of Thompson. One is the Kiamesha Artesian Spring Water Company (KASWC) and the other is the Village of Monticello Water Company. Both of these water systems rely upon conjunctive water usage drawing their separate water supplies from groundwater wells and from surface water intakes on Kiamesha Lake. In general, the KASWC purveys water to customers to the northwest and west of the site from its northern Lake facilities; and the separate Village of Monticello water system purveys water to its larger municipal customer base to the south from its Water Department facilities situated on the southwestern side of the Lake.

There is also a sewered area referred to as the Route 42 District situated generally between these two water system franchise areas west and southwest of the Lake that is supplied by water from the KASWC although it is understood that the water mains are owned by the Town of Thompson.

4.2.1.1 Kiamesha Artesian Spring Water Company (KASWC)

The Kiamesha Artesian Spring Water Company (KASWC) is a long-established localized water distribution system that primarily draws its potable public water supply from a ground water source (bedrock wells near the Lake) supplemented, as needed, by a surface water intake on Kiamesha Lake. KASWC was organized as a corporation on April 10, 1910 and it initially utilized at least four Lake intakes (prior to 1939) along with three artesian wells drilled in the vicinity of the pump station.

The three original wells reportedly range in depth from 131 to 440 feet deep with two of them averaging 50 gpm each (the third was low-yielding at 15 gpm) - for a combined total groundwater yield capacity of about 100+ gpm. The date of the installation of the original surface water intake lines first extended into the Lake is not known.

The original franchise customer service area of the KASWC coincided with the hamlet of Kiamesha Lake. The system now serves approximately 500 customers and includes Kiamesha Estates next to Kiamesha Lake and the designated mixed-use 'Route 42 Water District' immediately to the south.

The two active bedrock wells connected to the system are referred to as the Filtration Plant Well and the Frazer Road Well. Historically, the KASWC system also included a third on-site bedrock well called the Concord Well located away from the Lake to the east (adjacent to the Concord Hotel Golf Maintenance Shop). This well, historically called the "Concord Well" was installed in the early 1980s to a depth of about 300 feet. It was leased as an additional supply well and connected into KASWC's distribution and storage facilities (KASWC may own an existing water main along Route 109). The Concord Well remains active but was disconnected from KASWC in 1999 and, together with a second nearby bedrock well, now supplies well water locally to the nearby Concord-related facilities along Chalet Road.

KASWC's pumped well water withdrawals are in addition to its pre-*Compact* (Delaware River Basin Commission) surface water intake source of public water supply. Both the KASWC pump station and its filtration plant are located along the northeast side of Lake Kiamesha adjacent to Route 42 near the intersection of Route 109. The water is pumped up to two nearby elevated storage tanks of 440,000 and one million gallon capacity for gravity-fed distribution. The two visible standpipe storage tanks are situated at an elevation of about 1,550 feet MSL north of Route 109 (Kiamesha Lake Road) directly opposite and across the street from the former Concord Hotel complex.

Water from the KASWC is distributed throughout the company's franchise area. In the past (1950s), the distribution system has consisted of several thousand feet of pipe varying in size from two inches up to ten inches in diameter including at least 2,200 feet of 10" line, 2,500 feet of 8" line, 600 feet of 6" line, and several thousand feet of lines 4" in diameter and smaller. During the Catskill resorts heyday in the 1950s and early 1960s, water demands servicing the resort areas varied and were subject to extreme seasonal fluctuations. Historically, it is of interest to note that as much as two-thirds of KASWC's total annual demand was drawn during the 100-day period between June 1 and September 8.

Currently, water demand for the existing KASWC franchise is estimated to be less than 140,000 gpd during the winter months and is satisfied through pumpage from the KASWC well(s). During warmer summer months, demand increases and water well pumpage is supplemented by surface water intake from the Lake. Peak demand for the system is estimated to be on the order of 250,000 gallons per day (based upon an assumed averaged water usage of up to 500 gpd per franchise area user). Satisfying peak demand may necessitate 'supplemental' pumpage of about 110,000 gallons per day from the Lake.

Presently, KASWC has the capacity to draw from its two currently-active water wells: the Filtration Plant well and the Frazer Road Well. Of these, the Filtration Plant well is by far the better yielding of the two and at the time of this review (Feb 2006), is being chiefly relied upon during cooler winter months to adequately satisfy system water demands (personal communication: Alan Schachnovsky, KASWC). The Filtration Plant well and the Frazer Road Well are each 110' deep and 200' deep, and fitted with submersible pump capacities at 90 gpm and 67 gpm, respectively. The Filtration Plant well was drilled before 1900, and the Frazer Road well was drilled in 1988. The Concord Well, drilled in 1975, that formerly supplemented the KASWC system is 310 feet deep with a pump capacity reported at 69 gpm.

All the water service connections are metered and the well water is chlorinated prior to entering the distribution system. These wells were all included in the Delaware River Basin Commission (DRBC) Comprehensive Plan and KASWC is presently approved to take up to, but not exceed, as much as 9.8 million gallons during any 30 day period from its wells.

KASWC sewered wastewater is conveyed to the Town of Thompson's Kiamesha Lake Sewer Treatment Plant facility (as approved by DRBC Docket No. D-95-16 CP 5/24/95) and treated with eventual permitted discharge down into Kiamesha Creek.

4.2.1.2 Village of Monticello Water Company

Monticello's water system supplies water to a year-round population of approximately 6,000 persons with seasonal increases in service during warmer summer months up to approximately 8,000+ persons, (personal communication Clarence Decker) due to seasonal occupation in the resort-related areas and second-homes. The Village of Monticello Water Company public supply is a conjunctive use system in that it utilizes combined water sources drawing its potable water supply from both surface water (Lake Kiamesha) and ground water (three sand & gravel wells). These two different sources of water supply are separately situated in two different, but adjacent, subwatersheds.

Despite the conjunctive use, most of Monticello's water demand is met primarily through a pre-*Compact* surface water intake on Kiamesha Lake ("Lake") capable of providing the system with up to two million gallons per day (mgd). During the 1950s, the annual pumpage from the Lake to meet Village water demand (although considered high at that time) was less than today - with occasional annual withdrawals reported at that earlier time to be *'as high as 289 million gallons'*. In 2003, the total gallonage pumped from the Lake was 312,793,240. In the event of emergency, or to satisfy maximum demand during peak summer months, some additional water may be pumped from a sluice pipe intake at Stackhouse Pond (west of Kiamesha Lake) into the Lake.

Pumpage is also drawn from a well field comprised of three shallow, screened, sand & gravel wells. These wells are located in an unconsolidated sand and gravel aquifer known as the Pleistocene Stratified Drift Deposit situated in the Black Brook watershed south of the Village (at end of Park Ave. north of the old airport area). This saturated unit represents an unconfined aquifer system. Recharge to this system is primarily from precipitation and from storage in the adjoining wetland areas to the south. The Village owns about 127 acres of contiguous land within this subwatershed which offers additional capacity in the event of need. This well water is derived from an unconsolidated aquifer situated within a different subwatershed, which is separate and apart from the water resources within the KCS, to the north of the Village.

Monticello's three sand & gravel wells are identified as Well Nos. 1, 2 & 3. They are shallow, drilled to 38', 39' and 45' deep. Each is fitted with 30-hp submersible pumps having pump capacities of 230 gallons per minute (gpm), 225 gpm, and 225 gpm, respectively (Ed. note: historically reported bedrock well yields within the Village are comparably far less and have ranged widely - averaging about 25 gallons per minute). The first two sand and gravel wells completed in the well field were drilled in 1979 with the third one added in 1997 and approved (NYSDEC Permit No3-4846-00247-1). The most recently-installed third well was subsequently included (as are the first two wells) in the Delaware River Basin Commission's Comprehensive Plan (Section 3.8, Delaware River Basin *Compact).* This well field supplements the Village's Lake pumpage.

The newest third well (Well No. 3) in the field was only added to augment gradually declining yields experienced by simultaneous pumpage in the two older wells (Ed. Note: possibly due to reduced aquifer transmissivity caused by interwell drawdown). It was not intended to service increased demand, or new development, and was installed solely to improve the system. Combined, the Village's total water supply does not exceed its pre-existing Water Supply Allocation Permit (WSA #7036) from the New York State Dept. of Environmental Conservation (NYSDEC) of 27 mg/30days (for wells only).

The average and maximum water demand limits combined from both the wells and the Lake intake are 33 million gallons (mg) / 30 day period, and 69 mg / 30 day period, respectively, with about 10% of this total usage assumed lost from the system.

In 2003, the Village pumped 39,029,000 gallons (from its wells) which was 12 million gallons (11,723,000 gal) or 30% less than its 2001 well pumpage. In 2004, the Village's total combined pumpage (utilizing both Lake and wells) was 351,822,240 gallons (around 964,000 gal./day) - with about 18,177,828 gallons (5%) lost from the system. Recent Village pumpage has declined slightly compared to 2001 (down 1,514,409 gal).

The Village's well water and surface water intake is metered, as are almost all service connections. Water treatment includes chlorination and fluoridation prior to distribution, and treatment of the surface water taken from the Lake includes filtration prior to its distribution. The combined water distribution and storage system utilizes about 32 miles of water main throughout its franchise area and four elevated standpipes having a combined storage capacity in excess of 1.6 million gallons.

The existing approved diversions from both water systems are subject to ongoing regulatory reviews (at least every 10 years) in accordance with the DRBC *Compact*. In addition, any future expansions of either the Kiamesha Artesian Spring Water Company system and/or the Village of Monticello's Water System are subject to review and approval under the DRBC *Compact (*personal communication, DRBC). And for the duration of any drought emergency that may be declared (by DRBC), any DRBC-approved water service or water usage *"..may be subject to prohibition of any nonessential water usage (as specified by NYSDEC, where applicable).*

The important source of surface water supply for both public water systems will continue to be Kiamesha Lake, a 150-acre 'spring-fed' lake that has never been known to 'dry up' during drought conditions.

Although the topographic drainage basin immediately surrounding this Lake is relatively small, 0.75 square miles, which is roughly a land area of 450 acres (only 3x Lake acreage), we estimate Lake storage capacity due to its depth to exceed 1 billion gallons (150-acre surface area approx. 30-35 ft. deep at its midpoint).

In the past, combined Lake withdrawals exceeding one mgd by both water companies (to meet peak summer demands) have not induced significant or consequential (long-term) shortages, or chronically depleted Lake levels. In fact, the most recent notable Lake level decline recalled by local water managers was a 6 ft. drop in stage height during the mid-1980s. Thus, it can be concluded that a large portion of the water replenishing the Lake is attributable to groundwater underflow ('spring-fed').

Although neither water company owns or controls any portion of the local subwatershed or waterfrontage around Kiamesha Lake other than their own lands improved with their own plants and facilities (and despite the fact that there still remain a few old single wells around the Lake), no other additional surface water withdrawals compete for Lake water, nor are any contemplated in the future. Therefore, Kiamesha Lake will continue to be protected and utilized as an important and sustainable source of potable public water supply. As such, we judge that the annualized 'safe yield' of this Lake is approximately 365 million gallons, or 1 MGD.

Combining surface water <u>and</u> groundwater pumpage from both water systems indicate gross average and maximum day water demands of 46mg/30day period and 85mg/30day period, respectively. Both public water systems implement a Water Conservation Plan approved by NYSDEC.

4.2.1.3. Impacts of Existing Water Supply Systems on Ground Water Availability

Because the ground water pumped by the Village of Monticello is from a well field in a neighboring subwatershed south of the site, it is not expected to impact the availability of groundwater resources at the site. As such, this groundwater pumpage is not included in CA RICH's water budget calculations for the KCS.

The groundwater pumpage by KASWC totals approximately 140,000 gpd. In addition, KASWC's surface water withdrawals from Kimesha Lake are estimated to range from zero (during winter) to around 110,000 gpd during peak usage periods (summer) averaging 55,000 gpd on an annualized basis. Monticello pumps about 857,000 gpd from the Lake - using their reported pumpage figures available from 2003. Together with KASWC, the combined average daily surface withdrawals from the Lake (both systems) is about 900,000 gpd.

It must be recognized that a certain percentage of water withdrawn from the Lake is derived from groundwater underflow into the Lake. We estimate this percentage by subtracting the total surface inflow (Tsi) from the volume of water withdrawn by both water companies. Tsi is the volume of water supplying the Lake by both direct precipitation upon the 150-acre Lake surface and storm water runoff into the Lake from the very small 300-acre subwatershed land area around it. Using the same assumptions as in Section 4.1, but with a slightly higher evapotranspiration rate from the Lake's surface of 30 inches per year (Dunne, et. al. 1978), the total surface inflow for the Lake is estimated using the following equation:

Tsi = Dsr + Swr

where:

Tsr = total surface inflow
Dsi = direct surface inflow
Swi = surface water inflow

Dsi is calculated by subtracting the evapotranspiration figure of 30 inches per year from the precipitation figure of 50 inches per year for a net gain of 20 inches upon the Lake surface. Thus, Dsi is estimated at 223,000 gpd. Swi is then calculated by subtracting the land-surface evapotranspiration rate of 25 inches per year and the groundwater recharge figure of 8 inches per year from the 50 inch rainfall for a total of 17 inches of water (see Section 4.1) equivalent to an Swi estimate of 379,000 gpd. Based upon these two general volumes, averaged surface water inflow into Kiamesha Lake is 602,000 gpd.

Subtracting the total average daily surface water inflow into the Lake of 602,000 gpd from the combined Lake withdrawals of up to 900,000 gpd results in a net deficit of around 300,000 gpd attributed to groundwater underflow. Combining this volume of 'spring-fed' groundwater underflow with the reported groundwater pumpage from KASWC of 140,000 gpd, equates to an average total public water supply system groundwater deficit of around 440,000 gallons per day. This generalized volume of ground water supplied to the customers in the KASWC and Village of Monticello water companies originates from within the KCS and much of this water is returned (through wastwater effluent discharge) back into the KCS. However, because both the Town and Village sewage treatment plants discharge their effluent into streams or stream valleys, a large percentage (unknown) will not be recharged back into the local aquifer(s) and, as such, is considered lost to the system - exiting the subwatershed as streamflow.

4.2.2. Existing Private Water Supply Systems

The remaining groundwater usage within the KCS is attributable to other relatively small private water supply systems. Of these, the largest system is seasonal pumpage by the Kutshers Country Club and their associated Sports Academy, and year-round and seasonal residential buildings and support facilities.

Crystal Water Co. (a State Certified private water company) provides water to several of these users through pumpage of a well that reportedly yields 200 gpm. In addition, Kutshers uses a separate well with a yield of 130 gpm to supply the Sports Academy, a well yielding 30 gpm for the golf club, and another well yielding 25 gpm for some nearby residences and a seasonal bungalow colony at Anawana Lake (Continental Placer,. 2003).

Although the pumping capacities of the Crystal Spring and Kutshers wells are reported, the current and historical daily water demand from the wells servicing Kutshers Country Club and the associated residential developments (e.g. Hidden Ridge et. al) is estimated at 45,000 gpd on average and 70,000 gpd during peak (summer) usage (personal communication: John Whitlock). Based upon this information, groundwater usage for Crystal Water Co. and all of the Kutshers facilities (including the Sports Academy) is approximately 30,000 gpd (average) and 100,000 gpd (peak).

Irrigation for the Kutshers golf course along with snow-making for the on-site ski slope is provided by a surface water connection into Anawana Lake (personal communication: Pat McNamara). In 2005, Anawana Lake pumpage was 15,749,823 gallons, primarily for golf course irrigation. Kutsher's wastewater is conveyed to Frazer Lake where it becomes part of the surface water flow regime within the KCS.

Groundwater usage elsewhere is comprised of some 300 additional private (domestic) and/or non-community (seasonal) mostly rural wells with on-lot discharges to private septic systems. This figure is developed based upon reconnaissance within the subwatershed and review of 2004 aerial photography (NYS Geographic Information System Clearing House). Assuming an average daily and peak daily water usage from homeowner wells of 500 gpd and 650 gpd, respectively, means that cumulative pumpage may average 150,000 gpd increasing up to 195,000 gpd (peak). However, because these well water users are also on private septics, most of this pumpage (75 percent) is 'returned' back into the aquifer leaving the remaining 25 percent as "consumptive loss" -

the actual amount permanently lost from the system. Accordingly, we assign average and peak consumptive losses to these additional wells of 37,500 gpd and 48,750 gpd.

4.2.3. Summary of Groundwater Usage

A summary of the current average and peak groundwater usage within the Kiamesha Creek Subwatershed is tabulated below:

GROUND WATER USE

Groundwater User	Est. Average Daily Usage (gpd)	Est. Peak Daily Usage (gpd)
KASWC	140,000	170,000(1)
Village of Monticello	300,000(2)	365,000(3)
Crystal Water Co./ Kutshers	30,000	100,000
Private Wells	37,500(4)	48,750(4)
Estimated Total	507,500	683,750
Percent Available Groundwater Recharge	12 %	16 %

(1) includes 10% of groundwater withdrawal attributable to Kiamesha Lake
(2) includes 100% of groundwater withdrawal attributable to Kiamesha Lake
(3) includes 90% of groundwater withdrawal attributable to Kiamesha Lake & 125% of average pumpage
(4) represents consumptive loss

The tabulated information above indicates that the current groundwater usage within the Kiamesha Creek Subwatershed represents between approximately 12% and 16% of the available groundwater recharge for the entire Subwatershed. It is important to recognize that nearly half of the estimated groundwater usage within this Subwatershed is attributable to the groundwater underflow required to sustain Kiamesha Lake.

Based upon the above calculations, it may be conservatively assumed that as much as 84% of the remaining groundwater recharge, roughly 3.5 mgd, may be available for additional groundwater usage. The Concord Resort's water demand of 1.4 mgd represents less than half of this volume (40%) of available groundwater resources, and consequently, from the perspective of the KCS water balance overall, could theoretically be available to pumped well water withdrawals without adversely depleting the aquifers.

It is important to note that localized groundwater development may change the recharge-discharge regime within the subwatershed basin area as a function of time. In this regard, it is highly beneficial to track any gradual reduction in groundwater discharge, attributable to increased pumpage over time, by accurately metering all significant withdrawals.

A second common problem that occurs with increased development is the over-stressing of a particular aquifer(s) or water-bearing zone by either overpumping individual wells, inter-well interference created by excessive drawdowns in varying-depth wells, or by overly-concentrated centers of pumpage exceeding local recharge conditions. Most commonly in areas such as the KCS, problems readily develop when active wells are too closely spaced and/or drilled to similar depths along fracture - such that they are all collectively 'tapping' the same water-bearing fracture zone within the bedrock which by its nature is of limited aquifer transmissivity and storage capacity. Temporary water shortages, real or perceived, also occur due to unfavorable hydrogeologic conditions, diminution of an aquifer's recharge area, periods of extended insufficient rainfall, excessive pumpage, or any combination of these.

Based upon the Concord Resort's Development Plan and the rural nature of its existing environs, the combined water resources derived from the potential availability of saturated sand & gravel deposits in conjunction with fractured bedrock aquifer storage capacity, indicates that groundwater may be available from both local and regional resources to suitably satisfy water demand requirements.

However, as discussed above, the over-pumping of two or more wells drilled too closely-spaced to each other will serve to temporarily dewater shallow water-bearing fracture zones intercepted by the pumping wells. This unintentional practice accelerates declining well water levels in nearby wells, which in turn, reduces the yields expected from these wells. This may create increased pumping stress upon any remaining deeper fracture zones facilitating a popular practice or tendency to 'drill deeper' with successive newly-installed wells which then have the unintended effect of exacerbating the problem.

Thus, clustered rock wells, during extended periods of above-normal pumpage (e.g. summer months and/or during periods of drought) may create inter-well interferences. This condition arises over time and is not an uncommon phenomenon. It is also not discernible under any available investigative methodology without long-term aquifer pumping tests to evaluate conditions in actual on-site wells. An overall, long-term, water resource management plan and program is strongly recommended as the water system is developed to monitor trends, if any, in both water quantity and water quality over time.

5.0 PRELIMINARY WATER SUPPLY SYSTEM

5.1 Water Demand

The projected, estimated average water use for the Development Plan is 1,400,000 gallons per day (gpd), equivalent to a combined cumulative groundwater withdrawal rate of approximately 1,000 gallons per minute (gpm). Based upon the water demand, the peak hourly demand of the Plan is estimated at 180,000 gallons per hour (gph). The total storage capacity required for fire protection and varying water demand requirements is 1,500,000 gallons.

5.2 Existing and Potential Sources of Water Supply

5.2.1 Existing wells

Prior to the shutdown of the Concord Hotel Resort (CHR) in 1988, the primary source of potable water supply was Kiamesha Lake. This Lake is presently used as a public water source by others and cannot serve as a viable primary source of water supply for the full-scale Development Plan. Currently, there are two usable interconnected on-site wells located on the western side of Kiamesha Creek adjacent to the CHR Golf and Maintenance Shop. These two wells have a combined safe yield of 82 gpm, 118,000 gpd, and they have and continue to supply water to the Concord's seasonally operated golf courses, the Monster Club House and 42-room hotel as well as related maintenance and operational offices. One of these two adjacent wells, the northernmost, yields more ground water than the other and is chiefly relied upon at present. Several years ago, both wells were pump-tested for a 72-hr. period. Well No. 1 is 300 feet deep with its reported safe yield at 50 GPM with a well water level drawdown of 171 feet (specific capacity of 0.3 gpm/ft). Nearby Well No. 2 is deeper, 423 feet deep, with a reported safe yield of 32 GPM (but with considerable drawdown of 375 foot).

Throughout the ~~Development~~ development ~~Plan~~ plan ~~Property~~ property of 1,700 acres, there are at least 27 other identifiable wells of varying depths and yields drilled to service domestic year-round and seasonal use. A well inventory list is attached as Table 1 and the general locations of all 29 wells are shown on Plate 1. The general reported status of these wells is indicated but historical information is extremely limited and individual well yields are not known. Twenty of these wells are currently active, or have been recently active within the last 10 years (including the two CHR 'golf maintenance' wells). The remaining wells around the site are reportedly not fitted with submersible pumps.

Most of these wells are drilled in the relatively higher upland areas adjacent to roadways above the lower-lying central golf course areas. Two separate concentrations of wells reflect small residential/seasonal housing clusters situated to the north along Route 109 at its intersection with Concord Road, and to the southeast, where Chalet Rd. and Joyland Rd. intersect with Thompson Road (i.e. Breezy Corners Bungalows, etc.). These domestic wells are assumed to be mostly drilled into buried fractured bedrock, presumably characterized by the presence of sandstone and conglomerate, and efforts to gather more information about them will be conducted during any subsequent phase of on-site investigative activities.

5.2.2 Proposed Water Sources

Twelve separate new areas for potential groundwater exploration and development (test well sites) are identified (see Plate 2). Of these, six may provide sufficient thicknesses of unconsolidated deposits overlying the buried bedrock to warrant a possible second nearby adjacent well screened in 'sand & gravel', should it occur, to increase yield at this location. The projected system of at least approximately eighteen (18+) interconnected wells, arranged across the ~~Property~~ property in strategic locations, may reliably satisfy daily demand. Typical yields for any screened sand & gravel or 'stratified drift' water wells may exceed 100 gpm where suitable thicknesses of unconsolidated deposits occur. The typical yield for cased-off, open-hole, bedrock wells ranging from 250' to 500' deep is less, - more on the order of 30-40 gpm.

The rational for the locations of the twelve (12) prospective exploration sites that can be identified at this time is based upon the potential presence of significant valley-fill deposits along the Kiamesha stream valley, two buried bedrock structural geologic lineaments, available well inventory information, sufficient spacing to avoid potential well interference effects, the presence of wetlands, and in consideration of the Development Plan. The actual locations of these sites may be modified slightly to suit field conditions, set back requirements, and in consideration of required wellhead protection dedicated to the well field(s). Finally, additional exploratory well sites may be necessary pending test results.

Pumped well water withdrawals will be disinfected at each wellhead and an additional disinfection station will be provided at the system storage tanks once the need for increased system storage capacity develops and larger storage tanks are constructed.

5.2.3 Proposed System Development

The systematic development of a full-scale water system to satisfy water demand will occur in incremental stages relative to Development Plan build-out, rather than immediate design and construction of the entire water system. In this manner, several smaller localized public community (housing), or non-transient non-community (hotel, etc.) water systems will be successively developed to service the initial areas of development at or near their point-of-use. Each of the several successively built water systems will be a public water system and independently subject to New York State regulations governing same. At some point in the further development process, it will be efficient to consolidate selected systems through their interconnection, along with requisite modifications to overall system capacity, storage and distribution.

Each individual system will be comprised of a well field with wellhead protection, disinfection, and requisite storage (initially provided by hydroneumatic tanks). Each tank will be installed at or near grade either in a separate building or in the case of a larger building – within that building's mechanical space. Storage for fire protection in the initial stages of the Development Plan build-out may be provided by separate ground-level engineered structures.

At this time, a systematic physical exploration to determine the preliminary water-bearing potential of the twelve preferred test well exploration sites, additional sites, if needed, and to conduct selective aquifer pumping tests, surface water and ground water level monitoring, and water quality testing, as-needed, is recommended and will be performed.

5.2.4 Ground Water Quality

Despite the historical and present-day existence of at least 25-30 active or inactive water wells across the property, recent groundwater quality information is largely unavailable.

Review of available sampling results from a pumping test conducted on the Concord Well in 1999 indicates the well water at this location is free of volatile organic chemical compounds. This same well has also been tested for the full NYSDOH Part 5 Drinking Water Quality Standards. Results indicate that ground water supplying this well complied with applicable potability standards (LBG, 1999).

A Phase 1 & Phase 2 Environmental Site Assessment conducted for environmental due diligences purposes by others (1999) revealed the presence of several highly-localized potential areas of concern. Of these, it appears that the accidental or incidental petroleum discharges or historical spills that have occurred behind the Golf Maintenance Shop, on the east side of Kiamesha Creek, is potentially the most significant area from a water resource impact perspective. Further remedial investigation and available engineering and/or institutional controls (to satisfy all applicable regulatory compliance requirements) will be considered.

Both surface water quality and ground water quality will be properly evaluated as part of the further groundwater exploration and development program. This evaluation will include obtaining sampling information for any specific chemicals of concern that may be identified on-site in consideration of historical land use - along with requisite drinking water quality parameters (NYS Part 5). Given the projected development of this ~~Property~~Property over several years, including its ongoing utilization for recreational golf course purposes, it will be important to reveal any water quality trends.

Practices that can impact the quality of water resources on-site may include construction activities, erosion controls, golf course turf management, landscaping, roadway deicing, storm-water runoff and retention, and solid waste management. In addition to identifying and correcting any water quality concerns, it is judged that water conservation procedures will also be advantageous. The long-term preservation and protection of the site's precious water resources will be accomplished through design and implementation of a Water Resource Management Plan.

6.0 REQUIRED REGULATORY INVOLVEMENT

The water system needed to service the entire Development Plan would be classified as a Medium Public Water System (a system that services a population between 3,300 and 50,000). The water system's design, construction, operation, maintenance, and monitoring are regulated by the New York State Department of Health (NYSDOH) and the Sullivan County Department of Health. NYSDOH also provides guidance requirements for the design of "Small Water Systems". The permitting (water allocation limits) and operation of the proposed new water supply wells are subject to review and approvals by both the New York State Department of Environmental Conservation (NYSDEC) and the Delaware River Basin Commission (DRBC).

Additional filings for franchise, service area, and rate structure may be required with the New York State Department of Public Service, Public Service Commission (PSC).

Potential future interconnection agreements between any newly-developed 'Concord' water system and adjacent municipal water purveyors, as deemed advisable in a given situation, will likely be subject to review, approval and overall coordination between concerned parties and the Town of Thompson.

The future consolidation of area water systems is encouraged, and further discussion with the Town of Thompson regarding available water system operation and management alternatives may be considered (e.g. new water district). An example expression of interest to further consider system options for the area is available upon request

7.0 FINDINGS & CONCLUSIONS

1. The water demand for the Project is expected to be slightly less than 1.4 million gallons per day (MGD). To satisfy this demand, a sustainable water supply will be derived through exploration and development of on-site groundwater resources.

2. Hydrogeologic conditions indicate the potential presence of two separate aquifer systems: fractured bedrock and unconsolidated valley-fill deposits. On-site wells utilize the fractured bedrock aquifer for supply purposes. Valley fill deposits, if found to be of sufficient thickness and areal extent, could represent a significant and sustainable additional source of water supply for the Development Plan.

3. The Concord Resort property is situated within an 11 sq. mi. subwatershed. Natural groundwater recharge within this subwatershed averages 4.2 million gallons per day (MGD). The Plan's 1.4 MGD water demand represents one-third (33%) of this recharge volume (leaving a balance of 66%). An independent water system utilizing groundwater resources may be developed on-site. Such development should proceed gradually in a systematic fashion, subject to incremental review, to avoid adversely impacting neighboring water usage.

4. The conceptual approach to design and construction of a suitably-sized water system will be satisfied by establishing a series of several small well fields that in time, will be interconnected. At present, twelve exploratory test well sites, that may later be converted into water wells, are identified for on-site investigation and further water system development.

8.0 WATER RESOURCE EXPLORATION & DEVELOPMENT

An on-site groundwater resource exploration and development program will be performed. This next phase of study will entail methods of investigation such as:

1. Unconsolidated subsurface geophysical profiling of the potential valley-fill deposits to assist in determining whether such deposits are found suitable as an aquifer;

2. On-site exploratory test drilling utilizing both screened valley-fill wells in conjunction with bedrock wells - as strategically located on Plate 2 (subject to field modifications);

3. Aquifer pump testing of selected existing and newly-drilled test wells and observation wells, where applicable;

4. Water table mapping and development of baseline aquifer conditions with water level and water quality monitoring of both groundwater and surface water over time;

5. Reduction and interpretation of test results, and recommendations for system design - including development of a conceptual water resource management plan; and

6. Initiate regulatory permitting review process in cooperation with concerned parties.

9.0 CERTIFICATION

This DEIS-related Report addresses the question of whether the "Concord Resort" Plan Proposal may have an available, adequate, potable, sustainable and developable groundwater supply. The information contained herein is derived from review of reasonable available and readily accessible information, on-site reconnaissance, and CA RICH's professional experience in related Water Allocation Applications either proposed and/or built-out in similar environmental settings in New York State.

CA RICH cannot warrant actual property conditions because there may remain unknown or hidden conditions that could not be revealed during this investigation. Further, CA RICH cannot be held responsible for inaccurate statements or claims made and furnished to it relative to surface water and groundwater usage and availability within or around the study area. CA RICH does acknowledge that to the best of its belief, the information utilized in this review and the findings derived from it, are true, complete, and correct, within a reasonable degree of scientific certainty, and that any conditions, facts or figures that may have an adverse effect or impact upon the validity of the resulting findings and conclusions included herein have not purposely been omitted.

It is further represented that CA RICH has no interest, other than professional, in this Hydrogeologic Evaluation and Preliminary Water Supply study and neither its ongoing performance, nor compensation for same, is contingent upon study results as presented herein. This Report is not a legal opinion.

-oOo-

10.0 REFERENCES

KASWC Water Supply Application No. 2856, State of New York Department of Conservation, Water Power & Control Commission, Decision, June 6, 1957.

Soren, Julian, 1961, The Groundwater Resources of Sullivan County, New York, USGS Bulletin GW-46.

USGS Monticello Quadrangle, New York, Sullivan County, 1966 (photo-revised 1982) 7.5 Minute Series (Topographic)

New York State Museum and Science Service (NYSMSS), 1970, Geologic Map of New York, Lower Hudson Sheet.

Fisher, DW., Isachsen, Y.W. and Rickard, L. 1970, reprinted 1995. Geologic Map of New York, Lower Hudson Sheet, New York State Museum and Science Service Map and Chart Series No. 15.

Dunne, T. and Leopold, L. 1978. Water in Environmental Planning. W.H. Freeman & Co.

Environmental Hydrogeology Corporation, April 6, 1988, Preliminary Phase 1 Hydrogeologic Evaluation of the Village of Monticello, NY

Joseph Gottleib, P.E., 1995, Engineering Report for FRE-PAR Laboratories, Kiamesha Motel Water Supply System

Leggette, Brashears & Graham, 1999, Phase I & II ESA Review Memo of Concord Resort & Golf Club.

Leggette, Brashears & Graham, 1999, Existing Concord Well Pump Test information and water quality analytical data from OCL Analytical Services.

Delaware River Basin Commission Proceedings, re: Village of Monticello Ground Water Withdrawal Allocation & Review Application, Docket No. D-2001-5 CP

Delaware River Basin Commission Proceedings, re: KASWC Ground Water Withdrawal Allocation Renewal Application, Feb 6, 2002.

Continental Placer, Inc., 2003, Hydrogeologic Evaluation of Groundwater Availability and Potential Impacts Associated with Long-Term Groundwater Withdrawal, Proposed St. Regis Mohawk Casino, Kutshers Resort Property, Town of Thompson, New York

10.0 References contd. -

Village of Monticello Water Department Annual Water Supply Statement/Consumer Confidence Reports, 2004, 2002

NOAA, 2002, Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000, 30 New York

NYS Geographic Information System Clearing House, 2004, Ortho-imagery of New York State

Personal Communications (selected):

Henry Zagatta, Concord Associates, LP
Clarence Decker, Manager, Village of Monticello Water Company representatives
Allan Schachnovsky, Co-Owner, Kiamesha Artesian Spring Water Company co-owner
William Culligan, Manager, Town of Thompson Water & Sewer Department
John Whitlock, Water & Sewer; Kutshers Country Club
Pat McNamara, Superintendent, Golf Course Country Club, Kutshers Country Club

Additional. informational inquiries:

Sullivan County Health Department
Sullivan County Division of Planning
Delaware River Basin Commission
NYSDEC