LEGGETTE, BRASHEARS & GRAHAM, INC.

PROFESSIONAL GROUNDWATER AND
ENVIRONMENTAL ENGINEERING SERVICES

---

4 RESEARCH DRIVE, SUITE 204
SHELTON, CT 06484
(203) 929-8555
FAX (203) 926-9140
www.lbgweb.com

July 28, 2017

Mr. Anthony J. Ruggiero, M.P.A.
City Administrator, City of Beacon
City Hall
1 Municipal Plaza
Beacon, NY 12508

Via Electronic Transmission

RE: **PROPOSAL**
Water-System Evaluation
City of Beacon, New York

Dear Mr. Ruggiero:

Leggette, Brashears & Graham, Inc. (LBG) is pleased to provide the City of Beacon, in Dutchess, New York, with this proposal to complete a water-system evaluation to assess the system's existing capacity and potential future needs. Our proposal includes a summary of the proposed scope-of-work (SOW) for the analysis and the estimated cost to complete the proposed SOW. In addition, at the end of this document, costs have also been provided for conducting work to verify aspects of the safe yield analysis conducted in 2014 for the City of Beacon and investigate options to develop other water resources.

WATER-SYSTEM EVALUATION

LBG understands that the City of Beacon (the City) is seeking to conduct an evaluation of the existing water system. The evaluation will include a review of the capacity of the existing sources (groundwater and surface water) and a review of the current and historical water withdrawal and consumption information. The water withdrawal and consumption information will be used to calculate current and future water use based on current and future population data, commercial usage and industrial usage. Other aspects of the evaluation will include a review of available "finished" water storage capacity and a comparison of this value to future water needs, a review of existing water treatment methods and capacity and a comparison of this capacity value to future water needs. Based on the assessment of these water system

components, LBG will provide an analysis and recommendations regarding the timeframe for potential upgrades in the water system, including adding new sources, upgrading storage capacity and increasing treatment capacity in the future.

For this SOW, LBG has assumed that the City will provide the necessary information to conduct the above described assessment, including a safe yield analysis of the City's existing groundwater and surface water sources; Water Systems Operation Reports, customer billing/consumption data, and the New York State Department of Environmental Conservation (NYSDEC) annual Water Withdrawal Reporting Forms (WWRFs) for the past several years; available information regarding current and future population projections for the City; the capacity of the existing "finished" water storage facilities; the capacity of the existing water treatment facilities; and distribution system maps that display the location of the reservoirs, groundwater sources, the distribution system piping and the atmospheric storage tanks. It is understood that the City has completed a Comprehensive Plan (dated 2017) that will be incorporated into the evaluation. Based on a cursory review, it appears that the Comprehensive Plan provides historical population data and estimates the future population for only the year 2021. Our evaluation will include population estimates for the 10-year (2027) and 20-year (2037) planning periods. Additional information that will need to be provided by the City includes identification of vacant and undeveloped lots that are available for future development and their zoning designations, preferably in GIS format.

The proposed SOW is designed to utilize existing data for the City of Beacon's water system and future population estimates and development projections to assess its ability to meet future growth and determine when storage, new source and treatment upgrades may be required. Using the water operation reports, consumption information and WWRFs provided by the City, LBG will calculate the current and historical water demands for the water system. The water consumption records should include separate data for residential, commercial, industrial, municipal and institutional water users (non-residential water users). Using this information, a per capita water usage value will be calculated for the residential population along with a usage value for the non-residential water users. The data will be utilized to determine if the existing water source (groundwater and surface water) can meet future increases in demand. Similarly, this calculated increase in water usage will be compared to the existing "finished" water storage and water treatment capacities to assess the timeframe for when upgrades to these facilities would be needed.

Additionally, general costs for the upgrades to the "finished" water storage will be provided. These general costs will be for materials and construction only and would not include the cost for land procurement, design costs or permitting requirements.

Below is a summary of the tasks to be conducted by LBG to complete the water system assessment for the City of Beacon.

Assess Existing Water Source Safe Yield Information - $1,800-$2,500

- Project team communication to obtain necessary documents regarding water source safe yield, withdrawal and consumption data, existing storage and treatment capacity for the City and distribution system maps.
- Review safe yield information for groundwater and surface water sources that currently supply the City.
- Review the City of Beacon Comprehensive Plan.

Assess Existing Water Withdrawal and Consumption Data - $5,000-$7,500

- Review existing Water System Operation Reports and WWRFs to calculate current and historical average and peak water withdrawal for the system.
- Review water consumption data, WWRFs, and population information to calculate a per capita water usage value.
- Review non-residential user data to calculate water usage.
- Review information on vacant and undeveloped lots that are available for future build-out development and their zoning designations.
- Display available lot data on the water distribution system map.[1/]
- Converting information into GIS format for analysis.
- Conduct an assessment of future population increases, per capita water usage and non-residential user data to estimate future increases in water consumption.
- Compare estimated future increases in water consumption to existing source capacity to determine when an increase in source capacity would become necessary.

1/ LBG recommends obtaining a cost from Lanc & Tully Engineering and Surveying P.C. to prepare a current distribution system map.

Assess "Finished" Water Storage Information - $1,500

- Review existing "finished" water storage capacity.
- Compare existing storage capacity to current and future water usage to assess timeframe for potential upgrade.
- Provide general cost estimate for materials and construction for water storage upgrade.

Assess Water Treatment Facility Information - $1,500

- Review existing water treatment facility capacity information.
- Compare existing treatment capacity to current and future water usage to assess timeframe for potential upgrade.
- Project team communication with City and City's Engineering Consultant to assess potential cost for treatment upgrades.

Summary Report and Recommendations - $5,000

- Prepared report summarizing the water source safe yield information; water withdrawal, consumption and per capita water usage values; existing water storage and treatment capacity; potential timeframe for increase in water storage and treatment; and estimated costs for water storage upgrades.

WATER SUPPLY EVALUATION TOTAL..... $14,800-$18,000

SAFE YIELD VERIFICATION AND BATHYMETRIC SURVEY

At the request of the City, LBG has also reviewed the Safe Yield Analysis that was conducted in 2014 of the City's raw water supply. A desktop evaluation of the reservoirs' capacity was conducted and the methodology utilized was valid. However, no field data collection was conducted to verify the results of the desktop study. If field verification of the data is desired, LBG would recommend conducting a quarterly data collection program by measuring stream inflows into the reservoirs over a one year period to confirm that the approximated/correlated flows used in the analysis were valid or if adjustments are warranted.

Additionally, the storage volume calculations for the reservoirs were based on dam evaluation work conducted by O'Brien and Gere. However, it is unknown if bathymetric surveys (i.e. measurements of the depths and contours of the reservoirs' bottom topography) exist for the reservoirs. The bottom contours of a reservoir can change over time from influx and shifting of sediments. If confirmation of the reservoirs' storage values is desired, then an updated bathymetric survey of the reservoirs would need to be conducted. LBG, in conjunction with a Licensed Surveyor from Lanc & Tully Engineering and Surveying P.C. (Lanc & Tully), can conduct bathymetric surveys of the four reservoirs which comprise the City's surface-water supply. LBG will develop a sampling grid for each reservoir and will use a jon boat and sounding equipment to measure total depth at each grid sample location. Lanc & Tully will survey each location and the perimeter of the reservoirs using a high-resolution GPS unit. The depth and survey data will be used to prepare a GIS-generated, bathymetric survey map showing the reservoir depth contours, which will be used to calculate the storage volume of each of the reservoirs for use in determining stage-capacity relationship. A general cost estimate has been provided below for the completion of the bathymetric survey work; however, LBG would need to conduct a site visit to determine boat access at the reservoirs and confirm that the assumed timeframe for collection of the field data is accurate.

Safe yields for the City's groundwater supply wells were also reported in the Safe Yield Analysis, but were based on previous reported values established by others. It does not appear as if recent yield tests on the wells have been conducted to confirm their current yield capacities or to determine whether surplus capacity may be available. Yields in groundwater supply wells can change over time as a result of well biofouling, mineral deposition, or sedimentation. Conducting water-level data collection and/or yield testing can determine if well yields have diminished, whether well redevelopment is warranted to conduct maintenance on the wells, or if additional yield is available from the wells.

Assuming that all wells are accessible for water-level measurement collection, LBG can conduct short-term operational yield tests on the wells to compare current yield and water-level data to historic information. LBG would collect water-level measurements, either manually or with pressure transducers installed in the wells, over a period of three to five days while the wells are in operation. The water-level measurements and yield of the wells during the tests will be used to project long-term (180-day) water-level drawdown scenarios to assess the wells' safe yields.

Quarterly Stream Flow Measurement (4 Quarters) $4,000-$6,000

Conduct site visit to determine access to inflow streams to conduct stream gaging and set up stream gaging locations.

Complete four quarterly stream gaging events of main inflow stream channels that enter the City's reservoirs.

Process stream flow data collected and compare to the data from the Safe Yield Analysis to confirm or adjust correlation values used and calculated safe yield.

Bathymetric Survey - $9,500-$12,500

- Conduct bathymetric survey of reservoir system, includes rental of boat, and GPS/Sounding equipment to conduct the survey.
- Preparation of a bathymetric survey map by Lanc & Tully and LBG.

Groundwater Safe Yield Evaluation - $2,500-$3,500

- Review existing well construction and yield testing information and reports for supply wells and evaluate current well use information (yield, water level, daily withdrawal).
- Conduct short-term operational well tests by monitoring water levels for three to five days to assess current yields and water-level drawdown in the supply wells (assumes each well is accessible for measurement collection).
- Provide summary report detailing existing well information, results of operational well tests and well safe-yield analysis. Provide recommendations based on the results of testing.

SAFE YIELD VERIFICATION/BATHYMETRIC SURVEY TOTAL ..... $16,000-$22,000

OTHER WATER RESOURCES

LBG will evaluate options to develop additional supply from other water resources. The evaluation will include identifying any permits that will be required from the New York State regulatory agencies.

OTHER WATER RESOURCES TOTAL ..... $1,500-$2,500

The following table summarized the costs associated with the above described SOWs.

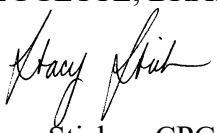
TASKS	TOTAL COST ESTIMATE
Water System Evaluation	$14,800 - $18,000
Safe Yield Verification and Bathymetric Survey	$16,000 - $22,000
Other Water Resources	$1,500 - $2,500

This cost proposal is limited to the proposed SOW and does not include the cost of any additional work that may be recommended based on the results of the SOW. Several of the tasks include site visits that need to be conducted to determine actual field conditions. If the site visits indicate conditions exist that are outside the SOWs provided, LBG will contact the City. If it is determined that a change in the SOW is warranted, a separate proposal will be prepared at that time.

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

Very truly yours,

LEGGETTE, BRASHEARS & GRAHAM, INC.



Stacy Stieber, CPG
Associate/Hydrogeologist

Affirmed by:



Thomas P. Cusack, CPG
Senior Vice President

SS:cmm
cc: Ed Balicki
John Russo – Lanc & Tully
H:\Beacon, City\2017\Water-Supply Evaluation Proposal.doc