ENVIRONMENT

RESOLUTION NO. 2025134

RE: SETTING A PUBLIC HEARING IN CONNECTION WITH THE ESTABLISHMENT OF ZONE OF ASSESSMENT "029A" AND ZONE OF ASSESSMENT "029B" IN THE DUTCHESS COUNTY WATER DISTRICT LOCATED IN THE TOWN OF HYDE PARK

Legislators D'AQUANNI, PAOLONI, and GORMAN offer the following and move its adoption:

WHEREAS, the New York State Legislature, by Chapter 592 of the Laws of 1991 (Section 1142, Public Authorities Law), as part of the creation of the Dutchess County Water & Wastewater Authority (WWA), established the Dutchess County Water District ("DCWD"), and

WHEREAS, the WWA, has presented to this Legislature a notice of project pursuant to Section 1124 of the Public Authorities Law which outlines the WWA's plan to create Zone of Assessment "029A" and Zone of Assessment "029B" within the DCWD located in the Town of Hyde Park, and

WHEREAS, the WWA proposes to construct a water main extension to connect the existing Hyde Park Regional Water System to the existing Dutchess Estates water distribution system in the Town of Hyde Park, and

WHEREAS, the WWA proposes to acquire the existing Dutchess Estates water distribution system from the current owner following interconnection to the Hyde Park Regional Water System, and

WHEREAS, said notice of project also describes the two zones of assessment that will be created which are more particularly described in Attachment A annexed hereto, and

WHEREAS, it is necessary to conduct a public hearing on the establishment of such Zones of Assessment, now, therefore, be it

RESOLVED, that this Legislature shall conduct a public hearing on the 14 day of October 2025 at 6:30 p.m. in the Chambers of the Dutchess County Legislature, County Office Building, 22 Market Street, Poughkeepsie, New York, on a proposal to establish Zone of Assessment "029A" and "029B" in the Dutchess County Water District located in the Town of Hyde Park as described in Attachment A, annexed hereto, and be it further

RESOLVED, that the Clerk of the Legislature shall public notice of said hearing in the official newspapers of the County and shall include therein a description, identifying the areas to be included within the Zone of Assessment "029A" and Zone of Assessment "029B", the improvements proposed, the maximum amount to be expended for the improvements, the proposed method of assessment of the cost, the estimated cost of hook-up fees, if any, the cost to the typical property or one or two family home, all in accordance with Section 254 of the County Law.

CA-084-25
JC/CRC/rjw
G-1217-DD
08/06/2025
Fiscal Impact: None.

STATE OF NEW YORK
ss:
COUNTY OF DUTCHESS

This is to certify that I, the undersigned Clerk of the Legislature of the County of Dutchess, have compared the foregoing resolution with the original resolution now on file in the office of said clerk, and which was adopted by said Legislature on the 8th day of September 2025, and that the same is a true and correct transcript of said original resolution and of the whole thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and seal of said Legislature this 8th day of September 2025.

DUTCHESS COUNTY SEAL

LEIGH WAGER, CLERK OF THE LEGISLATURE

FISCAL IMPACT STATEMENT

☑ NO FISCAL IMPACT PROJECTED

APPROPRIATION RESOLUTIONS

(To be completed by requesting department)

Total Current Year Cost $ ______________________

Total Current Year Revenue $ ______________________
and Source

Source of County Funds *(check one)*: ☐ Existing Appropriations, ☐ Contingency,
☐ Transfer of Existing Appropriations, ☐ Additional Appropriations, ☐ Other *(explain)*.

Identify Line Items(s):

Related Expenses: Amount $ ______________
Nature/Reason:

Anticipated Savings to County: ______________________

Net County Cost (this year): ______________________
Over Five Years: ______________________

Additional Comments/Explanation:

Prepared by: Jonathan Churins, Executive Director, DCWWA Prepared On: 08/04/2025

DUTCHESS COUNTY WATER AND WASTEWATER AUTHORITY

MEMORANDUM

To: Sue Serino, County Executive

From: Jonathan Churins, Executive Director
Dutchess County Water and Wastewater Authority

1 Lagrange Avenue
Poughkeepsie, NY 12603
845-486-3601 845-486-3656 FAX
jchurins@dutchessny.gov

Subject: Resolution Request

Date: August 4, 2025

Please find attached a Resolution Request Form and Fiscal Impact Statement. The purpose of the requested resolution is to schedule a public hearing on the creation of County Water District Zone of Assessment "029A" and "029B" (Dutchess Estates Water System.)

The DCWWA is requesting that the County establish County Water District Zones of Assessment "029A" and "029B" to provide water services within the existing Dutchess Estates community in the Town of Hyde Park. The DCWWA is finalizing an agreement with the owner of the Dutchess Estates Water System to acquire the system at the point in time that DCWWA can provide an interconnection from its Hyde Park Regional Water System to the existing Dutchess Estates water distribution system. The interconnection is part of a larger project that connects the Hyde Park Regional and Quaker Hill Water Systems. A Map, Plan and Report for Zone of Assessment "029A" and "029B" will be submitted for review. The request for resolution is to begin the public hearing procedure for the Zone of Assessment creation.

The DCWWA's ability to provide a new water service to this area is contingent on the creation of the Zones of Assessment within the County Water District, encompassing all properties in the System's service area. To create the requested County Water District Zones of Assessment, the Legislature must first adopt a resolution to schedule the required public hearing.

Attached, please find Resolution 2024062, which can be used as a template for this requested resolution.

Cc: Jason Teed, PE, DCWWA

DUTCHESS COUNTY

Proposed County Water District
Zones of Assessment "029A" and "029B"

(Dutchess Estates Water System)
Hyde Park, NY

MAP, PLAN AND REPORT

August 2025

Dutchess County Water and Wastewater Authority
Poughkeepsie, NY

August 2025

PROPOSED COUNTY WATER DISTRICT ZONES OF ASSESSMENT “029A” and “029B”
(DUTCHESS ESTATES WATER SYSTEM)

MAP, PLAN AND REPORT

INTRODUCTION

This Map, Plan and Report contains the information required for the formation of the proposed County Water District Zone of Assessment “029A” (Zone “029A”) and Zone of Assessment “029B” (Zone “029B”.) Together Zones “029A” and “029B” include an area of approximately fifty-seven (57) acres located in the center of the Town of Hyde Park and situated near the intersection of State Route 9G and all parts of the Dutchess Estates residential subdivision. Zone “029A” consists of parcels with direct access to the existing privately-owned Dutchess Estates Water System watermain, while Zone “029B” consists of parcels that are included within the Dutchess Estates residential subdivision as approved on August 24, 1956, as being served central water services, but require additional distribution system improvements in order to be served water. It is anticipated that, when the lots in Zone “029B” intend to be developed, a watermain extension into the undeveloped section of the Dutchess Estates residential subdivision will be required in order for Zone “029B” to be served water.

Upon successful formation of proposed Zone “029A” and Zone “029B” (the “Zones”) by the Dutchess County Legislature, and completion of a water main to allow an interconnection between the Dutchess Estates Water System and the DCWWA’s Hyde Park Regional Water System, ownership and operation of the Dutchess Estates Water System will transfer to the Dutchess County Water and Wastewater Authority (“DCWWA”, “Authority”) in accordance with the terms and conditions set forth in an agreement between the Authority and the Dutchess Estates Water Co. (“Owner”). The information provided herein includes the proposed Zone of Assessment boundaries and a list of the tax parcels that will comprise the future Zones of Assessment, as well as a description of the current and proposed infrastructure by which potable water will be produced, treated and delivered to customers.

In addition, budgetary estimates for the first-year operation and maintenance costs, and capital costs, as well as a cost allocation formula, have been included with this report.

The DCWWA will enter into a contract (the “Service Agreement”) with Dutchess County on behalf of the Zones of Assessment for the purpose of administering the retail sale of water services to all properties within the proposed Zones of Assessment, with such service to be provided through the water system facilities as described below. The Authority will administer the Zones of Assessment pursuant to guidelines established by the Service Agreement and collect water revenues. Water service rates will be set annually by the Authority.

HISTORY

The Dutchess Estates Water System (PWS ID# NY1302767) was originally constructed in the mid-1950s by a private developer. The water system gained its initial approval from the New York State Health Department. For all intents and purposes, the Dutchess Estates Water Co. has owned the Dutchess Estates Water System since inception, though the owner of Dutchess Estates Water Co. has changed over time. Wells 1 and 2 were developed under the original development. Well number 3 was developed in the 2010s; however, it remains offline as the existing treatment facility must be upgraded prior to making a permanent connection between Well number 3 and the system.

In May 2023, the Dutchess Estates Water Co. was awarded approval by the Dutchess County Department of Health for the full replacement of the existing water treatment facilities, which would consist of; building a new above-ground water treatment structure, replacement of the atmospheric storage facility (currently in disrepair,) the re-design of the booster pumping system via variable frequency drives (VFDs) in lieu of a standalone hydropneumatic tank, and the ability to bring Well 3 online to meet source capacity requirements.

On April 10, 2024, the Environmental Protection Agency (EPA) announced the final National Primary Drinking Water Regulation for six per- and polyfluoroalkyl substances (PFAS). Of those six, two chemicals (Perfluorooctanoic acid [PFOA] and Perfluorooctanesulfonic acid [PFOS]) had existing maximum contaminant levels reduced from 10 nanograms per liter (ng/L) to 4 ng/L. Due to the stricter regulations set forth by the EPA, and the history of PFOA and PFOS concentrations in Wells 1 and 2, the May 2023-approved water treatment facility replacement was no longer viable as it had not been required, nor was it designed to treat for the removal of PFAS. In addition, there is insufficient space within the design of the May 2023 water treatment facility replacement to house the treatment necessary to remove PFAS, further making the replacement insufficient to meet the new regulations set forth. The Dutchess Estates Water Co. has entered into the agreement to transfer ownership of the system to DCWWA to enable an interconnection to DCWWA’s Hyde Park Regional Water System, as an alternative to designing and constructing a new water treatment facility.

COUNTY WATER DISTRICT ZONE OF ASSESSMENT “029A”

The Dutchess Estates Service Area Zone “029A” (Water District Map: Appendix A) consists of one hundred thirty-five (135) properties including one hundred twenty (120) detached residential properties, fourteen (14) undeveloped properties, and one (1) church/daycare.

COUNTY WATER DISTRICT ZONE OF ASSESSMENT “029B”

The Dutchess Estates Service Area Zone “029B” (Water District Map: Appendix A) consists of fourteen (14) undeveloped vacant properties.

EXISTING PHYSICAL FACILITIES

Water Supply and Treatment System

The Dutchess Estates Water System uses groundwater from two functional wells, out of the three that have been developed over time. The two functional wells are considered groundwater under the direct influence of surface water (GWUDI). Cartridge filtration is provided as the first form of treatment. Sodium tri-polyphosphate is added to the water to provide disinfection. After treatment, water is stored in a buried storage tank with one wall of the tank exposed in the treatment facility. Visual observation of the exposed tank wall shows extreme deterioration. Water is then sent to the system on demand using system booster pumps and a hydropneumatic tank. There are no booster stations within the distribution system.

Transmission and Distribution

The Dutchess Estates Water System distribution system is located solely within proposed Zone "029A" and adjacent to Zone "029B" where the properties remain undeveloped. The distribution system includes approximately 1,500 linear feet of 8-inch asbestos cement (AC) pipe, and approximately 5,500 linear feet of 6-inch AC pipe. Service laterals include ¾-inch diameter copper or galvanized pipe to the single-family residences and 1-inch diameter copper or galvanized pipe to the church/daycare. There are currently three flushing hydrants located in the system. The water system as originally designed and built does not provide fire protection.

The properties located within Zone "029B" are undeveloped and no water distribution main exists. To serve the parcels in Zone "029B", a water distribution main must be constructed and tied into the existing water distribution system. At this time, the area within Zone "029B" is undeveloped with no construction nor permanent road access provided. The entirety of Zone "029B" is owned by a single corporation, and the DCWWA will work with the corporation on the requirements to extend a water main to serve their parcels within the Zone of Assessment at the time the parcels are being developed.

SOURCE CAPACITY AND QUALITY EVALUATION – CURRENT SYSTEM

The Dutchess Estates Water System has two active groundwater supply wells – Wells 1 and 2, and one well awaiting approval – Well 3. The two active wells provide variable quality and cannot provide production capability to serve the proposed Zone "029A". Typically during the summer months, bulk potable water must be hauled on site to provide adequate quantity in combination with Wells 1 and 2. A third well was approved to be drilled and has superior quality and production capability compared to Wells 1 and 2, however the connection of Well 3 will require a new water treatment facility in order to facilitate the addressment of on-going violations against the New York State Sanitary Code.

The System has historically had issues discoloration since the 1980s. Dutchess County Department of Health (DCDOH) records indicate as early as the early 1980s, the Dutchess Estates Water System has received numerous customer complaints pertaining to water quality. In the early to mid-2000s, the DCDOH conducted a sanitary survey indicating that it was time to replace the water treatment facility. No upgrades were provided on the system until roughly 2008 when the hydropneumatic tank suffered a full failure and required immediate replacement. Well 3 was drilled in 2014 to supplement the rapid deterioration of Wells 1 and 2 and provide source capacity for the Dutchess Estates Water System. Booster pumps were replaced upon total failure during the mid-2010s. No additional improvements to the system have been made, and no water treatment facility upgrade occurred per the sanitary survey requirement in the mid-2000s. The current representative of the Owner hired the services of a design professional with the intention of providing a design to replace the existing water treatment facility, and connect Wells 1, 2 and 3 to the new facility. The design for the water treatment facility was approved on May 4, 2023; however, no site work nor construction has commenced. With the addition of New York State regulation on emerging contaminants, including further decreasing the thresholds set forth by the regulations, Wells 1 and 2 currently exceed the maximum contaminant level for Per- and polyfluoroalkyl substances (PFAS), and will require additional treatment. The May 4, 2023, design approval of the water treatment facility replacement does not account for the exceedance of PFAS.

The installation date and depth of Wells 1 and 2 are unknown at this time; however, it has been noted in the past that both wells are GWUDI shallow gravel wells. Historically, it has been noted that Well 1 has been taken offline at times due to low production, including the need to hydro-surge the well to improve productivity. Well 3 is currently offline and not yet approved to connect to the system. Well 3 was drilled in 2014, providing a 35 gallon per minute stabilized yield. A Well Completion Report is on file with the DCDOH.

There have been no recent pump tests completed to determine the actual yield of the wells, and recent operating information has suggested that the actual yields are declining in a typical fashion each seasonal cycle.

According to Ten States Standards, the total developed groundwater source capacity shall equal or exceed the design maximum day demand with the largest producing well out of service. Per the DCDOH, the Dutchess Estates Water System cannot meet maximum day demand with the largest producing well out of service, hence the necessity to drill Well 3. With the inability to bring Well 3 online in a manner that meets State and local Health Department regulations, the system cannot meet the required source capacity.

There is limited atmospheric storage provided by a single 30,000-gallon water storage tank, which has considerably heavy corrosion. Under maximum day demand, the current storage would provide water for approximately 0.45 days if none of the groundwater wells were operating. Under average day demand, the current storage would provide water for approximately 1.1 days if none of the groundwater wells were operating.

PROPOSED PHYSICAL FACILITIES

The intention of the Authority is to create Zones “029A” and “029B” in anticipation that the Dutchess Estates Water System will connect to the proposed Quaker Hill Water - Hyde Park

Regional Interconnection Water Main ("the Interconnection Main") thus enabling the Dutchess Estates Water System to receive its water from the Hyde Park Regional Water System. An Engineer's Report titled Quaker Hill PFAS Remedy, prepared by Tighe & Bond, last revised June 2024, and included in Appendix "E", provides details including a water main extension from an existing 12-inch diameter water main along Crofton Street to State Route 9G. Once the 12-inch diameter water main has reached State Route 9G, it will travel northbound until Fallkill Road where the main will extend easterly toward North Quaker Lane. Once the water main reaches North Quaker Lane, it will extend southerly toward a public right-of-way that appears to be consistent with a town road extension from Pennington Drive to North Quaker Lane. The main will then extend westerly to the cul-de-sac of Pennington Drive where the main will connect into the existing QHW distribution system. That Interconnection Main Project has been awarded a combination of grant and loan funding from the NYS Environmental Facilities Corporation (EFC), and administrative steps are underway to begin the procurement process for the design phase of that interconnection.

After the Zones of Assessments are created, and construction of the Quaker Hills-Hyde Park Regional Interconnection Main has been completed to a point sufficient to enable a connection to Dutchess Estates Water the DCWWA will construct that tie-in to the Dutchess Estates Water System. The tie-in will be made where the Interconnection Main crosses State Route 9G nearest Halstead Drive and will be constructed with appropriate valve installation to isolate the existing Dutchess Estates water treatment plant from the distribution system. Upon completion of the tie-in, the DCWWA will acquire ownership of the distribution system from the Owner, while the Owner will continue to own the property associated with the wells and treatment plant. The future use of the existing water treatment plant parcel is unknown at this time and is not considered in the transfer of ownership from the Owner to the DCWWA.

SOURCE CAPACITY AND QUALITY EVALUATION – PROPOSED SYSTEM

Once the Dutchess Estates water system is connected to the Hyde Park Regional Water System, its sole source of water will come from the Hyde Park Water Treatment Plant, which is a surface water treatment plant sourced from the Hudson River. The Hyde Park Water Treatment Plant provides extensive treatment including but not limited to filtration, disinfection, and corrosion control before distributing water throughout its system. The Water Treatment Plant is permitted and capable of producing about 2,100,000 gallons per day but produces about 1,100,000 gallons per day to meet current demand. The Water Treatment Plant is committed to meeting a demand of approximately 1,600,000 gallons per day, considering the current service area, private projects currently under construction within the existing service area, and existing agreements to provide water for new service areas. The Hyde Park Water Treatment Plant will have no issues serving the proposed Zones of Assessment "029A" and "029B" in addition to the above commitments.

Finished water storage must also be provided to meet average daily demand. The Hyde Park Regional Water System provides approximately 1,750,000 gallons of finished water storage, which is sufficient to provide storage for Zones "029A" and "029B."

FUTURE DEMAND

There are approximately fourteen (14) vacant properties within Zone “029A” that are serviceable through an adjacent existing water main. There are approximately fourteen (14) vacant properties within Zone “029B”; however, those parcels cannot be serviced with water until such a time that the necessary water main extension is constructed and additional site improvements such as road and utility construction are complete. It is estimated that a full buildout of all twenty-eight (28) vacant properties provides a future demand of approximately 7,000 gallons per day, based upon current usage of existing dwellings within Dutchess Estates. The Hyde Park Regional Water System will have no issues serving the 28 vacant properties in addition to its previously discussed commitments.

FUTURE CAPITAL IMPROVEMENTS

Source and Treatment Improvements

Under the creation of the Zones of Assessment, and at the time the interconnection is made and permitted for use, the DCWWA will own, operate and maintain the water distribution system only. The source of water will be provided by the Hyde Park Regional Water System. No further source or treatment improvements are necessary by the Hyde Park Regional Water System to serve the Dutchess Estates Water System.

Improvements for Zone of Assessment “029B”

It is anticipated that, once the Dutchess Estates Water System has the ability to provide adequate source and quality water via the interconnection to the Hyde Park Regional Water System, properties in Zone “029B” will have the ability connect to, and receive water service from, the Dutchess Estates Water System.

At the time of this report, there are no water distribution system improvements within proposed Zone ”029B”. Approximately 950 linear feet of water main, hydrants and other appurtenances, including individual service connections with meters would need to be constructed to support the development of the fourteen (14) existing vacant lots.

A September 1986 litigation settlement between the Dutchess Estates Civic Association against the Dutchess County Department of Health, the Town of Hyde Park, and Carosel Homes, Inc., includes the stipulation of actions that must be taken for parcels within Zone “029B” to be developed; that stipulation includes the need to extend water mains to and throughout the undeveloped area. The remaining provisions of the stipulation pertain to Town of Hyde Park planning and zoning requirement.

As there are no current plans before the Town to develop the vacant lots in proposed Zone “029B”, estimated capital improvement costs provided are order-of-magnitude only. Actual costs will depend on the timing of the development, type of construction, and consideration of all applicable standards at the time of development.

PROJECTED CAPITAL COSTS AND ALLOCATIONS

The Dutchess Estates Water District currently has no outstanding bonded indebtedness. DCWWA’s ownership and operation of the Dutchess Estates Water System to provide service to properties within Zones “029A” and “029B” is predicated on the completion of the interconnection of the Dutchess Estates Water System to the Hyde Park Regional Water System in order to address a magnitude of water quality and quantity issues.

The interconnection of the Dutchess Estates Water System to the Hyde Park Regional Water System is part of a larger project that interconnects the Quaker Hill Water System to the Hyde Park Regional Water System. In addition, the Quaker Hill Water - Hyde Park Regional Water System Interconnection Main Project will also include the interconnection of the existing South Cross Water System (which DCWWA intends to acquire from the current owner) as well as the provision of water service to all directly adjacent properties along the projected Interconnection Main route. Proposals to establish a new Zone of Assessment for the South Cross Water service area, and a new Zone of Assessment (North Park Water) for the properties adjacent to the Interconnection Main route, will be submitted under separate cover.

The total cost of the Interconnection Main Project is estimated at $21,875,700. The DCWWA has received grant funding from the NYS Environmental Facilities Corporation (EFC) for up to 70% of the total cost of the project, resulting in a grant fund of $15,312,990. The remaining project balance of $6,562,710 will be paid through a subsidized loan from the NYS EFC issued to the DCWWA, spread over a 30-year period. It is DCWWA’s intent that debt service on the loan will be allocated among all Zones of Assessment that are directly serviced by Interconnection Main: the existing Zone of Assessment “U” (Quaker Hills Water System), the proposed Zones of Assessment “029A” and “029B” (Dutchess Estates Water System) and the two additional proposed Zones of Assessment described above for the South Cross Water System and the North Park Water Area, which are currently under development. The South Cross Water System will connect an existing community to the Interconnection Project while the North Park Water Area will address the properties directly adjacent to the proposed Interconnection Project. Both Zones of Assessment will be submitted under separate cover.

In order to provide a water main extension in accordance with the preferred route submitted in the NYS EFC grant request report, a transfer of ownership of existing main is being sought on the property defined as the Crofton Mews. The DCWWA continues to explore different cost-saving designs that make the project financially feasible while remaining in-line with one of the three alternative routes provided in the Engineer’s Report titled Quaker Hill PFAS Violation Remedy, prepared by Tighe & Bond, last revised June 2024 included in Appendix “E”.

In addition to the capital costs associated with the Interconnection Main, the existing annual debt expenses for previous improvements to the Hyde Park Regional Water System will be allocated equitably, through the assignment of benefit units, to each parcel included in the Zones of

Assessment that receive water from the Hyde Park Regional Water System and thereby benefit from funded improvements. This includes; these proposed Zones of Assessment “029A” and “029B”, existing Zones of Assessment “A”, “B”, “C”, “D”, “I”, “L”, “R”, “U”, and “028”, and proposed new Zones of Assessment “030” (South Cross Water System), North Park Water Area, and any future proposed Zones of Assessment that are established along the Interconnection Main Project, which will be submitted under separate cover.

Should all proposed Zones of Assessment benefitting from the Interconnection Main Project, as described above, be established, then the projected capital costs, including debt service, for a typical single-family residence within the Dutchess Estates Water Zone “029A” is approximately six hundred and five hundred and sixty-three dollars ($563). For the purposes of creating Zones of Assessment “029A” and “029B”, the worst-case scenario, that no additional Zones of Assessment are created beyond Dutchess Estates, would translate to an anticipated capital cost for a typical single-family residence of approximately one thousand five hundred and fifty-one dollars ($1,551.)

The anticipated capital costs for each undeveloped property within Zone “029B” is equivalent to Zone “029A” as it pertains to the cost of the Interconnection Main Project. To serve Zone “029B”, it is anticipated that the approximate 950 linear feet of water main, hydrants and other appurtenances will cost approximately $875,000. Assuming a 30-year market rate loan issued to DCWWA, allocation of the debt service expense across all parcels in Zone “029B” would result in an additional cost per parcel of approximately four-thousand four hundred ninety-seven ($4,497) dollars. The resulting total annual capital cost for a typical single-family residence in Zone “029B” would range from five thousand and one hundred dollars ($5,100) if all other proposed Zones of Assessment are established, to six thousand and forty-seven dollars ($6,047) if no additional Zones are established in conjunction with the Interconnection Project.

The methodology for the assignment of benefit units is attached in Appendix “C”.

OPERATION AND MAINTENANCE (O&M) COSTS

Unmetered – Interim Rate

The Dutchess Estates Water System currently does not provide metered water usage per service connection. A master meter for the entire system indicates an average water usage of 263 gallons per day per service connection, or roughly 7,900 gallons per month per service connection. The 2025 adopted Water Rates for Hyde Park Regional Water System provided in Appendix “B”, shows an unmetered water service rate that is based upon an average of 12,500 gallons per month and typical metered single family residence rate that is based upon an average of 5,000 gallons per month. Due to the Dutchess Estates Water System having the inability to provide individual metered service connections, the DCWWA is establishing an interim flat rate annual O&M charge of approximately one-thousand one hundred and seventy-two dollars ($1,172). It is estimated that it will take the DCWWA approximately two years to provide water meters for each service connection. It is anticipated that the installation of one hundred and twenty (120) ¾” and one (1) 1” water meters will cost approximately $103,000, or approximately sixty-two ($62) per typical single family residence, paid through a market rate loan issued to the DCWWA, spread over a 30-year period, with no additional grant funding.

Metered – Hyde Park Regional Rate

Once meters are provided for each service connection, the operation and maintenance costs for the Zones of Assessment will align with the typical costs of water produced by the Hyde Park Regional Water System and the Authority’s cost to operate, maintain and administer the water main distribution system, as reflected in the annual O&M budget adopted by the Authority. The 2025 adopted Water Rates for the Hyde Park Regional Water System are included in Appendix “B”. The rates include a fixed monthly service charge based on the customer connection meter size, and a charge per thousand gallons of metered water use. For a single-family residential parcel in Zone of Assessments “029A” and “029B” once developed, the estimated annual O&M charge would be approximately eight hundred forty-four dollars ($844).

CONNECTION CHARGES

For any properties within the proposed Zones of Assessment that are not connected and receiving water service from the Dutchess Estates Water System at the time that the DCWWA acquires the Water System, an “Application for Water Service” and a related fee will be required at the time water service is requested. This will include all parcels within Zone “029B” when it is developed. Generally, for a typical residential connection, the costs for the water meter, plan review and/or inspections, and tap on the main are covered by the Water Service Application (tapping fee) fee which is paid by the property owner to the DCWWA at the time of their request for service. As of the date of this report, the application fee for a standard ¾-inch water service connection is one-thousand one-hundred and fifty dollar ($1,150) per service and is a one-time charge. The cost to install, repair and/or maintain the water service line from the Authority’s curb valve to the property owner’s house or other structure shall be the sole responsibility of the respective property owner.

Annual Cost per a Typical Property – First Year

The total annual cost for a typical property in a zone is generally a combination of the long-term capital charges (debt service) and water usage charges.

In the proposed Zone “029A” a typical property will be a single-family dwelling unit. Given the assumptions and estimates described above, which includes the unmetered interim rate to provide water service, the projected “First Year” total cost for a typical single-family dwelling in County Water District Zone “029A” will be two-thousand seven hundred and twenty-three dollars ($2,723) at a worst case scenario, and one-thousand seven hundred thirty-five dollars ($1,735) at a best case scenario. It should be noted that the actual first year total cost within Zone “029A” does not consider that the Dutchess Estates Water System will be connected to the Hyde Park Regional Water System prior to the completion of construction of the interconnection project. Should Zone “029A” be connected prior to the completion of construction, the annual cost per typical property will include the allocated share of its debt service but will not have allocation towards the capital costs associated with the long-term financing of the Hyde Park Regional to Quaker Hill Water System interconnection as construction is still in progress. As such, the annual cost per typical property for the first year within Zone “029A” may be one-thousand three hundred and twenty-two dollars ($1,322) as a worst-case scenario, or one-thousand three hundred and twelve dollars ($1,312) as a best-case scenario. Reference is made to Appendix “D” for a breakdown of each scenario, based upon partial and full construction completion, and partial and full Zones of Assessments created under this report as well as the additional proposed Zones of Assessments to be submitted under separate cover.

At this time, as there are no developed parcels within Zone “029B”, and only its share of debt service will be charged against the Zone, the First-Year cost for a typical parcel in Zone “029B”, a vacant residential parcel, is one hundred and thirty-six dollars ($136) as previously described in its best-case scenario, or one hundred forty-seven dollars ($147) in its worst-case scenario.

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APPENDICES

Appendix A – Description of County District Zone of Assessment “029A” and “029B” (Map & Parcel List)

Appendix B – Proposed Operation & Maintenance Budget

Appendix C – Proposed Benefit Assessment Methodology

Appendix D – Annual Cost per Typical Property – First Year - Table

Appendix E – Engineer’s Report titled Quaker Hill PFAS Violation Remedy, prepared by Tighe & Bond, last revised June 2024

APPENDIX “A”

DUTCHESS COUNTY WATER DISTRICT
ZONE OF ASSESSMENT “029A” and “029B”
Dutchess Estates Water System

DESCRIPTION OF ZONE

(map and parcel listing)

The Dutchess County Water District Zone of Assessment “029A” shall include all those tax parcels presently indicated on the attached boundary map. These parcels are further described by the following list of tax parcel grid numbers:

6165-01-492737-0000
6165-01-482739-0000
6165-02-612664-0000
6165-02-501779-0000
6165-02-569718-0000
6165-02-575737-0000
6165-02-625745-0000
6165-02-516712-0000
6165-02-644779-0000
6165-02-592737-0000
6165-01-488698-0000
6165-02-558666-0000
6165-01-498770-0000
6165-02-599718-0000
6165-02-512653-0000
6165-02-626673-0000
6165-02-590746-0000
6165-02-665709-0000
6165-01-499736-0000
6165-02-540746-0000
6165-02-637677-0000
6165-02-645732-0000
6165-02-526729-0000
6165-02-621681-0000
6165-02-593669-0000
6165-02-519751-0000
6165-02-532703-0000
6165-02-563674-0000
6165-02-511754-0000
6165-02-622652-0000
6165-02-647811-0000
6165-02-580660-0000
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6165-02-623812-0000
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6165-02-556692-0000
6165-02-510672-0000
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6165-02-617657-0000
6165-02-627646-0000
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6165-02-548687-0000
6165-02-551718-0000
6165-02-569705-0000
6165-02-630757-0000
6165-02-525687-0000
6165-02-621803-0000
6165-02-564696-0000
6165-02-547711-0000
6165-02-616687-0000
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6165-02-504755-0000
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6165-02-522718-0000
6165-02-534728-0000
6165-02-644795-0000
6165-02-614771-0000
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6165-01-490677-0000
6165-02-645802-0000
6165-02-637832-0000
6165-02-658758-0000
6165-02-644722-0000
6165-02-667753-0000
6165-02-594727-0000
6165-02-549744-0000
6165-02-509683-0000
6165-01-499723-0000

6165-02-544681-0000	6165-02-644654-0000	6165-02-523680-0000
6165-02-512705-0000	6165-02-647824-0000	6165-02-506733-0000
6165-02-541726-0000	6165-02-539708-0000	6165-02-527695-0000
6165-02-655680-0000	6165-02-609700-0000	6165-02-642760-0000
6165-02-518730-0000	6165-02-584707-0000	6165-02-669719-0000
6165-02-639703-0000	6165-02-527749-0000	6165-02-676730-0000
6165-02-604759-0000	6165-02-686746-0000	6165-02-627738-0000
6165-02-567739-0000	6165-02-654672-0000	6165-02-606740-0000
6165-02-510691-0000	6165-02-602677-0000	6165-02-522653-0000
6165-02-681738-0000	6165-02-579719-0000	6165-02-608727-0000
6165-02-626752-0000	6165-02-570679-0000	6165-02-539656-0000
6165-02-650663-0000	6165-02-636692-0000	6165-02-697758-0000
6165-02-511698-0000	6165-02-643787-0000	6165-02-675770-0000
6165-02-662702-0000	6165-02-577684-0000	6165-02-542673-0000
6165-02-552726-0000	6165-02-620793-0000	6165-02-691764-0000
6165-02-655747-0000	6165-02-589698-0000	6165-02-541665-0000
6165-02-632641-0000	6165-02-559742-0000	6165-02-625715-0000
6165-02-625826-0000	6165-02-584688-0000	6165-02-685769-0000
6165-01-495656-0000	6165-02-556657-0000	6165-02-542809-0000

The Dutchess County Water District Zone of Assessment "029B" shall include all those tax parcels presently indicated on the <u>attached</u> boundary map. These parcels are further described by the following list of tax parcel grid numbers:

6165-02-659778-0000
6165-02-688803-0000
6165-02-663793-0000
6165-02-686796-0000
6165-02-666817-0000
6165-02-693822-0000
6165-02-681780-0000
6165-02-685788-0000
6165-02-670830-0000
6165-02-683831-0000
6165-02-661785-0000
6165-02-664800-0000
6165-02-690810-0000
6165-02-665807-0000

Dutchess Estates Water
Hyde Park, NY
Dutchess County Water District
Zone of Assessment

DISCLAIMER: pipeline shown for discussion purposes,
but field verification is required to determine location of pipe in street.

Existing Water Main
Zone 029A
Zone 029B

0 250 500 1,000 Feet

N S E W

Dutchess County
Water and Wastewater Authority
1 LaGrange Avenue
Poughkeepsie, NY 12603

Sheet No.
1 of 1

Data Sources: Dutchess County Real Property Tax Service Agency
Prepared by: Dutchess County Department of Planning & Development

Date: March, 2025

DUTCHESS COUNTY
WATER AND
WASTEWATER AUTHORITY

APPENDIX “B”

Dutchess Estates Water System

Proposed Operation & Maintenance Budget

Adopted Water Rate Schedule – Effective January 1, 2025
(Future Connection to Hyde Park Regional Water System)

DUTCHESS COUNTY WATER AND WASTEWATER AUTHORITY

DUTCHESS COUNTY WATER DISTRICT ZONES A & B – HYDE PARK REGIONAL WATER SYSTEM

Adopted Water Rate Schedule - Effective January 1, 2025

A. WATER CHARGES ARE BILLED TO THE PROPERTY OWNER WITHIN A REASONABLE PERIOD FOLLOWING THE CLOSE OF THE BILLING CYCLE:

Section 1000--Periods end February 28, May 31, August 31, and November 30
Section 2000--Periods end March 31, June 30, September 30, and December 31
Section 3000--Periods end February 28, May 31, August 31, and November 30

NOTE: *Rates subject to change on January 1, 2026

B. WATER CHARGES

1. Metered Usage Rate: $9.12 per 1,000 gallons + monthly service charge.
   (All customers subject to monthly service charge regardless of usage).
2. Monthly Service Charge:
   In addition to the water charges described above, there will be a monthly service charge assessed according to meter/service size as follows:

Meter/Service Size:	Rate Per Month:
3/4 inch	$24.73
1 inch	$34.62
1.5 inch	$44.51
2 inch	$71.70
3 inch	$271.98
4 inch	$346.15
6 inch	$519.23
8 inch	$717.03
10 inch	$890.10
16 inch	$1,409.33

3. Domestic Non-metered (Based upon size of connection) + monthly service charge.

Meter/Service Size:	Rate Per Month:
3/4 inch	$114.00
1 inch	$177.33
1.5 inch	$253.33
2 inch	$380.00
3 inch	$1,097.77
4 inch	$2,195.54
6 inch	$6,755.51
8 inch	$13,511.02
10 inch	$25,333.16
16 inch	$67,555.09

C. MISCELLANEOUS CHARGES

See following definitions.

Charges:	Rates:	
Property Transfer Charge - Buyer	$60.00	
Property Closing Charge - Seller	$85.00	
Inaccessible Meter Charge	$100.00	*
Meter Re-Read Charge	$50.00	
Meter Tampering Charge	$50.00	**
Returned Check Charge	$20.00	
Service Restoration Fee	$150.00	
Service Tampering Charge	$50.00	***

D. PAST DUE BILL CHARGE

All arrears of water rents, charges and penalties after each due date shall be subject to interest computed at the annual rate of 21% or 5.25% per billing period.

E. RELEVY OF UNPAID BILLS

In September/October of each year all accounts in arrears will be referred to the property tax collector for inclusion on the following year's January tax bill. Included in these amounts will be a late charge of up to 4 months for the total amount due.

F. PROPERTY TRANSFER CHARGE - BUYER

There will be a charge assessed each time title to a property changes or transfers. The charge will appear on the next scheduled billing of the new property owner. This fee will cover the cost of establishing a new customer account along with preparing pro-rated bills as needed for both the new and former owner.

G. PROPERTY CLOSING CHARGE - SELLER

There will be a charge assessed to the current owner each time title to a property changes or transfers. The charge will appear on the final bill due on account and presented at closing of the property. This fee will cover operational and administrative costs incurred during the processing of account closeout.

H. SPRINKLER SYSTEM CHARGE

Service charge only for size of service line supplying the fire sprinkler system.

I. INACCESSIBLE METER CHARGE

An inaccessible meter charge may be assessed *each month to customers who refuse to allow access to their property for meter installation, who fail to remove obstructions encumbering access to the water meter or its remote read head, and/or who refuse access to their property for an indoor meter reading.

J. MULTIPLE REGISTER METER CHARGE

Each register billed for gallonage plus service charge - see above schedule.

K. METER READINGS

If there is a meter reading discrepancy between the meter (located inside) versus the remote read head (located outside), it is the meter that has precedence. Meter tampering is unlawful and may result in legal action.

L. METER TAMPERING CHARGE

Tampering with meter and meter appurtenances is prohibited. Tampering with meter and meter appurtenances will result in a fine** plus a surcharge for labor and materials for replacing and/or repairing the tampered equipment and shall be imposed on the next water bill.

M. RETURNED CHECK CHARGE

There will be a charge for each returned check. The Dutchess County Water and Wastewater Authority (DCWWA) reserves the right not to accept checks in the future.

N. RESTORATION OF WATER SERVICE

A customer may request water service to be temporarily suspended and shut off at the curb valve. However, the customer will remain financially responsible for all monthly service charges and applicable capital surcharges due per billing cycle while service is suspended. Additionally, a service restoration fee upon water turn on will be added to the next billing cycle.

O. SERVICE TAMPERING CHARGE

Water service is turned on or off at the curb or the main by the DCWWA. Unauthorized persons are not permitted to turn water on or off at the curb valve or corporation stop. The owner of the affected property shall be subject to a service tampering charge for each offense*** plus a surcharge for labor and materials for replacing and/or repairing the tampered equipment and shall be imposed on the next water bill.

APPENDIX “C”

Dutchess Estates Water System Dutchess County Water District Zones of Assessment “029A” and “029B”

Proposed Benefit Assessment Methodology
COUNTY WATER DISTRICT
ZONES OF ASSESSMENT C, D, H, M, O, P, Q, R, S, T, U and 028 (Not J or K)

PART COUNTY SEWER DISTRICT #1, 2, 3, 6 & 7

BENEFIT ASSESSMENT METHODOLOGY

DEVELOPED LAND (Use the higher of either LAND USE/WATER USE or ACREAGE)

LAND USE/WATER USE	
RESIDENTIAL	
FIRST DWELLING UNIT	**10**
EACH ADDITIONAL DWELLING UNIT	**8**
COMMERCIAL/INSTITUTIONAL:	
FIRST 500 GPD WATER USAGE	**20**
EACH ADDITIONAL 100 GPD	**4**
ACREAGE	
FIRST 2 ACRES	**10**
EACH ADDITIONAL WHOLE ACRE	**2**

UNDEVELOPED LAND

FIRST 2 ACRES	**8**
EACH ADDITIONAL WHOLE ACRE	**2**

STATE PARK LANDS

FIRST 500 GPD WATER USAGE	**20**
EACH ADDITIONAL 100 GPD	**4**

APPENDIX "D"

Dutchess Estates Water System Dutchess County Water District Zones of Assessment "029A" and "029B"

Annual Cost per Typical Property – First Year - Table

DEW Annual Cost per a Typical Property - First Year (Assuming full construction of interconnection project *__not complete__* [8])

	Worst Case Scenario				Best Case Scenario
	QHW[1]	QHW + **DEW**[2]	QHW + **DEW** + SCW[3]	QHW + **DEW** + NPW[4]	QHW + **DEW** + NPW + SCW[6]
Project Cost Allocation	$ -	$ -	$ -	$ -	$ -
HPR Debt Service Allocation[5]	$ -	$ 150.00	$ 147.00	$ 143.00	$ 140.00
O&M[7]	$ -	$ 1,172.00	$ 1,172.00	$ 1,172.00	$ 1,172.00
Total Cost	**$ -**	**$ 1,322.00**	**$ 1,319.00**	**$ 1,315.00**	**$ 1,312.00**

DEW Annual Cost per a Typical Property - First Year (Assuming full construction of interconnection project *__completed__*)

	Worst Case Scenario				Best Case Scenario
	QHW[1]	QHW + **DEW**[2]	QHW + **DEW** + SCW[3]	QHW + **DEW** + NPW[4]	QHW + **DEW** + NPW + SCW[6]
Project Cost Allocation	$ 3,101.00	$ 1,403.00	$ 872.00	$ 524.00	$ 427.00
HPR Debt Service Allocation[5]	$ 151.00	$ 148.00	$ 145.00	$ 139.00	$ 136.00
O&M[7]	$ 844.00	$ 1,172.00	$ 1,172.00	$ 1,172.00	$ 1,172.00
Total Cost	**$ 4,096.00**	**$ 2,723.00**	**$ 2,189.00**	**$ 1,835.00**	**$ 1,735.00**

[1] QHW is the existing Quaker Hill Water system that assumes no Zones of Assessment created

[2] QHW + DEW assumes only Dutchess Estates Water (DEW) Zone of Assessment is created and benefits from the interconnection project

[3] QHW + DEW + SCW assumes only DEW and South Cross Water (SCW) (under separate cover) are created and benefit from the interconnection project

[4] QHW + DEW + NPW assumes only DEW and North Park Water (NPW) (under separate cover) are created and benefit from the interconnection project

[5] HPR Debt Service Allocation refers to the debt service shared by all Zones of Assessment that benefit from the Hyde Park Regional Water Treatment Facility and storage tanks

[6] QHW + DEW + NPW + SCW assumes all of DEW, NPW and SCW (under separate cover) are created and benefit from the interconnection project

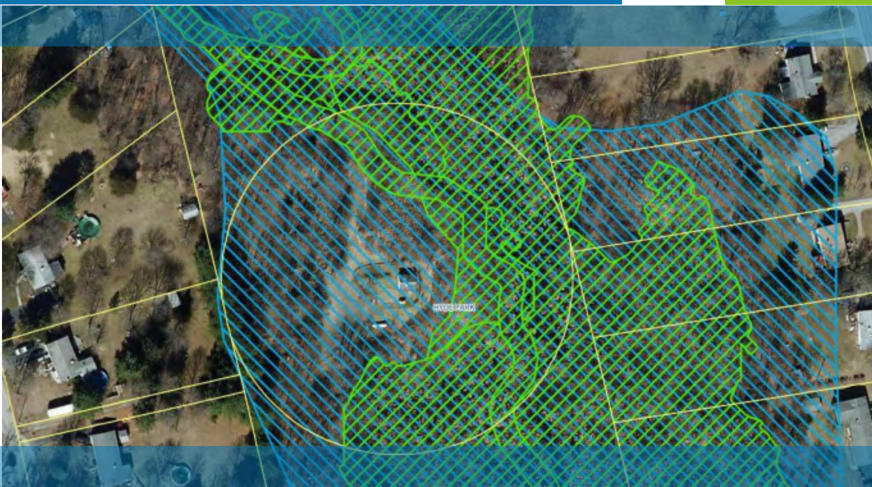
[7] The difference in O&M for DEW assumes the interim un-metered water rate as DEW will not have water meters installed at the time of the connection, but the intention that they will be installed within the next two years. Once meters are installed, the O&M will be the same as all other Zones of Assessment connected to the Hyde Park Regional Water System which are all metered. The current 2025 metered rate calculates an average $844 per year in O&M costs

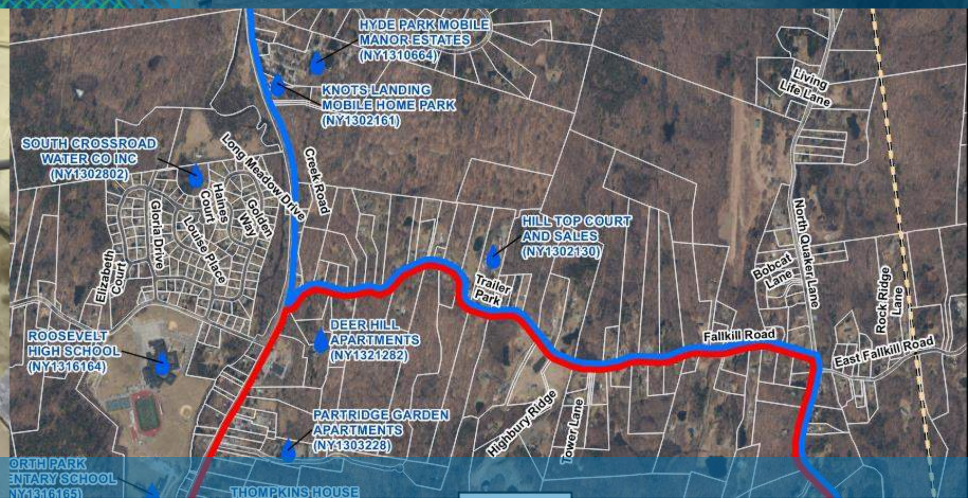
[8] Not complete refers to a point where long-term financing has not closed, and QHW has not connected. For the purposes of limiting the number of scenarios versus the miniscule differences in Debt Service, not complete shall refer to QHW not connected, but the other ZOAs connected and paying into the Debt Service

APPENDIX “E”

Dutchess Estates Water System County Zone of Assessment “029”

Engineer’s Report titled Quaker Hill PFAS Violation Remedy, prepared by Tighe & Bond, last revised June 2024





Quaker Hill PFAS Violation Remedy

Dutchess County Water & Wastewater Authority

Preliminary Engineering Report
June 2024

05/31/2024

Services Provided in New York by T&B Engineering and Landscape Architecture, PC

Tighe&Bond

100% Recyclable

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Executive Summary

Tighe & Bond has evaluated two alternatives for addressing the recent PFOS MCL exceedance at the Quaker Hill Water System. The two alternatives considered for the Quaker Hill Water System include abandonment of the existing wellfield and treatment system and interconnection to the Hyde Park Regional Water System (HPRWS) or replacement of the existing wellhouse/treatment building with a new system with PFAS treatment. A no-action alternative is also discussed in the report but will not satisfy the Notice of Violation. A summary of the alternatives that will be considered is below:

- Alternative No. 1:
  - Connect the Quaker Hill Water System to the HPRWS (Route B)
  - Booster pump station at the North Tank site
  - Abandon the existing Quaker Hill Wellfield and treatment system
- Alternative No. 2:
  - Install a new treatment building with deep foundation
  - Install new system components including treatment for PFOS
  - Improvements to existing wells
  - Demolish the existing wellhouse/treatment building
  - Site improvements to protect the new facilities from flooding

An opinion of probable project cost was developed for the two alternatives (Section 2.6) and are summarized in Table E-1, detailed opinions of probable cost for each alternative are provided in Appendix C.

TABLE E-1
Alternative No. 1 & 2 Opinion of Probable Cost

Item	Alternative No. 1	Alternative No. 2
Construction Cost	$12,881,100	$4,886,000
Engineering (20%)	$2,576,300	$977,200
Contingency (30%)	$3,864,400	$1,465,800
Escalation (4%/year for 3 years)	$1,609,900	$612,000
Opinion of Probable Cost	**$20,931,700**	**$7,941,000**

A life cycle cost analysis (Section 3.1) was utilized to better compare the two alternatives to determine the most long-term cost-effective alternative, rather than just the alternative with the lowest capital construction cost. Table E-2 summarizes the net present value of each alternative over a 70-year life cycle planning period, which is the anticipated life cycle of the Alternative No. 1 transmission main.

TABLE E-2
Alternative Life Cycle Cost Analysis

Item	Alt. No. 1	Alt. No. 2
Capital Cost	$20,931,700	$7,941,000
Annual O&M Cost	$112,500	$230,800
Present Day O&M Cost	$13,566,900	$27,833,200
Present Day Salvage Value	-$210,400	-$647,000
Net Present Value of Life Cycle Cost	**$34,709,000**	**$36,421,200**
	Planning Period	70 years
	Inflation Rate	4.0%
	Discount Rate	2.5%

As shown in Table E-2, Alternative No. 1 is expected to have a lower life cycle cost than Alternative No. 2. Additionally, Alternative No. 1 has the ability to increase the customer base served by connecting other Public Water Systems along the route which could ultimately result in the lowest debt service cost per EDU. Alternative No. 2 has no potential to increase the customer base.

Based on the life cycle cost analysis, estimated annual debt service, potential to increase the customer base by interconnecting other public water systems, and non-monetary factors (see Section 2.7), Alternative No. 1 is the recommended alternative. The basis for selection of Alternative No. 1 is as follows:

- Lowest life cycle cost
- Potential to connect several other PWSs, including PWSs in potential environmental justice areas and disadvantaged communities
- Potential for the lowest annual debt service cost per user if all existing PWSs along the proposed route connect to the system
- Simpler construction and permitting
- Less operation and maintenance
- Better public perception

It is important to consider that the number of PWSs that have PFAS concerns is based upon data provided by DCDBCH which is relative to the previous MCL of 10 ppt. It is anticipated that additional PWSs may have PFAS concerns when considering the new MCL of 4 ppt.

This engineering report has been prepared in anticipation of the pursuit of a low-interest loan or grant. Table E-3 provides the opinion of probable cost for implementation of Alternative No. 1 in a format that is consistent with funding agency requirements.

TABLE E-3
Recommended Project Costs

Item	Cost
1. Construction Costs[1]	
a. Contract 1 - General	$14,201,200
b. Contract 2 - Electrical	$289,800
c. Contract 3 - HVAC	$0
d. Contract 4 - Plumbing	$0
2. Engineering Costs	
a. Planning	$62,400
b. Design	$1,030,500
c. Construction	$1,545,800
3. Other Expenses	
a. Local Counsel	$10,200
b. Bond Counsel	$43,500
c. Work Force	$202,900
d. Financial Services	$0
e. Net Interest	$0
f. Miscellaneous	$0
4. Equipment	$0
5. Land Acquisition	$0
6. Project Contingency (30%)	$3,864,400
7. Total Project Costs	$21,250,700
8. Less Other Sources of Financing	$0
9. Project Costs to be Financed	$21,250,700
10. SRF Issuance Costs	
a. Direct Expense (1%)	$212,600
b. Bond Issuance Charge (0.84%)	$178,600
c. Administrative Fee (1.1%)	$233,800
Total Project Cost Including Financing	**$21,875,700**

[1]Includes an escalation of 4%/year for 3 years

Section 1
Project Background & History

1.1 Introduction

This report presents an alternatives analysis performed for the Dutchess County Water and Wastewater Authority (DCWWA) to address the Dutchess County Department of Behavioral and Community Health (DCDBCH) Notice of Violation issued in response to exceedance of the Maximum Contaminant Limit (MCL) for Perfluorooctanesulfonic Acid (PFOS) at their Quaker Hill Water System. This evaluation aims to identify the most appropriate and cost-effective way (or ways) of addressing the MCL violation in a manner that is protective of public health and in the best interests of the DCWWA and its customers.

Tighe & Bond, whose services are provided in New York through T&B Engineering & Landscape Architecture, P.C. (Tighe & Bond), has been engaged by DCWWA to prepare this Preliminary Engineering Report (PER) in a format consistent with the New York State Environmental Facility Corporation (EFC) New York State Drinking Water State Revolving Fund Engineering Report guidelines.

1.2 Site Information

1.2.1 Location

The Quaker Hill Water District (District) is in the eastern extent of the Town of Hyde Park, NY, as shown in Figure 1-1 below. The District serves approximately 109 residential connections located along Quaker Hill Drive and surrounding streets including Pennington Drive, Guerney Drive, Barkley Road, and Shaker Lane.

FIGURE 1-1
Quaker Hill Water District

The District was formed in 1970 and, after being acquired by the Town of Hyde Park in 1980, underwent significant upgrades including construction of a new treatment building and the addition of Well No. 2. The Water District Advisory Committee was formed in 1988 to assist the Town with effective administration of the District. At present, the District's facilities include two wells, one hydropneumatic tank, and one wellhouse/treatment building. Water is delivered to the distribution system via a series of 6-inch cast iron water mains, totaling approximately 9,500 feet in length.

1.2.2 Geologic Conditions

Figure 1-2 shows the USDA Natural Resources Conservation Service (NRCS) soil map for the District. The District is largely composed of Nassau, Hoosic, and Natchaug soil types. The existing wellfield and the existing wellhouse/treatment building are within the Natchaug muck soil type as shown in Figure 1-2. Natchaug muck is categorized as Hydrologic Soil Group (HSG) Type B/D and is defined as highly decomposed organic material over loamy glaciofluvial deposits and/or loamy till. Natchaug muck soils are very poorly drained, nearly level soils in low areas or wetlands. The reported depth to bedrock is more than 80-inches and the reported depth to the water table is 0-6 inches.

FIGURE 1-2
Quaker Hill Soil Map

A report titled *Quaker Hill Water District Pumphouse Building Evaluation* by Morris Associates dated April 2010 (2010 Report) provides information about the subsurface conditions at the Quaker Hill wellfield and wellhouse/treatment building site. The report was developed to understand why the wellhouse/treatment building had settled over the years and to recommend improvements for repairing or replacing the wellhouse/treatment building.

The 2010 Report references a geotechnical report prepared by Daniel Loucks. Subsurface conditions at the site, based on one boring drilled at the site and documented in the above-referenced geotechnical report, are expected to consist of the following soil stratums:

- 0 - 4 feet below ground surface (bgs) - loose to very loose silty sand FILL;
- 4 - 14.5 feet bgs - Very soft, black, PEAT;
- 14.5 - 41 feet bgs - Loose, native sandy gravel or gravelly sand with minor amounts of silt;
- 41 - 43.5 feet bgs - Dense native gravelly sand with silt; and
- Refusal at 43.5 feet bgs.

In addition to the one test boring near the existing wellhouse/treatment building, the 2010 report describes that two deep test pits were excavated with a backhoe approximately 100 feet west of the existing wellhouse/treatment building. However, the results of these test pits were that the same peat material is present at a depth of approximately 6 feet below grade.

1.2.3 Surface Water Features

As shown on Figure 1-3, the existing wellhouse/treatment building parcel is completely within a New York State Department of Environmental Conservation (NYSDEC) regulated freshwater wetland (SP-21). Fall Kill Creek flows from north to south through the parcel and there are also federal wetlands around Fall Kill Creek; much of which overlap with the NYSDEC wetlands. Fall Kill Creek is a Class C waterbody. Class C waterbodies are suitable for supporting fisheries and non-contact activities.

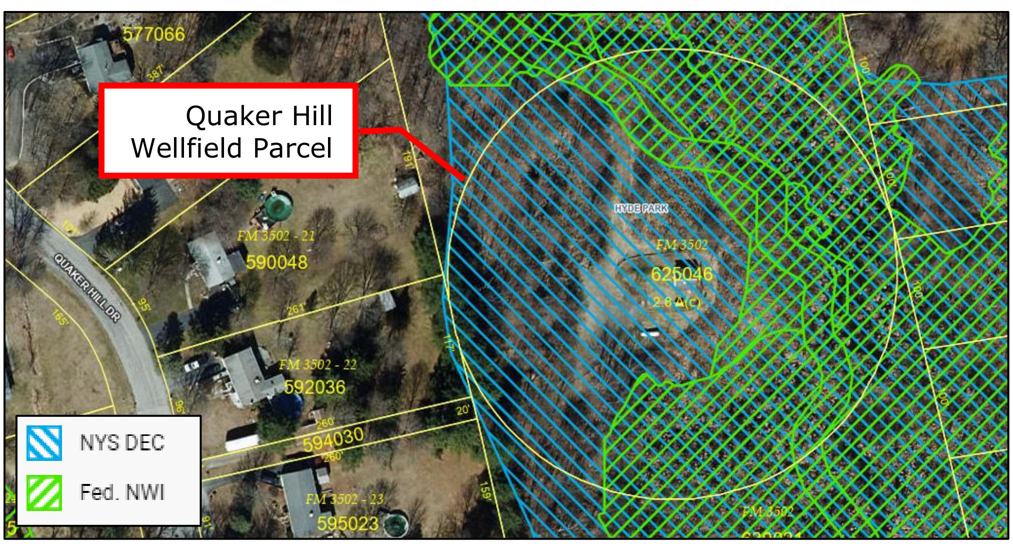


FIGURE 1-3
Wetlands at Quaker Hill Wellhouse/Treatment Building

1.2.4 Environmental Resources

The District was found to be within the NYSDEC rare plants and rare animals check zone as shown on their Environmental Resource Mapping tool. The locations shown in the Environmental Resource Mapper Rare Plants and Rare Animals layer are not precise locations. Rather, they show those generalized areas where New York Natural Heritage has information in its databases regarding rare animals and/or rare plants. These generalized areas show the vicinity of actual, confirmed observations and collections of rare animals and rare plants. The precise locations are not provided by this tool. The Environmental Resource Mapper Tool noted that the District is within the vicinity of Bats which are listed as endangered or threatened. No significant natural communities were noted within the vicinity of the District.

1.2.5 Environmental Justice Areas & Disadvantaged Communities

The Quaker Hill Water District is not within a potential environmental justice area (PEJA) according to the NYSDEC info locator mapping tool presented in Figure 1-4. However, an area just north of the Quaker Hill Water District between Route 9G and Fallkill Road is identified as PEJA (purple shading). Some of the public water supply systems (PWSs) discussed later in the report are within this PEJA.

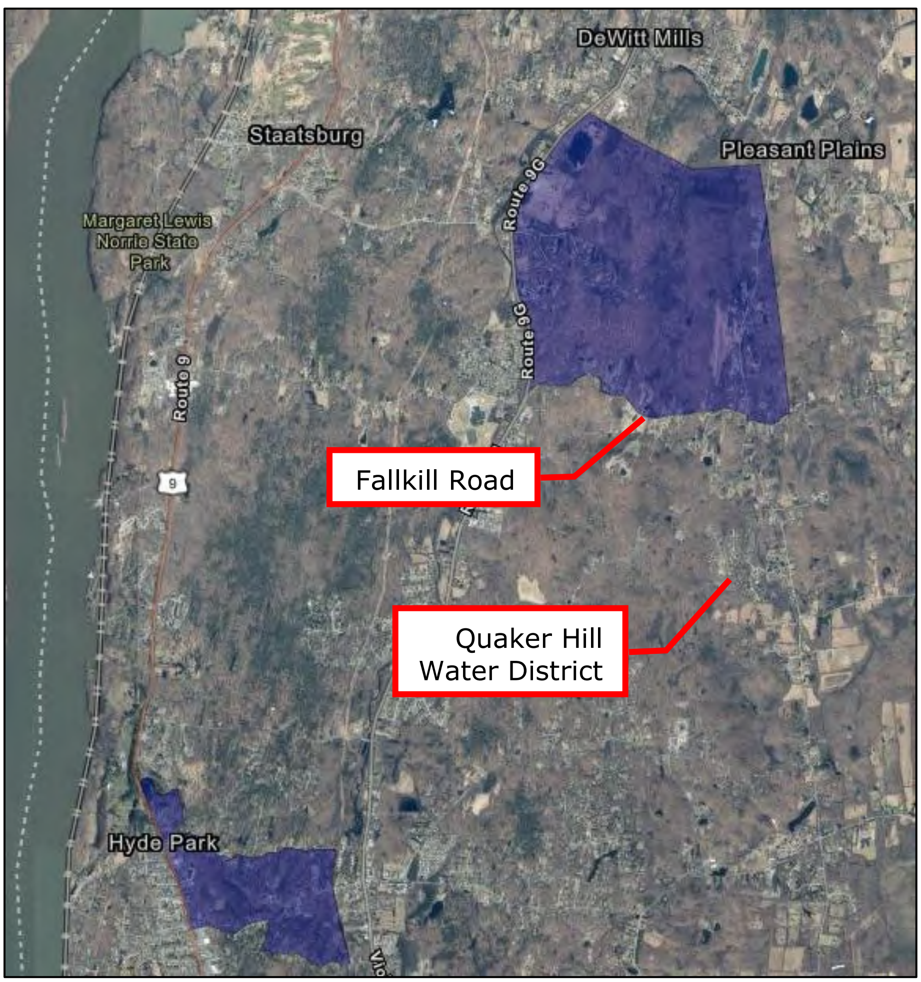


FIGURE 1-4
Town of Hyde Park Potential Environmental Justice Areas

The PEJA maps are based on U.S. census block groups that had populations that met or exceeded at least one of the following statistical thresholds:

1. At least 52.42% of the population in an urban area reported themselves to be members of minority groups; or
2. At least 26.28% of the population in a rural area reported themselves to be members of minority groups; or
3. At least 22.82% of the population in an urban or rural area had household incomes below the federal poverty level.

According to the 2014-2018 5-year American Community Survey (ACS), conducted by the US Census Bureau, the percentage of the census block group who reported themselves as a minority population is 34.73% and the percentage below the poverty level is 3.82%. Therefore, this portion of Hyde Park is considered a PEJA since more than 26.28% of the population in the rural area reported themselves to be members of minority groups. The percentage of the population below the federal poverty level (3.82%) is less than the statistical thresehold (22.82%).

The Quaker Hill Water District is not a disadvantaged community (DAC) according to the NYSDEC info locator mapping tool. However, the area west of Route 9G is identified as a DAC (see Figure 2-1). Some of the public water supply systems (PWSs) discussed later in the report are within this DAC area.

1.2.6 Floodplain Considerations

The Quaker Hill wellfield and wellhouse/treatment building has experienced flooding in the past, with the most notable flooding event in August 2011 during Hurricane Irene. Reportedly, flood waters rose up to 3 feet above grade in the vicinity of the wellhouse/treatment building, submerging the generator, lifting the propane tank off its support, and entering the wellhouse/treatment building, rendering the system inoperable.

Review of Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRMs) shows that the area is not within a mapped 100-year or 500-year flood area, and therefore, no formal flood elevation exists. As such, we recommend utilizing historical records to provide adequate protection from flooding for any new buildings at the site. Although official measurements were not recorded for the 2011 flooding, District representatives stated that flood waters rose to just below the electrical equipment inside the wellhouse. Based on field measurements, this is approximately 3 feet above the finished floor of the existing wellhouse/treatment building.

In accordance with the Recommended Standards for Water Works (10 State Standards), the finished floor of any new building constructed at the site should be located at least 3 feet above the flood of highest record, or approximately six feet above existing grade.

1.3 Ownership & Service Area

The Quaker Hill Water District is owned and operated by the DCWWA. DCWWA is an independent public benefit corporation established, at the request of the County of Dutchess, by an act of the State Legislature and governed by an appointed Board of Directors. The mission of DCWWA is to protect and enhance the health, environmental sustainability, and economic stability of Dutchess County and its residents through the provision of clean drinking water and proper treatment of wastewater.

As an owner and operator of water and wastewater systems, DCWWA is committed to the provision of reliable water and wastewater service. DCWWA has a team of professionals including certified water operators who operate the Quaker Hill and Hyde Park systems.

1.3.1 Water District Boundaries

The Quaker Hill Water District is approximately 100 acres in size and includes 109 served properties. There is only one vacant parcel within the District that is undeveloped and there are 4 other undevelopable lots. The district delineation is described in the Proposed County Water District Zone of Assessment U Map, Plan, and Report (MP&R) dated February 2015. Figure 1-5 from the MP&R shows the Quaker Hill Water District boundaries.

FIGURE 1-5
Quaker Hill Water District

1.3.2 Outside Users

There are no existing outside users, water purchase contracts, or inter-municipal agreements with the Quaker Hill Water District.

1.3.3 Population Trends

The population for the Quaker Hill Water District has been relatively consistent since the completion of the residential development in 1970. There is no census data available for only the Quaker Hill Water District. The estimated population served by the district is 350.

The development is built out and all residences are occupied excluding a single vacant developable parcel. There are no current or anticipated plans to expand the Quaker Hill Water District. Therefore, the population is projected to remain steady over the next 20 years.

1.3.4 Historical and Projected Water Use Data

Existing Demands

The Quaker Hill Water District has two onsite groundwater wells (Well No. 1 and Well No. 2). One totalizing flow meter measures total flow from the facility; however, no individual flow meter for each well with readout is present to measure and record individual flow production. Since no individual flow data is available, monthly operating reports were reviewed to evaluate well production for the district. Monthly operating reports from January 2022 through November 2023 were evaluated. A summary of wellfield daily demand including data from January 2022 through November 2023 is summarized in Figure 1-6.

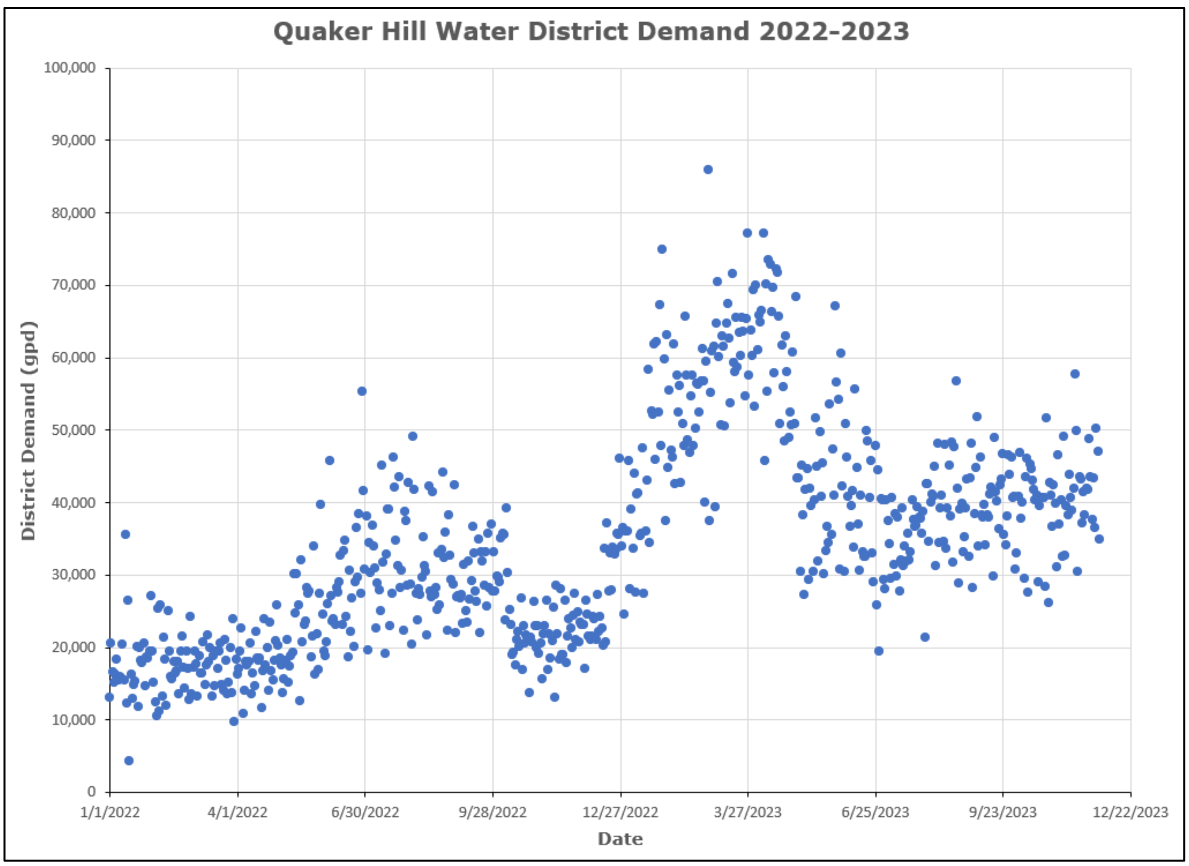


FIGURE 1-6
Quaker Hill Water District Daily Demand 2022-2023

As shown in Figure 1-6, daily demand was generally higher in 2023 than it was in 2022. This increased demand was caused by water main breaks in the distribution system, the largest of which was estimated by DCWWA operations staff as 60,000 gpd. There were no major leaks in 2022, therefore, the flow data from 2022 is assumed to be more representative of actual system demands. For this reason, production data from January through December 2022 was used to determine average and maximum day demand.

Since there is no flow meter monitoring instantaneous flow from the facility, there are no records for peak hourly demand for the facility. As such, the peak hour demand was estimated using typical peaking factors. Typical peak hour peaking factors (ratio of peak hour demand to average day demand) range from 2 to 7 (*Water Treatment*, Montgomery, 1985). A summary of this average day demand, maximum day demand, and peak hour demand is provided in Table 1-1.

TABLE 1-1
Quaker Hill Water District Demands

Condition	Demand (gpd)	Demand (gpm)
Average Day Demand	25,000	17
Maximum Day Demand	56,000	39
Peak Hour Demand[1]	100,000	69

[1]Based on Peaking Factor of 4.0 x Average Day Demand

As shown in Table 1-1, average day demand is 25,000 gpd, or approximately 17 gpm, the maximum day demand during this period was 56,000 gpd (which occurred in June 2022), and the estimate peak hour demand is 4,200 gallons per hour (gph), or approximately 69 gpm.

In 2014, as part of the Quaker Hill Water District Evaluation (2014 Report), the demands for the Quaker Hill Water system were based on 2013 production data. Based on 2013 production data, the average day demand was determined to be 24,428 gpd and the maximum day demand was 44,100 gpd. This indicates relatively consistent demands in the Quaker Hill Water District during years with minimal water main breaks.

The 2014 Report recommended several steps to address issues in the distribution system including a leak detection program, replacement of meters, installation of backflow preventers, and strategic water main improvements. Although not necessary to address the PFAS violation, we agree that improvements to the water distribution system are important to reduce unaccounted for water and ultimately a more stable water demand. As such, the recommended distribution system improvements for the Quaker Hill Water System are not included in the alternative analysis but are presented as "Phase 2" as discussed in Section 2.5. Further discussion regarding the condition of the existing water mains can be found in section 1.4.2.

Fire Flow

With no elevated storage, the system is not currently designed to provide fire flow. The 2014 Report estimated ISO needed fire flows of 750 gpm for 2 hours (90,000 gallons) based on the minimum distance of 30-50 feet between existing single-family dwellings.

Future Demands

The development is built out and all residences are occupied excluding a single vacant but developable parcel. The system has sufficient capacity to serve the additional parcel should it be developed. The District is located in a rural area of Hyde Park, and so there are a limited number of properties that could feasibly connect to the District, therefore, no future demands are anticipated.

Unaccounted Water

Based on the wide variation in total daily production discussed above, it appears that there has been a significant amount of unaccounted for water throughout the life of the Quaker Hill Water System. The 2014 Report estimated unaccounted for water due to water main breaks and leaks may have exceeded 100% for many months in 2013. However, metering limitations (customers are billed at a flat rate and usage is not metered) make it difficult to estimate what percentage of the demand is unaccounted for water.

Adjacent Public Water Systems

Several PWSs, the largest of which is the Hyde Park Regional Water System (HPRWS), are located near the Quaker Hill Water District. These systems are discussed in greater detail in Section 2.2.

Community Involvement

DCWWA maintains a website and notification system for alerts and advisories regarding the Quaker Hill Water System. This provides a convenient way of communicating with the users of the Quaker Hill Water System.

There have been no major capital improvement projects for the Quaker Hill Water System in many years. It is assumed that the community would be in support of improvements that protect the drinking water system and address the outstanding PFOS MCL violation.

There is also potential for enhanced community involvement if the interconnection alternative (see Section 2.2) is selected, offering a resolution for adjacent PWSs with outstanding water quality violations.

1.4 Existing Facilities

1.4.1 Location & Layout

The Quaker Hill Water District is accessed from North Quaker Lane in the Town of Hyde Park and serves the residential properties along Quaker Hill Drive, Shaker Lane, Barkley Road, Guerney Drive, and Pennington Drive (see Figure 1-5).

The District facilities are located on an approximately 7 acre site, as shown in Figure 1-7 below. Access to the site is via a 20-foot-wide utility easement near the end of Quaker Hill Drive. The access drive is a gravel road approximately 260 feet long that runs between two residential properties.

The parcel is 400-feet in diameter centered on one of the wells. The parcel is low-lying and completely within a NYSDEC freshwater regulated wetland. Fall Kill Creek runs through the parcel.

The electric service for the existing facilities is overhead from the power line that runs in a back lot right of way on the west side of North Quaker Lane. The overhead power lines cross the creek and the wetland, with utility poles located in the wetland.

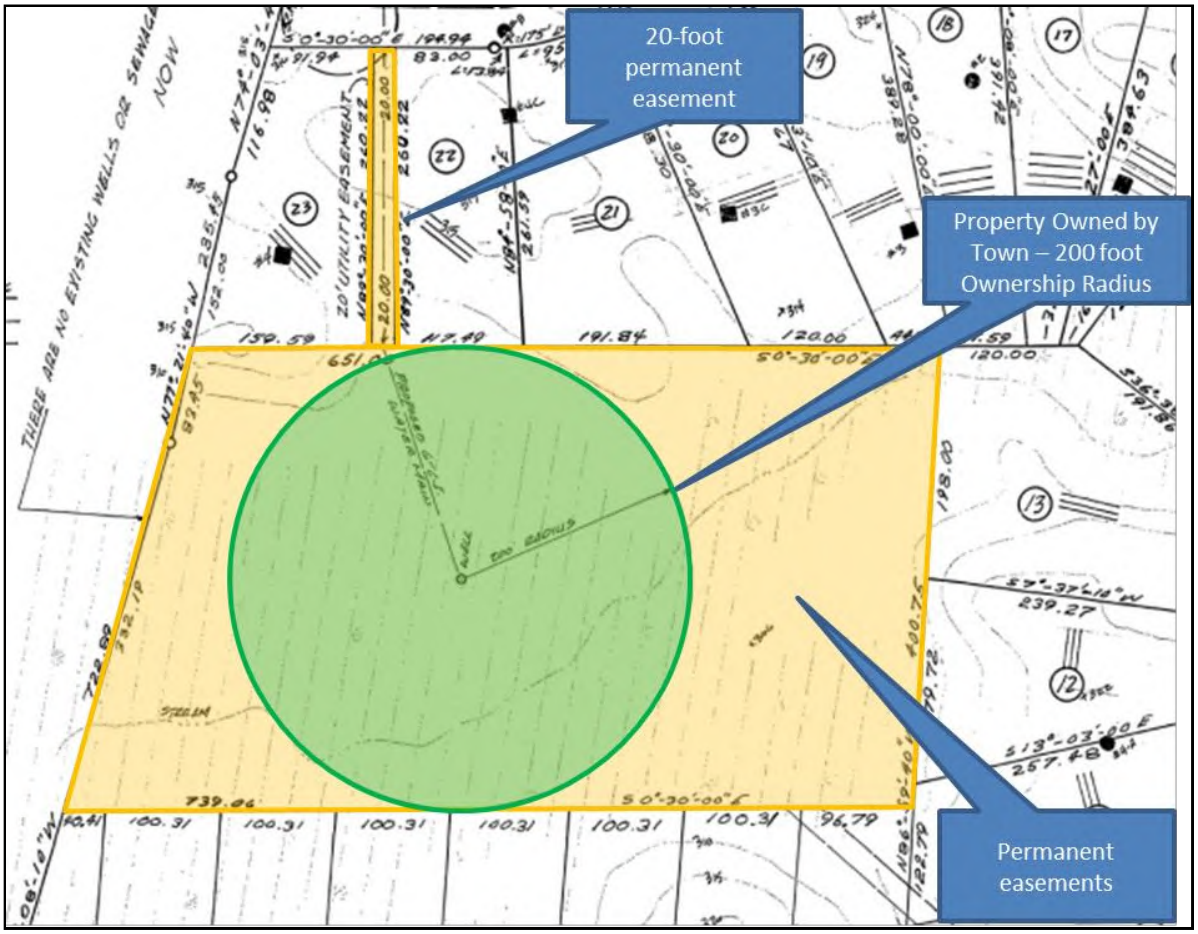


FIGURE 1-7
Quaker Hill Water District Ownership and Easements

The site contains three wells (two active and one abandoned), the wellhouse/treatment building, a buried hydropneumatic tank, security fencing, a generator, and a propane tank. Figure 1-8 shows a general layout of these structures at the site, including:

- Wellhouse/Treatment Building with Well No. 1 inside (1)
- Well No. 2 (2) – originally designated as Well No. 3 on historical drawings, but was renamed with the abandonment of the original Well No. 2.
- Generator (3)
- Buried hydropneumatic tank (4)
- Propane tank (5)
- Test Well No. 3 (abandoned) (6) – Originally designated as Well No. 2 on historical drawings.
- Security fencing (7)

- Access drive (8)
- Overhead electric service (9)

FIGURE 1-8
Quaker Hill Water Treatment Facilities

Appendix A contains photographs of the existing facilities.

1.4.2 General Description & History

The Quaker Hill Water District source and treatment system includes two wells (Well No. 1 and Well No. 2), a small masonry wellhouse/treatment building, a sodium hypochlorite feed system, and a buried 10,000 gallon hydropneumatic tank. Figure 1-9 shows a schematic of the existing system.

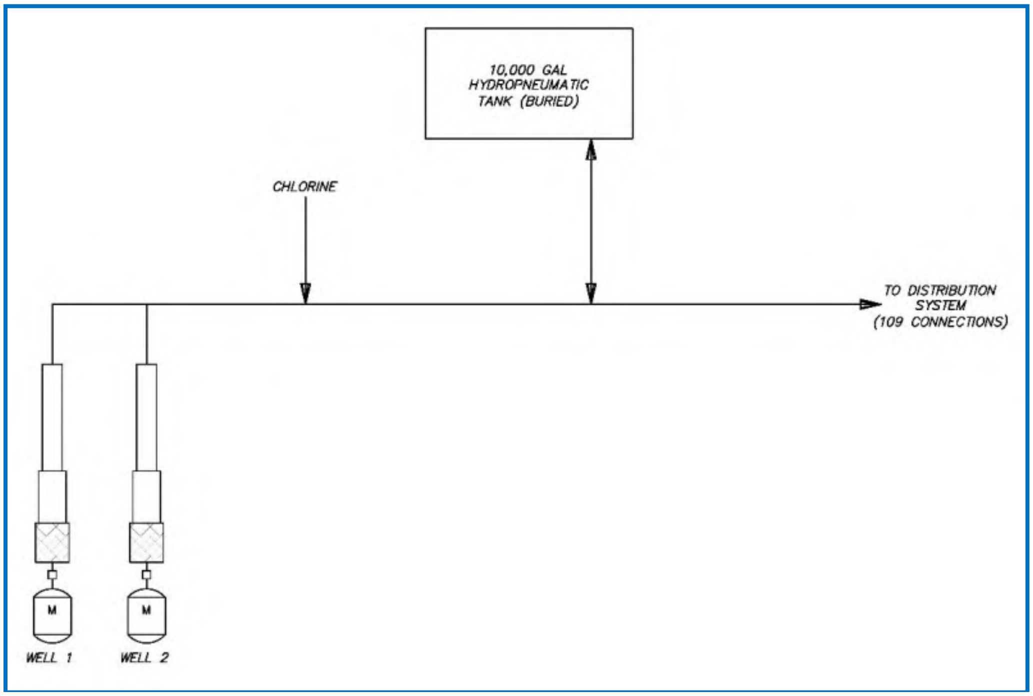


FIGURE 1-9
Existing System Schematic

According to available system documentation from the Town of Hyde Park, the Quaker Hill Water Corporation developed the central water system during the period of 1965 to 1970. Due to poor water distribution main installation practices, the water system experienced extensive water main leaks by 1976. District records indicate that the water mains were installed directly on shale, with no gravel bedding. This has resulted in a multitude of water main failures over the years. Unfortunately, leak detection programs have had minimal success because of the fractured nature of shale. It has also been noted that, in general, the water mains were not installed to five feet below ground surface, and on average have just over three feet of cover, rendering the piping susceptible to damage from frost.

By 1978 the Dutchess County Department of Health assumed operational control of the system from the Quaker Hill Water Corporation. Circa 1980, the Town acquired the water system, forming the Quaker Hill Water District. The water system's sole hydropneumatic tank was replaced around 1998.

The New York Department of State awarded the Town of Hyde Park a Local Government Efficiency Grant in 2011. The Grant funds were used for an engineering evaluation and to assess the feasibility of transferring the District's assets and management to DCWWA. In February of 2015, the Town of Hyde Park transferred ownership of eight water and wastewater systems to DCWWA, including the Quaker Hill Water System.

As the Quaker Hill Water System is now 54 years old, and with minimal reconstruction projects undertaken under previous ownership, it is generally recognized that most system components are beyond their useful service life. The 2014 Report noted concerns regarding the condition of the wellhouse/treatment building and distribution system and identified several mechanical and safety issues.

While the water supply of the District is of adequate quantity, there has been a recent MCL exceedance for PFOS (see Section 1.5 for further discussion).

1.4.3 Present Condition

Source Capacity

Groundwater Well No. 1 and Well No. 2 are the two sources of water supply for the Quaker Hill Water System. Both wells are located within the same parcel. The DCDBCH, following its 2019 sanitary survey, required that both source wells be evaluated for potential Groundwater Under Direct Influence of Surface Water (GWUDI). The first stage of GWUDI testing data collection was conducted from April 2020 to May 2021. DCDBCH representatives reviewed the data and issued an official determination that the Quaker Hill Water System source wells are not under the direct influence of surface water.

Existing well capacity was estimated as part of the 2014 Report based on historical records and the DCDBCH inspection reports. According to a 1978 report by Morris Associates, Well No. 1 is an 8-inch diameter shallow gravel well, with a safe yield of 220 gpm. The well is approximately 50 feet deep, with a 20 foot deep clay confining layer. Well No. 1 is equipped with a 185 gpm well pump.

There are no well construction details for Well No. 2; however, a DCDBCH inspection report from 1983 reports that the well is equipped with a well pump rated for 112 gpm. In both the 1983 and 1984 reports, it was noted that Well No. 2 had not received a completed works approval; we were unable to confirm if this had ever been received. Table 1-2 shows the reported capacity for the two wells based on the most recent water withdrawal reporting forms.

TABLE 1-2
Reported Well Capacity

Well	Capacity (gpm)	Capacity (gpd)
Well 1	180	259,200
Well 2	109	157,000

According to 10 States Standards, the total developed groundwater source capacity shall equal or exceed the design maximum day demand with the largest producing well out of service. Since there is no atmospheric storage, the groundwater wells must meet peak hour demand (estimated to be 69 gpm, see Section 1.3.4). The system has had no issues maintaining system pressures, even with the history of water main breaks.

With the largest well (Well No. 1) out of service, the firm capacity of the wellfield is 109 gpm, or the reported capacity of Well No. 2. This is greater than the estimated peak hour demand of 69 gpm, therefore, this requirement is satisfied. However, we recommend that District consider yield testing to determine the actual safe yield of the wells, specifically for Well No. 2. The well pump sizes and capacities should also be confirmed.

Water Quality

Prior to recent regulations requiring public water supplies to test for perfluoroalkyl substances in source waters, Quaker Hill records indicate that concentrations of all regulated contaminants were well below their respective regulatory limits. However, both Quaker Hill source water wells contain perfluoroalkyl concentrations that exceed the EPA's MCL of 4 nanograms per liter (ng/L) or parts per trillion (ppt), and New York State's current MCL of 10 ppt. Section 1.5 provides further discussion regarding the MCL exceedances in the Quaker Hill System.

Site/Civil/Security

Several low hanging branches were observed along the entrance road. These branches should be trimmed and maintained to ensure continuous access to the site. The grounds surrounding the Quaker Hill Water Wellhouse/treatment building are generally wet and muddy due to their low-lying nature in the wetland. The facility is surrounded by a perimeter fence with barbed wire and is equipped with a manual swing gate at the main entrance. The fence is in fair condition, with several areas of rusting observed. There are no door contacts, security cameras, or security alarms.

Safety

The Quaker Hill Water System facilities were evaluated for compliance with general health and safety practices as well as OSHA CFR 1910 as part of the 2014 Report. Although OSHA does not have direct jurisdiction over municipality-owned public utilities in New York, the facility is subject to compliance with New York State safety requirements which are very similar to OSHA and must provide a safe working environment for employees, contractors, and visitors at all times. Several of the safety concerns highlighted in the 2014 Report have been addressed since DCWWA took ownership of the system. The following health & safety concern remain:

- Eye wash is accomplished through the use of portable bottles. Permanent eye wash/shower stations should be considered in all locations where chemicals are handled and stored. Appropriate signage should be located near all eye wash stations.

Structural/Architectural

The existing wellhouse/treatment building is a single story structure with single wythe, 8-inch CMU walls, a concrete slab on grade and timber framed gable roof. The interior dimensions are 14′-9″ by 14′-9″ with a floor to ceiling height of 7′-10″.

Overall, the existing wellhouse/treatment building is in poor condition. The building structure has significant structural issues. Occupancy of the building in an earthquake or significant wind or flooding event would be unsafe. Settlement of the building and floor slab has resulted in misalignments of the piping system and cracks in the floor slab leaving the wells vulnerable to contamination. The building has been subjected to flooding (see Section 1.4.5), which has also impacted the life expectancy of the structure and its equipment. Settling of the structure is likely due to poor subsurface ground conditions and the history of the issues are well documented.

The architectural components of the building are also in poor condition including the asphalt shingle roofing which is heavily deteriorated and is approaching a failed condition. There is also moderate rust on the hollow metal door and door frame.

It is feasible to remove and replace the broken mortar joints. However, since it is likely unreinforced, the repaired masonry system will be susceptible to further cracking of the mortar joints particularly if any further movement of the building occurs. Also, while some of the failed mortar joints have been filled with spray foam insulation, it is likely that other failed joints have allowed moisture to enter into the concrete masonry blocks.

Finally, unreinforced masonry does not provide significant lateral load resistance (wind/earthquake), and so the building might be unsafe during these conditions. We recommend demolishing the existing masonry building and replacing it with a new structure.

Process/Mechanical

Equipment at the Quaker Hill Water District facility varies in age and condition. However, most of the equipment is at or past the end of its useful service life. This section provides an overview of the condition of the process/mechanical equipment including:

- Wells & Well Pumps
- Process Piping
- Hydropneumatic Tank
- Chemical Feed System

Two wells are currently in place at the site. Well No. 1 is located inside the treatment building. A sleeve was installed in Well No. 1 a few years ago according to DCWWA staff; however, this solution was only intended to be temporary and therefore Well No. 1 needs to be replaced. The new well casing should be extended at least 18 inches above grade, and 3 feet above maximum flood elevation, in accordance with 10 States Standards, and be provided with a lockable, watertight well cap.

Well No. 2 is located outside of the fenced area and the grading around Well No. 2 is not graded to allow surface drainage away from the well. We recommend that grading improvements be made to Well No. 2 and the casing should also be extended to 3 feet above the maximum flood elevation. Test Well No. 3 has been abandoned.

The motor for Well Pump No. 1, along with the wiring, check valve, and well pipe was replaced in 2023. The age of both well pumps and the motor for Well Pump No. 2 is unknown, and we expect they are past their useful life expectancy. Both well pumps should be replaced and sized for the conditions of the new treatment facility. Well yield testing is also recommended to confirm the safe yield capacity of each well.

The piping system inside the building consists of cast iron pipe, isolation valves, a flow totalizer, and chlorine injection point. Overall, the piping is in poor condition. The paint system on the piping has deteriorated, and areas of corrosion were observed. Portions of piping where it interfaces with the floor slab have significant corrosion. Settlement of the building following its construction has resulted in a significant amount of cracks and misalignment of the floor slab. This has resulted in notable pipe alignment issues and stress on the existing piping system joints and restraints. Repairs have been made over the years to account for the misalignment, but these are generally less resilient installation practices and the piping is at risk as the building continues to settle. All piping inside the building should be replaced.

Pressure stabilization for the system is achieved using a 10,000 gallon hydropneumatic tank. The hydropneumatic tank was replaced in approximately 1998 and is past its useful life expectancy.

The existing hydropneumatic tank is completely buried, however, according to 10 State Standards, hydropneumatic tanks should be located above normal ground surface and be completely housed.

The wellhouse/treatment building houses a sodium hypochlorite chemical feed system. Overall, the feed system is in good condition, with the day tank and metering pump recently replaced. The metering pump is a diaphragm style pump. Based on the typical service life for chemical feed system equipment, the tank and metering pump will be due for replacement in a three to five years. Therefore, it is recommended that the chemical feed system be replaced at the time of the treatment building improvements/replacement. The design of the new chemical feed system should include redundant metering pumps and a tank vented to the exterior.

Instrumentation & Controls

A cellular alarm system at the existing facility notifies operations staff of high and low pressure conditions. This is currently the only alarm system at the facility.

Neither well is equipped with level instrumentation, flow meters, or individual pressure gauges on their discharge lines. The new treatment processes should include new instrumentation and controls for well levels, individual well flow meters, combined flow meter, pressure monitoring, tank level monitoring, new pump controls, chlorine residual monitoring, and alarms.

Electrical and HVAC

The existing electrical system at Quaker Hill facility consists of a propane fired engine generator, automatic transfer switch (ATS), main disconnect switch, pump starters, load center, pump control panel and a compressor disconnect switch. Most of the equipment has reached the end of its useful life and shows signs of corrosion. We recommend that the main disconnect switch, starters, pump control panel, compressor disconnect switch and load center be replaced. There is currently no surge protection provided on the well pumps. We recommend that surge protection be provided to protect the well pumps.

The generator is a 35 kilowatt propane-fired Katolight generator, located exterior to the building, but within the perimeter fencing system. The ATS is a 100 amp, 240 volt Katolight. Both the generator and ATS appear to be in fair condition, despite having weathered a flooding condition, when both the generator and switch were partially submerged. It is our understanding that most of the critical components in both pieces of equipment were evaluated and/or replaced following the flooding event. Also, the battery and charger were replaced in 2014. However, the generator and ATS are past their anticipated useful life and should be replaced and sized appropriately for the new treatment facility design.

Also, the main disconnect switch and ATS installations are in violation of working space requirement of 36 inches (National Electrical Code) for electrical equipment. As a result, the main disconnect should be powered down completely before completing any service work on the switch.

The existing exterior light and interior unit heater are original to the facility and should be replaced. In general, wiring, conduit, and receptacles inside the building are in poor condition, and the receptacles are not GFI rated.

The overhead electrical service for the wellfield and wellhouse/treatment facility comes from the east, across the wetland. DCWWA staff report that vegetation in the wetland has grown up beneath the electrical service and interfered with the overhead electrical lines. The vegetation has caused disruptions to the electrical service. It is difficult to perform maintenance and trimming of the vegetation beneath the electrical service because it runs through the wetland. Consideration was given to relocating the electrical service to Quaker Hill Road, however the only power available at Quaker Hill Road is single phase and it is a residential dead-end road, which poses significant difficulties to power the station loads.

1.4.4 Permit Conditions

The Quaker Hill Water District is subject to a water withdrawal permit. The water withdrawal permit limit for the Quaker Hill Water System is 289 gpm or approximately 416,000 gpd.

There are no wastes generated as part of operations at the Quaker Hill Water System.

1.4.5 History of Infrastructure Damage due to Storm/Flood Impacts

As discussed in Section 1.2.6, the Quaker Hill wellfield and wellhouse/treatment building has experienced flooding in the past, with the most notable flooding event in August 2011 during Hurricane Irene. Reportedly, flood waters rose up to 3 feet above the finished floor elevation of the existing wellhouse/treatment building, submerging the generator, lifting the propane tank off its support, and entering the wellhouse/treatment building, rendering the system inoperable.

1.5 Need For Project

On January 17, 2024, DCWWA received a Notice of Violation for exceeding the PFOS MCL (10 ppt) based on an average of the last three samples for Well #2 at the Quaker Hill Estates Water System. A copy of the Notice of Violation is attached as Appendix B.

Samples collected since 2021 from Well 1 and Well 2 consistently detected PFOA and PFOS, and concentrations have risen over time. Recent water quality samples collected in late 2023 and early 2024 from both wells at the Quaker Hill Water System range from 3.10 ppt to 13.60 ppt for both PFOS and perfluorooctanoic acid (PFOA). The current New York State MCL for PFOS and PFOA is 10 ppt.

On April 10, 2024, the EPA announced the final National Primary Drinking Water Regulation for six per- and polyfluoroalkyl substances (PFAS). The new rule set a MCL for PFOS and PFOA of 4 ppt and a MCL for PFHxS, PFNA, and HFPO-DA (commonly known as GenX Chemicals) of 10 ppt. In addition, mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS will be regulated by a calculated *Hazard Index* (HI) value of 1 (unitless) based on the sum of individual compound's concentrations relative to their reference dose (Equation 1-1). Table 1-3 provides a summary of the raw water sample results for PFAS compounds with current regulatory limits.

$$Hazard\ Index = \left(\frac{[GenX_{water}]}{[10\ ppt]}\right) + \left(\frac{[PFBS_{water}]}{[2{,}000\ ppt]}\right) + \left(\frac{[PFNA_{water}]}{[10\ ppt]}\right) + \left(\frac{[PFHxS_{water}]}{[10.0\ ppt]}\right) \qquad \text{[Equation 1]}$$

TABLE 1-3
Summary of PFAS Data for Quaker Hill Water System Wells 1 and 2

Source	Date	PFOA	PFOS	PFHxS	PFNA	PFBS	GenX	HI
Well 1	3/29/2024	3.10	3.70	0.00	0.00	0.00	0.00	0.00
	11/9/2023	5.10	7.52	1.27	0.00	3.02	0.00	0.14
	10/11/2023	4.90	5.44	1.09	0.00	2.72	0.00	0.12
	5/18/2023	4.62	4.40	1.03	0.00	2.46	0.00	0.12
	1/11/2023	3.27	2.53	0.99	0.00	2.00	0.00	0.11
	11/21/2022	3.54	3.00	1.26	0.00	2.38	0.00	0.14
	5/17/2022	3.84	3.55	1.75	0.00	2.92	0.00	0.20
	3/1/2022	2.35	2.56	1.12	0.00	2.78	0.00	0.13
	12/23/2021	5.42	7.67	1.38	0.00	4.70	0.00	0.16
	9/21/2021	4.06	6.02	0.80	0.00	3.48	0.00	0.09
	5/25/2021	2.64	2.80	0.69	0.00	1.88	0.00	0.08
	2/10/2021	2.83	3.71					
Well 1 Average		3.81	4.41	1.03	0.00	2.58	0.00	0.12
Well 2	3/29/2024	3.70	10.00	0.00	0.00	2.80	0.00	0.00
	11/9/2023	8.59	13.60	1.62	1.04	4.32	0.00	0.29
	10/12/2023	10.60	13.50	1.65	0.81	4.26	0.00	0.27
	5/18/2023	9.81	9.26	1.46	0.00	3.66	0.00	0.16
	1/11/2023	8.90	8.64	1.55	0.00	4.47	0.00	0.17
	11/8/2022	6.36	5.66	1.41	0.00	3.54	0.00	0.16
	8/16/2022	5.05	4.70	1.14	0.00	3.04	0.00	0.13
	5/17/2022	6.72	7.30	1.25	0.00	4.63	0.00	0.14
	3/1/2022	7.05	7.44	1.31	0.00	4.99	0.00	0.15
	12/23/2021	5.64	7.39	1.39	0.61	4.75	0.00	0.22
	9/21/2021	7.45	9.18	1.02	0.00	4.85	0.00	0.12
	5/25/2021	7.38	8.30	1.26	0.00	3.56	0.00	0.14
	2/10/2021	7.17	8.09					
Well 2 Average		7.26	8.09	1.26	0.21	4.07	0.00	0.16

LEGEND:
Exceeds current MCL (4 ppt) | Will require quarterly monitoring

In addition to the Notice of Violation, sanitary surveys from the DCDBCH continually note issues with aging infrastructure. To summarize, the improvement project at the Quaker Hill Water System is needed for the following reasons:

- Notice of Violation for MCL PFOS Exceedance
- Sanitary Surveys identify issues with the condition of existing equipment
- Infrastructure is well past its useful life
- Infrastructure is in poor condition
- Facilities are subject to flooding
- Certain system components do not meet current design standards

1.6 Capacity Development

The New York State Department of Health (DOH) is required to ensure that all systems receiving DWSRF assistance have adequate technical, managerial, and financial capabilities to provide safe drinking water. Systems that lack adequate capacity may be determined as ineligible by DOH to receive DWSRF assistance unless the project to be financed corrects the technical, managerial, and financial deficiencies.

Attached in Appendix D is the completed Capacity Development Program Evaluation Form.

Section 2
Alternative Analysis

2.1 Alternatives Considered

There are two main alternatives to consider for the Quaker Hill Water System including abandonment of the existing wellfield and treatment system and connection to the Hyde Park Regional Water System (HPRWS) or replacement of the existing wellhouse/treatment building with a new system. A summary of the alternatives being considered is below:

- Alternative No. 1:
  - Connect the Quaker Hill Water System to the HPRWS (Route B)
  - Booster pump station at the North Tank site
  - Abandon the existing Quaker Hill Wellfield and treatment system
- Alternative No. 2:
  - Install a new treatment building with deep foundation
  - Install new system components including treatment for PFOS
  - Improvements to existing wells
  - Demolish the existing wellhouse/treatment building
  - Site improvements to protect the new facilities from flooding
- Alternative No. 3:
  - No Action

A no-action alternative (Alternative No. 3) will be discussed, but given the issues noted in Section 1.5 of this report, it is not a viable alternative. Rehabilitation of the existing wellhouse/ treatment building was also considered but found to be infeasible due to the significant settling issues and vulnerability to future flooding.

Section 2.5 presents the recommendations for water main improvements in the Quaker Hill Water System. Although not necessary to address the PFAS violation, the water main improvements should be considered as a second phase to either of the alternatives. A total of 500 feet of water main replacement within the existing Quaker Hill distribution system has been included in each alternative to address the highest priority areas of water main replacement.

2.2 Alternative No. 1 – Interconnection to HPRWS

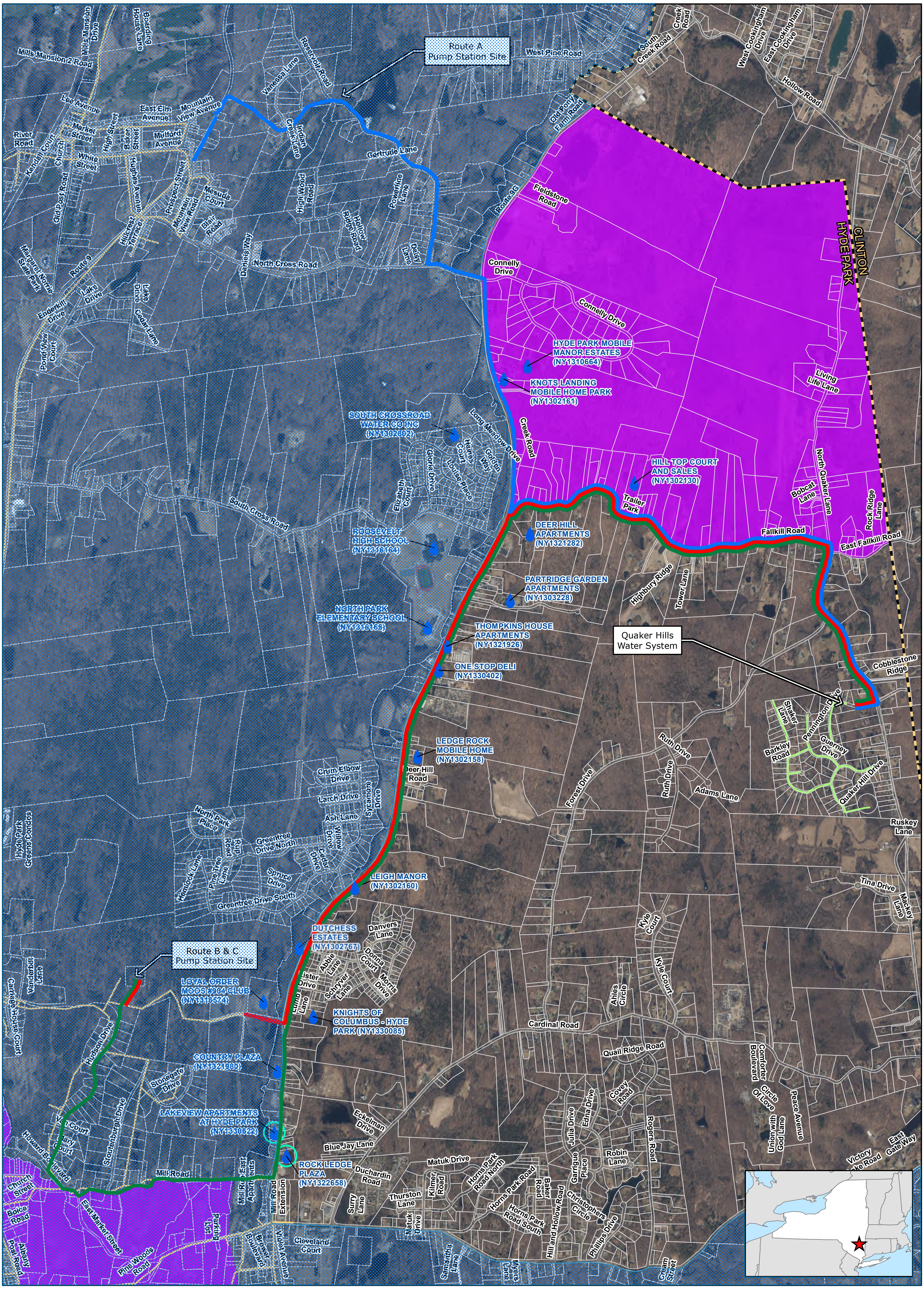
As part of the alternatives analysis to address the PFOS MCL exceedance, the installation of a transmission water main from the HPRWS to replace the impacted water supply for the Quaker Hill Water System was considered.

Hydraulic conditions along the alternative interconnection routes were evaluated for water main sizing and the need for pumping and/or pressure reduction. The hydraulic evaluation used both the existing HPRWS hydraulic model (WaterGEMS) and GIS data to develop elevation and pressure profiles along each route. Hydraulic calculations presented utilize the Hazen-Williams equation to calculate headloss, assuming the installed main is cement lined ductile iron pipe with a C-factor of 130 (most conservative in range of values).

The Quaker Hill Water System does not currently provide fire flow. Therefore, the interconnection evaluation considers domestic flows only and recommended sizing does not include fire flow capacity. Three interconnection route alternatives were evaluated:

- Route A - Connection to the HPRWS from the 12-inch main in Route 9 at the Prospect Street intersection. (26,300 LF)
- Route B - Connection to the HPRWS at the North Storage Tank site via a cross country easement. (25,100 LF)
- Route C – Connection to the HPRWS at the North Storage Tank site via Mill Road and Hudson Drive. (35,900 LF)

The Route A, Route B, and Route C interconnections are shown in Figure 2-1.



LEGEND

- Surounding PWS
- PWS with PFAS Issues
- Potential Environmental Justice Area (PEJA)
- Approximate Parcel Boundary
- Proposed Interconnection (Route A)
- Proposed Interconnection (Route B)
- Proposed Interconnection (Route C)
- Existing Quaker Hill Water Main
- Existing Hyde Park Water Main
- Town Boundary
- Disadvantaged Community

1:21,600

0 900 1,800 Feet

Tighe&Bond

Ortho provided by dhses.ny.gov (2018).

FIGURE 2-1
ALTERNATIVE 1
INTERCONNECTION ROUTES

Hyde Park - Quaker Hill Interconnection Analysis
Hyde Park, New York

June 2024

V:\Water_Modeling\Hyde Park NY\130280-007F Quaker Hill PFAS\GIS\Figure2-1_InterconnectionAlternatives_PEJA.mxd [Exported By: AFreudenberg, 6/10/2024, 11:12:18 AM]

D-0280

2.2.1 Water Main Sizing

Flow from HPRWS to the Quaker Hill Water System was calculated from 2022 daily production in the Quaker Hill system (see Section 1.3.4). Based on 2022 flow data, the maximum day demand of the Quaker Water System is 56,000 gpm (39 gpm) and average day demand is 25,000 gpd (17 gpm). Peak hour demand data for Quaker Hill is unavailable but estimated to be 4,200 gph (69 gpm). There is potential for connection to additional PWSs located along each interconnection route. Table 2-1 summarizes the demands for each PWS along the alternative interconnection routes.

TABLE 2-1
Summary of Public Water System Demand

		Max Day Demand[2]	
PWS ID No[1]	**PWS Name[1]**	**gpd**	**gpm**
NY1302796	Hyde Park Regional (HPRWS)	1,383,000	959
NY1302797	Quaker Hill	56,000	39
Route A			
NY1310664	Hyde Park Mobile Manor Estates	32,000	22
NY1302161	Knots Landing Mobile Home Park	3,400	2
NY1302802	South Crossroad Water Co Inc	74,000	51
NY1321282	Deer Hill Apartments	2,400	2
NY1302130	Hilltop Court and Sales	6,600	5
Route B			
NY1321980	Country Plaza DC	3,000	2
NY1316574	Loyal Order Moose #904 Club	1,200	1
NY1330085	Knights of Columbus - Hyde Park	1,600	1
NY1302767	Dutchess Estates Inc	64,000	44
NY1302160	Leigh Manor	2,600	2
NY1302158	Ledge Rock Mobile Home Park	2,800	2
NY1330402	One Stop Deli	1,600	1
NY1321926	Thomkins House Apartments	1,200	1
NY1316165	North Park Elementary School	14,200	10
NY1303228	Partridge Garden Apartments	16,800	12
NY1316164	Roosevelt High School	49,800	35
NY1302802	South Crossroad Water Co Inc	74,000	51
NY1321282	Deer Hill Apartments	2,400	2
NY1302130	Hilltop Court and Sales	6,600	5
Route C (All of Route B +)			
NY1322658	Rock Ledge Plaza	4,200	3
NY1330622	Lakeview Apartments at Hyde Park	3,600	3

[1]Provided by Dutchess County Department of Behavioral and Community Health (DCDBCH)

[2]Quaker Hill demand from 2022 production data, all other demands based either on reported system average day production or estimated from population served and assuming 75 gpd per capita served. With the exception of Quaker Hill & HPRWS, max day demands are calculated as average day demand with assumed 2.0 max day peaking factor

Water system demands were used to calculate the flow along each interconnection route to size the water main for the alternative interconnections. Hydraulic results showed an 8-inch cement lined ductile iron water main is able to maintain reasonable flow velocities and headloss and is the recommended size to supply domestic flows for all alternatives (Table 2-2). The 8-inch main also provides the shortest residence time to transfer water from the HPRWS to Quaker Hill.

TABLE 2-2
Water Main Sizing Alternatives

Alternative	Max Velocity (ft/s)[1]				Total Headloss (ft)[1]				Residence Time (days)[2]
	Quaker Hill Only		Quaker Hill + PWSs		Quaker Hill Only		Quaker Hill + PWSs		Quaker Hill Only
	MDD	PH	MDD	PH	MDD	PH	MDD	PH	
Route A									
8-inch	0.1	0.1	0.2	0.4	1.2	4.2	5.5	19.9	2.8
12-inch	0.0	0.1	0.1	0.2	0.2	0.6	0.8	2.8	6.3
16-inch	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.7	11.2
Route B & C[3]									
8-inch	0.1	0.1	0.3	0.6	1.6	5.8	20.5	73.6	3.8
12-inch	0.0	0.1	0.1	0.3	0.2	0.8	2.3	10.2	8.6
16-inch	0.0	0.0	0.1	0.2	0.1	0.2	0.7	2.5	15.3

[1]Max Day (MDD) values calculated using on max day flows shown in Table 2-1. Peak hour (PH) values calculated as 2xMDD and assumes all systems experience a simultaneous peak hour.

[2]Calculated assuming average day flow in the Quaker Hill PWS and accounts for pipe volume. Does not consider water age entering the interconnection from the HPRWS.

[3]Values shown are representative of Route C and are conservative for Route B.

2.2.2 Pressure and Pump Station Sizing

Operating pressure for each alternative interconnection route was calculated assuming maximum day demand flow and the modeled operating max day hydraulic grade line (HGL) at each alternative connection point to the HPRWS. Route A connects to the existing 12-inch main at the intersection of Route 9 and Prospect Street upstream of the pressure reducing valve (353 ft HGL; 84 psi), Route B connects to an existing 12-inch main near the Loyal Order Moose Club and ultimately at the North Tank Site (354 ft HGL; 44 psi), and Route C connects to the existing 16-inch inlet/outlet main at the North Storage Tank (354 ft HGL; 44 psi).

Hydraulic modeling shows that the existing HPRWS is able to supply max day demands to Quaker Hill and the additional PWSs included in Table 2-1 for each route alternative with little to no impact on pressure or velocity in the HPRWS. Elevation and pressure profiles for Route A, Route A with the additional PWSs, Route C, and Route C with the additional PWSs are shown in Figures 2-2, 2-3, 2-4, and 2-5 respectively. Please note that Route B pressure profiles are not presented but are the same as Route C starting at approximately 12,500 LF. Pressure profiles show that pumping will be required to maintain positive pressure along each route. Pump stations were conceptually sited at the former Staatsburg well site parcel at 57 Reservoir Road, Hyde Park, along Route A and at the North Storage Tank parcel at 56 Hudson Drive, Hyde Park, at the beginning of Route B & C. Pressure profiles assuming pumping at these locations are include in Figures 2-2 through 2-5.

Each pump station is conceptually sized to boost water to the HGL that will maintain the existing 529 ft nominal HGL in the Quaker Hill Water System. Table 2-3 summarizes the conceptual pump station sizing criteria.

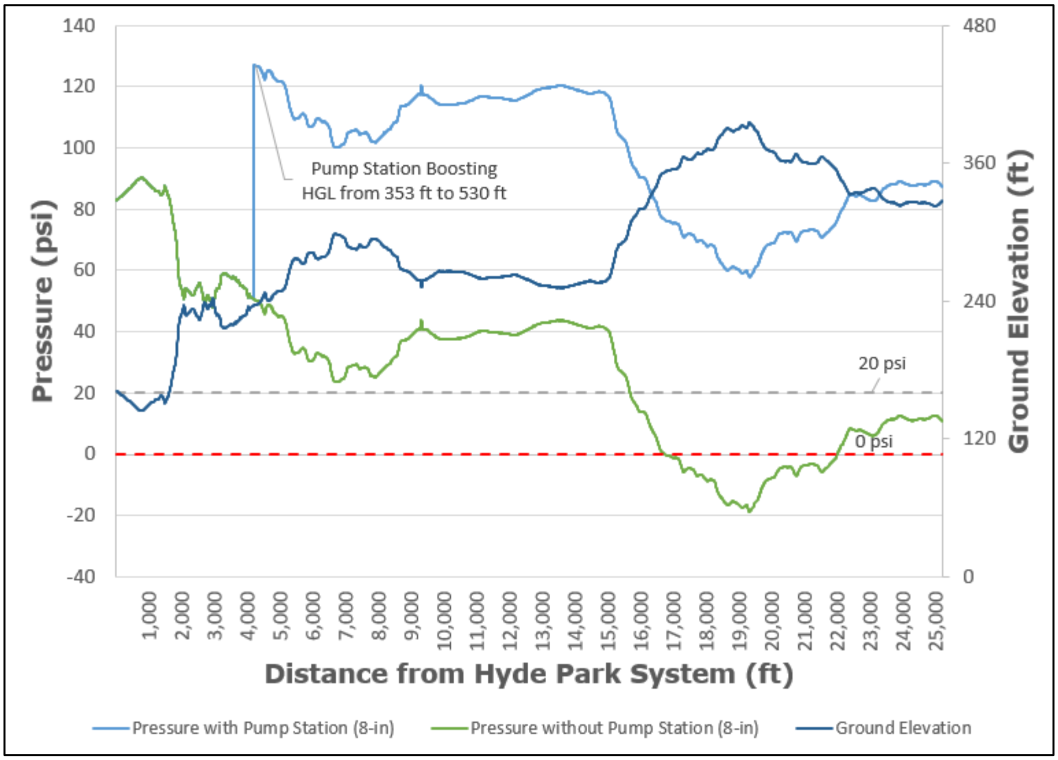


FIGURE 2-2

Route A Elevation Profile and Modeled Operating Pressure at Quaker Hill MDD

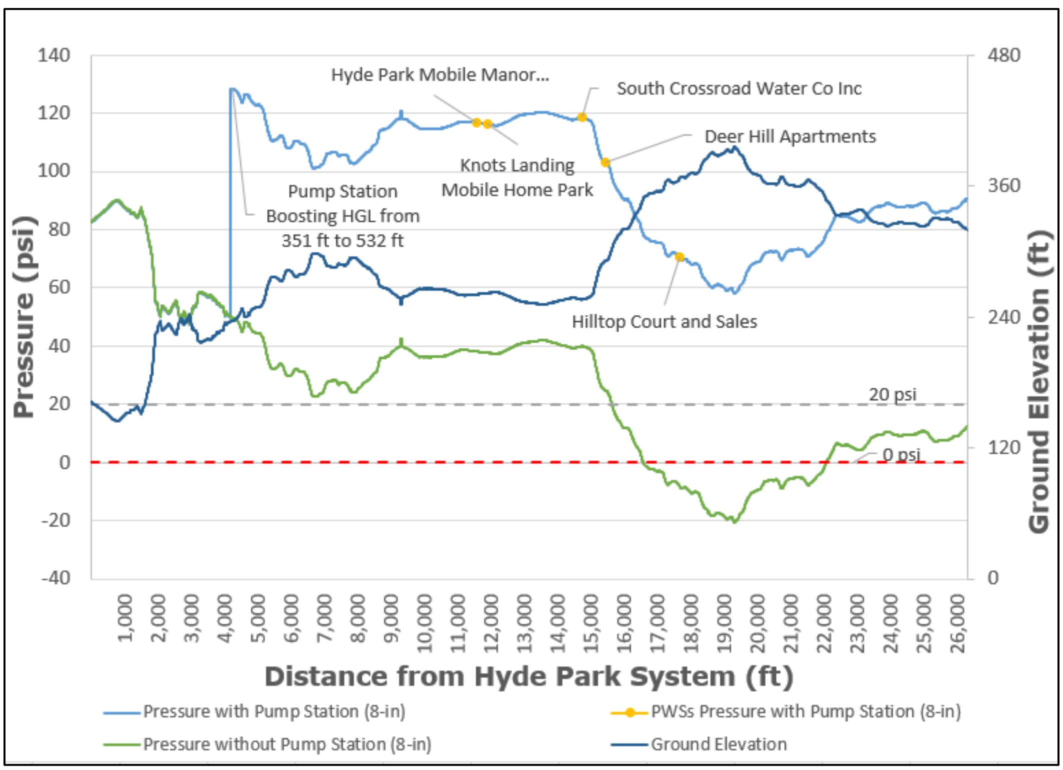


FIGURE 2-3

Route A and PWSs Elevation Profile and Modeled Operating Pressure at Quaker Hill MDD

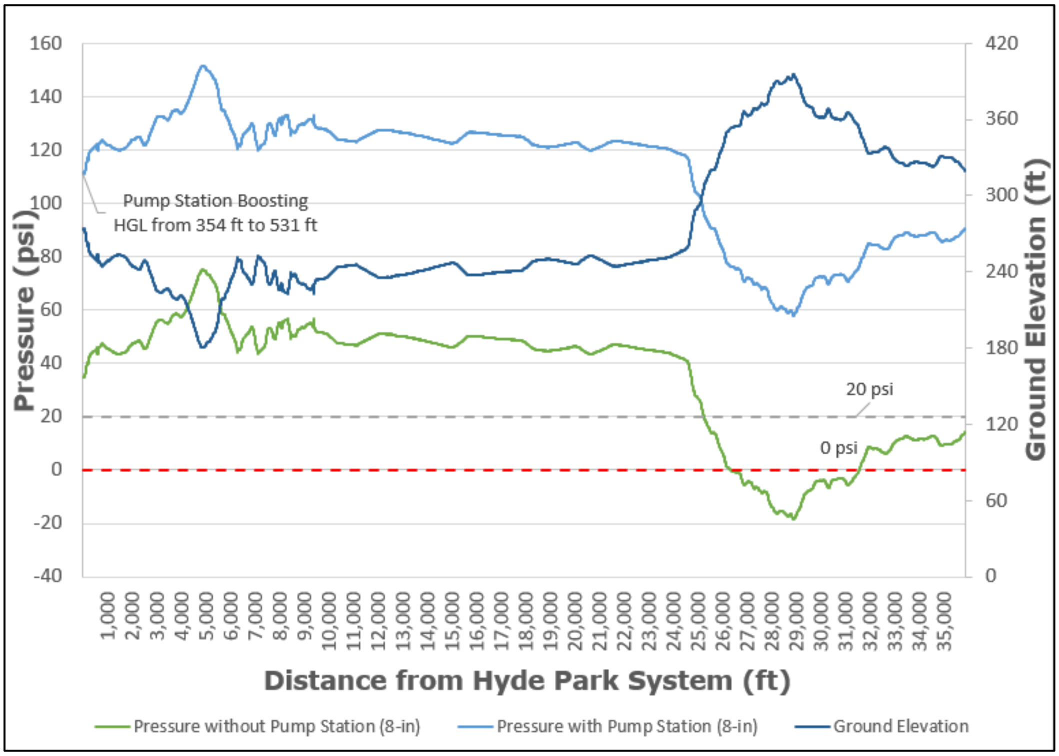


FIGURE 2-4
Route C Elevation Profile and Modeled Operating Pressure at Quaker Hill MDD

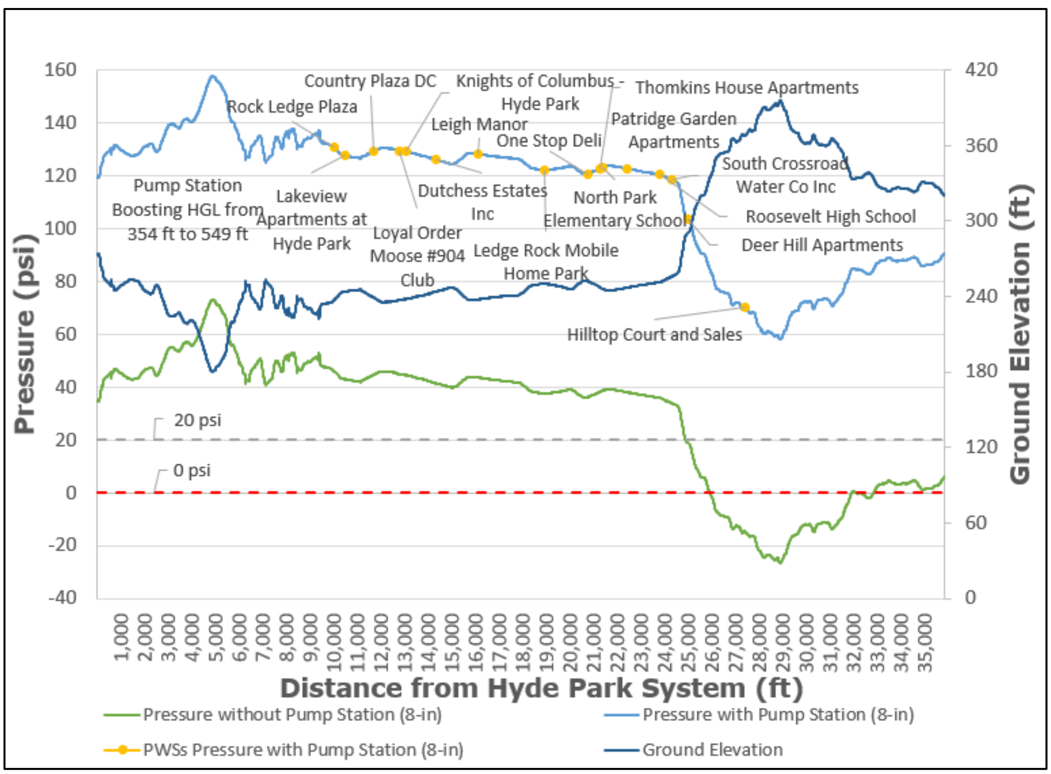


FIGURE 2-5
Route C and PWSs Elevation Profile and Modeled Operating Pressure at Quaker Hill MDD

TABLE 2-3
Modeled Interconnection Pump Station Sizing for Various Flow Conditions

Alternative	Conceptual Pump Station Sizing			
	Flow (gpm)	**TDH (ft)**	**Suction Head (ft)**	**Discharge Head (ft)**
Route A[3]				
ADD – Quaker Hill Only[1]	17	176	353	529
MDD – Quaker Hill Only[1]	39	177	353	530
PH – Quaker Hill Only[1,2]	78	183	350	533
ADD - Quaker Hill + PWSs[1]	58	177	353	530
MDD – Quaker Hill + PWSs[1]	121	181	351	532
PH – Quaker Hill + PWSs[1,2]	242	201	342	543
Route B & C[4]				
ADD – Quaker Hill Only[1]	17	175	354	529
MDD – Quaker Hill Only[1]	39	177	354	531
PH – Quaker Hill Only[1,2]	78	181	354	535
ADD - Quaker Hill + PWSs[1]	104	180	354	534
MDD – Quaker Hill + PWSs[1]	214	195	354	549
PH – Quaker Hill + PWSs[1,2]	428	250	353	603

[1]ADD = Average Day Demand; MDD = Max Day Demand; PH = Peak Hour
[2]Peak Hour demands modeled as 2.0 x MDD. Actual peak hour demands are unknown
[3]Route A Pump Station modeled at former Staatsburg wellfield site on Reservoir Road (El. 236 ft)
[4]Route B Pump Station modeled at existing North Storage Tank site (El. 252 ft). Values shown are representative of Route C and are conservative for Route B.

A summary of the pressures and elevations of the PWSs along Route A, Route B, and Route C are presented in Table 2-4 below. The table contains elevation, pressure, distance from the Hyde Park Interconnection, and information for each of the PWSs within Route A, Route B, and Route C. As shown in Table 2-4, the modeled pressure at some of the PWSs is excessive and may require pressure reducing valves at the services.

TABLE 2-4
Elevation and Modeled Pressure at PWS connections along Route A, Route B, and Route C

PWS ID No.[1]	PWS Name[1]	Distance from HPRWS (ft)	Ground Elevation (feet)	Pressure (psi)
Route A				
NY1310664	Hyde Park Mobile Manor Estates	11,570	261	117
NY1302161	Knots Landing Mobile Home Park	11,900	262	117
NY1302802	South Crossroad Water Co Inc	14,740	256	118
NY1321282	Deer Hill Apartments	15,540	291	103
NY1302130	Hilltop Court and Sales	17,660	368	71
NY1302797	Quaker Hill	26,300	320	91
Route B & C[2]				
NY1322658	Rock Ledge Plaza	10,020	237	131
NY1330622	Lakeview Apartments at Hyde Park	10,510	244	128
NY1321980	Country Plaza DC	11,720	239	129
NY1316574	Loyal Order Moose #904 Club	12,800	237	129
NY1330085	Knights of Columbus - Hyde Park	13,050	238	129
NY1302767	Dutchess Estates Inc	14,340	244	126
NY1302160	Leigh Manor	16,100	238	128
NY1302158	Ledge Rock Mobile Home Park	18,930	250	122
NY1330402	One Stop Deli	20,750	252	121
NY1321926	Thomkins House Apartments	21,290	247	123
NY1316165	North Park Elementary School	21,380	246	123
NY1303228	Partridge Garden Apartments	22,410	247	123
NY1316164	Roosevelt High School	23,790	251	121
NY1302802	South Crossroad Water Co Inc	24,310	256	119
NY1321282	Deer Hill Apartments	25,010	291	103
NY1302130	Hilltop Court and Sales	27,410	368	70
NY1302797	Quaker Hill	35,860	320	91

[1]Provided by Dutchess County Department of Behavioral and Community Health (DCDBCH)
[2]Values shown are representative of Route C and are conservative for Route B.

2.2.3 Interconnection Route Summary

The hydraulic evaluation of the interconnection alternatives shows that a new booster pump station will be required for each alternative route, with potential to site the Route A pump station at the former Staatsburg wellfield site and the Route B & C pump station at the existing North Storage Tank site. For each route, 8-inch water mains will be capable of providing domestic supply to the Quaker Hill System with potential for PWSs along the route to connect.

Modeling suggests that the HPRWS can provide domestic flows at both connection points with little to no impact on existing system operating conditions. Fire protection is not currently provided in the Quaker Hill System and the interconnection was not sized for fire flow capacity.

Table 2-5 summarizes the hydraulic conditions along each route. In general, elevation along Route A provides more favorable pressure conditions and is shorter resulting in lower headloss and anticipated lower capital cost. Route B, while longer and having less favorable pressure conditions (high pressure near the HPRWS), provides more opportunity to supply other PWSs, and is considerably shorter than Route C. For this reason, Route B is the recommended route.

TABLE 2-5
Summary of Alternative Interconnection Routes

	Route A	Route B	Route C
Total length (LF)	26,300	25,100	35,860
Pump station required?	Yes	Yes	
Average pressure (psi)	92	113[2]	
Max pressure (psi)	128	158[2]	
Min pressure (psi)	47	58[2]	
No. of additional PWSs that could potentially connect	5	14	16
No. of PWSs w/ PFAS Concerns[1]	0	0	2

[1]Provided by Dutchess County Department of Behavioral and Community Health (DCDBCH)
[2]Value is representative of Route C and conservative for Route B.

It is important to consider that the number of PWSs that have PFAS concerns is based upon data provided by DCDBCH which is relative to the previous MCL of 10 ppt. It is anticipated that additional PWSs may have PFAS concerns when considering the new MCL of 4 ppt.

2.2.4 Preliminary Interconnection Design

The preliminary design of Alternative No. 1 includes the following design considerations and assumptions:

- Route B interconnection layout as shown in Figure 2-1
- 8-inch HDPE DR11 water main (sized for Quaker Hill + PWS domestic flows only, not sized for fire flow)
- Water mains installed primarily via horizontal directional drilling (HDD) beneath the paved section of the ROW. Assumed quantities of HDD water main installation through different soil conditions are shown below and have been estimated based on NRCS soil mapping:
  - 12,740 linear feet through loam soils
  - 2,530 linear feet through soft rock soils
  - 9,420 linear feet through hard rock soils
- Flushing hydrants every 500 feet
- Gate valves every 1,000 feet
- No service connections at the other PWSs (Quaker Hill only)
- Replacement of 500 feet of water main within the existing Quaker Hill distribution system with new 8-inch HDPE DR11 water main

- Prefabricated booster pump station at the North Tank site
  - Installed on a concrete frost wall with spread footing foundation (assumed no deep foundation is needed)
  - Shipped fully assembled, factory pre-piped and wired
  - HVAC system included with package
  - Triplex pump arrangement with VFDs, each of the pumps sized for 50% of peak hourly demand of the Quaker Hill System plus a Jockey pump sized for 40% of the maximum day demand. The pump station will also have provisions and room for future pumps that could be added when other PWSs connect to the system.
  - Standby generator and ATS included in booster pump station package
  - Brick exterior finish
- New 3 phase electric service at the North Tank site
- Minor site grading/access improvements at the booster pump station
- Pressure sensor, PLC and cellular radio to relay pressure at Quaker Hill to the booster pump station

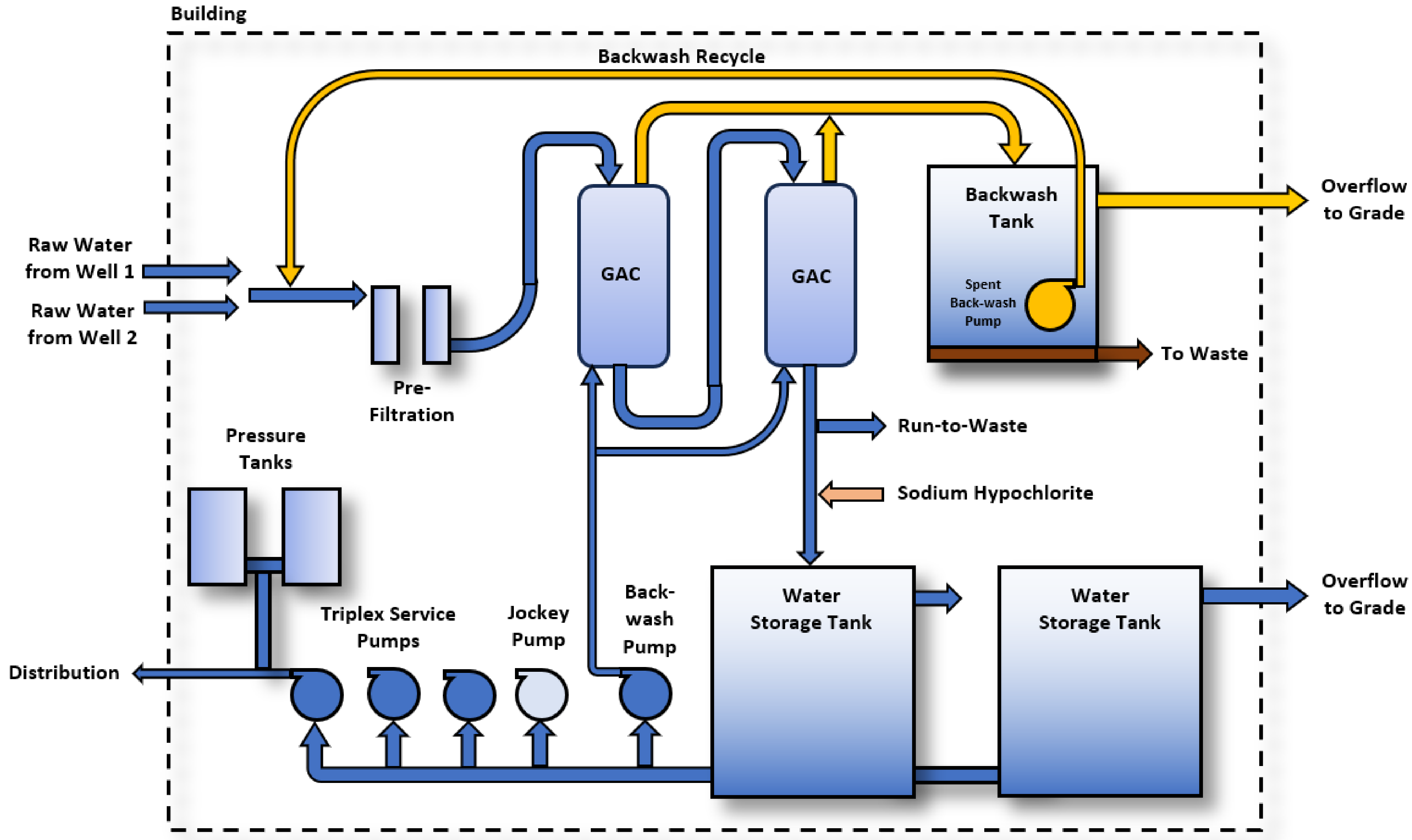
Other water main materials that could be considered include Class 52 cement lined ductile iron and C900 polyvinyl chloride (PVC) DR21 (200 psi) pipe. However, given the long length of water main, limited number of services, and to minimize disturbance and restoration costs, we believe HDPE piping installed via HDD will be the most cost effective option for the interconnection.

2.3 Alternative No. 2 – Replace Water Treatment System

As part of the alternatives analysis to address the PFOS MCL exceedance and issues with the existing Quaker Hill facilities, the replacement of the Quaker Hill Water Treatment System was considered. This alternative generally includes the following:

- New treatment building on a deep foundation
- Pre-filtration system and adsorptive media contactors for removal of PFAS
- New atmospheric water storage tanks and service pumps
- Spent backwash tank and backwash pumps
- Sodium hypochlorite feed system
- New well pumps and piping
- New instrumentation and controls
- New generator and electrical components
- HVAC and plumbing in the new treatment building
- Site improvements to protect the new facilities from flooding
- Demolition of the existing wellhouse/treatment building
- Replacement of 500 feet of water main within the existing Quaker Hill distribution system with new 8-inch HDPE DR11 water main

More details regarding the individual components are provided in the sub-sections below. A process flow diagram of the proposed system is shown in Figure 2-6.



QUAKER HILL PFOS VIOLATION REMEDY
HYDE PARK, NY

PROPOSED PROCESS FLOW DIAGRAM

DATE:	JUNE 2024
SCALE:	1" = 40'
FIGURE:	2-6

Tighe&Bond

2.3.1 PFAS Treatment

Treatment strategies for PFAS in drinking water include proven, commercially available technologies as well as emerging technologies. Commercially available technologies that have been demonstrated at full scale to reduce concentrations of PFAS in drinking water include the following:

- Granular Activated Carbon (GAC)
- Anion Exchange (AIX) resin
- Novel Sorbents (e.g., Fluoro-Sorb)
- Nanofiltration (NF) and Reverse Osmosis (RO)

GAC, AIX resin, and novel sorbents utilize adsorption through filter/contactor vessels. In general, these adsorptive media selectively remove PFAS without affecting other ionic species once the media has been flushed and conditioned. NF/RO systems utilize membrane filtration to remove all ionic species from the influent flow. While they can be designed with multiple stages to increase permeate recovery, NF/RO systems create a continuous waste stream. This is problematic in unsewered areas such as the Quaker Hill Water System. Additionally, because NF/RO membranes remove ionic species indiscriminately, they often require downstream treatment processes to restore alkalinity and mineral content for corrosion control. They also are prone to fouling and many systems require extensive upstream pre-treatment. For these reasons, NF/RO was eliminated from further consideration as an alternative.

GAC and AIX resin are both effective at removing PFAS, but have unique design, operation, and performance characteristics. GAC has been used extensively in drinking water applications for decades and is the most studied and used treatment method for PFAS systems in the United States. With GAC media, PFAS are adsorbed in the pore spaces of the media particles. Since the pore spaces aren't selective, the GAC will adsorb a variety of other contaminants, particularly organic matter, which can reduce its lifespan as adsorption sites become occupied more rapidly. In an ion exchange process, the target contaminant is exchanged with a non-toxic compound on the surface of the resin bead – for PFAS treatment it is chloride ions that are transferred to the treated water.

Novel Sorbents have gained more attention in the past 1-2 years as alternatives to GAC or AIX resin. Fluoro-sorb 200, manufactured by Colloid Environmental Technologies Company (CETCO), is a bentonite clay-based product with a surface modification making it effective at PFAS adsorption, while being more resistant to chlorine and other competing organic substances than GAC. Another novel sorbent, DEXSorb, is a corn-based media developed by Cyclopure. Although novel sorbents appear promising, there are relatively few full-scale municipal drinking water applications. A summary of the adsorptive media technologies is provided in Table 2-6.

TABLE 2-6
Summary of Adsorptive Media Technologies for PFAS Removal

	Advantages	Considerations
GAC	• Proven technology at full-scale, many successful installations • Lower unit-cost basis • Can operate as "filter-adsorber"	• Larger full scale filters, larger building footprint • Competition from background organics can reduce performance, longevity • Startup requires high rate backwashing, large rinse water volume • Breakthrough driven by short chain PFAS
AIX	• Smaller full-scale filters, smaller building footprint • More effective at removal of short-chain PFAS than GAC • No backwashing – less rinse water required for startup/conditioning than GAC (requires high-purity source water)	• Removal rate for long chain PFAS molecules is not as efficient compared to other media • Presence of DOC and organic material can impact adsorption of PFAS • Higher unit-cost basis • Cannot withstand exposure to chlorine or other oxidants
Novel Sorbents	• Potential for higher PFAS capacity than GAC • More resilient to interference from organics and other co-contaminants • Lower Empty Bed Contact Times than GAC • More resilient to chlorine than GAC	• Relatively new media with limited full-scale installations for PFAS removal

For the conceptual Quaker Hill PFAS treatment design, we have assumed a GAC system will be used. GAC media is a well-known adsorbent for organics and has been widely applied in water treatment. Although it has the largest footprint requirement due to higher empty bed contact time (EBCT) requirements, the media itself is much cheaper on a unit-cost-basis, and GAC systems are more resilient to fouling because they can be backwashed and employed as "filter-adsorbers" whereby the lead filter protects a polishing vessel from fouling agents. Furthermore, pressure vessels are now being fabricated with underdrains and distributors that make them adaptable to use of multiple media types. Thus, using a GAC system as the model for this alternatives analysis will produce a conservative estimate to which value engineering concepts may be applied in subsequent design phases.

Process selection (including GAC media selection) is typically confirmed through demonstration testing (bench or pilot testing) to account for the unique characteristics of the source water. The primary design criteria for GAC contactors are the design flow rate, EBCT - which is the time the water is in contact with the media, and surface loading rate. Backwash loading rates and durations are also important design considerations. The design conditions for the Quaker Hill GAC design are shown in Table 2-7. These design conditions are based on the AWWA WITAF 56 Technical Memorandum and Tighe & Bond's experience.

TABLE 2-7
GAC System Design Criteria

Component	Value	Units
Design Flow Rate	100	gpm
Surface Loading Rate	6	gpm/sqft
Empty Bed Contact Time (EBCT)	10	min
No. of Contactors	2	
Contactor Type	Pressure Vessel	
Vessel Configuration	Dual Stage	
Backwash Headspace	30%	
Backwash Loading Rate	12	gpm/sqft
Backwash Duration	20	min
Backwash Frequency	TBD	
No. of Backwash Cycles Stored	1	cycles

Based on the design criteria shown in Table 2-7, the Quaker Hill GAC system would consist of two GAC pressure vessels, each 6 feet in diameter with approximately 10 feet sidewall tank height. Total tank height with floor supports would be approximately 12 feet. Each vessel would contain approximately 135 cubic feet of GAC media.

The GAC contactors would be installed in a dual stage arrangement. This arrangement would allow simultaneous production during media replacement and would allow sampling between vessels to monitor breakthrough of the lead vessel. With this arrangement, the lead vessel can remain in service until the media is completely exhausted, leading to high utilization of the adsorbent media. The dual stage arrangement includes built in redundancy as either the lead or lag vessel can be removed from service without reducing the treatment flow rate. Thus, no dedicated redundant vessels would be provided.

There will be a valve tree with butterfly valves between the lead and lag contactors. The valves will be manually operated and allow for operators to switch the lead and lag vessels, isolate the lead and lag vessels, run the vessels to waste, and backwash the vessels.

2.3.2 Pre-filtration

No raw water sample data was reviewed as part of this conceptual design. However, it has been assumed that a pre-filtration system such as a bag filter or cartridge filter system will be installed upstream of the GAC contactors to prevent buildup of particulates which would cause differential pressure to increase. Raw water sampling should be performed during the final design phase to select the most appropriate pre-filtration technology. Two pre-filtration trains will be installed to allow continuous operation while the filters are being changed.

2.3.3 Sodium Hypochlorite

Sodium hypochlorite will be injected into the flow downstream of the GAC contactors for disinfection. For the conceptual design, it has been assumed that a sodium hypochlorite system consisting of the following components will be installed:

- HDPE spill containment pallet
- Polyethylene (PE) storage tank vented to the exterior
- Two diaphragm type chemical metering pumps

- PE injection tubing in a PVC containment pipe w/ retractable injection quill

It has been assumed that finished water will be plumbed close to the polyethylene storage tank to allow operators to mix the sodium hypochlorite solution. In addition, a tepid water eyewash/safety shower will also be installed near the sodium hypochlorite equipment.

2.3.4 Water Storage

In addition to meeting peak demands, having adequate storage will be important for the new treatment facility since it will provide a source of water to backwash/rinse media.

Three are three options for water storage at Quaker Hill:

- Replace the existing hydropneumatic tank
- Install atmospheric storage with pumps
- Install an elevated water storage tank

Although 10 State Standards states that hydropneumatic tanks are acceptable for very small water systems (less than 150 living units), large hydropneumatic tanks are generally considered a safety hazard and best engineering practice is to avoid large hydropneumatic tanks in system designs, when feasible.

The only property currently owned by the DCWWA that could be used for elevated storage is the treatment facility parcel which has limited room and significant geotechnical challenges. Elevated storage would likely not be cost effective due to the poor subsurface conditions at the site and would also be very visible. Therefore, we recommend that the existing hydropneumatic tank be replaced with new above grade atmospheric storage that meets 10 State Standards.

10 State Standards says that the minimum storage capacity for systems not providing fire protection shall be equal to the average daily consumption (25,000 gpd for Quaker Hill). However, 10 State Standards says that this requirement can be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system.

The proposed system will have standby power and reported capacity with the largest well out of service is 157,000 gpd (see Section 1.4.3). Therefore, the storage for the Quaker Hill Water System could be less than 25,000 gallons per day and still be in compliance with 10 State Standards.

As discussed in Section 2.3.5, approximately 5,000 gallons of finished water will be required for a typical backwash and more during initial backwash processing. The backwash volume should be considered in the water storage tank sizing.

Tighe & Bond recommends a minimum of 20,000 gallons of storage for the Quaker Hill Water System. We recommend the 20,000 gallons of storage is accomplished by installing two 10,000 gallon polyethylene atmospheric storage tanks. The dimensions of a 10,000 gallon PE storage tank are approximately 11’-10” in diameter and 14’-1” tall. Installing two 10,000 gallon tanks instead of a single 20,000 gallon tank will allow for the building height to be shorter and allow redundancy for when the tanks are eventually replaced.

The new atmospheric water storage tanks will be vented, have an overflow to grade, and have bulkheads for service pump suction piping. All tank appurtenances should be designed in accordance with 10 State Standards.

The existing Quaker Hill Water System has been documented to provide treatment to achieve log-4 inactivation with free chlorine based on a peak flow of 60 gpm and maintaining a 0.8 mg/L free residual at the entry point tap. The new system is anticipated to also achieve log-4 inactivation as there will be more storage, and the atmospheric storage tanks have a higher available volume factor and baffle factor compared to the existing hydropneumatic tank.

2.3.5 Spent Backwash Water Management

GAC systems require extensive backwashing and rinsing when virgin media is installed to remove fines and rinse residual metals from the media surfaces (e.g., arsenic and iron). Additionally, systems may require backwashing of the lead filter vessel if there are particulates or mineral concentrations (Fe/Mn) that precipitate out over time causing differential pressure to build. In the past, backwashing of adsorptive media contactors was discouraged because it was believed to disrupt the mass-transfer-zone, mixing "spent" media with "fresh" media and making contaminant breakthrough less predictable. This belief has been found to be invalid and GAC is often used as a filter-adsorber, where backwashing occurs more frequently to prevent differential pressure buildup. For high-purity water sources, the media may only require a low-rate backwash annually or semi-annually to "fluff" the bed. A more thorough review of the raw water quality is necessary to estimate the degree to which backwashing will be required at the Quaker Hill Water System.

At a minimum, extensive backwashing will be required any time new media gets installed. As shown in Table 2-7, the anticipated backwash rate of each pressure vessel is as high as 12 gpm/sqft (depending on water temperature). This equates to a backwash flow rate of 236 gpm. Backwashing at 236 gpm for 20 minutes equates to a backwash volume of approximately 4,800 gallons per backwash. The backwash is then followed by rinsing/conditioning step, which is described in more detail in Section 2.3.13.

If routine backwashing (say monthly) will be required, integrating a spent backwash water storage tank and recycling system will reduce lost water and simplify operations. Accounting for freeboard within the tank, a nominal spent backwash storage volume of 6,000 gallons is recommended for such a system. We have assumed the spent backwash storage tank will also be a PE tank. The dimensions of a 6,000 gallon PE storage tank are approximately 10'-0" in diameter and 12'-1" tall.

In some cases, backwash and rinse water may be directed to a dewatering filter bag where it is allowed to permeate and discharge over the ground surface. This is unlikely to be permitted for Quaker Hill due to its proximity to surface water and wetlands. Therefore, either a permanent spent backwash water tank as described in this section must be installed or operators must coordinate for a frac tank to collect and haul the backwash water away.

Note that the backwash water should not have any dissolved PFAS compounds since they will have adsorbed to the media. The fines, however, will need to be disposed of in accordance with local, state, and federal regulations. These can typically be collected as part of the spent media extraction process by the GAC supplier.

At present, there are no wastewater regulations for PFAS and most sewered systems allow the discharge from frac tanks into their system as it represents a small fraction of their rated capacity and domestic flows.

The spent backwash tank would be vented, have an overflow to grade, a drain valve, and a lid to allow for periodic removal of accumulated media. A submersible pump will be installed inside the spent backwash tank and suspended approximately 18 inches above the bottom. The submersible pump will recycle the decant water to the head of the treatment system.

2.3.6 Pumping

The head condition for the well pumps will change since they will no longer be pumping into the hydropneumatic tank but will be pumping though the pre-filtration system and the GAC vessels to the atmospheric storage tanks. Because of the change in head condition and since the existing well pumps are beyond their useful life, we recommend replacement of the existing well pumps, discharge piping, and electrical wires and controls.

New service pumps will be required to pump the water from the atmospheric storage tanks into the distribution system. The pumps will be controlled to maintain pressure within the distribution system. We anticipate the use of two 500 gallon air bladder pressure tanks, triplex service pumps with variable frequency drives (VFDs), and a jockey pump to handle low flow conditions in the system.

As discussed in Section 2.3.5, a submersible pump will be installed inside the spent backwash tank and suspended approximately 18-inches above the bottom. The submersible pump will recycle the decant water to the head of the treatment system.

2.3.7 Instrumentation & Control

All new instrumentation and controls should be provided for the Quaker Hill Water System. The anticipated new instrumentation includes:

- Individual well level monitoring transducers
- Individual well flow meters
- Pressure gauges/switches to monitor headloss through pre-filtration system and GAC vessels
- Water storage tank level sensors
- Backwash tank level sensor and backwash flow meter
- Sodium hypochlorite tank level sensor
- Finished water flow meter
- System pressure sensor
- Door security switches
- Pump controls
- Control panel
- Chlorine analyzer
- Security cameras

2.3.8 Water Treatment Building

Based on the subsurface conditions expected at the site (see Section 1.2.2), the following are critical geotechnical considerations for construction at the site. Additional subsurface explorations are needed as design advances.

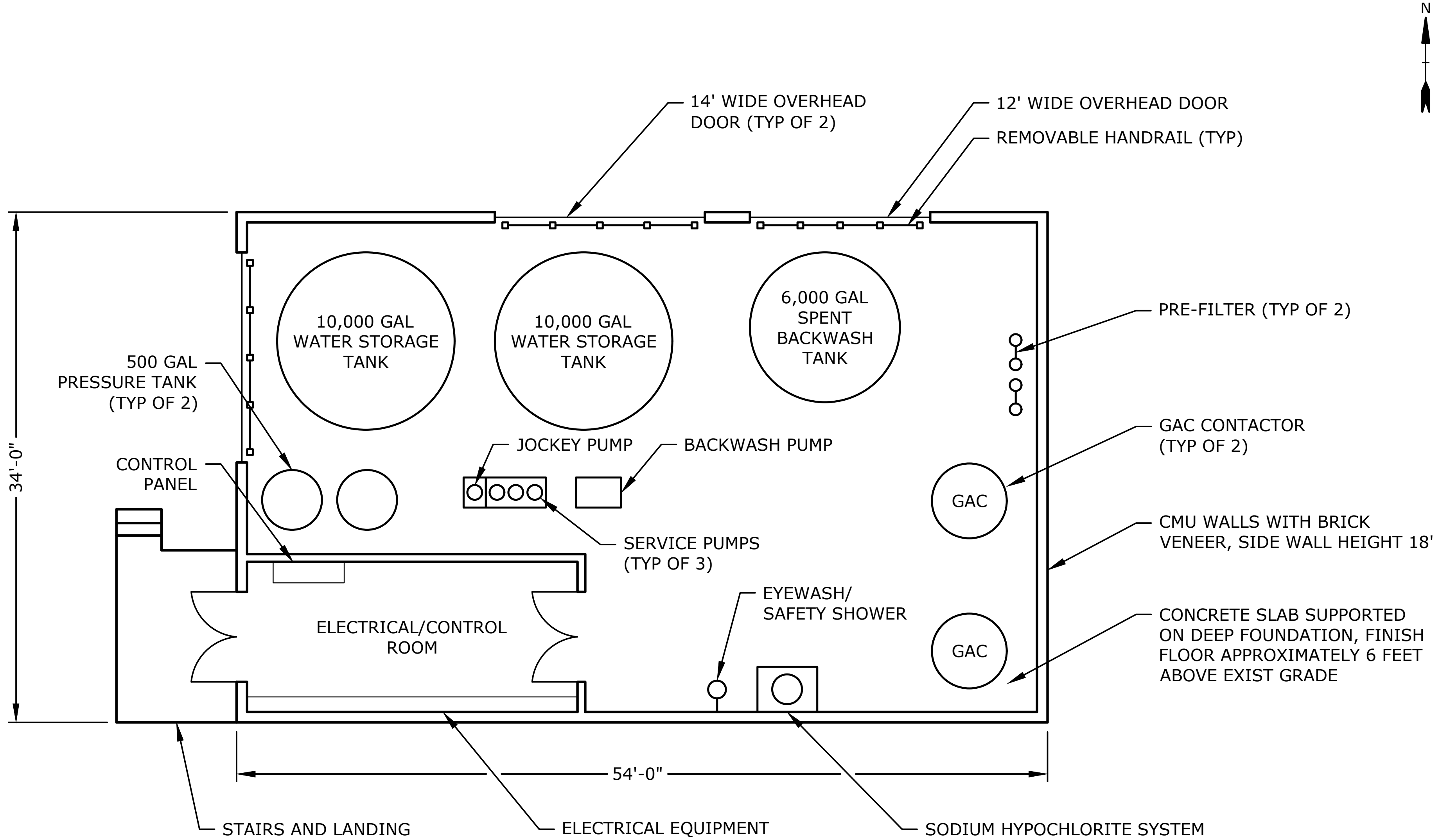
- Subsurface conditions are unsuitable for support of the proposed treatment building and tank/generator pad on conventional shallow soil-supported foundations. These structures should be supported on deep foundations. The treatment building should be supported on deep foundations with associated pile caps, grade beams and a structural slab. Deep foundations should be piles bearing on the dense gravelly sand with silt or underlying bedrock at around 41 feet bgs.
- Piles could consist of driven timber piles or steel H-piles, or other suitable pile types. It is expected that the building loads will be relatively low and therefore timber piles are expected to be an effective pile type.
- Limited subsurface information and laboratory testing is available for evaluation of the existing organics layer with respect to estimating settlements at the site. However, the available data suggests that compression of the organics on the order of 10 inches could occur as a result of placement of 3 feet of fill across the site for raising site grades. Similarly, placement of 1 foot of fill across the site could result in settlement on the order of 4 inches. Therefore, placement of fill at the site should be minimized to the extent possible.
- However, since placement of fill at the site will be necessary to provide dry access during a flood event, an approach than can be considered is to surcharge the site with a preload. The preload would generally consist of placement of fill across the site to some elevation above the planned finished grades (fill to 2 feet above the proposed finished grade, for example), settlements resulting from the fill would be monitored, and then once settlement monitoring indicates that settlements reached asymptotic conditions, the additional fill could be removed from the site to the target finished grades. Additional information would be needed to estimate the duration of preloading, but generally it would be expected that the surcharging program would require multiple months to consolidate the organics.
- It should be expected that long-term settlement from the organics will occur as a result of secondary compression and organics degradation, whether or not additional fill is placed over the site. The magnitude of settlement from secondary compression and organics degradation is not known, but it is anticipated that approximately 1 to 2 inches of settlement would occur over 30 years.
- Installation of utilities through areas underlain by organics should consider the effects of long-term settlements.

Based on the geotechnical considerations discussed above, we recommend that the new treatment building is supported by a deep foundation bearing on the dense gravelly sand with silt or underlying bedrock at around 41 feet bgs. The deep foundation will be designed to support the new loads inside the water treatment building including the water storage tanks, spent backwash tank, GAC vessels, and the building structure itself. We also recommend that the propane tanks and generator are installed on a concrete pad supported by a deep foundation. Schematic phase design for the treatment building and equipment pad foundations includes the following:

- Timber piles spaced at 9 ft oc (+/-) throughout the treatment building footprint and exterior equipment pad (47 total piles)
- Reinforced concrete for pile caps/grade beams, foundation walls, and reinforced slab
- Backfill interior of the building 5 feet in height
- Exterior grade beams to 4 feet below exterior grade, consisting of 2.5 ft wide, 2 ft height beams
- Exterior walls exposed up to 6 ft above exterior grade, total height 8 ft (6 ft above grade, 2 ft below grade to top of grade beam), 1.5 ft thick
- Interior grade beams 2 ft thick, 2.5 ft wide
- Slab assumed 12 inches thick
- Exterior equipment mat 2.5 feet thick
- Volume of soil backfill interior of building to achieve elevated floor slab equal to building footprint x 5 ft fill height (6 ft filling less 1 ft thick slab)

We anticipate that the finished floor elevation (FFE) of the new treatment building will be approximately 6 feet above the FFE of the existing treatment building for compliance with 10 State Standards to protect the system from flooding. An aluminum staircase and landing will be provided for access into the building with double man doors. Overhead coiling doors will be located on the west and north sides of the building to facilitate future equipment removal. Removable guardrails will be installed on the interior side of the overhead door openings to meet safety requirements for fall protection.

Figure 2-7 shows a conceptual layout of the system components and size of the building. As shown in Figure 2-7, the preliminary building size is 34' X 54' with a 18' side wall height. The building superstructure will consist of concrete masonry unit (CMU) walls with a 4-inch masonry veneer. The cavity walls will be designed and detailed to meet the in-force energy code requirements. A gabled roof will be constructed of timber roof trusses with asphalt shingle roofing. We anticipated one interior room for electrical/controls and storage space.



QUAKER HILL PFOS VIOLATION REMEDY
HYDE PARK, NY

PRELIMINARY WATER TREATMENT BUILDING LAYOUT

DATE:	JUNE 2024
SCALE:	1" = 10'
FIGURE:	2-7

Tighe&Bond

0 10' 20'

SCALE: 1" = 10'

2.3.9 Site Improvements

Figure 2-8 shows the preliminary site layout. As shown, the proposed building would be located south of the existing wellhouse/treatment building and the generator and propane tank equipment pad would be located west of the existing treatment building. Clearing and grubbing will be required for construction of the building and other site improvements.

The existing generator and propane tank will need to be temporarily relocated during construction. The existing treatment building and components will need to be maintained during construction until the new system is commissioned. The new treatment building is to be located far enough from the existing building to provide sufficient room for construction, while also maintaining access to the existing wellhouse/treatment building. The existing hydropneumatic tank, treatment building, and generator/propane tank will be demolished once the new system is commissioned.

To provide dry access to the treatment building entrance during a flood event, the access drive approaching the west side of the treatment building will need to be raised approximately 2-3 feet. This will require fill and preloading as discussed in Section 2.3.8. Since the north side of the building does not need to be accessed during a flood event, we anticipate that the grade will slope down to the north to approximately match existing grades. Therefore, the finished floor elevation on the north side of the building will be approximately 5-6 feet above finished grade. This will minimize the amount of fill and preloading that is required.

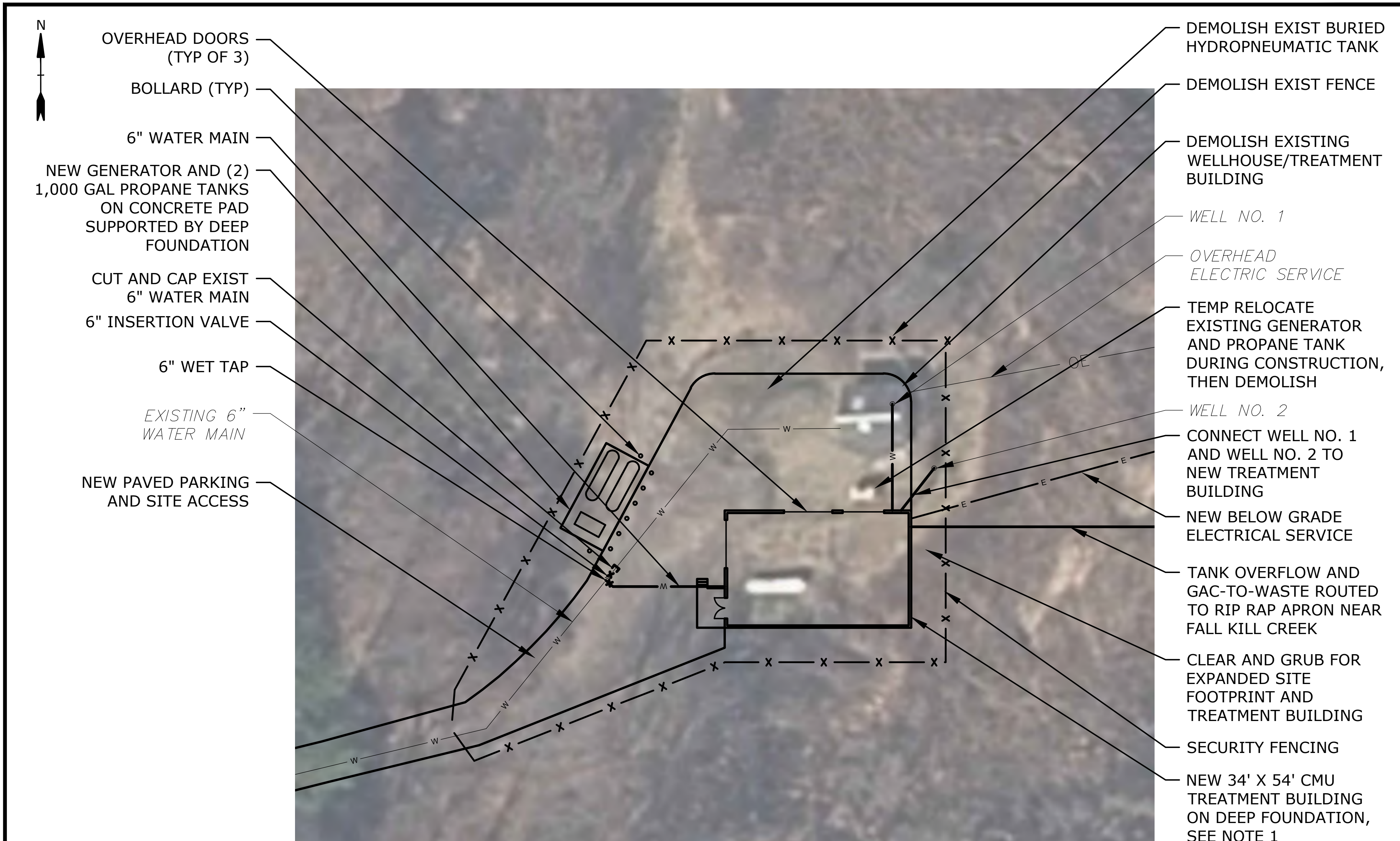
The access drive in the ROW will be widened to a minimum of 15 feet for equipment access. The finished surface for the access drive and area around the treatment building will be paved as shown in Figure 2-8.

The generator and propane tank mat will be at grade with individual equipment pads to elevate the generator and propane tanks at least 3 feet above the FFE of the existing water treatment building to protect from flooding. Bollards will be installed to protect the equipment from accidental vehicle strikes.

Existing Well No. 1 and Well No. 2 will need to be tied over to the new treatment building one at a time once the new system is ready for start-up. The finished water from the new treatment building will connect to the existing 6-inch water main below the access drive and the old water main going to the existing wellhouse/treatment building will be capped and abandoned. We recommend flexible pipe connections at wall penetrations through the new treatment building foundation due to the potential long term settlement of the fill around the treatment plant as discussed in Section 2.3.8.

Other miscellaneous site improvements include the following:

- Security fencing and gates
- Tree trimming along the access road
- Water storage tank overflows and filter-to-waste lines run to a rip rap apron towards Fall Kill Creek
- Replace Well No. 1
- Extending the well casing for Well No. 2 with new pitless adapter
- Concrete secondary containment pad for spill containment during media changeout



NOTES

1. FINISHED FLOOR ELEVATION (FFE) OF NEW TREATMENT BUILDING SHALL BE APPROXIMATELY 6 FEET ABOVE FFE OF EXISTING TREATMENT BUILDING. ACCESS DRIVE SHALL BE RAISED APPROXIMATELY 2-3 FEET ABOVE EXISTING GRADE ALONG WEST SIDE OF PROPOSED TREATMENT BUILDING TO PROVIDE ACCESS DURING FLOOD EVENT, SLOPE GRADE AWAY FROM NEW TREATMENT BUILDING IN ALL DIRECTIONS TO PROVIDE POSITIVE DRAINAGE.

0 40' 80'

SCALE: 1" = 40'

QUAKER HILL PFOS VIOLATION REMEDY
HYDE PARK, NY

PRELIMINARY SITE LAYOUT

DATE:	JUNE 2024
SCALE:	1" = 40'
FIGURE:	2-8

Tighe&Bond

2.3.10 Process Piping

The well discharge piping from Well No. 1 and Well No. 2 will enter the new treatment building and transition to Schedule 80 PVC piping. It is assumed that all interior process piping will be Schedule 80 PVC and that the piping will be supported through a combination of ground, wall, and overhead supports.

The process piping following the service pumps will transition to ductile iron before leaving the building and eventually connecting to the existing 6-inch water main. Sample taps will be installed at various locations in the process piping between the different process components.

2.3.11 HVAC, Plumbing, and Electrical

Electric unit heaters will maintain space temperature in the proposed treatment building. A dehumidifier will operate based on incoming water temperature to reduce condensation on surfaces. The building will be ventilated intermittently with 0.25 cfm/sqft during winter and 1cfm/sqft during summer. A programmable timeclock will enable the system twice daily to flush out potential build-up of chemical fumes. A manual switch allows operation in continuous ventilation mode if needed. The heating system will be sized to maintain space temperature during winter at low airflow operation only.

An emergency eyewash and safety shower will be installed near the chemical system. Code requires tempered water for emergency fixtures to be between 60°F and 100°F. A condensing tankless propane fired water heater will provide sufficient water in this temperature range. Propane for the water heater and a standby generator will be stored in two (2) 1000 gallon above ground tanks. The tanks shall be monitored by the supplier to assure fill levels are maintained at 60% during periods below +10°F. This fill level is required to provide sufficient evaporation down to -5°F.

To support the building loads during a loss of normal power, a 60kW propane generator with a 260A ATS and a propane tank will be provided.

A new electric service is required for the treatment building. We have assumed that a new underground electric service will be installed for the new building and the old service will be removed. The conduits for the new service will be horizontal directional drilled (HDD) beneath the wetland to avoid the maintenance issues with the existing overhead utilities (see Section 1.4.3).

The new electrical service will be a 250A, 208V 3PH to support the mechanical loads, required building HVAC, lights, and receptacles. A new electrical meter, 250A service entrance-rated enclosed circuit breaker, and panelboard will be installed for the building loads. A motor control/SCADA panel will be provided for the new well pumps, treatment system, and associated instrumentation. Motor starter/disconnect will be provided for motor loads not supported from a VFD.

2.3.12 Waste Generation and Removal

Exhausted GAC media will be saturated with PFAS. Bulk GAC can be reactivated by the media supplier through thermal treatment at high temperatures to remove and destroy adsorbed contaminants. This reactivation process restores the media's adsorptive capacity. However, this process will not remove all the compounds and will not destroy the PFAS compounds; therefore, reactivation is not appropriate for GAC utilized for PFAS removal. Thus, the spent GAC from the Quaker Hill Water System will need to be periodically removed and replaced with virgin GAC.

Disposal alternatives for spent GAC include disposal by reactivation for industrial reuse (media suppliers may not accept the low volumes of GAC required for small systems), incineration, and landfilling. The cost of each disposal method depends on the proximity to disposal sites and volume of material. Disposal costs can be a significant operation cost for GAC treatment systems.

On April 19, 2024, the EPA finalized a rule which designates PFOS and PFOA as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund. The designation is expected to limit the disposal sites willing to accept spent GAC media.

Many GAC suppliers have incineration/regeneration facilities capable of PFAS destruction and incorporate the cost for disposal in their estimates. We will confirm that unit-cost quotations used for media purchase/replacement reflect the additional expense for disposal. If the quotes do not reflect the disposal cost, we will estimate the cost to dispose at a landfill.

There will be a small quantity of GAC that accumulates in the bottom of the spent backwash tank. This media should be removed annually or semi-annually. The pre-filtration filters will need to be changed regularly and properly disposed of. There are no other anticipated waste streams.

2.3.13 GAC Start-up Considerations

There are a few aspects of starting up GAC systems that should be discussed, including:

- Soaking requirements
- Backwash requirements
- Forward Flow Media Conditioning
    - pH Adjustment Period
    - Arsenic Flush
- Disinfection

Soaking Requirements

When new GAC is added to a vessel it is relatively dry and void spaces and pore spaces are filled with air. Soaking allows the water to diffuse into the voids and pores and displace the entrained air. Because GAC surfaces are hydrophobic, it takes a reasonably long time to wet the carbon pores and displace the air. Soaking times depend on ambient temperatures and specifics of the carbon media but generally soaking requires about 48 to 72 hours. The vessel should be slowly filled in upflow mode to begin the soaking period and then let the water sit in the vessel. Raw water can be used for soaking.

Backwash Requirements

After soaking, the GAC media needs to be backwashed to displace all the entrapped air, remove carbon fines, and stratify the bed. Stratification allows the larger carbon particles to settle to the bottom of the vessel and provide vertical particle size distribution.

Recommended backwash procedures upon start-up vary from vendor to vendor but generally include a slow ramp-up period, a full rate backwash period, and a ramp down period. This initial backwash procedure is longer than the typical operating backwash procedure. The backwash water can be captured in frac tanks and hauled away, captured then recycled, discharged to a pre-treatment and sediment control system for conveyance to ground surface, or a combination thereof.

In the treatment system described above, we have assumed a spent backwash storage and recycle system. If review of raw water data suggests that backwashing is not routinely required and only performed during media changeouts, the design could be modified to eliminate the spent backwash tank from the design and use the other approaches described above.

Forward Flow Media Conditioning

GAC media will create high pH conditions and can leach some trace metals (arsenic, iron) for periods after initial soaking. Operators must run the system in forward flow "filter-to-waste" mode at the design flow rate for a significant amount of time until field measurements and/or laboratory samples indicate the water meets drinking water standards. The following sections provide a basis for how to address the two primary parameters of concern – pH and arsenic.

<u>pH Adjustment Period</u>

The start-up of GAC systems often exhibit unacceptable increases in pH, often above 10 standard units (SU). The pH of the forward flow effluent can be elevated above allowable drinking water standards for 50 to 500 bed volumes. One bed volume for the proposed Quaker Hill GAC vessels is approximately 135 cubic feet or about 1,000 gallons. Therefore, the pH adjustment period for each GAC vessel may take anywhere from 50,000 to 500,000 gallons. The pH, while high for drinking water purposes, poses relatively little threat to vegetation and can be discharged to ground where space is available and where permitted to do so. A riprap apron, sediment dewatering bag, or other methods can be used to prevent erosion and limit environmental impacts.

We have assumed that a "filter-to-waste" line will discharge to grade at a rip rap apron towards Fall Kill Creek during the pH adjustment period. This outfall will be subject to a NYS DEC State Pollutant Discharge Elimination System (SPDES) permit, and we have assumed that neutralization will be required before discharging to grade. The filter-to-waste procedure during the pH adjustment period may require a standard operating procedure to waste at a slow flow rate to prevent localized flooding due to the poorly draining nature of the area.

If the outfall is not permittable, then frac tanks will need to be used until the pH has dropped to acceptable levels. Frac tanks would be a significant operational cost since we are anticipating anywhere from 50,000 to 500,000 gallons. A full size frac tank is approximately 20,000 gallons which means anywhere from 3 to 25 frac tanks would be required during the pH adjustment period for each vessel.

<u>Arsenic Flush</u>

Most GAC media contains some arsenic. As such, when GAC media is placed on-line, there is a high likelihood that leachable arsenic present on the activated carbon surface can be transferred to the liquid and end up in the drinking water. Thus, a flush of the GAC to waste is often required. The arsenic levels are usually reduced in a much lower number of bed volumes (20 to 100 BVs) compared to the number of bed volumes required during the pH adjustment period. Therefore, storing the initial flush (e.g., first 20-50 BVs) with the remaining flushed water can lead to concentrations that fall below enforceable limits. This can be achieved through a large frac tank or equalization tank for collecting the first 20-50 BVs of water, then running to ground for the rest of the rinse/conditioning period until pH stabilizes.

Alternatively, GAC manufacturers are now producing pre-rinsed products with much lower residual arsenic concentrations to address this problem. These products (e.g., Calgon Filtrasorb®-01) are pre-treated and have effluent arsenic concentrations below 2 ppb immediately upon startup. They do, however, carry a cost-premium over conventional coal-based GAC products.

For the operational cost estimate presented in Section 2.6, we have assumed that standard (not pre-rinsed) GAC media will be used and up to three frac tanks will be needed to capture the initial flush.

Disinfection

Disinfection of empty adsorption vessels, piping, and other equipment should be achieved through chlorination through standard AWWA procedures.

After the GAC is installed, soaked, backwashed, and flushed as described above, the system needs to be checked for the presence of bacteria via a rinsing procedure before being placed into service. Rinsing should be performed at the design flow rate that corresponds to an EBCT of 10 minutes. Two bacteriological samples shall be collected from the GAC effluent after the rinsing period.

If the vessel fails the bacteriological tests, it will require disinfection using sodium hydroxide. The vessel will need to be retested until disinfection is successful.

2.4 Alternative No. 3 – No Action

The "no action" alternative means that no improvements are made at the existing water treatment plant and that no interconnection to the Hyde Park Regional Water System will be installed. The no action alternative is unacceptable as it does not address the notice of violation or public health risks associated with PFAS as noted in Section 1.5 of this report.

2.5 Phase 2 – Quaker Hill Distribution System Improv.

Due to the poor water main installation practices including shallow depth of installation and lack of pipe bedding, the Quaker Hill water system continues to experience a significant number of water main failures that are difficult to locate and repair. Based on the reported installation conditions and the history of water main failures, water main failures are likely to continue if the condition is not addressed.

As per the 2014 Report, installation of customer water meters to quantify actual customer usage is still recommended and will be useful in determining the actual volume of lost water in the system. Therefore, we recommend the following distribution system improvements are implemented for the Quaker Hill Water system as Phase 2, after the PFAS violation is addressed:

- Installation of new 8” HDPE water mains for the entire system
- New flushing hydrants, valves, and air releases
- Re-connect all services
- Flow meters for each service connection

2.6 Opinion of Probable Cost

2.6.1 Cost Estimate Approach

Conceptual opinions of probable costs (OPC) have been prepared for each of the viable alternatives discussed in Section 2.2 and 2.3. The opinion of probable cost includes the following components:

1. **Construction Cost:** The budgetary cost estimates are based on Class 4 level construction cost estimates, as defined by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practices and Standards. According to AACE International Recommended Practices and Standards, the estimate class designators are labeled Class 1, 2, 3, 4, and 5, where a Class 5 estimate is based on the lowest level of project definition and a Class 1 estimate is closest to full project definition and maturity. The end usage for a Class 4 estimate is a conceptual study. The expected accuracy range of a Class 4 estimate is between +40% and -25%. The level of project definition for a Class 4 estimate is between 1% and 15%. The costs include overhead and profit, equipment costs, demolition/removal of existing equipment (if applicable), temporary provisions (if applicable), facilities and bypasses (if necessary, to complete the work), property acquisition (if applicable), easements, and costs regarding installation and start-up of improvements. This cost also includes a 5% mobilization/demobilization cost factor, and a contractor general conditions cost factor of 15% of the construction subtotal.

   The costs are based upon recently completed project bid forms, quotes from equipment manufacturers/vendors, and data contained in R.S. Means Construction Cost Data.
2. **Engineering (20%):** A 20% contingency has been applied to the estimated construction costs for the engineering fees. The 20% for engineering fees can generally be broken down further as: Engineering Design (8%) and Construction Administration/Observation (12%).
3. **Contingency (30%):** A 30% general contingency has been applied to the estimated construction costs. This contingency is in-line with the current level of project definition.
4. **Escalation (4%/year):** A 4% per year cumulative escalation has been applied to the estimated construction costs. This escalation accounts for changes in construction costs from the time this estimate was developed (2024) to the time the project is anticipated to be constructed (2027).
5. **Total Project Costs:** The total project costs are the sum of the construction costs, engineering costs, contingency, and escalation.

2.6.2 Total Project Costs

Table 2-8 summarizes the opinion of probable cost for Alternative No. 1 and Alternative No. 2. The detailed OPCs for each alternative are provided in Appendix C.

TABLE 2-8
Alternative No. 1 & 2 Opinion of Probable Cost

Item	Alternative No. 1	Alternative No. 2
Construction Cost	$12,881,100	$4,886,000
Engineering (20%)	$2,576,300	$977,200
Contingency (30%)	$3,864,400	$1,465,800
Escalation (4%/year for 3 years)	$1,609,900	$612,000
Opinion of Probable Cost	**$20,931,700**	**$7,941,000**

Table 2-9 summarizes the opinion of probable cost for the recommended Phase 2 Quaker Hill distribution improvements. Please note that the escalation for the Phase 2 improvements has been escalated to 5 years instead of 3 years as they are expected to be completed after the PFAS violation remedy. The detailed OPC for the recommended Phase 2 improvements is provided in Appendix C.

TABLE 2-9
Phase 2 Opinion of Probable Cost

Item	Cost
Construction Cost	$6,494,600
Engineering (20%)	$1,299,000
Contingency (30%)	$1,948,400
Escalation (4%/year for 5 years)	$1,411,400
Opinion of Probable Cost	**$11,153,400**

2.6.3 Annual Operation & Maintenance Costs

Table 2-10 presents a summary of the probable annual operation and maintenance (O&M) costs for Alternative No. 1 and Alternative No. 2. The opinion of probable O&M costs includes the annual operation and maintenance costs for the interconnection and booster pump station for Alternative No. 1 and the new treatment system for Alternative No.2 as well as administrative costs, short-lived assets, and a 30% contingency. These probable annual O&M costs presented in Table 2-10 are in 2024 dollars. A detailed opinion of probable annual O&M costs for each alternative are provided in Appendix C.

TABLE 2-10
Alternative No. 1 & 2 Opinion of Probable Annual O&M Cost

Alternative	Cost
Alternative No. 1	$112,500
Alternative No. 2	$230,800

2.6.4 Annual Debt Service

The Drinking Water State Revolving Fund (DWSRF) program can provide either low-interest loans or interest-free loans and/or grant/principal forgiveness for project financing. To qualify for interest-free financing, called hardship financing, the municipality must:

- Have a population of less than 300,000
- Meet at least one of the following criteria:
    - Have a Medium Household Income (MHI) as defined by the U.S. Census Bureau's American Community Survey 5-year estimate of data less than 80% of the regionally adjusted statewide MHI, or
    - If the MHI of the municipality is between 80% and less than 100% of the regionally adjusted statewide MHI, then the poverty rate of the municipality must be greater than the statewide poverty rate of 10.4%, or
    - At least 50% of the project cost or project scope must serve, protect, or benefit an identified PEJA

The population is less than 300,000 and therefore the first criteria is satisfied for both alternatives. The regionally adjusted MHI for Dutchess County is $86,977; 80% of this is $69,582. The Town of Hyde Park MHI (from the 2021 American Community Survey 5-year estimate) is $78,725. Therefore, the MHI is between 80% and 100% of the regionally adjusted statewide MHI. However, the Town of Hyde Park poverty rate is 8% (from the 2021 American Community Survey 5-year estimate) which is less than the statewide poverty rate of 10.4%. Additionally, Alternative No. 2 does not benefit a PEJA. Alternative No. 1 does benefit one PEJA but it is estimated that less than 50% of the project cost/scope would benefit the PEJA.

Given the scope of the proposed alternatives, it is likely that the project would not meet hardship financing criteria for disadvantaged communities. However, there are Water Infrastructure Improvement Act (WIIA) grants available for drinking water projects addressing an emerging contaminant above the state determined MCL which may be awarded 70% of the total net eligible project costs with no maximum cap. Therefore, to estimate the annual debt service, we have presented two scenarios: no grant funding and 70% grant funding as shown below in Table 2-11 and Table 2-12. Alternative No. 1 (Table 2-11) also shows the cost per Equivalent Dwelling Unit (EDU) with Quaker Hill users only and assuming all potential PWSs connect to the system.

TABLE 2-11
Alternative No. 1 Annual Debt Service Estimate

	No Grant Funding		With 70% Grant Funding[1]	
Item	**QHW Users Only**	**QHW Users & All PWS Users**	**QHW Users Only**	**QHW Users & All PWS Users**
Opinion of Probable Cost	$20,931,700	$20,931,700	$20,931,700	$20,931,700
Grant Amount	$0	$0	$14,652,200	$14,652,200
Amount to be Financed	$20,931,700	$20,931,700	$6,279,500	$6,279,500
Annual Debt Service Payment[2]	$1,210,482	$1,210,482	$363,144	$363,144
Total Number of Potential EDUs[3]	110	847	110	847
Annual Debt Service per EDU	$11,004	$1,429	$3,301	$429

[1]Maximum WIIA Grant amount calculated as 70% of project cost

[2]Based on a low-interest loan of 4% for 30 years

[3]No. of EDUs for QHW = No. of services. PWS EDUs based on ADD from DCDBCH divided by 164 gpd/EDU.

TABLE 2-12
Alternative No. 2 Annual Debt Service Estimate

Item	No Grant Funding	With 70% Grant Funding[1]
Opinion of Probable Cost	$7,941,000	$7,941,000
Grant Amount	$0	$5,558,700
Amount to be Financed	$7,941,000	$2,382,300
Annual Debt Service Payment[2]	$459,229	$137,769
Total Number of Potential EDUs[3]	110	110
Annual Debt Service Payment per EDU	$4,175	$1,252

[1]Maximum WIIA Grant amount calculated as 70% of project cost

[2]Based on a low-interest loan of 4% for 30 years

[3]No. of EDUs for QHW = No. of services.

Table 2-13 provides a summary of the estimated debt service payment per EDU. As shown in Table 2-13, Alternative No. 1 with 70% grant funding and assuming all PWS users has the potential for the lowest debt service payment per EDU.

TABLE 2-13
Annual Debt Service Estimate Summary

Item	No Grant Funding[2]	70% Grant Funding[1]
Alternative No. 1 - QHW Users Only	$11,004	$3,301
Alternative No. 1 - QHW Users + All PWS Users	$1,429	$429
Alternative No. 2	$4,175	$1,252

[1]Maximum WIIA Grant amount calculated as 70% of project cost

[2]Based on a low-interest loan of 4% for 30 years

2.7 Non-Monetary Factors

Non-monetary factors such as environmental impacts, availability for future connections, service for PEJAs & DACs, sustainability considerations, permitting, and public perception for each alternative should also be considered. Each of these items are briefly discussed in this Section.

Environmental Impacts

Alternative No. 1 is anticipated to have minor environmental impacts since the new water mains will primarily be installed within existing road rights-of-way and the booster pump station will be installed at the North Tank site which is already disturbed.

Alternative No. 2 will have more significant environmental impacts due to construction of the new treatment building and site improvements within the wetland. Vegetation will need to be cleared and grubbed within the wetland as well as fill brought into the site. Some wetland area will be lost as a result of this alternative. The tank overflow and filter-to-waste line will also discharge to Fall Kill Creek periodically during operations.

Availability for Future Connections

Alternative No. 1 has the potential to connect 14 other PWSs. Although the other PWSs currently do not have known elevated levels of PFAS, it is important to consider that the number of PWSs that have PFAS concerns is based upon data provided by DCDBCH which is relative to the previous MCL of 10 ppt. It is anticipated that additional PWSs may have PFAS concerns when considering the new MCL of 4 ppt.

In addition, the DCDBCH has indicated that several of the other PWSs would heavily benefit from connection to the HPRWS due to other issues such as poor water quality, poor system management, system violations, etc. Although there are 14 PWSs currently identified that could potentially connect, the water main covers a significant distance along a developed road (Route 9G) and would provide the opportunity for additional service connections in the future.

Alternative No. 2 will serve the Quaker Hill Water System but there are no opportunities for other connections.

Service for PEJAs & DACs

Alternative No. 1 has the potential to serve the PEJA north of Fall Kill Road (see Section 1.2.5) including one PWS that is within the PEJA which is referred to as Hill Top Court and Sales (NY1302130). Alternative No. 2 does not have the potential to serve any PEJAs.

Alternative No. 1 has the potential to serve several PWSs within the disadvantaged community (DAC) including the Loyal Order Moose Club (NY1316574), the North Park Elementary School (NY1316165), the Roosevelt High School (NY1316164), and the South Cross Road Water Co. (NY1302802).

Sustainability Considerations

Alternative No. 1 is expected to have a lower carbon footprint as compared to Alternative No. 2. Alternative No. 1 has less pumps, a smaller building to heat, will have less waste generated (no GAC media waste), etc.

Permitting

Alternative No. 1 will require local and state highway work permits for installation of the water mains within the public road right-of-way. It will also require a NYSDEC Joint Application Submission for an Article 24 Freshwater Wetland Permit.

Alternative No. 2 will require a much more involved permitting process and is anticipated to require a NYSDEC Joint Application Submission for an Article 24 Freshwater Wetland Permit and NYS DEC State Pollutant Discharge Elimination System Permit.

Public Perception

We anticipate that Alternative No. 1 may have positive public perception because it has the potential to serve multiple PWSs, has essentially no visible impacts, and would remove the source well supplies which contain unacceptable levels PFAS.

Alternative No. 2 may have more public perception challenges, particularly for property owners close to the site where the new, larger treatment building will be visible and there will be more vehicle traffic for operation of the GAC system.

Section 3
Summary & Comparison of Alternatives

3.1 Life Cycle Cost Analysis

A life cycle cost analysis was utilized to better compare the two alternatives to determine the most cost-effective alternative, rather than just the alternative with the lowest capital construction cost. The net present value was calculated for each alternative as the capital cost (which includes construction and non-construction costs such as engineering) plus the present worth of the uniform series of annual O&M, minus the present worth of the salvage value of the system. This was calculated for a planning period of 70 years with a 4.0% inflation rate and a 2.5% discount rate (real discount rate taken from the latest version of Appendix C of OMB Circular A-94). The net present value for each alternative is presented in Table 3-1.

TABLE 3-1
Alternative Life Cycle Cost Analysis

Item	Alt. No. 1	Alt. No. 2
Capital Cost	$20,931,700	$7,941,000
Annual O&M Cost	$112,500	$230,800
Present Day O&M Cost	$13,566,900	$27,833,200
Present Day Salvage Value	-$210,400	-$647,000
Net Present Value of Life Cycle Cost	**$34,709,000**	**$36,421,200**
	Planning Period	70 years
	Inflation Rate	4.0%
	Discount Rate	2.5%

As shown in Table 3-1, Alternative No. 1 is expected to have a lower life cycle cost than Alternative No. 2. Additionally, Alternative No. 1 has the ability to increase the customer base served by connecting other Public Water Systems along the route which could ultimately result in the lowest debt service cost per EDU as shown in Table 2-13. Alternative No. 2 has no potential to increase the customer base.

3.2 Alternative Comparison

Table 3-2 on the following page provides a summary of the alternatives, identifying major differences, pros, cons, non-monetary factors, and costs.

TABLE 3-2
Alternative Comparison Summary

Item	Alternative No. 1	Alternative No. 2
Description	Interconnection with Hyde Park Regional Water System	New Water Treatment Building with GAC System
Pros	• Eliminates PFAS source water • Simple operation • Ability to connect other PWSs • Lower life cycle cost • Potential for lower cost per user	• Lower Capital Cost
Cons	• Higher Capital Cost • Significant portion of main is anticipated to be installed in bedrock	• Constructability challenges in wetland • Risk of site flooding • More operator training required • More extensive maintenance • Higher life cycle cost
Environmental Impacts	Low Impacts	High Impacts
Future Connections	Potential for multiple connections including other PWSs with water quality issues, reducing cost per user	No potential for other connections
Service for PEJAs & DACs	Potential to serve one PEJA & four DACs	Will not serve any PEJAs or DACs
Sustainability	Lower carbon footprint	Higher carbon foot print
Permitting	Less permitting	More permitting
Public Perception	Generally Good	Potential Visual Impacts and Perceived Water Quality Issues
Capital Cost	$20,931,700	$7,941,000
Life Cycle Cost	$34,709,000	$36,421,200
Potential Lowest Annual Cost per EDU[1]	$429[2]	$1,252

[1] Cost per EDU assumes a 70% WIIA Grant Award for the project
[2] Cost assumes all existing PWSs along the proposed route connect to the system

Section 4
Recommended Alternative

4.1 Basis of Selection

Based on the life cycle cost analysis, estimated annual debt service, potential to increase the customer base by interconnecting other public water systems, and non-monetary factors, Alternative No. 1 is the recommended alternative. The basis for selection of Alternative No. 1 is as follows:

- Lowest life cycle cost
- Potential to connect several other PWSs, including PWSs in potential environmental justice areas and disadvantaged communities
- Potential for the lowest annual debt service cost per user if all existing PWSs along the proposed route connect to the system
- Simpler construction and permitting
- Less operation and maintenance
- Better public perception

4.2 Cost Estimate

This engineering report has been prepared in anticipation of the pursuit of a low-interest loan or grant. Table 4-1 provides the opinion of probable cost for implementation of Alternative No. 1 in a format that is consistent with funding agency requirements.

TABLE 4-1
Recommended Project Costs

Item	Cost
1. Construction Costs[1]	
a. Contract 1 - General	$14,201,200
b. Contract 2 - Electrical	$289,800
c. Contract 3 - HVAC	$0
d. Contract 4 - Plumbing	$0
2. Engineering Costs	
a. Planning	$62,400
b. Design	$1,030,500
c. Construction	$1,545,800
3. Other Expenses	
a. Local Counsel	$10,200
b. Bond Counsel	$43,500
c. Work Force	$202,900
d. Financial Services	$0
e. Net Interest	$0
f. Miscellaneous	$0
4. Equipment	$0
5. Land Acquisition	$0
6. Project Contingency (30%)	$3,864,400

7. Total Project Costs	$21,250,700
8. Less Other Sources of Financing	$0
9. Project Costs to be Financed	$21,250,700
10. SRF Issuance Costs	
a. Direct Expense (1%)	$212,600
b. Bond Issuance Charge (0.84%)	$178,600
c. Administrative Fee (1.1%)	$233,800
Total Project Cost Including Financing	**$21,875,700**

[1]Includes an escalation of 4%/year for 3 years

4.3 Project Schedule

Figure 4-1 presents the anticipated project implementation schedule for the recommended alternative. The project implementation schedule assumes that engineering will commence in Q2 2025 after project funding is secured.

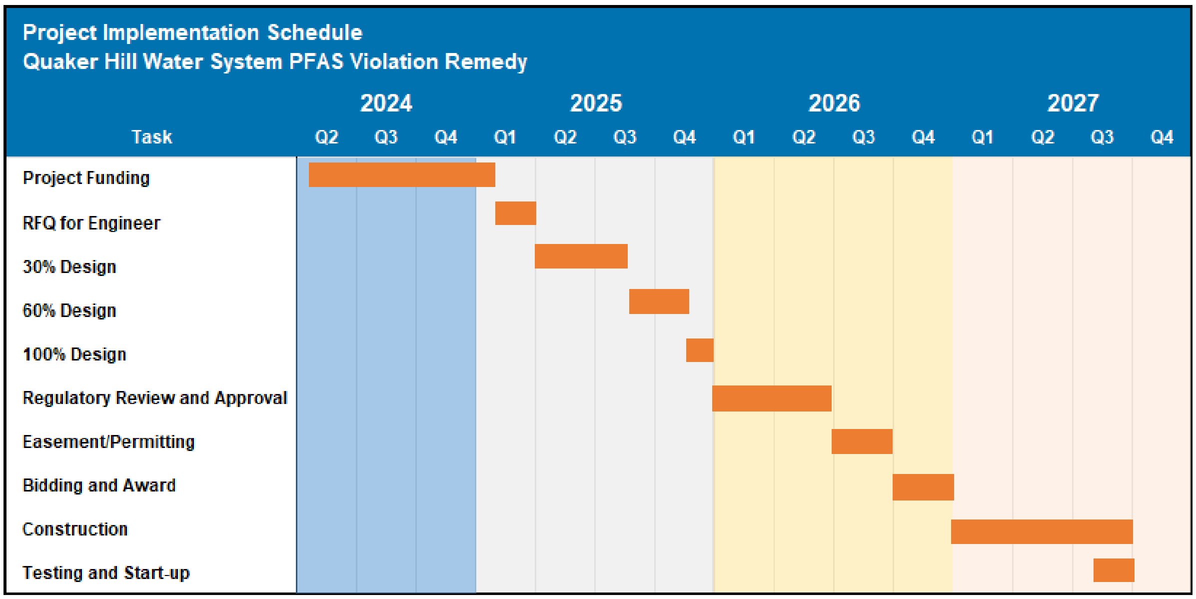


FIGURE 4-1
Project Implementation Schedule

4.4 Next Steps

The following are the next steps for project implementation of the recommended alternative:

1. Secure Project Funding - As indicated in this report, the cost of the proposed system is substantial. It is recommended that this report is used to apply for financial assistance for funding the design and construction of the recommended alternative.
2. Engineering & Design:
    a. Engineering – DCWWA will hire an engineering consultant to design and oversee construction of the recommended alternative

   b. Site Survey - A topographic and boundary survey will be conducted by the engineering consultant.
   c. Soil Testing – Geotechnical information will be collected.
   d. Design Phases– Design of the recommended alternative will advance in stages including 30%, 60%, and 100% (permit set) design phases. The engineering consultant will have discussions with regulators during the design.
   e. Contract Documents - Contract documents appropriate for permitting and construction will be developed and will consist of drawings and specifications for each phase of the design process.
   f. Regulatory Review – It is anticipated that the Dutchess County Department of Behavioral and Community Health and New York State Department of Health will need to review and approve the 100% design prior to bidding.
   g. Bidding – The project will go out to public bid after receiving approval.
3. Easements – Easements must be obtained for water mains. This needs to be completed prior to construction.
4. Permitting - Permits will be required for construction of the water mains.
5. Construction – Construction will be awarded and commence following receipt of reasonable bids. It is anticipated that the construction project will be split into two prime contracts: general construction and electrical construction per Wick’s Law.
6. Testing and Start-up – Testing and start-up will begin as construction nears completion.

APPENDIX A

Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5

Photograph 6

Photograph 7

Photograph 8

APPENDIX B

WILLIAM F.X. O'NEIL
COUNTY EXECUTIVE

LIVIA SANTIAGO-ROSADO, MD, FACEP
COMMISSIONER

ANTHONY J. RUGGIERO, MPA
ASSISTANT COMMISSIONER

COUNTY OF DUTCHESS

DEPARTMENT OF BEHAVIORAL AND COMMUNITY HEALTH

RECEIVED
JAN 17 2024
DCWWA

January 5, 2024

NOTICE OF VIOLATION

New York State Sanitary Code, 10 NYCRR Part 5

Michael Keating, DCWWA
1 Lagrange Avenue
Poughkeepsie, NY 12603

Re: Quaker Hill Estates – PFOS MCL Violation
Federal ID# 1302797
Town of Hyde Park

Dear Mr. Keating:

Our records indicate that the required Perfluorooctanesulfonic Acid (PFOS) sampling collected for the above referenced Public Water Supply (PWS) has resulted in an exceedance of the maximum contaminant level (MCL). Based upon your sample results, the following samples have indicated that you have exceeded the MCL based upon an average of the initial and conformation samples:

- Well #2 – 13.55 ng/L PFOS

You are hereby requested to hire a NYS licensed Design Professional in order to provide treatment for the above referenced MCL exceedance. **Since you already indicated that you have retained a NYS licensed Professional Engineer, please have the Professional Engineer draft a letter to this department indicating their retained services no later than January 31, 2024.**

If you have any questions, please contact me at (845) 486-3404.

Yours very truly,

Jason W. Teed, P.E.
Senior Public Health Engineer
Environmental Health Services

cc: PWSID# NY1302797 → File 0120221
James Fouts, Associate Public Health Sanitarian

APPENDIX C

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Alternative No. 1 - Interconnection to HPRWS

Quaker Hill Water System, Hyde Park, NY

Quaker Hill PFAS Violation Remedy

Item Description	Unit Cost	Units	Quantity	Cost
Clearing and Grubbing in Water Main Easement	$12,000	ACRE	0.5	$6,000
8" HDPE Water Main - Loam	$125	LF	13,200	$1,650,000
8" HDPE Water Main - Boulder/Rocky Soils	$400	LF	2,500	$1,000,000
8" HDPE Water Main - Bedrock	$600	LF	9,400	$5,640,000
Entry/Exit Pits Excavation & Restoration - Local Road	$5,300	EA	26	$137,800
Entry/Exit Pits Excavation & Restoration - State Road	$6,000	EA	23	$138,000
Entry/Exit Pits Excavation & Restoration - Cross Country	$2,900	EA	3	$8,700
Flushing Hydrant Assembly	$8,200	EA	51	$418,200
8" Mainline Gate Valves w/ Boxes	$3,200	EA	26	$83,200
Air Releases	$6,000	EA	11	$66,000
Utility Potholing Including Restoration & Traffic Control	$5,100	DAY	42	$214,200
Pressure Testing & Disinfection	$40,000	LS	1	$40,000
Clearing and Grubbing for Booster Pump Station/Parking	$12,000	ACRE	0.2	$2,400
Rough Grading for Booster Pump Station/Access Drive/Parking	$1	SF	8,000	$8,000
Gravel Access Drive/Parking Area Extension	$5	SF	1,000	$5,000
New 3 Phase Overhead Electric Service	$50	LF	4,350	$217,500
Concrete Frost Wall with Spread Footing Foundation	$1,500	CY	31	$46,500
Packaged Booster Pump Station (Inc. Start-up & Training)	$760,000	LS	1	$760,000
Install Packaged Booster Pump Station	$38,000	LS	1	$38,000
Water Main Connections	$6,500	LS	1	$6,500
Electrical Service Connection to Booster Pump Station	$8,000	LS	1	$8,000
Final Grading, Mulch & Seed around Booster Pump Station	$2	SF	3,000	$6,000
Demolish Existing Quaker Hill Treatment Facility	$45,000	LS	1	$45,000
Pressure Monitoring System at Quaker Hill	$32,000	LS	1	$32,000
Traffic Control (2%)	$188,100	LS	1	$188,100
Mobilization/Demobilization (5%)	$529,000	LS	1	$529,000
Contractor General Conditions (15%)	$1,586,600	LS	1	$1,587,000
Opinion of Probable Construction Cost				**$12,881,100**

NOTES: This is an engineer's Opinion of Probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the estimates of probable construction costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this estimate of the Probable Construction Cost. Engineering, contingency, and inflation price escalation are not included in this figure.

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Alternative No. 2 - Replace Water Treatment System

Quaker Hill Water System, Hyde Park, NY

Quaker Hill PFAS Violation Remedy

Item Description	Unit Cost	Units	Quantity	Cost
Tree Trimming at Access Drive	$8,000	LS	1	$8,000
Temporarily Relocate Existing Generator and Propane Tanks	$5,000	LS	1	$5,000
Temporarily Maintain Operation of Existing WTP	$20,000	LS	1	$20,000
Temporary Water Control	$40,000	LS	1	$40,000
Temporary Erosion and Sediment Control	$6,000	LS	1	$6,000
Clearing and Grubbing	$12,000	ACRE	0.5	$6,000
General Fill, Overfill 2 Feet for Preload and then Remove	$100	CY	740	$74,000
Paved Access Drive/Parking Area Improvements	$12	SF	10,200	$122,400
Concrete Spill Containment Area	$1,500	CY	64	$96,000
Bollards	$1,000	EA	10	$10,000
Galvanized Security Fencing	$65	LF	460	$29,900
Galvanized Swing Gate	$3,500	LS	1	$3,500
Standby Generator System	$100,000	LS	1	$100,000
Propane Tanks, Piping, and Regulators	$32,000	LS	1	$32,000
New Well Pumps w/ VFDs, Discharge Pipe, and Wiring	$60,000	LS	1	$60,000
Replace Well No. 1	$75,000	LS	1	$75,000
Extend Well No. 2 Casing	$4,500	EA	1	$4,500
6" Water Main, Insertion Valve, Cap Existing 6" Water Main	$26,000	LS	1	$26,000
Tank Overflow/Filter-to-Waste Outfall Pipe	$200	LF	150	$30,000
Rip Rap Apron	$6,000	LS	1	$6,000
New Buried HDD Electric Service Conduit	$200	LF	450	$90,000
Excavation for Building Foundation	$26,000	LS	1	$26,000
Timber Piles (for building foundation and generator pad)	$190,000	LS	1	$190,000
Reinforced Concrete (for building foundation and generator pad)	$190,000	LS	1	$190,000
Concrete Equipment Pads for Propane Tanks and Generator	$1,500	CY	10	$15,000
Interior Foundation Backfill	$33,500	LS	1	$33,500
Insulated CMU Building with Brick Veneer	$537,000	LS	1	$537,000
Timber Roof Trusses and Asphalt Shingle Roof	$142,000	LS	1	$142,000
Aluminum Landing/Stairs	$38,300	LS	1	$38,300
14' Wide x 16' Tall Insulated Rollup Door	$11,400	EA	2	$22,800
12' Wide x 14' Tall Insulated Rollup Door	$9,500	EA	1	$9,500
Double Man Access Door	$5,500	EA	2	$11,000
Interior Walls/Ceiling	$54,000	LS	1	$54,000
Removable Handrail	$60	LF	40	$2,400
Concrete Equipment Pads	$1,500	CY	2	$3,000
Prefiltration System	$22,200	EA	2	$44,400
GAC Contactors, Valve Tree, Initial Media Fill, Start-up/ Training	$314,000	LS	1	$314,000
10,000 Gallon Water Storage Tank	$41,900	EA	2	$83,800
6,000 Gallon Spent Backwash Tank	$24,200	EA	1	$24,200
Triplex Service Pumps w/ VFDs	$49,600	LS	1	$49,600
Jockey Pump	$3,800	LS	1	$3,800
Backwash Pump	$10,100	LS	1	$10,100
Submersible Spent Backwash Pump	$8,000	LS	1	$8,000
500 Gallon Pressure Tank	$40,000	EA	2	$80,000
Disinfection System (Tank, Metering Pumps, Containment, Etc.)	$26,200	LS	1	$26,200
Interior Process Piping & Supports (Sch. 80 PVC)	$140	LF	500	$70,000
Process Piping Isolation Valves (Sch. 80 PVC)	$300	EA	24	$7,200
Building HVAC System (Unit heaters, DHU, Fans, Louvers, Etc.)	$163,000	LS	1	$163,000
HVAC Hoist and Monorail System	$98,000	LS	1	$98,000
Building Plumbing (Water Heater, Safety Shower, Piping, Etc.)	$30,000	LS	1	$30,000
Building Electrical and Controls (Panels, Conduit, Lights, Etc.)	$299,000	LS	1	$299,000
Control Panel & Alarm System Inc. Programming	$58,000	LS	1	$58,000
Instrumentation	$175,000	LS	1	$175,000
Lab Equipment and Misc. Interior Building Supplies	$7,500	LS	1	$7,500
Equipment for GAC Media Changeouts	$12,000	LS	1	$12,000
Demolish Existing Quaker Hill Treatment Facility	$45,000	LS	1	$45,000
8" HDPE Water Main - Bedrock	$600	LF	500	$300,000
Entry/Exit Pits Excavation & Restoration - Local Road	$5,300	EA	4	$21,200
Flushing Hydrant Assembly	$8,200	EA	2	$16,400
8" Mainline Gate Valves w/ Boxes	$3,200	EA	2	$6,400
Mobilization/Demobilization (5%)	$203,600	LS	1	$203,600
Contractor General Conditions (15%)	$610,800	LS	1	$610,800
Opinion of Probable Construction Cost				**$4,886,000**

NOTES: This is an engineer's Opinion of Probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the estimates of probable construction costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this estimate of the Probable Construction Cost. Engineering, contingency, and inflation price escalation are not included in this figure.

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Phase 2 - Quaker Hill Distribution System Improvements
Quaker Hill Water System, Hyde Park, NY
Quaker Hill PFAS Violation Remedy

Item Description	Unit Cost	Units	Quantity	Cost
8" HDPE Water Main - Loam	$125	LF	2,600	$325,000
8" HDPE Water Main - Bedrock	$600	LF	6,400	$3,840,000
Entry/Exit Pits Excavation & Restoration - Local Road	$5,300	EA	18	$95,400
Flushing Hydrant Assembly	$8,200	EA	18	$147,600
8" Mainline Gate Valves w/ Boxes	$3,200	EA	9	$28,800
Air Releases	$6,000	EA	2	$12,000
Utility Potholing Including Restoration & Traffic Control	$5,100	DAY	15	$76,500
Reconnect Services & Restoration - Local Road	$8,900	EA	109	$970,100
Water Meters	$1,300	EA	109	$141,700
Pressure Testing & Disinfection	$10,000	LS	1	$10,000
Traffic Control (2%)	$106,500	LS	1	$106,500
Mobilization/Demobilization (5%)	$267,000	LS	1	$267,000
Contractor General Conditions (15%)	$798,400	LS	1	$799,000
Opinion of Probable Construction Cost				**$6,494,600**

NOTES: This is an engineer's Opinion of Probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the estimates of probable construction costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this estimate of the Probable Construction Cost. Engineering, contingency, and inflation price escalation are not included in this figure.

ENGINEER'S OPINION OF PROBABLE ANNUAL O&M COST
Alternative No. 1 - Interconnection to HPRWS
Quaker Hill Water System, Hyde Park, NY
Quaker Hill PFAS Violation Remedy

Item Description	Unit Cost	Units	Quantity	Cost
Proactive System Maintenance (Daily Check at Booster PS)	$80	HOUR	365	$29,200
Scheduled Water Main Flushing	$80	HOUR	16	$1,300
Air Release Inspection	$80	HOUR	8	$700
Residual Monitoring at Quaker Hill	$80	HOUR	12	$1,000
Reactive System Maintenance (Water Main Breaks)	$80	HOUR	32	$2,600
Water Main Break Repair by Contractor	$12,000	EA	2	$24,000
Reactive System Maintenance (Booster PS Component Failure)	$2,500	LS	1	$2,500
Booster Pump Station Energy Consumption	$0.25	kWh	24777	$6,200
Standby Generator Fuel Consumption	$4.50	GAL	650	$3,000
Cellular Service for Alarm System	$100	MONTH	12	$1,200
Annual Booster Pump Maintenance	$1,500	YEAR	1	$1,500
Annual Booster PS HVAC System Maintenance	$300	YEAR	1	$300
Annual Standby Generator Maintenance	$400	YEAR	1	$400
Annual Booster Pump Station Misc. Maintenance	$600	YEAR	1	$600
Sampling Supplies	$500	YEAR	1	$500
			Subtotal Annual O&M Costs	$ 75,000
			Contingency (30%)	$ 22,500
			Administrative, Billing, & Accounting	$ 15,000
			Opinion of Probable Annual O&M Cost	**$112,500**

NOTES: This is an engineer's Opinion of Probable Annual O&M Cost. Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions and that the estimates of probable annual O&M costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the actual annula O&M costs will not vary from this estimate of the Probable Annual O&M Cost.

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE ANNUAL O&M COST

Alternative No. 2 - Replace Water Treatment System

Quaker Hill Water System, Hyde Park, NY

Quaker Hill PFAS Violation Remedy

Item Description	Unit Cost	Units	Quantity	Cost
Proactive System Maintenance (daily visit)	$80	HOUR	730	$58,400
Pre-Filter Bag Replacement (twice per week)	$80	HOUR	104	$8,400
GAC Backwashing (twice per year)	$80	HOUR	8	$700
Residual Monitoring at Quaker Hill	$80	HOUR	12	$1,000
PFAS Sampling	$600	EA	12	$7,200
Part 5 Sampling	$2,000	LS	1	$2,000
Reactive System Maintenance (Component Failure)	$7,500	LS	1	$7,500
Spent GAC Media Removal/Disposal & Replace (1 vessel/2 yrs)	$18,200	LS	1	$18,200
GAC Media Startup (1 vessel/2 yrs)	$8,000	LS	1	$8,000
Spent Backwash Tank Media Removal	$7,500	EA	2	$15,000
Annual Jockey Pump Maintenance	$500	YEAR	1	$500
Annual Service Pump Maintenance	$1,500	YEAR	1	$1,500
Annual Backwash Pump Maintenance	$500	YEAR	1	$500
Annual Spent Backwash Pump Maintenance	$500	YEAR	1	$500
Annual Sodium Hypochlorite Metering Pump Maintenance	$400	YEAR	1	$400
Annual HVAC System Maintenance	$300	YEAR	1	$300
Annual Standby Generator Maintenance	$500	YEAR	1	$500
Annual Misc. Building Maintenance	$800	YEAR	1	$800
Sodium Hypochlorite	$17	GAL	300	$5,100
Quaker Hill System Energy Consumption	$0.25	kWh	94846	$23,800
Standby Generator Fuel Consumption	$3.50	GAL	390	$1,400
Cellular Service for Alarm System	$100	MONTH	12	$1,200
Access Road Maintenance	$600	LS	1	$600
Maintain Vegetation at Outfall Pipe	$1,300	LS	1	$1,300
Snow Plowing	$400	LS	1	$400
Sampling Supplies	$750	YEAR	1	$800
Subtotal Annual O&M Costs				$ 166,000
Contingency (30%)				$ 49,800
Administrative, Billing, & Accounting				$ 15,000
Opinion of Probable Annual O&M Cost				**$230,800**

NOTES: This is an engineer's Opinion of Probable Annual O&M Cost. Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions and that the estimates of probable annual O&M costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the actual annula O&M costs will not vary from this estimate of the Probable Annual O&M Cost.

Net Present Value (NPV) for Operational and Maintenance (O&M)

Inflation Rate (%)	4.0%
Discount Rate (%)	2.5%
Plannning Period (years)	70

Alt No. 1

No.	Cost	Discount Rate	Inflation Rate	Annual O&M with Inflation	Present Value
1	$ 112,500	1	1	$ 112,500	$ 112,500
2	$ 112,500	0.976	1.040	$ 117,000	$ 114,146
70	$ 112,500	0.182	14.973	$ 1,684,430	$ 306,553
				NPV for O&M from Year 1 through Year 70	$ 13,566,873
				NPV for O&M from Year 1 through Year 70 (rounded)	**$ 13,566,900**

Alt. No. 2

No.	Cost	Discount Rate	Inflation Rate	Annual O&M with Inflation	Present Value
1	$ 230,800.00	1	1	$ 230,800	$ 230,800
2	$ 230,800.00	0.976	1.040	$ 240,032	$ 234,178
70	$ 230,800.00	0.182	14.973	$ 3,455,701	$ 628,911
				NPV for O&M from Year 1 through Year 70	$ 27,833,194
				NPV for O&M from Year 1 through Year 70 (rounded)	**$ 27,833,200**

Salvage Value

Discount Rate (%)	2.5%
Planning Period (years)	70

Alternative No. 1

Equipment	Purchase Price	Useful Life	SL Depreciation	Salvage Value at 70 years	Present Worth
8" HDPE Water Main	$8,574,500	70	$122,493	$0	$0
Hydrant Assemblies	$418,200	50	$8,364	-$167,280	-$29,701
Gate Valves	$83,200	40	$2,080	-$62,400	-$11,079
Air Releases	$66,000	20	$3,300	-$165,000	-$29,296
Booster Pump Station	$798,000	40	$19,950	-$598,500	-$106,266
Pressure Monitoring System at Quak	$32,000	10	$3,200	-$192,000	-$34,090
				Salvage Value @ 70 years	-$1,185,200
				NPV of Salvage Value @ 70 years	**-$210,400**

Alternative No. 2

Equipment	Purchase Price	Useful Life	SL Depreciation	Salvage Value at 70 years	Present Worth
Galvanized Fencing and Gate	$33,400	50	$668	-$13,360	-$2,372
Standby Generator	$100,000	20	$5,000	-$250,000	-$44,388
Propane Tanks	$32,000	30	$1,067	-$42,667	-$7,576
Well Pumps	$60,000	15	$4,000	-$220,000	-$39,062
6" Water Main	$26,000	60	$433	-$4,333	-$769
Treatment Building	$820,000	40	$20,500	-$615,000	-$109,195
Prefiltration System	$44,400	60	$740	-$7,400	-$1,314
GAC Contactors	$314,000	40	$7,850	-$235,500	-$41,814
10,000 Gallon WSTs	$83,800	20	$4,190	-$209,500	-$37,197
6,000 Gallon Backwash Tank	$24,200	20	$1,210	-$60,500	-$10,742
Triplex Service Pumps w/ VFDs	$49,600	15	$3,307	-$181,867	-$32,291
Jockey Pump	$3,800	15	$253	-$13,933	-$2,474
Backwash Pump	$10,100	15	$673	-$37,033	-$6,575
Submersible Spent Backwash Pump	$8,000	15	$533	-$29,333	-$5,208
500 Gallon Pressure Tank	$80,000	15	$5,333	-$293,333	-$52,082
Disinfection System (Tank, Metering	$26,200	10	$2,620	-$157,200	-$27,911
Interior Process Piping & Supports (S	$70,000	50	$1,400	-$28,000	-$4,972
Process Piping Isolation Valves (Sch.	$7,200	40	$180	-$5,400	-$959
Building HVAC System (Unit heaters	$163,000	25	$6,520	-$293,400	-$52,094
HVAC Hoist and Monorail System	$98,000	80	$1,225	$12,250	$2,175
Building Plumbing (Water Heater, Sa	$30,000	60	$500	-$5,000	-$888
Building Electrical and Controls (Pan	$299,000	40	$7,475	-$224,250	-$39,816
Control Panel & Alarm System Inc. P	$58,000	30	$1,933	-$77,333	-$13,731
Instrumentation	$175,000	15	$11,667	-$641,667	-$113,930
8" HDPE Water Main	$300,000	70	$4,286	$0	$0
Hydrant Assemblies	$16,400	50	$328	-$6,560	-$1,165
Gate Valves	$6,400	40	$160	-$4,800	-$852
				Salvage Value @ 70 years	-$3,645,000
				NPV of Salvage Value @ 70 years (rounded)	**-$647,000**

APPENDIX D

CAPACITY DEVELOPMENT PROGRAM

TECHNICAL, MANAGERIAL, AND FINANCIAL EVALUATION CRITERIA
FOR: COMMUNITY PUBLIC WATER SYSTEMS

SYSTEM NAME: Quaker Hill Estates Water System

COUNTY: Dutchess **PWSID #:** 1302797

COMPLETED BY: DCWWA **DATE:** 5/30/2024

Technical Capacity

A. System Infrastructure

1. Does the system have as-built plans, drawings, or maps of its facilities including source, treatment, storage, and distribution?

   ☑ Yes ☐ No ☐ Not Applicable

   If the system lacks certain plans, please specify:
   Missing as-built plans of distribution system

2. Does the system have exact location measurements of all main valves and service shut-offs?

   ☑ Yes ☐ No ☐ Not Applicable

3. Can the system's pumping, storage and distribution facilities meet current normal and peak demands and required distribution pressures?

   ☑ Yes ☐ No ☐ Not Applicable

4. Does the system have a water conservation plan?

   ☐ Yes ☐ No ☑ Not Applicable

5. Are all customers on the water system metered?

   ☐ Yes ☑ No ☐ Not Applicable

6. Is the system equipped with "master" meters that measure the amount of water the system produces or purchases for each source of water?

   ☑ Yes ☐ No ☐ Not Applicable

B. Source Water Evaluation

1. Does the system have a copy of its Source Water Assessment?

☐ Yes ☐ No ☑ Not Applicable

2. Has a yield analysis been done for the system's source?

☐ Yes ☑ No ☐ Not Applicable

3. Does the system have a description of the existing source-pumping capacity and the system's raw and finished water storage capacity?

☑ Yes ☐ No ☐ Not Applicable

4. For groundwater systems, does your system have a wellhead protection program in place?

☑ Yes ☐ No ☐ Not Applicable

C. Technical Knowledge

1. Has an evaluation of the water system facilities been conducted with respect to its ability to reliably meet current and proposed State and Federal drinking water regulations?

☑ Yes ☐ No ☐ Not Applicable

If system can't meet regulations, please specify:
Currently unable to meet PFAS standards, which is the reason for this application.

2. Does the system have monthly water production records or treatment records that show daily and monthly water production for <u>each source</u> used by the system?

☑ Yes ☐ No ☐ Not Applicable

3. Has an evaluation been conducted to document the condition and remaining service life of existing facilities?

☑ Yes ☐ No ☐ Not Applicable

4. Has the system been cited within the past two years for failing to sample and report test results?

☐ Yes ☑ No ☐ Not Applicable

5. Has the system been cited within the past two years for operating deficiencies as a result of a sanitary survey or other inspection conducted by the DOH?

☑ Yes ☐ No ☐ Not Applicable

6. If you answered *"Yes"* to Questions 4 or 5, has corrective action been taken to correct all deficiencies?

☑ Yes ☐ No ☐ Not Applicable

D. Certified Operators

1. Does the water system have a certified water operator(s) and designated an operator in responsible charge?

☑ Yes ☐ No

2. If the water system does not have a state-certified water treatment operator, or lacks the necessary number of operators to safely and reliably operate the system, does the system have a plan to acquire the services of a (additional) state-certified operator?

☐ Yes ☐ No ☑ Not Applicable

Managerial Capacity

A. Staffing and Organization

1. What type of training/continuing education did system personnel attend within the last two years (please specify)?
Personnel receive ongoing safety training, continuing education for water licensing, and cyber security and data management.

2. Who is responsible for policy and operational decisions for the water system *(name and title)*?
Michael J. Keating, Executive Director; Richard Winchester, Director of Operations

3. Who is responsible for ensuring compliance with state regulatory requirements *(name and title)*?
Michael J. Keating, Executive Director; Richard Winchester, Director of Operations

4. Who is responsible for approving expenditures *(name and title)*?
Michael J. Keating, Executive Director; Richard Winchester, Director of Operations; Jonathan Churins, Asset Manager

5. *For systems that contract for system operation or management*: Does the system have a valid (signed) contract that summarizes the duties and responsibilities the contractor must provide to the system?

☐ Yes ☐ No ☑ Not Applicable

B. Ownership

1. *If the system is under temporary ownership*, has a future owner been found for the water system?

   ☐ Yes ☐ No ☑ Not Applicable

   If *"Yes"*, who will the future owner be?

   ____

2. *For systems that use, but do not own, land or facilities that are essential to water system operation:* Is there a valid long-term contract (i.e., lease) between the water system and the owner of the land or facilities essential to the operation of the system?

   ☐ Yes ☐ No ☑ Not Applicable

3. *For systems with a single proprietor:* Does the system have a contingency plan for continuing system operation in the event the owner becomes incapable of carrying out his/her responsibilities?

   ☐ Yes ☐ No ☑ Not Applicable

C. Consolidation/Restructuring

1. Has the system examined the feasibility of:

   a) Incorporating with an existing water system in the immediate proximity?

   ☑ Yes ☐ No ☐ Not Applicable

   b) Selling ownership to an existing water system?

   ☐ Yes ☐ No ☑ Not Applicable

   c) Contracting for the management or operation of the system with an existing system or satellite management/operations agency?

   ☐ Yes ☐ No ☑ Not Applicable

D. Emergency/Disaster Response Plans

1. Has the system developed an Emergency Response Plan?

   ☑ Yes ☐ No ☐ Not Applicable

2. Does the Emergency Response Plan:

   a) Designate responsible personnel in the event of an emergency?

   ☑ Yes ☐ No ☐ Not Applicable

b) Provide for emergency phone and radio capabilities?

☑ Yes ☐ No ☐ Not Applicable

c) Describe public and health department notification procedures?

☑ Yes ☐ No ☐ Not Applicable

3. Does the system have any emergency contract agreements under which it operates (e.g., emergency water interconnections and alternative sources)?

☑ Yes ☐ No ☐ Not Applicable

E. Water System Policies

1. Does the system have a *written* System Operations Manual or Policy?

☑ Yes ☐ No ☐ Not Applicable

F. Record Keeping

1. Does the system keep water utility records including: financial, regulatory, facility, operations and maintenance, data quality, Annual Water Quality Reports, and correspondence with the NYS Department of Health and/or local Health Departments (and where appropriate, the NYSPSC)?

☑ Yes ☐ No ☐ Not Applicable

Financial Capacity

A. Budget Projection – Revenues and Expenses

1. Does the system have a water budget?

☑ Yes ☐ No ☐ Not Applicable

2. Are the system's annual water revenues sufficient to cover the annual water expenses as well as anticipated capital improvements?

☐ Yes ☑ No ☐ Not Applicable

3. Are the system's water rates, when combined with other revenue sources, sufficient to cover all listed expenditures for the water system?

☑ Yes ☐ No ☐ Not Applicable

4. Does the system retain budget information for at least two years?

   ☑ Yes ☐ No ☐ Not Applicable

B. Reserves

1. Does the system have a reserve account (or funds within a reserve account) dedicated to: *Note*: System maintains sufficient fund balance to cover a) and b) below, but does not maintain specific reserve accounts.

   a) Financing the emergency replacement of critical facilities in the event of their failure?

   ☐ Yes ☑ No ☐ Not Applicable

   b) The maintenance of cash flow in the event of an unexpected funding shortfall?

   ☐ Yes ☑ No ☐ Not Applicable

2. If the system has a reserve account, how does it determine the amount to put into the account?

   ____ Fixed Amount_____Percentage of Revenues_____Percentage of Expenses

   ____Other (please specify) ____

3. If the system has a reserve account, what type(s) of reserve account(s) does it have?

   _____Operation and Maintenance______Capital Projects______Debt Service

   _____Other (please specify)____

C. Capital Improvement Plan

1. How do you finance operation and maintenance costs (Check all that apply)?

   __✓__Rates collected from ratepayers _____Rental fees
   _____Other business revenue _____Personal capital
   _____Surcharges _____Reserve account
   _____Other (Please specify) ____

2. How did you finance your LAST major repair or improvement?

   _____Commercial bank loan ____Bonds
   _____ DWSRF ____Other State or federal loan/grant program
   _____Surcharge ____Personal Capital
   _____Reserve Account ____Revenue from other business
   __✓__Other (Please specify) Paid from system fund balance

3. What options do you have for financing your NEXT major repair or improvement?

______Commercial bank loan	____Bonds
✓ DWSRF	✓ Other State or federal loan/grant program
______Surcharge	____Personal Capital
______Reserve Account	____Revenue from other business
______Other (Please specify) ________________________	

D. Water System Rates

1. Does the water system management review user fee, user charge, or rate system at least once every two years?

☑ Yes ☐ No ☐ Not Applicable

2. What is the frequency of billing (e.g., 12, 6, or 4 times per/year)? 4 times/year

3. Where applicable, what are the system's water rates?
$1,033.40/year

4. What are rates based on?
______Capital Improvement Plan and Annual Budget
✓ Annual Budget Only
______Cash on Hand
______Last year's expenses
______Not sure
______Other (Please specify________________________)

5. What was the date of the last rate increase? -
01/01/2024

END OF DOCUMENT

APPENDIX E

Department of Health | **Environmental Facilities Corporation**

Smart Growth Assessment Form

This form should be completed by an authorized representative of the applicant, preferably the project engineer or other design professional.[1]

Section 1 – General Applicant and Project Information

Applicant: Dutchess County Water & Wastewater Authority Project No.: D0280-007F

Project Name: Quaker Hill PFAS Violation Remedy

Is project construction complete? ✔ Yes, date: ☑ No

Please provide a brief project summary in plain language including the location of the area the project serves:

The proposed project involves construction of a 8-inch water main (approximately 25,100 linear feet) and booster pump station to connect the Quaker Hill Estates Water System in Hyde Park, NY to the Hyde Park Regional Water System. The Quaker Hill Estates Water System serves a residential development with 109 service connections. The Quaker Hill Water System is served by two groundwater wells which have an MCL violation for PFAS.

Section 2 – Screening Questions

A. Prior Approvals

1. Has the project been previously approved for Environmental Facilities Corporation (EFC) financial assistance? ☐ Yes ☑ No

2. If yes to A(1), what is the project number(s) for the prior approval(s)? Project No.:

3. If yes to A(1), is the scope of the previously-approved project substantially the same as the current project? ☐ Yes ☐ No

If your responses to A(1) and A(3) are both yes, please proceed to Section 5, Signature.

B. New or Expanded Infrastructure

1. Does the project involve the construction or reconstruction of new or expanded infrastructure? ☑ Yes ☐ No

Examples of new or expanded infrastructure include, but are not limited to:

(i) The addition of new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant where none existed previously;

(ii) An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing wastewater treatment system; and OR

[1] If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

(iii) An increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system such that a Department of Environmental Conservation (DEC) water withdrawal permit will need to be obtained or modified, or result in the Department of Health (DOH) approving an increase in the capacity of the water treatment plant.

If your response to B(1) is no, please proceed to Section 5, Signature.

Section 3 –Smart Growth Criteria

Your project must be consistent will all relevant Smart Growth criteria. For each question below please provide a response and explanation.

1. Does the project use, maintain, or improve existing infrastructure?

   ☑ Yes ✔ No

   Explain your response: The proposed interconnection water and booster pump station will be new. But the source water will be provided by the existing Hyde Park Regional Water System and the Quaker Hill distribution system piping will be reused and eventually replaced (Phase 2).

2. Is the project located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center, as such terms are defined herein (please select one response)?

   ☐ Yes, my project is located in a municipal center, which is an area of concentrated and mixed land uses that serves as a center for various activities, including but not limited to: central business districts, main streets, downtown areas, brownfield opportunity areas (see www.dos.ny.gov for more information), downtown areas of local waterfront revitalization program areas (see www.dos.ny.gov for more information), areas of transit-oriented development, environmental justice areas (see *www.dec.ny.gov/public/899.html* for more information), and hardship areas (projects that primarily serve census tracts or block numbering areas with a poverty rate of at least twenty percent according to the latest census data).

   ☑ Yes, my project is located in an area adjacent to a municipal center which has clearly defined borders, is designated for concentrated development in the future in a municipal or regional comprehensive plan, and exhibits strong land use, transportation, infrastructure, and economic connections to an existing municipal center.

   ☐ Yes, my project is located in an area designated as a future municipal center in a municipal or comprehensive plan and is appropriately zoned in a municipal zoning ordinance

   ☐ No, my project is not located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center.

   Explain your response and reference any applicable plans:

   The Quaker Hill water system is not in a municipal center. However, the proposed water main will traverse a significant distance along Route 9G which is a commercial area exhibiting strong land use, transportation, infrastructure, and economic connections to the Hyde Park municipal center. The water main will also have the potential to serve several other public water supplies, including one in a potential environmental justice area and a few others in disadvantaged communities.

3. Is the project located in a developed area or an area designated for concentrated infill development in a municipally-approved comprehensive land use plan, local waterfront revitalization plan, and/or brownfield opportunity area plan?

   ☑Yes ☐No

   Explain your response and reference any applicable plans:

   The proposed water main will traverse a significant distance along Route 9G which is a commercial area with potential for additional development. This area is part of the East Park Village Center and Neighborhood Core areas as defined in the Town of Hyde Park Comprehensive Plan.

4. Does the project protect, preserve, and enhance the State's resources, including surface and groundwater, agricultural land, forests, air quality, recreation and open space, scenic areas, and significant historic and archaeological resources?

   ☑Yes ☐No

   Explain your response:

   The project is not anticipated to have any negative impacts on the state's resources. The project also includes demolition of the existing treatment facilities which are located within a wetland. The alternative to this project was to build new facilities at the existing treatment location which would have negative effects on the wetland.

5. Does the project foster mixed land uses and compact development, downtown revitalization, brownfield redevelopment, the enhancement of beauty in public spaces, the diversity and affordability of housing in proximity to places of employment, recreation and commercial development, and the integration of all income and age groups?

   ☑Yes ☐No

   Explain your response:

   The project may encourage development along the Route 9G corridor which is encouraged as part of the Town of Hyde Park Comprehensive Plan.

6. Does the project provide mobility through transportation choices including improved public transportation and reduced automobile dependency?

   ☐Yes ☐No ☑N/A

   Explain your response:

   The project will not have any impact on transportation choices.

7. Does the project involve coordination between State and local government, intermunicipal planning, or regional planning?

   ☑Yes ☐No

   Explain your response and reference any applicable plans:

   Coordination will be required between the Owner, Contractor, NYSDEC, DOH, and County Highway Department for review and approval of the proposed plans.

8. Does the project involve community-based planning and collaboration?

☑Yes ☐No

Explain your response and reference any applicable plans:

Planning and collaboration will be necessary between DCWWA, the Quaker Hill Water Users, and several other Public Water Supply users that may connect to the system.

9. Does the project support predictability in building and land use codes?

☑Yes ☐No ☐N/A

Explain your response:

The project may encourage development along the Route 9G corridor which is encouraged as part of the Town of Hyde Park Comprehensive Plan and supports the land use codes for this area.

10. Does the project promote sustainability by adopting measures such as green infrastructure techniques, decentralized infrastructure techniques, or energy efficiency measures?

☑Yes ☐No

Explain your response and reference any applicable plans:

Yes, the proposed project will consolidate two water systems into one and involves demolition of the existing Quaker Hill water treatment facilities. The energy consumption of the proposed project will ultimately be less than the alternative of replacing the existing treatment system with a new treatment system and large building.

11. Does the project mitigate future physical climate risk due to sea-level rise, storm surges, and/or flooding, based on available data predicting the likelihood of future extreme weather events, including hazard risk analysis data, if applicable?

☑Yes ✔No

Explain your response and reference any applicable plans:

The existing Quaker Hill Water system treatment facilities are within a wetland area that has a history of flooding and damage due to flooding. The proposed project involves removal of the existing facilities from the flood area.

Section 4 – Miscellaneous

1. Is the project expressly required by a court or administrative consent order? ☐ Yes ☑ No

   If yes, and you have not previously provided the applicable order to EFC/DOH, please submit it with this form.

Section 5 – Signature

By signing below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant: Dutchess County Water & Wastewater Authority	Phone Number: 845-516-5872
Name and Title of Signatory: Daniel Valentine, PE	
Signature:	Date: 5/30/2024

APPENDIX F

Engineering Report Certification

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Drinking Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: Quaker Hill PFAS Violation Remedy

Date of Report: June 2024

Professional Engineer's Name: Dainel F. Valentine, PE

Signature:

Date: June 1, 2024

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