2020 BOND REPORT

Garden City Park Water District
Town of North Hempstead
Nassau County, New York

H2M Project No.
GCPK2001

JUNE 2020

Prepared for:

Garden City Park Water District
333 Marcus Avenue
Garden City Park, New York 11040

Prepared by:

H2M architects + engineers
538 Broad Hollow Road
4th Floor East
Melville, New York 11747

H2M architects + engineers

Table of Contents

TABLES

FIGURES

APPENDIX

1.0 SCOPE AND INTRODUCTION

The Board of Commissioners of the Garden City Park Water District (District) has authorized H2M architects + engineers to prepare this report for submission to the Town of North Hempstead in support of the District's petition for bond financing for capital improvements. These capital requirements are required to ensure that the District can continue to meet existing and anticipated demands on the water supply system. While the District is substantially developed and future growth in residential and commercial development within the District is expected to be minimal, it is important that the District continue to maintain and upgrade its existing water supply facilities, in light of aging facilities and upcoming regulations.

This report will identify those projects making up the capital improvement program. The significant cost of these projects will require the District to obtain financing in the form of a capital improvement bond from the Town of North Hempstead. The projects anticipated to be included in the improvement program are: emerging contaminant treatment for Plant Nos. 6, 7/10, 8, and 9, new portable standby generator for use at Plant Nos. 6 or 8, new generator at Plant No. 9, rehabilitation of the Denton Avenue Tank, and water distribution system improvements. These improvements will be necessary for the District to continue to provide high quality water in sufficient quantity to its customers, even during periods of high demand or production shortages. This report will include a description of the required capital improvement projects, the associated cost opinions and the financial impact of the proposed bond on District taxpayers.

2.0 EXISTING WATER SUPPLY SYSTEM

2.1 WATER DISTRICT DESCRIPTION

The Garden City Park Water District presently supplies potable water to an estimated population of 18,000 through 7,000 metered service connections. The District has practically reached the saturation point, with a minimal amount of vacant land remaining. Geographically, the District is located in the south west portion of the Town of North Hempstead. The District covers about 3.08 square miles area of the west central portion of Nassau County, New York.

The District's service area includes the unincorporated areas of Garden City Park, Herricks, portions of New Hyde Park, Manhassett Hills, Mineola, North Hills, Roslyn, Albertson, Garden City and Williston Park. It is bounded on the north and northwest by the Manhasset-Lakeville Water District; on the northeast by the Albertson and Roslyn Water Districts; on the east by the Villages of Williston Park and Mineola; on the south by Village of Garden City; and on the southwest by the Water Authority of Western Nassau County. Figure 2-1 indicates the District's service area within the Town of North Hempstead.

The Garden City Park Water District is within Nassau County Sewer District No. 2 and is served by public sewers which have been in service since the late 1950's. The sewage is transmitted to the Nassau County-operated Bay Park Water Pollution Control Center. The treated effluent is discharged through a marine outfall into Reynolds Channel.

2.2 SYSTEM AND SOURCE OF WATER SUPPLY

The Garden City Park Water District currently obtains its entire potable water supply from the Magothy formation through six (6) supply wells (numbered 6 through 11) drilled at five (5) individual plant sites throughout its service area. Two other wells (Well Nos. 1 and 2) have been decommissioned due to poor water quality that included both nitrates and VOCs. Well No. 3 was abandoned between 1993 and 1994, and the property was sold. Well Nos. 4 and 5 were abandoned between 2003 and 2004. A summary of each supply well location, authorized capacity, and other pertinent data is presented in Table 2-1.

At each facility, the District utilizes sodium hydroxide for pH adjustment, calcium hypochlorite for disinfection, and packed tower aeration for organics removal (at four of the five sites, excluding Plant No. 11). The District also employs a nitrate treatment system at Plant No. 9. Granular Activated Carbon (GAC) is utilized at two of the facilities (Plant Nos. 6 and 11). Advanced oxidation process (AOP) treatment is under construction at two of the facilities (6, 9), and GAC treatment is under construction at three of the facilities (Plant Nos. 6, 7/10, and 9). See Section 5.0 for further details on emerging contaminant treatment.

All five (5) supply facilities provide a combined available capacity of 10.37 million gallons per day (MGD). During a short-term electrical power outage, 8.64 MGD (based on standby power at Well Nos. 6, 7, 10, 8, and 11) of stand-by well capacity is also available.

2.3 TOPOGRAPHY

The topography of the District can be generally classified as gently sloping with elevation of the terrain varying between 70 and 200 feet above mean sea level (MSL). The highest elevations are recorded in the north of the District at approximately 200 feet above MSL in the area of the Links Condominiums. A booster pumping station is located at Plant No. 11 to provide a high-pressure zone for the Links complex. Additionally, backup booster pumps for the Links Condominiums are located at Plant No. 8. Another area of high elevation in the District is in the extreme northwest corner and along the north border of the Links property. This area ranges in elevation between 150 and 185 feet above MSL. The District slopes off to the south at a rather constant rate. The lowest elevation above MSL is recorded in the southwestern corner of the District where elevations dip to approximately 70 feet above MSL. Overall, the District is relatively flat in the central area with ground elevations ranging between 100 and 120 feet above MSL.

2.4 STORAGE FACILITIES

The Garden City Park Water District presently maintains two (2) elevated steel water storage tanks with 1.5 million gallons (MG) at Herricks Road and 1.0 MG at Denton Avenue as presented in Table 2-2. The high water overflow elevation of both tanks is 265 feet above mean sea level (AMSL). The District uses elevated storage facilities for two main functions: (1) to allow the District to meet maximum day demand plus fire flow requirements and (2) to help maintain regulated static water pressures throughout the District.

2.5 WATER DISTRIBUTION SYSTEM

The Garden City Park Water District transports water from its supply sources to its consumers through about seventy-seven (77) miles of pipe network consisting of cast iron and cement-lined ductile iron mains. These mains vary in size from four inches to twenty inches in diameter. A tabulation of mains, as obtained from the District's records and the Engineer's files, is shown in Table 2-3. A map of the District's distribution system is included as Figure 2-7.

2.6 INTERCONNECTIONS

The Garden City Park Water District maintains six (6) interconnections with its neighboring water suppliers, one (1) each with the Inc. Village of Mineola Water Department, the Water Authority of Western Nassau County, the Inc. Village of Garden City, the Inc. Village of Williston Park Water Department, the Albertson Water District, and the Manhasset-Lakeville Water District. The size and location of each interconnection are listed in Table 2-4.

2.7 ANNUAL PUMPAGE

Between 2000 and 2019, the District has pumped an annual average of 1,231 MG. In its peak year, 2015, the District pumped 1,385 MG. In 2009, the District pumped its twenty-year minimum of 1,054 MG. Table 2-5 presents historical pumpage data including yearly, average day, and maximum day pumpage between 2000 and 2019.

2.8 CONSUMPTIVE WATER USE AND SYSTEM CAPACITY

A review of historical water pumpage data provides valuable information on the District's ability to supply water during peak and emergency conditions. The summary of pumpage statistics since 2000 is presented in Table 3-1, and a summary of Garden City Park Water District well and storage capacity is presented in Tables 2-1 and 2-2.

2.9 CONSUMPTIVE WATER USE AND SYSTEM CAPACITY

Average day, maximum day, peak hour and maximum day plus fire flow statistics are reviewed and analyzed to ascertain the current and future supply and storage capacity needs of the District. Average daily demand represents the total yearly pumpage uniformly distributed or averaged over the entire calendar year. This statistic provides a basis of forecasting estimated revenues for budgetary purposes and is utilized in long-range water resources planning with respect to safe yield. Average day demand, as it relates to system capacity assessment, is used to establish the base need for minimum standby power pumping capacity during short-term regional electrical power outages.

Maximum day pumpage statistics are reviewed to evaluate available supply well capacity while peak hour and maximum day plus fire flow demand is used to analyze system capacity requirements. Supply sources must be designed and maintained to satisfy average and maximum day demand. Storage facilities and excess well capacity must be capable of providing an adequate supply of potable water to satisfy peak hour as well as fire flow demands on the maximum day. Inadequate supply well and/or storage capacity under maximum day, peak hour and maximum day plus fire flow demand conditions can result in system pressures that are far below normal operating requirements. American Water Works Association (AWWA) standards and “10-State Standards” recommend maintaining a total source capacity equaling or exceeding the design maximum day demand with the largest producing supply well out of service. The state and county health departments also require, as part of water supply emergency planning, an analysis of system capacity with the largest capacity plant out of service, versus peak hour or maximum day plus fire flow, whichever is greater.

As shown in Table 3-3, the total capacity of supply wells with backup power has provided a surplus of 4.85 MGD to satisfy peak average day demand. The total capacity of supply wells has provided a surplus of 0.89 MGD to satisfy peak maximum day demand. The total capacity of supply wells plus storage capacity has provided a surplus of 0.98 MGD to satisfy maximum day plus 3,500 GPM fire flow. Therefore, the District has enough standby power pumping capacity in the event of a short-term power outage on an average day and some additional supply well and storage capacity in the event of a major fire on maximum day. However, as shown in Table 3-3, the District has a deficit of 0.96 MGD based on peak hour demand conditions. This indicates that the District does not have adequate supply well and/or storage capacity for such a scenario should such historical peak hour demand conditions occur again. The deficit will be increased should emerging contaminant detections above the newly proposed MCLs cause one or more wells to go out of service. Funding provided by the bond is necessary to implement emerging contaminant treatment and prevent the loss of wells due to detections above the MCLs.

Based on the above comparison of actual system capacity vs. demand, if the District is operating only on standby power and its storage tanks are empty, it cannot meet peak hour condition, and should this occur, the District must rely on its interconnections to provide additional water. It is our opinion that additional supply well capacity would reduce project peak hour demand deficit and provide system redundancy. See Section 5.9 for further details about the proposed new supply well.

2.10 INTERCONNECTION CAPACITY

The interconnection capacity available to the Garden City Park Water District is outlined in Table 2-4. To evaluate interconnection capacity requirements of the water supplier, the system capacity is analyzed under a reasonable "worst case" emergency. An emergency for this analysis is the loss of operation of the highest capacity plant during the peak hour demand. Additional required flow from outside of the water supply area may be required and must be analyzed. This is the difference between the maximum peak hour demand (14.73 MGD from 2002) and the actual system capacity with the largest capacity plant inoperative (13.77 MG w/o Herricks Tank).

For the Garden City Park Water District, an interconnection capacity of approximately 666.67 gallons per minute (GPM) (0.96 MGD) is required. The capacities of individual interconnections were determined by a method developed by Hardman & Cheremisinoff with further modifications by H2M. The Garden City Park Water District has sufficient interconnection capacity with 6,222 GPM (8.96 MGD) available at 20 psi differential, assuming the surrounding water suppliers are not in peak supply mode. Approval should be obtained to use any of the interconnections prior to the transfer of water through the interconnection by contacting the New York State Department of Environmental Conservation, Nassau County Department of Health, and the respective public water supplier.

2.11 AUXILIARY POWER

The District's auxiliary power is provided by a mixed use of natural gas and diesel generators. Theoretically, as long as gas pipelines are intact, supply is continuous and unlimited for natural gas generators. The District maintains a three (3) day supply of diesel fuel. The District can supply enough water to meet the average daily demand with auxiliary power and two (2) wells out of service during a primary electrical outage. Total emergency source capacity of Well Nos. 6, 7, 8, 10 & 11 is 8.64 MGD. If Well Nos. 6 & 8 (wells with greatest capacities with auxiliary power) are out of service, the net capacity becomes 5.18 MGD, which is more than the average daily demand of 3.37 MGD (1999-2019). Well and storage capacity with major plant in-operative (Herricks Tank) is 13.77 MGD. See Sections 5.6 and 5.7 for further details about the District's proposed new generators.

Criteria for adequate fire protection are established by the Insurance Services Office (ISO). ISO has a Public Protection Classification (PPC) Program which evaluates communities according to a uniform set of criteria defined in the Fire Suppression Rating Schedule (FSRS). These criteria incorporate nationally recognized standards developed by the National Fire Protection Association (NFPA) and AWWA.

One of ISO's important services is to evaluate the fire suppression delivery systems of jurisdictions around the country. The result of those reviews is a classification number that ISO distributes to insurers. Insurance companies use the Public Protection Classification (PPC™) information to help establish fair premiums for fire insurance – generally offering lower premiums in communities with better fire protection.

ISO uses the Fire Suppression Rating Schedule (FSRS) to define the criteria used in the evaluation of a community's fire defenses. Within the FSRS, a section titled "Needed Fire Flow" outlines the methodology for determining the amount of water necessary for providing fire protection at selected locations throughout the community. ISO uses the needed fire flows to:

1. Determine the community's "basic fire flow." The basic fire flow is the fifth highest needed fire flow in the community. ISO uses the basic fire flow to determine the number of apparatus, the size of apparatus fire pumps, and special fire-fighting equipment needed in the community.
2. Determine the adequacy of the water supply and delivery system. ISO calculates the needed fire flow for selected properties and then determines the water flow capabilities at these sites. ISO then calculates a ratio considering the need (needed fire flow) and the availability (water flow capability). ISO uses that ratio in calculating the credit points identified in the FSRS.

Fire flow tests are performed on distribution systems to determine the available rate of flow at various locations for fire fighting purposes. The flows obtained during the test are utilized to calculate the flow that would be obtained at a residual pressure of 20 psi and then compared to recommended flows. A residual pressure of 20 psi in the mains is specified to avoid the creation of a vacuum in the distribution system. ISO established the recommended flows based on the type of hazard, construction, and use or occupancy of the buildings in the area of the test. The largest recommended flow established by ISO (based on the 2014 hydrant flow tests) for the District service area is 4,500 GPM (7.2 MGD). However, ISO notes that fire flows greater than 3,500 GPM are not considered in determining the fire classification area.

As indicated in Appendix A, 29 tests were conducted at fourteen locations throughout the District during the 2014 ISO assessment and an additional 7 tests were performed by H2M at 4 locations in 2016. Of the 29 ISO tests, only four tests yielded results that provided an available fire flow that was above the NFF. The NFFs are for property insurance premium calculations only and are not intended to predict the maximum amount of water required for a large-scale fire condition. Furthermore, a flow test is a snapshot of time and is a function of the availability of supply, booster and storage facilities, system demand and condition of the distribution system at the time and day of the test. Notwithstanding, the test results indicate a need for distribution improvements to improve the reliability of the system. These tests were performed before the 2016 Water Distribution System Improvements Program began. The District plans to continue with the Program to address the areas that need improvements.

Maximum day plus fire flow assumes a 3,500 gallons per minute (GPM), or a rate of 5.04 MGD, fire flow. 3,500 GPM is a practical upper fire flow limit most water suppliers should anticipate based on a 3–hour duration or 0.63 MG storage capacity for one fire event (reference AWWA Manual M31, 4th edition). As shown in Table 3-3, the system can meet maximum day demand plus fire flow demand, according to historical peak demand.

If the District could not meet its average daily demand plus fire demand during a primary electrical outage, the District would rely on its two (2) elevated storage tanks and, if necessary, on interconnections with neighboring suppliers to meet demand. To mitigate the demand problem, the District would require non-essential large users (i.e., car washes, restaurants, industries, etc.) to cut back. Depending on the severity of the problem, the District may even consider shutting these users off.

3.0 EXISTING FACILITIES

3.1 PLANT NO. 6 SITE DESCRIPTION

Plant No. 6 is centrally located within the Garden City Park Water District. The site is on the corner of Denton Avenue and Hickory Road. See Figure 2-2 for the site plan and location map. The elevation of this site is approximately 112 feet AMSL.

Well No. 6 (N-5603) was constructed in 1955 and drilled to a depth of 420 feet below grade surface. It is screened in the Magothy formation from 365 to 415 feet below grade surface and is authorized for a capacity of 1,200 GPM. The well is equipped with a 75 HP motor that runs on electric power. The well pump was replaced in 2011 as part of planned plant improvements.

Raw source water from Well No. 6 is treated with sodium hydroxide for pH adjustment, calcium hypochlorite for disinfection, and packed tower aeration and granular activated carbon for organics removal. The packed tower aeration system was installed in 1985, and its packing depth was extended in 1989. In 1996, the existing tower was replaced with a new fiberglass tower. The tower has a 7-foot, 6-inch diameter and 26-feet, 6-inches of packing depth. Plant No. 6 has a clearwell that receives treated packed tower effluent. The clearwell is equipped with one 100 HP booster pump that supplies treated water to the GAC treatment system.

AOP treatment is currently under construction to comply with the new regulations proposing a maximum contaminant level (MCL) for 1,4-dioxane. Water will be pumped from the clearwell to the AOP chamber and then will flow to the GAC vessels. The GAC system was installed in 2014 to address the presence of tetrachloroethene (PCE) and methyl tert-butyl ether (MTBE) in the tower effluent and consists of two 12-foot diameter GAC vessels and piping tree, though recent sample results from the pilot study revealed no detections of either PCE or MTBE in the packed tower effluent. GAC will simultaneously remove other emerging contaminants, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), present in Well No. 6 raw water. PFOA and PFOS are two compounds included in the group of contaminants called perfluorinated alkyl substances (PFAS). See Section 5.2 for further details on future treatment.

3.2 PLANT NO. 7/10 SITE DESCRIPTION

Plant No. 7/10 is located in the far northeast corner of the Garden City Park Water District on the east side of Shelter Rock Road. The elevation of this site is approximately 156 feet above mean sea level. See Figure 2-3 for site plan and location map.

In addition to Well No. 7, this site includes Well No. 10, a concrete reservoir (clear well) with associated booster pumps, and a packed tower aeration system. New GAC treatment for Well Nos. 7 and 10 is currently under construction to comply with the new regulations proposing MCLs for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS).

Well No. 7 (N-6945) was drilled to a depth of 409.5 feet below grade surface, completed in 1960, accepted in June of 1961, and refurbished in January of 1974. It is screened in the Magothy formation from 354.5 to 404.5 feet below grade surface and is authorized to produce 1,200 GPM capacity. Its 100 HP motor runs on electric power. The well pump was replaced in 1989 as part of planned plant improvements. The pump and motor were most recently replaced in 2010.

Well No. 10 (N-9768) was drilled to a depth of 480 feet below grade surface and completed in August of 1980. It is screened in the Magothy formation from 405 to 475 feet below grade surface and is authorized to produce 1,200 GPM capacity. The well pump was replaced in 1997 with 100 HP "Simflo" pump as part of planned plant improvements, and the motor was replaced in 2006 as a part of an MCC replacement at Plant No. 7/10.

Raw source water from Well No. 7 and Well No. 10 is treated with sodium hydroxide for pH adjustment and calcium hypochlorite for disinfection. The raw water is also treated for Volatile Organics (VOC) Removal with packed tower aeration. Treated effluent from the packed tower enters the clearwell. When the new GAC treatment is complete, water will be pumped out of the clearwell to two sets of two 40,000-pound GAC vessels for PFAS removal. GAC effluent will be treated with calcium hypochlorite for disinfection (relocated from pre-treatment) and then sent to the distribution system. See Section 5.3 for further details on future treatment.

3.3 PLANT NO. 8 SITE DESCRIPTION

Plant No. 8 is located in the far north-west corner of the Garden City Park Water District on the east side of Old Courthouse Road. The elevation of this site is approximately 122 feet above mean sea level. See Figure 2-4 for the site plan and location map.

In addition to Well No. 8, this site includes a concrete reservoir (clear well) with associated booster pumps, and a packed tower aeration system.

Well No. 8 (N-7512) was drilled to a depth of 375 feet below grade surface, completed in December 1963, equipped in February 1964, and accepted in June 1965. It is screened in the Magothy formation from 325 to 375 feet below grade surface and is authorized to produce 1,200 GPM. Its original 125 HP motor was replaced in 1990 with a 75 HP motor. The pump and motor were most recently replaced in 2008.

Raw source water from Well No. 8 is treated with sodium hydroxide for pH adjustment and calcium hypochlorite for disinfection. The raw water is also treated for VOC removal via packed tower aeration. In conjunction with Calgon Carbon Corporation, H2M and the District conducted an AOP pilot study at Plant No. 8 in 2017 to test the UV-oxidation process for the treatment of 1,4-dioxane, with use of chlorine as the oxidant. The Calgon chamber remains installed on the packed tower riser and will be removed and replaced with the Trojan UV AOP chamber as part of the proposed project, Emerging Contaminant Removal at Plant No. 8. See Section 5.4 for further details on future treatment.

3.4 PLANT NO. 9 SITE DESCRIPTION

Plant No. 9 is located in the south-east corner of the Garden City Park Water District. The site is bordered by Bedford Avenue on the north, Park Avenue on the south, Cornelia Avenue on the east and County Court House Road on the west. The elevation of this site is approximately 95 feet above mean sea level. See Figure 2-5 for the site plan and location map.

In addition to Well No. 9, this site includes a concrete reservoir (clear well) with associated booster pumps, packed tower aeration system and building and nitrate removal building with the associated nitrate removal equipment. New treatment for Well No. 9 is currently under construction. The new treatment system consists of advanced oxidation process (AOP) and granular activated carbon (GAC) to remove 1,4-dioxane and PFAS. This treatment is necessary to comply with new regulations proposing MCLs for 1,4-dioxane, perfluorooctanoic acid (PFOA), and perfluorooctanesulfonic acid (PFOS). It was necessary for the District to begin constructing an emergency system to support water demands on an interim basis. The permanent facility will house the AOP/GAC system in an enclosed, heated building.

Well No. 9 (N-8409) was drilled to a depth of 405 feet below grade surface and completed in November of 1968. It is screened in the Magothy formation from 340 to 400 feet below grade surface and is authorized to produce 1,200 GPM. Its 150 HP motor runs on electric power. The well pump was replaced in 2018 as part of plant improvements.

Raw source water from Well No. 9 is treated by ion exchange for nitrate removal with sodium hydroxide for pH adjustment, calcium hypochlorite for disinfection, and packed tower aeration for organics removal. When the AOP/GAC system is complete, water will flow from the clearwell through the AOP chamber to treat for 1,4-dioxane. AOP effluent will flow through two 40,000-pound GAC vessels operating in parallel to quench hydrogen peroxide and treat for PFAS. Treated water will then be sent to the distribution system. See Section 5.5 for further details about future treatment.

4.0 GROUNDWATER QUALITY

4.1 OVERVIEW

Historically, the general water quality found on Long Island has been exceptionally good. Through the 1970s and to the present, water quality has significantly deteriorated in a number of areas throughout Nassau and Suffolk Counties. This is primarily due to large increases in industrial chemical usage, lack of sewers in industrial and densely populated areas, the continued application of fertilizer and the application of increasing amounts of pesticides and herbicides, leaking underground fuel storage tanks, and unlined landfills.

During the 1940s through the 1970s, water quality issues on Long Island were related to parameters such as pH, iron, dissolved solids, chlorides, nitrate, and bacteria. Within the past 30 years, there has been a dramatic increase in the ability to test pollutants at very low concentrations. In addition, the improved toxicology has made possible determining the health impacts of contaminants at very low concentrations. With the advent of new and improved technology, the detection of organic compounds has been incorporated into today's drinking water standards.

The June 1987 implementation of the 1986 Federal Safe Drinking Water Act (SDWA) Amendments brought water quality standards concerning organic components to a new level of water management planning.

The United States Environmental Protection Agency (USEPA) regulations under the 1986 SDWA Amendments resulted in the establishment of maximum contaminant levels (MCLs) for 15 volatile organic compounds (VOCs). In 1989, the NYSDOH advanced the water quality issue one step further with the establishment of MCLs of 5 micrograms per liter for 45 other compounds. Since 1989, the Federal and State agencies have continued to add testing for additional organic parameters.

The District, to comply with NYSDOH/EPA/NCDH requirements, routinely tests for the parameters listed in Table 4-1.

In the fall of 1999, the USEPA promulgated the final version of the Unregulated Contaminant Monitoring Rule (UCMR). The rule addresses parameters in three (3) separate lists, which will be investigated as directed by USEPA. Under the UCMR round one, the District was required to test for certain compounds it had never tested for in the past. For example, perchlorate, MTBE, and certain herbicides (DCPA) were required to be monitored. The District is currently monitoring compounds for the Fourth UCMR, which is through 2020.

Deteriorating water quality as a result of VOC contamination is a trend that has impacted many Long Island water suppliers. The potential for the future loss of supply wells due to increasing organic compounds is a realistic threat. At which time or location contamination will occur is uncertain without performing extensive hydrogeological investigations. These investigations are costly and would involve the drilling of dozens of monitoring wells at strategic locations. This type of investigation can be used to precisely map the extent of VOC contamination and identify the source of contamination. Generally, sources of VOC contamination will occur hydraulically downgradient from industrial and/or commercially developed areas. Available monitoring wells and hydrogeological data can assist in mapping and identifying the extent and source of VOC contamination.

In 2017, Governor Cuomo appointed a Drinking Water Quality Council (DWQC) charged with evaluating emerging contaminant threats to drinking water State-wide. The first contaminants on the agenda being evaluated were 1,4-dioxane, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). Such contaminants currently have no Federal regulations; however, NYS took it upon itself to establish contaminant-specific regulations State-wide. In December 2018, the DWQC made NYS MCL recommendations to the Commissioner of Health of 1.0 µg/L for 1,4-dioxane and 10.0 ng/L each for PFOS and PFOA. Several other states have already established an MCL for 1,4-dioxane at a level of 1.0 µg/L or lower.

On July 8, 2019, Governor Cuomo announced that the Commissioner of Health was accepting the recommendations of the DWQC and that the NYSDOH would be proposing the recommended MCLs for public comment. Public comment commenced on July 24, 2019 and ended on September 23, 2019. Following the public comment period, the NYSDOH revised the proposed rule in January 2020, followed by a 45-day comment period which ended on March 6, 2020. The compliance schedule for the rule indicates that the MCLs will be effective immediately upon publication of a Notice of Adoption in the New York State Register. The revised regulations will allow water suppliers to request a deferral of their obligation to comply with the MCL for two years, plus an additional one year if needed, as the State recognizes the necessary remediation will be costly and time consuming. The District will have to provide public notification if the proposed MCLs are exceeded during this extension period. The District began construction of both interim and permanent treatment for emerging contaminants in anticipation of the new MCLs.

Based on the NYS standards, 50% of the District's wells would be directly impacted due to the proposed 1,4-dioxane MCL and 100% of the wells would be directly impacted by the proposed PFOA and PFOS MCLs. Based on their low concentrations, Well Nos. 7, 10, and 11 presently do not require any treatment for 1,4-dioxane. All six District wells are impacted by PFAS at concentrations above 50% of the proposed MCL, requiring the consideration for treatment, in accordance with NCDH policy.

4.2 SERVICE AREA WATER QUALITY

Water quality samples are routinely taken for each District supply well. In addition, there is a significant number of Nassau County monitoring wells located within the District service area. Unfortunately, not all of these monitoring wells have been recently tested by the County. The sampling results obtained are normally examined in the County's laboratory and compared to the drinking water standards to obtain an understanding of the water quality of the aquifers beneath the District. See Tables 4-2 through Table 4-5 for further water quality details. Raw water from the supply wells within the District in 2019 can generally be characterized as:

1. Moderate to corrosive with a low to neutral pH from 6.1 to 7.8. The water can be expected to be aggressive and generally will cause undesirable amounts of corrosion to ferrous (iron) and copper piping. If not properly treated, this can result in red or blue/green water complaints. The District presently uses sodium hydroxide (caustic soda) for pH adjustment.
2. Iron levels below detectable levels of 0.02 mg/L at all District supply wells except Well Nos. 6 (0.048 mg/L) and 8 (0.16 mg/L). Generally, iron concentrations in excess of the 0.30 mg/L secondary standard for aesthetics will stain plumbing fixtures and laundered clothing.
3. Total (carbonate and non-carbonate) hardness is moderate ranging from 81.7 to 167.0 mg/L. Moderately hard water can cause scale buildup and requires the addition for more soap, as compared to soft water, for laundering.
4. High total dissolved solids, between 169 and 278 mg/L, and moderate chloride with levels ranging from 42.8 to 77 mg/L.
5. Nitrate concentrations are considered moderate, and samples ranged from 1.2 to 8.2 mg/L. A nitrate treatment system is currently in place at Plant No. 9. The drinking water standard is currently 10 mg/L, as high levels of nitrate can cause methemoglobinemia and are potentially toxic for infants.
6. Perchlorate, an endocrine disrupting compound (EDC), has been non-detect in all six (6) wells in 2019.

All of the District's wells tap into the Magothy aquifer for supply. While the deeper Magothy Formations provide water that is generally of excellent quality, the Glacial and Upper Magothy Formations have been impacted by VOC contamination. VOC contamination is not simply limited to the District but is found in many areas of Long Island.

Drinking water standards and regulations relative to VOCs have become more and more stringent, with the USEPA and NYSDOH setting their maximum contaminant levels (MCLs) to 5.0 µg/L. In 2019, eleven (11) VOCs have been identified in the District's supply wells at levels above the detectable limit of 0.5 µg/L. Packed tower aeration systems have been constructed at Plant Nos. 6, 7 & 10, 8, and 9, and Granular

Activated Carbon (GAC) Adsorption Vessels have been constructed at Plant Nos. 6 and 11 for the removal of these contaminants from the raw water supply.

4.2.1 1,4-DIOXANE

1,4-Dioxane is a synthetic chemical commonly used as a stabilizer for chlorinated solvents. It is classified as a likely carcinogen but has no federal Maximum Contaminant Level (MCL). It is currently listed on the United States Environmental Protection Agency's (EPA) third Contaminant Candidate List (CCL3) which is used as an indication of possible future regulation under the Safe Drinking Water Act. The New York State MCL for 1,4-dioxane is 50 µg/L as it is listed as an Unspecified Organic Contaminant (UOC). All other NYS regulated solvent based Organic Contaminants have an MCL of 5 µg/L. As discussed above, NYS is expected to establish an MCL of 1.0 µg/L within the next few months.

1,4-Dioxane has been detected at varying levels within all of the Garden City Park Water District's operating wells. With 100% of the District's wells detecting 1,4-dioxane, it is critical to identify wells that will require treatment systems along with the minimum number of wells needed to ensure a reliable water supply that complies with all drinking water standards and meets maximum day demand plus fire protection requirements. Table 4-3 shows 1,4-dioxane maximum annual concentrations detected in the District supply wells from 2013 through 2019.

The treatment system most familiar to regulators and the only system that is currently approved for use on Long Island for 1,4-dioxane removal is a UV/hydrogen peroxide (UV/H_2O_2) Advanced Oxidation Process (AOP). One manufacturer of UV/H_2O_2 AOP is Trojan Technologies (Trojan), which has installed a number of AOP systems with the UV/H_2O_2 process to remove 1,4-dioxane from contaminated water across the United States. These treatment systems range from 5,300 gallons per day (GPD) to 100 million gallons per day (MGD). This system is currently being implemented by two Long Island water suppliers on a full-scale basis with both systems approved by the NYSDOH, and either the NCDH or the Suffolk County Department of Health Services (SCDHS). The first system was approved to go on-line in 2014 and the second in 2019. A number of Long Island water suppliers have recently completed their own on-site pilot testing and are currently in the design and construction phases for full-scale systems.

4.2.2 PFOA & PFOS

The drinking water contaminants classified as per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA and PFOS. PFAS are commonly categorized into two groups—"long-chain" and "short-chain" PFAS. PFOA and PFOS are both considered long-chain PFAS. Neither occurs in nature. The long-chain designation includes perfluoroalkyl sulfonic acids containing six or more carbons, and perfluoroalkyl carboxylic acids which have eight or more carbons.

PFAS have been manufactured and used in a variety of industries around the world, including in the United States since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body. There is evidence that exposure to PFAS can lead to adverse human health effects. PFAS impact drinking water by way of manufacturing facilities, firefighting, and leachate from landfills. As PFAS exhibit properties that allow resistance to water, grease and stains, they are used in many products, including carpets, clothing, fabrics for furniture, paper packaging for food and other materials including cookware, and firefighting foams.

There is currently no Federal MCL for these contaminants. In 2009, the EPA published provisional health advisories for PFOA and PFOS at 400 ng/l and 200 ng/l, respectively; formal national regulation has not been established to date. In May 2016, the EPA released a Lifetime Health Advisory of 70 ng/L for either PFOA or PFOS, or a sum of the two. Although neither is a legally enforceable MCL, the Lifetime Advisory was significantly lower than the 2009 provisional advisory. Several states have developed guidelines or standards for potable water, and several have developed or are in the process of establishing groundwater limits or other mechanisms to curtail PFAS discharges or initiate remediation of known contamination. As discussed above, NYSDOH intends to set State-wide MCLs on PFOA and PFOS, each at 10.0 ng/L.

In 2013 and 2014, PFOA and PFOS samples were collected by the District under the UCMR3 protocol which required collection of treated water Entry Point samples. Subsequent samples were analyzed under newer NYSDOH protocol which required dramatically lower reporting limits. Specifically, laboratories are now directed to report PFOA and PFOS to a limit of 2 ng/L. The prior UCMR protocol required reporting to 20 ng/L for PFOA and 40 ng/L for PFOS. The new lower reporting limit requirement of 2 ng/L resulted in detections experienced during the 2019 sampling that were not previously seen. In addition, the subsequent sampling locations for PFOA and PFOS now reflect raw water quality, which is more appropriate for assessment of contaminant occurrence. Table 4-4 shows maximum 2019 concentrations of PFAS detected in the District.

Both PFOA and PFOS can be removed from the drinking water supply via GAC or ion exchange using PFAS specific resin. Use of a PFAS specific resin or carbon other than F300 would require pilot testing by the Nassau County Department of Health and the New York State Department of Health.

5.0 RECOMMENDED CAPITAL IMPROVEMENTS AND COST OPINIONS

5.1 OVERVIEW

Over the past twenty years, the District has invested significant capital to upgrade and maintain their water supply, treatment, storage, and distribution system facilities. There are eight projects that the District has identified that have an overall cost of approximately $30,000,000 million. To implement the major capital investments, the District must arrange for long term financing.

The eight projects are:

1. Emerging Contaminant Removal at Plant No. 6
2. Emerging Contaminant Removal at Plant No. 7/10
3. Emerging Contaminant Removal at Plant No. 8
4. Emerging Contaminant Removal at Plant No. 9
5. New Portable Generator for Plant Nos. 6 and 8
6. New Generator at Plant No. 9
7. Rehabilitation of Denton Avenue Tank
8. Water Distribution System Improvements

Each of the recommended improvements is described in greater detail below.

5.2 EMERGING CONTAMINANT REMOVAL AT PLANT NO. 6

Well No. 6 has exceeded the proposed MCLs for PFOA and PFOS and has surpassed 80% of the proposed MCL for 1,4-dioxane. It is necessary for the District to implement new emergency treatment at Plant No. 6 for these three emerging contaminants. Although Plant No. 6 contains a packed tower aeration and GAC system, current typical VOC treatment systems are ineffective in removing 1,4-dioxane. The appropriate treatment technology for 1,4-dioxane is Advanced Oxidation Process (AOP). GAC is needed in conjunction with AOP to quench excess hydrogen peroxide used to oxidize 1,4-dioxane. GAC, using F300 carbon, is an approved method to treat for PFOA and PFOS and is not expected to require a pilot. The two (2) existing 20,000-pound GAC vessels at Plant No. 6 have already been shown to effectively remove PFOA and PFOS. To ensure operation of this critical well after the proposed MCLs take effect, the District has purchased and has begun emergency construction to install an AOP chamber to remove 1,4-dioxane. The new chamber will be installed permanently inside the existing GAC Building. The work proposed at Plant No. 6 for this project, including the work in progress, is as follows:

A. AOP pilot study
B. Design and construction of new grating system and support beams for AOP chamber inside GAC Building
C. New roll-up door for AOP lamp access

D. Installation of one (1) 4-bank Trojan Flex 100 AOP chamber and all associated equipment
E. New piping, including AOP influent/effluent, connections to existing piping, chemical/sampling lines, and drain lines
F. Installation of hydrogen peroxide dosing system, including exterior 3,000 gallon hydrogen peroxide storage tank, hydrogen peroxide dosing pump skid, hydrogen peroxide injection taps, and associated piping, accessories, and power/controls/monitoring
G. Exterior portico to cover hydrogen peroxide storage tank
H. New power/controls and chemical treatment safety panel associated with new treatment

The construction cost opinion for the emerging contaminant treatment is $2,200,000. The overall cost opinion is $3,214,000 (Table 5-1).

5.3 EMERGING CONTAMINANT REMOVAL AT PLANT NO. 7/10

Well No. 7 has exceeded the proposed MCL for PFOS and is approaching the MCL for PFOA. Well No. 10 is approaching the MCLs for both PFOA and PFOS. It is necessary for the District to implement new emergency treatment at Plant No. 7/10 for these two emerging contaminants. GAC, using F300 carbon, is an approved method to treat for PFOA and PFOS and is not expected to require a pilot. Concentrations of 1,4-dioxane levels in both Well Nos. 7 and 10 remain under 50% of the proposed MCL, and thus do not require treatment at this time. To ensure operation of critical Well Nos. 7 and 10, the District has authorized the emergency purchase of GAC vessels to install on a concrete foundation and be utilized during the 2020 and 2021 pumping seasons until a permanent treatment building can be constructed. Due to the time constraints of the newly proposed regulations, construction for the GAC system is already in progress at Plant No. 7/10. The work proposed at Plant No. 7/10 for this project, including the work in progress, is as follows:

A. Design and construction of the below-grade GAC Building foundation
B. Installation of two (2) sets of two (2) 12-foot diameter, 40,000-pound GAC vessels
C. New piping including GAC influent/effluent, chemical/sampling lines, piping provisions for future AOP treatment, and drain lines
D. New power/controls and chemical treatment safety panel associated with new treatment
E. Electrical, architectural and civil work associated with construction of permanent building to enclose interim GAC system, including:
    a. Power and controls for permanent treatment building, including lighting, heat, and receptables
    b. Exterior to match onsite building features
    c. New walkway/access to GAC Building, site restoration, and planting

The construction cost opinion for the emerging contaminant treatment is $4,815,000, and the overall cost opinion is $6,500,000 (Table 5-2).

5.4 EMERGING CONTAMINANT REMOVAL AT PLANT NO. 8

Well No. 8 has exceeded the proposed MCLs for 1,4-dioxane, PFOA, and PFOS. It is necessary for the District to implement new treatment at Plant No. 8 for these three emerging contaminants to be able to utilize this well. As discussed previously, current typical VOC treatment systems are ineffective in removing 1,4-dioxane. The appropriate treatment technology for 1,4-dioxane is Advanced Oxidation Process (AOP) followed by GAC. Calgon Carbon Corporation conducted a pilot study at Plant No. 8 to test the UV-oxidation process for the treatment of 1,4-dioxane. This system used chlorine as the oxidizer and medium pressure UV lamps, while other AOP systems throughout Long Island utilize hydrogen peroxide as the oxidant and low pressure UV lamps. Several operational difficulties arose during the Calgon pilot, including atypical water chemistry, as well as waste neutralization and disposal challenges. As such, the Calgon pilot was not fully conducted. The Calgon chamber remains installed at Plant No. 8 and will be removed and replaced with an AOP chamber utilizing hydrogen peroxide as the oxidant as part of the proposed project, matching the oxidation processes for the emergency AOP projects at Plant Nos. 6 and 9. But at Plant No. 8, the District has the opportunity to explore piloting of a medium pressure AOP unit with hydrogen peroxide, instead of the low pressure units installed at Plant Nos. 6 and 9. GAC, using F300 carbon, will also be installed to quench excess oxidant and to treat for PFOA and PFOS. GAC treatment is not expected to require a pilot. The work proposed at Plant No. 8 for this project is as follows:

A. AOP pilot study
B. Design and construction of permanent AOP/GAC Building
C. Installation of GAC vessels
D. Installation of permanent AOP chamber and all associated equipment
E. New piping including AOP influent/effluent, GAC influent/effluent, chemical/sampling lines, and drain lines
F. Installation of hydrogen peroxide dosing system, including exterior hydrogen peroxide storage tank, hydrogen peroxide dosing pump skid, hydrogen peroxide injection taps, and associated piping, accessories, and power/controls/monitoring
G. Exterior portico to cover hydrogen peroxide storage tank
H. Power and controls to AOP chamber
I. New power/controls and chemical treatment safety panel associated with new treatment

The construction cost opinion for the emerging contaminant treatment is $5,676,000. This project is expected to begin in 2022, so an annual 3.0% construction inflation allowance for two years has been included. The overall cost opinion is $7,272,000 (Table 5-3).

5.5 EMERGING CONTAMINANT REMOVAL AT PLANT NO. 9

Well No. 9 has exceeded the proposed MCL for 1,4-dioxane and is approaching the MCL for PFOA and PFOS, with a maximum concentration of PFOA over 80% of the proposed MCL. It is necessary for the District to implement new emergency treatment at Plant No. 9 for these three emerging contaminants. As previously discussed, treatment of 1,4-dioxane requires an AOP chamber, followed by GAC treatment to quench excess oxidant, while also providing PFOA and PFOS treatment.

To ensure operation of this critical well, the District has authorized the emergency purchase of AOP equipment and GAC vessels to install on concrete slabs/foundations and be utilized during the 2020 and 2021 pumping seasons until a permanent treatment building can be constructed. Due to the time constraints of the proposed regulations, construction for the AOP/GAC system is already in progress. The work proposed at Plant No. 9 for this project, including the work in progress, is as follows:

A. AOP pilot study
B. Design and construction of the below-grade GAC Building foundation and at-grade AOP enclosure foundation
C. Installation of one (1) set of two (2) 12-foot diameter, 40,000-pound GAC vessels
D. Installation of one (1) temporary AOP enclosure, which will enclose one (1) 4-bank Flex100 Trojan AOP chamber and all associated equipment
E. New piping including AOP influent/effluent, GAC influent/effluent, and chemical/sampling lines
F. Installation of hydrogen peroxide dosing system, including exterior 3,000 gallon hydrogen peroxide storage tank, hydrogen peroxide dosing pump skid, hydrogen peroxide injection taps, and associated piping, accessories, and power/controls/monitoring
G. Exterior portico to cover hydrogen peroxide storage tank
H. Power and controls to AOP enclosure
I. New power/controls and chemical treatment safety panel associated with new treatment
J. Electrical, architectural, and civil work associated with construction of permanent building to enclose the interim AOP/GAC system, including:
    a. Disassembly of the temporary AOP enclosure and integration of all interim equipment into the permanent building
    b. Provisions for power and controls for permanent AOP/GAC Building, including lighting, heat, and receptables
    c. Exterior to match onsite building features
    d. New walkway/access to AOP/GAC Building, site restoration and planting

The construction cost opinion for the emerging contaminant treatment is $5,200,000, and the overall cost opinion is $6,500,000 (Table 5-4).

5.6 NEW PORTABLE GENERATOR FOR PLANT NOS. 6 AND 8

The District intends to purchase a portable standby generator that can be used at either Plant Nos. 6 or 8 in the event of an emergency. The existing generator at Plant No. 6 is not sized to handle proposed AOP loads and is proposed to be removed and disposed of. Similarly, the existing direct drive motor at Well No. 8 will be removed and disposed of. The new portable generator will either be 400 kW, fueled by diesel or 350 kW, fueled by natural gas. A diesel generator would have to be sized at 400 kW because there are no EPA emissions rated 350 kW diesel generators. Both options are sized to handle new AOP treatment electrical loads at both sites and can be transported to either site that needs the backup power. The cost opinions for either diesel or natural gas options are presented in Table 5-5. The overall cost opinion for either the portable diesel generator or the portable natural gas generator, including site work, electrical work, demolition of existing generator and direct drive motor, and associated work with installation, is $859,000 (Table 5-5).

5.7 NEW GENERATOR AT PLANT NO. 9

The District intends to install a new exterior generator at Plant No. 9, which will be able to handle additional AOP loads. The new generator will be sized at 450 kW and fueled by either diesel or natural gas. Plant No. 9 does not currently have any form of backup power. The cost opinions for both options are presented in Table 5-7. The overall cost opinion for the diesel generator is $903,000. The overall cost opinion for the natural gas generator is $958,000 (Table 5-6).

5.8 REHABILITATION OF DENTON AVENUE TANK

Various repairs and upgrades are necessary to maintain the function of the District's 1.0 MG Denton Avenue Elevated Storage Tank. The tank provides essential storage capacity for periods of high demand and fire flow. The construction cost opinion for this rehabilitation is $3,084,850. This project is expected to begin in 2021, so an annual 3.0 % construction inflation allowance for one year has been included. The overall cost opinion is $3,697,000 (Table 5-7).

5.9 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

The District began implementing the Water Distribution System Improvements Program under the 2015 bond. The District intends to continue the improvement of aging infrastructure by targeting water mains with a history of the most breaks, in addition to other factors such as critical locations of high demand within the District, pipe material, and age. The target areas include the southern portion of the District, near Plant No. 9, central portion around Mineola High School and Armstrong Road, and the northern portion of the District, northwest of Michael J. Tully Park. This continued improvement will ensure a stable distribution system and high-quality water.

This project is expected to take place between 2021 and 2025, so an annual 3.0 % construction inflation allowance was included for five years. We assumed the construction cost, $701,000 would be divided equally across five years and added a 3.0% inflation allowance for each year. The overall cost opinion for the water distribution system improvements is $1,000,000 (Table 5-8).

Completed Flow Test results from November 2014 and April 2016 indicate the low flow conditions in the south east District's area (Appendix A). The Water Distribution System Improvements Program, which started in 2016, began to address these low flow areas, but the Program is essential to continue to bring the required volume of water to improve the reliability of the system in the areas indicated above.

5.10 COST SUMMARY

We have prepared our preliminary cost opinion for construction; engineering, construction administration and observation services; contingencies, bonding and related legal costs using 2020 as the base year. An annual 3.0% construction inflation allowance was included for various planning periods depending on the expected start date of each project. See Tables 5-1 through 5-8 for planning period details. As work commences on each project, we will review and define the project scope in more detail with the Superintendent and the Board and revise the cost opinion as necessary to reflect the final proposed scope. The estimated total capital cost for the recommended improvement program is $30,000,000 as shown in Table 5-9.

6.0 FINANCIAL ANALYSIS / IMPLEMENTATION CONSIDERATIONS

The Garden City Park Water District budget for calendar year 2020 is based on revenues and expenditures of $5,696,500. The District's budget includes the following sources of revenues: water sales, hydrant rentals, unmetered water sales, water service charges, interest & penalties on water rents, interest income, rental of real property, and other unclassified revenue and taxes. It is anticipated that thirty percent (30%) of the revenue will be raised through water sales. The next major source of revenue is taxes, which accounts for sixty percent (60%). The balance (10%) will be raised through water service charges, interest & penalties on water rents, interest income, rental of real property, and other unclassified revenue.

Previously, the Garden City Park Water District has successfully implemented major improvements utilizing a combination of capital funds raised through bonds and accumulated cash reserves through cost savings and surplus water sales with only a minor increase in water rates. The capital cost associated with the proposed bond issue has been estimated at $30,000,000.

We have reviewed the revenue sources for five other Water Districts that are within the Town of North Hempstead. In Table 6-1, we have compared the Garden City Park Water District to the Albertson Water District, Carle Place Water District, Manhasset-Lakeville Water District, Port Washington Water District and Roslyn Water Districts. As indicated, these five Districts raise between 25 and 69 percent of their revenue from taxes (and direct assessments) and between 19 and 69 percent of their revenue from water sales. Compared to five Water Districts, Garden City Park Water District currently receives among the highest percentage of its revenues from taxes and among the lowest percentage from water rates.

We have also tabulated in Table 6-1 the respective percentages of each of the revenue sources if the District were to proceed with a bond issue. Based on the District proceeding with a $30,000,000 bond issue, taxes would account for 93 percent of the revenue and water sales would account for 5 percent of the revenues. This bond issue would result in the District raising more of its revenue through taxes.

Typically, capital improvements are paid through taxes since they benefit current and future residents. Similarly, operating costs are paid through water rates since they are for costs associated with supporting today's operations. Since the capital improvements currently being considered would benefit the current residents of the District and will also benefit those residents that will reside within the District in the future, the costs associated with the capital improvements should be paid through taxes. The current 2020 District tax rate is $39.73 per $100 Assessed Valuation (AV). A typical single-family house would be assessed at $1,000 which would result in an annual tax to the homeowner of $397.31 based on the current District tax rate.

We have prepared a fixed payment bond retirement schedule based on conservatively estimating that the existing Assessed Valuation of the District ($8,588,758) will remain the same over the twenty-year bond schedule. We have utilized an interest rate of 4%, as indicated in Table 6-2.

While the improvements are being implemented during 2020 through 2025 or later, it is anticipated that the Town of North Hempstead will finance the construction for the District utilizing Bond Anticipation Notes (BANs). The majority of the construction associated with the improvements is forecasted to occur in 2020 through to 2025. Since the interest on the BANs should be paid for during the period 2020 to 2024, we have estimated that there will be annual cumulative BAN interest expenses ranging from $300,000 in 2021 to $1,200,000 in 2024. The resultant tax rates to pay for the BANs per $100 AV are $3.49, $6.99, $10.48, and $13.97, as shown in Table 6-2. In 2025, the annual principal and interest payment associated with the bond will increase by an additional $1,007,453 ($2,207,453 less $1,200,000). This would result in a tax increase of $25.70 per $100 AV in 2025 and each year after during the bond payment period. For a typical single-family house, the annual cost added by the bond would be approximately $257 per year over the life of the twenty-year bond.

7.0 CONCLUSIONS AND RECOMMENDATIONS

1. The capital cost associated with implementing the eight identified projects is estimated at $30,000,000.
2. The proposed 2020 District tax rate is $39.73 per $100 Assessed Valuation (AV). Based on a typical assessed value of $1,000 for a single-family house, the current tax rate results in an annual tax to the homeowner of $397.31. Based on a very conservative assumption of no change in the assessed valuation over the life of the bond, we have estimated that the capital cost of $30,000,000 bonded at 4 percent will result in an increase in the tax rate of approximately $25.70 per $100 AV over the twenty-year bond schedule. The proposed bond will result in an increase in the average annual tax of $257 over the twenty-year bond for the typical house with an assessed valuation of $1,000.

In consideration of the above conclusions, we recommend that the District proceeds with a $30,000,000 twenty-year bond in order to implement the eight projects described in this report. The District should petition the Town of North Hempstead to schedule a public hearing so that the District may obtain the Town Board's approval to bond the proposed improvements.

TABLES

TABLE 2-1
GARDEN CITY PARK WATER DISTRICT
SUMMARY OF EXISTING SUPPLY WELL FACILITIES

WATER DISTRICT WELL NO.	YEAR PLACED IN SERVICE	NYSDEC NO.	PLANT LOCATION	TERMINAL DEPTH (FEET)	FORMATION	AUTHORIZED CAPACITY (GPM)
1*	1938	N-650	Herricks Road	356	Magothy	700
2*	1938	N-651	Herricks Road	348	Magothy	500
3(1)	1948	N-2565	Marcus Ave.	-	-	-
4(1)	1951	N-3672	Marcus & Denton	-	-	-
5(1)	1951	N-3673	Marcus & Denton	-	-	-
6(2)(4)	1955	N-5603	Denton & Hickory	420	Magothy	1,200
7(2)	1960	N-6945	Shelter Rock Road	401	Magothy	1,200
8(2)	1964	N-7512	Old Court House Road	380	Magothy	1,200
9(2)(3)	1968	N-8409	Court House Road	405	Magothy	1,200
10(2)	1980	N-9768	Shelter Rock Road	480	Magothy	1,200
11(4)	1988	N-10612	Links G.L.	455	Magothy	1,200
				OPERATIONAL TOTAL:		7,200

Notes:

* These wells are maintained in reserve due to high levels of nitrate.
(1) Well No. 3 was abandoned in 1993-1994. Well Nos. 4 and 5 were abandoned in 2003-2004
(2) Well uses packed tower aeration system on site.
(3) Well uses nitrate treatment system on site.
(4) Granular activated carbon treatment system on site.

TABLE 2-2
GARDEN CITY PARK WATER DISTRICT
EXISTING STORAGE TANK FACILITIES

LOCATION	TYPE OF FACILITY	DESIGN CAPACITY (MG)
Herricks Road	Elevated Steel Tank	1.5
Denton Avenue	Elevated Steel Tank	1.0
WATER DISTRICT TOTAL:		**2.5**

Notes:
MG - Million Gallons

TABLE 2-3
GARDEN CITY PARK WATER DISTRICT
DISTRIBUTION SYSTEM*

PIPE SIZE (INCHES)	LINEAR FEET	MILES
4	363	0.1
6	193,932	36.7
8	124,976	23.7
10	31,299	5.9
12	44,307	8.4
16	11,804	2.2
20	94	0.0
TOTALS:	406,775	77.0

Notes:

* As of June 2020
No major improvements or additions have been completed since.

TABLE 2-4
GARDEN CITY PARK WATER DISTRICT
INTERCONNECTIONS CAPACITY

WATER SUPPLIER	LOCATION	INTERCONNECTION SIZE (INCHES)	CAPACITY AT 20psi DIFFERENTIAL (GPM) (SHORT-TERM RATE)
Inc. Village of Mineola - Water Dept.	Herricks Road & Wilson Boulevard	6	-(*)
Water Authority of Western Nassau County	Denton Avenue & Evergreen Drive	6	-(*)
Inc. Village of Garden City	Nassau Boulevard & Atlantic Avenue	6	1,067
Inc. Village of Williston Park - Water Dept.	Concord Avenue	6	551
Albertson Water District	I.U. Willets Road & Reed Drive	10	3,604
Manhasset-Lakeville Water District	Executive Drive	8	1,000
		TOTAL:	6,222

TOTAL NUMBER OF INTERCONNECTIONS IS 6
TOTAL CAPACITY AT 20 PSI IS 6,222 GPM (8.96 MGD)
**INTERCONNECTION CAPACITY REQUIRED IS 666.67 GPM (0.96 MGD)

Notes:
*Unverified Capacity
**Interconnection capacity required = Maximum peak hour demand - Actual well and storage capacity (85%) with major plant (Herricks Tank) inoperative

TABLE 2-5
GARDEN CITY PARK WATER DISTRICT
HISTORICAL GROWTH AND DEMAND (1999-2019)

Fiscal Year	Yearly Pumpage (MG)	Average Day Pumpage (MGD)	Maximum Day Pumpage (MGD)	Maximum Day to Average Day Ratio
2000	1,242	3.39	6.49	1.91
2001	1,362	3.73	7.71	2.07
2002	1,380	3.78	7.75	2.05
2003	1,225	3.36	6.25	1.86
2004	1,188	3.24	5.94	1.83
2005	1,299	3.56	6.50	1.83
2006	1,163	3.19	6.23	1.96
2007	1,275	3.49	6.08	1.74
2008	1,155	3.16	6.36	2.01
2009	1,054	2.89	5.23	1.81
2010	1,148	3.15	7.08	2.25
2011	1,128	3.09	7.17	2.32
2012	1,152	3.16	6.17	1.95
2013	1,281	3.51	6.88	1.96
2014	1,296	3.55	6.29	1.77
2015	1,385	3.79	6.70	1.77
2016	1,307	3.58	6.39	1.78
2017	1,257	3.44	6.29	1.83
2018	1,236	3.39	6.61	1.95
2019	1,084	2.97	5.36	1.81
YEAR AVERAGE:	**1,231**	**3.37**	**6.47**	**1.92**

Notes:
MG - Million Gallons
MGD - Million Gallons Per Day

TABLE 3-1
GARDEN CITY PARK WATER DISTRICT
CONSUMPTIVE WATER USE AND SYSTEM CAPACITY (1999-2019)

FISCAL YEAR	AVERAGE DAY (MG)	MAXIMUM DAY (MGD)	PEAK* HOUR (MGD)	MAX. DAY +3,500 GPM** FIRE FLOW (MGD)
2000	3.39	6.49	12.33	11.53
2001	3.73	7.71	14.65	12.75
2002	3.78	7.75	14.73	12.79
2003	3.36	6.25	11.88	11.29
2004	3.24	5.94	11.29	10.98
2005	3.56	6.50	12.35	11.54
2006	3.18	6.23	11.84	11.27
2007	3.49	6.08	11.26	11.12
2008	3.16	6.36	12.08	11.40
2009	2.80	5.23	9.94	10.27
2010	3.14	7.07	13.43	12.11
2011	3.09	7.17	13.62	12.21
2012	3.16	6.17	11.73	11.21
2013	3.50	6.88	13.07	11.92
2014	3.54	6.29	11.95	11.33
2015	3.79	6.70	12.73	11.74
2016	3.58	6.39	12.14	11.43
2017	3.44	6.29	11.95	11.33
2018	3.39	6.61	12.55	11.65
2019	2.97	5.36	10.18	10.40
YEAR AVERAGE:	3.36	6.47	12.29	11.51

Notes:

MGD – indicates million gallons per day
* – Estimated on maximum day
** – Maximum day plus fire flow assumes a 3,500 gallons per minute (GPM), or a rate of 5.04 MGD, fire flow. 3,500 GPM is a practical upper fire flow limit most water suppliers should anticipate based on a 3–hour duration or 0.63 MG storage capacity for one fire event (reference AWWA Manual M31, 4th edition).

TABLE 3-2
GARDEN CITY PARK WATER DISTRICT
TOTAL WELL AND STORAGE CAPACITY

WELL No.	AUTHORIZED CAPACITY (GPM)	ACTUAL CAPACITY (GPM)
1*	700	-
2*	500	-
3(1)	-	-
4(1)	-	-
5(1)	-	-
6(2)(4)(5)(6)	1,200	1,200
7(2)(5)(6)	1,200	1,200
8(2)(5)(6)	1,200	1,200
9(2)(3)(4)(5)	1,200	1,200
10(2)(5)(6)	1,200	1,200
11(4)(6)	1,200	1,200
TOTAL ALL WELLS OPERABLE	8,400 GPM (12.10 MGD)	7,200 GPM (10.37 MGD)
TOTAL WELLS OPERABLE PLUS STORAGE CAPACITY**	20.37 MGD	18.87 MGD
WELL & STORAGE CAPACITY WITH MAJOR PLANT INOPERATIVE (Herricks Tank)**	15.27 MGD	13.77 MGD
CAPACITY OF WELLS IN OPERATION WITH AUXILIARY POWER (MGD)	6,000 GPM (8.64 MGD)	6,000 GPM (8.64 MGD)

Notes:

* These wells are maintained in reserve due to high levels of nitrates.

** For authorized capacity, tank capacity is assumed 100% with a 6 hour draft. For actual capacity, tank is assumed 85% with a 6 hour draft.

(1) Well No. 3 was abandoned in 1993-1994. Well Nos. 4 and 5 were abandoned in 2003-2004.

(2) Well uses packed tower aeration system on site.

(3) Well uses nitrate treatment system on site.

(4) Granular activated carbon treatment system on site.

(5) AOP and/or GAC treatment system under construction.

(6) Well has existing auxiliary power. Note: Well No. 6 can only be operated with auxiliary power if AOP treatment is off.

TABLE 3-3
GARDEN CITY PARK WATER DISTRICT
SYSTEM CAPACITY vs. DEMAND

DEMAND	ACTUAL SYSTEM CAPACITY (MGD)	PEAK DEMAND (MGD) RECORDED SINCE 1995/YEAR
Average Day	8.64*	3.79/2015
Maximum Day	8.64**	7.75/2002
Peak Hour	13.77***	14.73/2002
Maximum Day +3,500 GPM Fire Flow	13.77***	12.79/2002

Notes:
* Total supply wells with backup power.
** Total supply wells with largest capacity well out of service.
*** Total system capacity with largest capacity plant out of service. Largest plant out of service is the largest storage tank (1.5 MG) at 85% capacity with 6 hour draft (5.1 MGD).

H2M

TABLE 4-1

GARDEN CITY PARK WATER DISTRICT
WATER QUALITY MONITORING REQUIREMENTS
CONSTITUENTS/CONTAMINANTS REQUIRED TO BE TESTED

Analysis Category	Constituents/Contaminants	Maximum Contaminant Level (mg/l)
IOC's	Alkalinity, Total	--
	Ammonia as N	--
	Antimony	0.006
	Arsenic	0.05
Physical And Inorganic Constituents (mg/l)	Barium	2
	Beryllium	0.004
	Cadmium	0.005
	Calcium Hardness	--
	Chloride	250
	Chromium	0.10
	Color	15 units
	Copper	1.3(A)
	Cyanide, Free	0.2
	Dissolved Solids, Total	--
	Foaming Agents	--
	Fluoride	2.2
	Hardness, Total	--
	Iron	0.3(B)
	Langelier Index	(C)
	Lead	0.015(A)
	Manganese	0.3(B)
	Magnesium	--
	Mercury	0.002
	Nickel	0.1
	Nitrate as N	10.0(D)
	Nitrite as N	1.0(D)
	Odor	3 units
	pH	7.5-8.5(F)
	Selenium	0.05
	Silver	0.1
	Sodium	(E)
	Suflate	250
	Temperature (F or C)	--
	Thallium	0.002
	Turbidity	5 units
	Zinc	5.0
Inorganic Contaminats	Prechlorate: Primary Action Level Secondary Action Level	 0.018 0.005
Inorganic Contaminats	Abestos:	7.0 million fibers/liter (MFL)(>10microns)

TABLE 4-1 (cont'd.)

GARDEN CITY PARK WATER DISTRICT
WATER QUALITY MONITORING REQUIREMENTS
CONSTITUENTS/CONTAMINANTS REQUIRED TO BE TESTED

Analysis Category	Constituents/Contaminants	Maximum Contaminant Level (mg/l)
SOC's	Alachlor	0.002
	Aldicarb	0.003
	Aldicarb Sulfone	0.002
	Aldicarb Sulfoxide	0.004
Specific Organic Chemicals/ Pesticides (mg/l)	Atrazine	0.003
	Carbofuran	0.04
	Chlordane, Total	0.002
	DBCP (G)	0.0002
	2,4,D	0.05
	Endrin	0.002
	1,2-Dibromoethane (EDB)	0.00005
	Heptachlor	0.0004
Group 1 Chemicals	Heptachlor Epoxide	0.0002
	Lindane	0.0002
	Methoxychlor	0.04
	Polychlorinated Biphenyls (PCBs)	0.0005
	Pentachlorophenol	0.001
	Toxaphene	0.003
	2,4,5-TP (Silvex)	0.01
Group 2 Chemicals	Aldrin	0.005
	Benzo(a)pyrene	0.0002
	Butachlor	0.05
	Carbaryl	0.05
	Dalapon	0.2
	Di(2-ethylhexyl)adipate	0.4
	Di(2-ethylhexyl)phthalate	0.006
	Dicamba	0.05
	Dieldrin	0.005
	Dinoseb	0.007
	Diquat	0.02
	Endothall	0.1
	Glyphosate	0.7
	Hexachlorobenzene	0.001
	Hexachlorocyclopentadiene	0.05
	3-Hydroxycarbofuran	0.05
	Methomyl	0.05
	Metolachlor	0.05
	Metribuzin	0.05
	Oxamyl (Vydate)	0.2
	Picloram	0.5
	Propachlor	0.05
	Simazine	0.004
	2,3,7,8-TCDD (Dioxin)	0.00000003

TABLE 4-1 (cont'd.)

GARDEN CITY PARK WATER DISTRICT
WATER QUALITY MONITORING REQUIREMENTS
CONSTITUENTS/CONTAMINANTS REQUIRED TO BE TESTED

Analysis Category	Constituents/Contaminants	Maximum Contaminant Level (mg/l)
POC's	Benzene	0.005
	Bromobenzene	0.005
	Bromochloromethane	0.005
	Bromomethane	0.005
Principal Organic Contaminants (mg/l)	N-Butylbenzene	0.005
	sec-Butylbenzene	0.005
	tert-Butylbenzene	0.005
	Carbon Tetrachloride	0.005
	Chlorobenzene	0.005
	Chlorodifluoromethane	0.005
	Chloroethane	0.005
	Chloromethane	0.005
	2-Chlorotoluene	0.005
	4-Chlorotoluene	0.005
	Dibromomethane	0.005
	1,2-Dichlorobenzene	0.005
	1,3-Dichlorobenzene	0.005
	1,4-Dichlorobenzene	0.005
	Dichlorodifluoromethane	0.005
	1,1-Dichloroethane	0.005
	1,2-Dichloroethane	0.005
	1,1-Dichloroethene	0.005
	cis -1,2-Dichloroethene	0.005
	trans-1,2-Dichloroethene	0.005
	1,2-Dichloropropane	0.005
	1,3-Dichloropropane	0.005
	2,2-Dichlropropane	0.005
	1,1-Dichloropropene	0.005
	cis -1,3-Dichloropropene	0.005
	trans-1,3-Dichloropropene	0.005
	Ethylbenzene	0.005
	Hexachlorobutadinene	0.005
	Isopropylbenzene	0.005
	p-Isopropyltoluene	0.005
	Methylene Chloride	0.005
	Methyl Tert. Butyl Ether (MTBE)	0.01
	n-Propylbenzene	0.005
	Styrene	0.005
	1,1,1,2-Tetrachloroethane	0.005
	1,1,2,2,-Tetrachloroethane	0.005

TABLE 4-1 (cont'd.)

GARDEN CITY PARK WATER DISTRICT
WATER QUALITY MONITORING REQUIREMENTS
CONSTITUENTS/CONTAMINANTS REQUIRED TO BE TESTED

Analysis Category	Constituents/Contaminants	Maximum Contaminant Level (mg/l)
POC's	Tetrachloroethene	0.005
	Toluene	0.005
	1,2,3-Trichlorobenzene	0.005
	1,2,4-Trichlorobenzene	0.005
Principal Organic Contaminants (mg/l)	1,1,1-Trichloroethane	0.005
	1,1,2-Trichloroethane	0.005
	Trichloroethene	0.005
	Trichlorofluoromethane	0.005
	1,2,3-Trichloropropane	0.005
	1,1,2 Trichloro 1,2,2-trifluoroethane	0.005
	1,2,4-Trimethylbenzene	0.005
	1,3,5-Trimethylbenzene	0.005
	m-Xylene	0.005
	o-Xylene	0.005
	p-Xylene	0.005
	Vinyl Chloride	0.002
TTHM's	Total Trihalomethanes (H)	0.08
	Bromoform	0.08
	Bromodichloromethane	0.08
	Chloroform	0.08
	Chlorodibromomethane	0.08
HAA5	Haloacetic Acids (K)	0.06
UOC	Unspecified Organic Contaminant	0.05
	Total POC's and UOC's	0.1
Microbiological	Total Coliform	None Detected
	MIC. Escherichia Coliform (I)	None Detected
RAD.	**Radiological**	
	Gross Alpha Particle Activity	15.0 pc/l (J)
	Gross Beta Particle Activity	
	Radium 226/228	5.0 pc/l (J)

Notes:

(A) USEPA Action Level
(B) The combined concentration of iron and manganese should not exceed 0.5 mg/l.
(C) The NCDH recommends that the Langelier Index Saturation Index should be close to zero as possible.
(D) The total Nitrate and Nitrite should not exceed 10.0 mg/l.
(E) The NYSDOH recommends that the sodium level not exceed 20 mg/l for severely restricted sodium diets and 270 mg/l for moderately restricted sodium diets
(F) NCDH guideline
(G) 1,2-Dibromo-3-Chloropropane
(H) Total Trihalomethanes means the sum of Bromoform, Bromodichloromethane, Chloroform and Chlorodibromomethane.
(I) The Escherichia Coliform (E.Coli) analysis is only required in a sample where the Total Coliform is positive.
(J) If the gross alpha particle activity is >5 pc/l, the same or an equivalent sample shall be analyzed for Radium-226. If the concentration of Radium-226 is >3 pc/l, the same or equivalent sample shall be analyzed for Radium-228.
(K) 5 Haloacetic Acids means the sum of Monochloroacetic acid, Dichloroacetis acid. Trichloroacetic acid, Bromoscetic acid and Dibromoacatic acid.

TABLE 4-2
GARDEN CITY PARK WATER DISTRICT
SUMMARY OF PHYSICAL RAW WATER QUALITY PARAMETERS 2019

	REGULATORY LIMIT	DETECT. LIMIT	WELL NO.						UNITS
			6	7	8	9	10	11	
pH	none	none	7.8	7.0	7.0	6.1	7.0	7.0	pH Units
TOTAL HARDNESS	none	1.0 mg/L	81.7	83.0	167.0	87.1	83.2	102.0	mg/L
TOTAL DISSOLVED SOLIDS	none	5 mg/L	178	190	278	218	254	169	mg/L
CHLORIDE	250 mg/l	1.0 mg/L	47	50	58.1	77	44.7	42.8	mg/L
IRON	0.3 mg/l	0.02 mg/L	0.048	ND	0.16	ND	ND	ND	mg/L
NITRATE	10.0 mg/l	0.1 mg/L	5.6	4.3	1.2	8.2	4.6	6.2	mg/L
PERCHLORATE	none	1.0 µg/L	ND	ND	ND	ND	ND	ND	µg/L

Source: 2019 Laboratory Results

Notes:

All concentrations are annual maximum results in the raw source water.

ND - Non-Detect

TABLE 4-3
GARDEN CITY PARK WATER DISTRICT
1,4-DIOXANE ANNUAL MAXIMUM CONCENTRATIONS

	MAXIMUM CONCENTRATION (µg/L)					
	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11
2013	0.69	0.26	3.0	0.29	NA	0.12
2014	0.26	0.37	3.9	0.33	NA	0.11
2017	0.57	0.15	8.2	0.58	0.33	0.075
2018	0.8	0.29	9.9	1.10	0.39	0.13
2019	0.94*	0.19	12.4	1.1	0.34	0.17

Notes:

The proposed MCL for 1,4-dioxane is 1.0 µg/L.

NA - No data for that sample date/well.

2013 and 2014 results are UCMR3 samples taken from distribution system entry point (treated water).

Remaining results are raw water samples.

*Sample was taken from clearwell.

TABLE 4-4
GARDEN CITY PARK WATER DISTRICT
PFAS 2019 MAXIMUM CONCENTRATIONS

	MAXIMUM CONCENTRATION (ng/L)					
	PFHpA	PFOA	PFNA	PFBS	PFHxS	PFOS
WELL NO. 6	4.9	25.0	13.8	ND	7.00	19.9
WELL NO. 7	3.9	8.8	7.3	ND	9.77	15.3
WELL NO. 8	6.69	68.7	3.7	ND	4.3	18.9
WELL NO. 9*	3.8	9.5	ND	ND	4.8	5.1
WELL NO. 10	ND	6.3	4.12	ND	4.35	7.95
WELL NO. 11	5.2	8.5	35.0	ND	30.4	107.0

Notes:

The proposed MCL for both PFOA and PFOS is 10.0 ng/L.

All results are raw water samples.

Data before 2019 is not included because the detection limits were high and not representative of the proposed MCLs, causing many non-detect results.

*Results are maximum concentrations between 2018 and 2019. Sampling was conducted at only Well No. 9 with lower detection limits in 2018.

TABLE 4-5
GARDEN CITY PARK WATER DISTRICT
2019 VOLATILE ORGANIC COMPOUND DETECTIONS

CONTAMINANTS (VOC's)	WELL NO.					
	6	7	8	9	10	11
1,1,1-TRICHLOROETHANE	ND	ND	ND	0.51	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	1.2	ND
1,1-DICHLOROETHENE	ND	ND	ND	3.4	1.1	ND
1,4-DICHLOROBENZENE	ND	ND	1.2	ND	ND	ND
CHLOROBENZENE	ND	ND	2.4	ND	ND	ND
CHLORODIFLUOROMETHANE	0.59	ND	2.6	ND	ND	ND
CIS-1,2-DICHLOROETHENE	ND	ND	3.5	0.81	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	0.58	3.2	ND	ND
METHYL-TERT-BUTYL ETHER	1.4	0.74	0.51	0.55	ND	2.2
TETRACHLOROETHENE (PCE)	121	1.9	2.3	150	4.3	10.4
TRICHLOROETHENE (TCE)	3.9	ND	1.3	7.7	ND	1.0

Source: 2019 Laboratory Results

Notes:

All concentrations are annual maximum results in the raw source water in units of µg/L

ND - Non-Detect

TABLE 5-1

GARDEN CITY PARK WATER DISTRICT

EMERGING CONTAMINANT REMOVAL AT PLANT NO. 6

CAPITAL COST OPINION

AOP TREATMENT SYSTEM

Total System Flow = 1200 gpm

ITEM	DESCRIPTION	ESTIMATED COST (2020)
Construction Costs		
1	Mobilization and Demobilization	$ 110,000.00
2	Bonds and Insurances	$ 55,000.00
3	General Conditions	$ 110,000.00
4	Electrical Modifications	$ 200,000.00
5	Controls	$ 25,000.00
6	AOP System	$ 1,000,000.00
7	Peroxide Tank System	$ 40,000.00
8	Interior Mechanical Piping, Valves, and Accessories	$ 50,000.00
9	Interior Small Piping, Valves, and Accessories	$ 10,000.00
10	FRP Grating System	$ 80,000.00
11	Lamp Access Door	$ 20,000.00
12	Chemical Modifications and Treatment	$ 150,000.00
13	Exterior Chemical Storage Area and Transfer Pad	$ 100,000.00
14	Testing and Contingency Allowances	$ 250,000.00
	Construction Subtotal:	**$ 2,200,000.00**
Engineering Design, Construction and Startup Services (est.)		$ 750,000.00
Legal (2%)		$ 44,000.00
Contingencies (10%)		$ 220,000.00
Estimated Project Cost:		**$ 3,214,000.00**

TABLE 5-2
GARDEN CITY PARK WATER DISTRICT
EMERGING CONTAMINANT REMOVAL AT PLANT NO. 7/10
CAPITAL COST OPINION
GAC TREATMENT SYSTEM
Total System Flow = 2400 gpm

ITEM	DESCRIPTION	ESTIMATED COST (2020)	
Construction Costs			
1	Mobilization and Demobilization	$	250,000
2	Bonds and Insurances	$	117,000
3	General Conditions	$	229,000
4	Testing and Contingency Allowances	$	75,000
5	Granular Activated Carbon Vessels	$	707,000
6	Granular Activated Carbon	$	357,000
7	Site Piping modifications and new site valves	$	300,000
8	New Building Excavation	$	60,000
9	New GAC Excavation	$	60,000
10	New GAC Treatment Building and Foundation, Masonry Construction	$	1,440,000
11	Mechanical HVAC and Plumbing for New GAC Building	$	150,000
12	Site work - drainage, curbs, sidewalk, paving, seeding, etc.	$	300,000
13	Mechanical Piping, Valves, and Accessories	$	200,000
14	Relocation of Chemical Injection Systems	$	75,000
15	Instrumentation, control & integration, and building monitoring	$	100,000
16	New Analyzers (Cl2, pH, NO3)	$	60,000
17	Site Electrical Work	$	300,000
18	Electrical Work in New GAC Building	$	35,000
	Construction Subotal:	**$**	**4,815,000**
	Engineering, Permits, and Design & Construction Administration	**$**	**866,700**
	Inspection	**$**	**240,700**
	Legal (2%)	**$**	**96,100**
	Contingencies (10%)	**$**	**481,500**
Estimated Project Cost:		**$**	**6,500,000**

H2M

TABLE 5-3
GARDEN CITY PARK WATER DISTRICT
EMERGING CONTAMINANT REMOVAL AT PLANT NO. 8
CAPITAL COST OPINION
AOP/GAC TREATMENT SYSTEM
Total System Flow = 1200 gpm

ITEM	DESCRIPTION	ESTIMATED COST (2022)	
Construction Costs			
1	Mobilization and Demobilization	$	250,000
2	Bonds and Insurances	$	137,000
3	General Conditions	$	273,000
4	AOP Piloting	$	165,000
5	Testing and Contingency Allowances	$	200,000
6	Site Work	$	300,000
7	Site Piping	$	300,000
8	Masonry Treatment Building	$	1,000,000
9	Mechanical HVAC and Plumbing for New Treatment Building	$	100,000
10	Granular Activated Carbon Vessels	$	400,000
11	Granular Activated Carbon	$	160,000
12	AOP Treatment Equipment	$	1,000,000
13	Mechanical Piping, Valves, and Accessories	$	200,000
14	Hydrogen Peroxide System and Portico	$	110,000
15	Chemical Injection Systems	$	75,000
16	Booster Pumps and Motors (Contingency)	$	100,000
17	New Analyzers (Cl2, pH, UVT, H2O2, NO3)	$	130,000
18	Electrical Work	$	450,000
19	Construction Inflation (3% over two years)	$	326,000
	Construction Subotal:	**$**	**5,676,000**
	Engineering, Permits, and Design & Construction Administration	**$**	**630,500**
	Inspection	**$**	**283,800**
	Legal	**$**	**113,500**
	Contingencies	**$**	**568,200**
Estimated Project Cost:		**$**	**7,272,000**

TABLE 5-4
GARDEN CITY PARK WATER DISTRICT
EMERGING CONTAMINANT REMOVAL AT PLANT NO. 9
CAPITAL COST OPINION
AOP/GAC TREATMENT SYSTEM
Total System Flow = 1200 gpm

ITEM	DESCRIPTION	ESTIMATED COST (2020)
Construction Costs		
1	Mobilization and Demobilization	$ 250,000
2	Bonds and Insurances	$ 137,000
3	General Conditions	$ 273,000
4	AOP Piloting	$ 165,000
5	Testing and Contingency Allowances	$ 200,000
6	Site Work	$ 300,000
7	Site Piping	$ 300,000
8	Masonry Treatment Building	$ 1,000,000
9	Mechanical HVAC and Plumbing for New Treatment Building	$ 100,000
10	Granular Activated Carbon Vessels	$ 400,000
11	Granular Activated Carbon	$ 160,000
12	Temporary AOP Trailer and Installation	$ 400,000
13	AOP Treatment Equipment	$ 450,000
14	Mechanical Piping, Valves, and Accessories	$ 200,000
15	Hydrogen Peroxide System and Portico	$ 110,000
16	Chemical Injection Systems	$ 75,000
17	Booster Pumps and Motors (Contingency)	$ 100,000
18	New Analyzers (Cl2, pH, UVT, H2O2, NO3)	$ 130,000
19	Electrical Work	$ 450,000
	Construction Subtotal:	**$ 5,200,000**
	Engineering, Permits, and Design & Construction Administration	**$ 626,800**
	Inspection	**$ 273,200**
	Legal	**$ 100,000**
	Contingencies	**$ 300,000**
Estimated Project Cost:		**$ 6,500,000**

TABLE 5-5

GARDEN CITY PARK WATER DISTRICT

CAPITAL COST OPINION

NEW PORTABLE GENERATOR FOR PLANT NOS. 6 AND 8

ITEM	DESCRIPTION	ESTIMATED COST (2020)
1A	Diesel Generator (400 kW)	$ 682,000.00
2A	Demolition (disassembly and removal) of existing generator	$ 22,000.00
	Construction Subtotal (A - Diesel):	**$ 704,000.00**
	Engineering Design, Construction, and Startup Services	$ 70,500.00
	Legal (2%)	$ 14,000.00
	Contingencies (10%)	$ 70,500.00
Estimated Project Cost (A - Diesel):		**$ 859,000.00**

ITEM	DESCRIPTION	ESTIMATED COST (2020)
1B	Natural Gas Generator (350 kW)	$ 682,000.00
2B	Demolition (disassembly and removal) of existing generator	$ 22,000.00
	Construction Subtotal (B - Natural Gas):	**$ 704,000.00**
	Engineering Design, Construction, and Startup Services	$ 70,500.00
	Legal (2%)	$ 14,000.00
	Contingencies (10%)	$ 70,500.00
Estimated Project Cost (B- Natural Gas):		**$ 859,000.00**

Notes:

Items 1A and 1B include electrical work, site work, and other work associated with installation.

TABLE 5-6

GARDEN CITY PARK WATER DISTRICT

CAPITAL COST OPINION

NEW GENERATOR AT PLANT NO. 9

ITEM	DESCRIPTION	ESTIMATED COST (2020)
1A	Diesel Generator (450 kW)	$ 740,000.00
	Construction Subtotal (A - Diesel):	**$ 740,000.00**
	Engineering Design, Construction, and Startup Services	$ 74,000.00
	Legal (2%)	$ 14,800.00
	Contingencies (10%)	$ 74,200.00
Estimated Project Cost (A - Diesel):		**$ 903,000.00**

ITEM	DESCRIPTION	ESTIMATED COST (2020)
1B	Natural Gas Generator (450 kW)	$ 785,000.00
	Construction Subtotal (B - Natural Gas):	**$ 785,000.00**
	Engineering Design, Construction, and Startup Services	$ 78,500.00
	Legal (2%)	$ 15,700.00
	Contingencies (10%)	$ 78,800.00
Estimated Project Cost (B- Natural Gas):		**$ 958,000.00**

Notes:

Items 1A and 1B include electrical work, site work, and other work associated with installation.

TABLE 5-7
GARDEN CITY PARK WATER DISTRICT
CAPITAL COST OPINION
REHABILITATION OF DENTON AVENUE TANK (1.0 MG EST)

ITEM	DESCRIPTION	ESTIMATED COST (2021)	
1	Exterior Tank Rehabilitation	$	1,500,000.00
2	Interior Tank Rehabilitation	$	1,300,000.00
3	Miscellaneous Tank Repairs and Upgrades	$	195,000.00
4	Construction Inflation (3% over one year)	$	89,850.00
	Construction Subtotal:	**$**	**3,084,850.00**
	Engineering/Design/Present Condition Evaluation	$	92,600.00
	Construction Administration	$	31,000.00
	Construction Observation (5%)	$	154,200.00
	Permitting - NCDOH and SEQRA	$	10,000.00
	Legal (.5%)	$	15,400.00
	Contingences (10%)	$	308,950.00
Estimated Project Cost:		**$**	**3,697,000.00**

TABLE 5-8
GARDEN CITY PARK WATER DISTRICT
CAPITAL COST OPINION
WATER DISTRIBUTION SYSTEM IMPROVEMENTS

ITEM	DESCRIPTION	ESTIMATED COST (2021-2025)
1	Main Replacement & Distribution Upgrade	$ 655,000.00
2	Valve Rehabilitation	$ 46,000.00
3	Construction Inflation	$ 55,000.00
	Construction Subtotal:	**$ 756,000.00**
	Engineering	$75,600.00
	Construction Inspection	$37,800.00
	Legal	$37,800.0
	Contingencies	$92,800.0
Estimated Project Cost:		**$ 1,000,000.00**

TABLE 5-9
GARDEN CITY PARK WATER DISTRICT
CAPITAL COST OPINION
SUMMARY

RECOMMENDED IMPROVEMENTS	CAPITAL COST
Emerging Contaminant Removal at Plant No. 6	$ 3,214,000.00
Emerging Contaminant Removal at Plant No. 7/10	$ 6,500,000.00
Emerging Contaminant Removal at Plant No. 8	$ 7,272,000.00
Emerging Contaminant Removal at Plant No. 9	$ 6,500,000.00
New Portable Generator for Plant Nos. 6 and 8	$ 859,000.00
New Generator at Plant No. 9	$ 958,000.00
Rehabilitation of Denton Avenue Tank	$ 3,697,000.00
Water Distribution System Improvements	$ 1,000,000.00
Total Capital Cost Opinion:	**$ 30,000,000.00**

TABLE 6-1
GARDEN CITY PARK WATER DISTRICT
COMPARISON OF REVENUE SOURCES
GCPK VS OTHER SELECTED WATER DISTRICTS
(% OF REVENUE SOURCE)

Revenue Source	ALWD	CPWD	PWWD	MLWD	RLWD	GCPK	GCPK* w/Bond
Sales of water	40%	19%	69%	53%	35%	30%	5%
Hydrant rental	0%	0%	0%	0%	0%	0%	0%
Unmetered water sales	3%	2%	0%	1%	2%	1%	0%
Water service charges	1%	0%	0%	0%	1%	0%	0%
Interest & penalties on water rents	1%	0%	0%	0%	0%	1%	0%
Interest income	0%	0%	0%	0%	0%	0%	0%
Interest income/(Repair reserve)	0%	0%	0%	0%	0%	0%	0%
Rental of real property	0%	0%	0%	2%	0%	5%	1%
Sale of equipment & property	0%	0%	1%	0%	0%	0%	0%
Sale of scrap	0%	0%	0%	0%	0%	0%	0%
Refunds of prior year's expenses	0%	0%	0%	0%	0%	0%	0%
Other unclassified revenue	0%	6%	2%	0%	4%	2%	0%
Pilot	4%	3%	0%	2%	0%	0%	0%
Water services for other communities	0%	0%	0%	4%	0%	0%	0%
Other compensation of loss	0%	0%	0%	2%	0%	0%	0%
Appropriated fund balance	0%	0%	2%	0%	8%	0%	0%
Appropriated capital reserves	0%	0%	0%	0%	0%	0%	0%
Raised by taxation	51%	69%	25%	34%	48%	60%	93%
YEAR AVERAGE:	100%	100%	100%	100%	100%	100%	100%

Albertson Water District	ALWD
Carle Place Water District	CPWD
Garden City Park Water District	GCPK
Manhasset-Lakeville Water District	MLWD
Port Washington Water District	PWWD
Roslyn Water District	RLWD

* Based on a 20 year $45,365,000 bond amortized at 5 percent

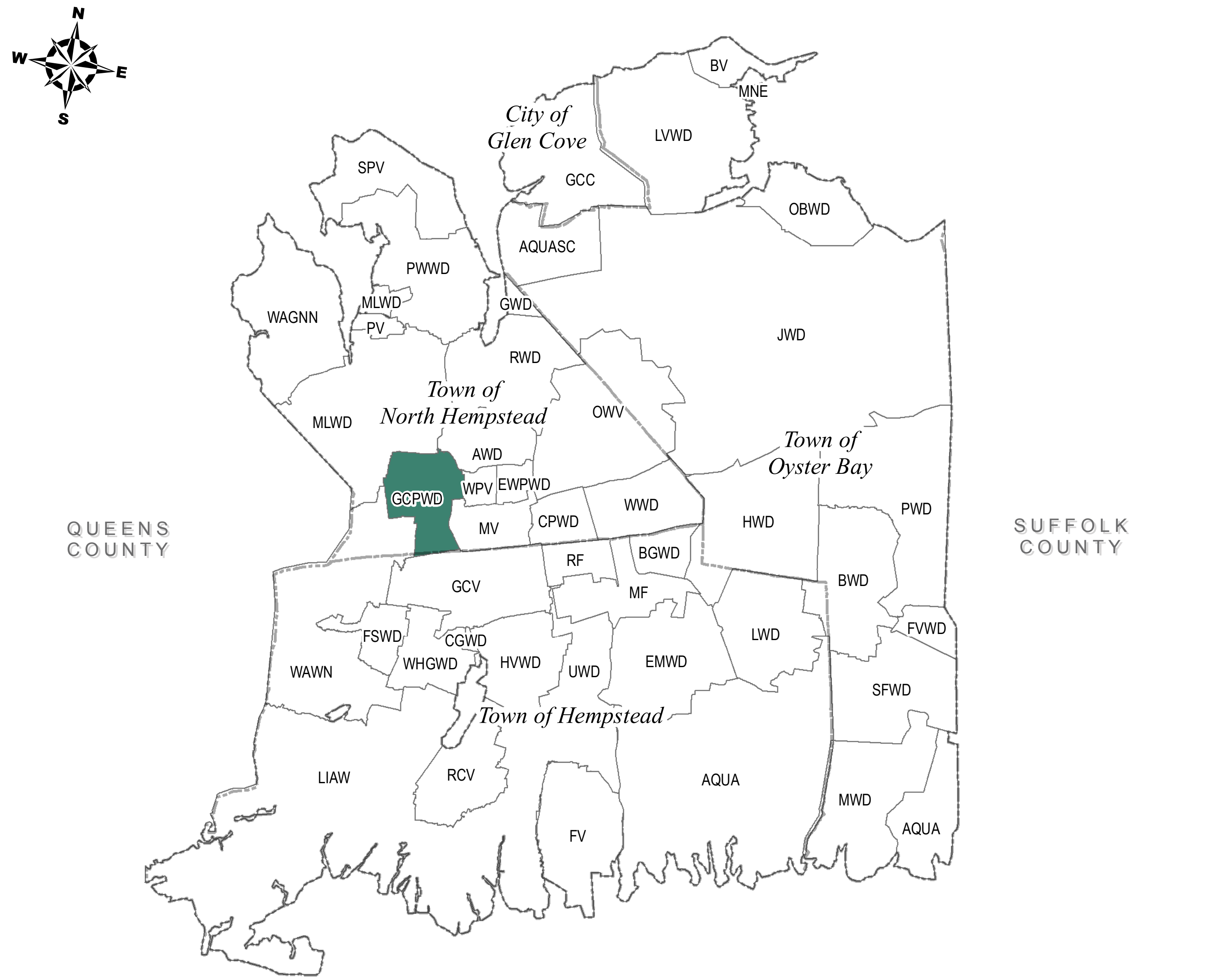
TABLE 6-2
GARDEN CITY PARK WATER DISTRICT
ESTIMATED PRINCIPAL/INTEREST PAYMENTS & TAX RATE INCREASE FOR RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

YEAR	OUTSTANDING DEBT ($)	PRINCIPAL ($)	INTEREST ($)	TOTAL ($)	TAX RATE * PER $100 AV ($)
2020**	$ -	$ -	$ -	$ -	$ -
2021**	$ 7,500,000.00	$ -	$ 300,000.00	$ (300,000.00)	$ 3.49
2022**	$ 7,500,000.00	$ -	$ 600,000.00	$ (600,000.00)	$ 6.99
2023**	$ 7,500,000.00	$ -	$ 900,000.00	$ (900,000.00)	$ 10.48
2024**	$ 7,500,000.00	$ -	$ 1,200,000.00	$ (1,200,000.00)	$ 13.97
2025	$ 30,000,000.00	$ (1,007,452.51)	$ 1,200,000.00	$ (2,207,452.51)	$ 25.70
2026	$ 28,992,547.49	$ (1,047,750.61)	$ 1,159,701.90	$ (2,207,452.51)	$ 25.70
2027	$ 27,944,796.88	$ (1,089,660.63)	$ 1,117,791.88	$ (2,207,452.51)	$ 25.70
2028	$ 26,855,136.25	$ (1,133,247.06)	$ 1,074,205.45	$ (2,207,452.51)	$ 25.70
2029	$ 25,721,889.19	$ (1,178,576.94)	$ 1,028,875.57	$ (2,207,452.51)	$ 25.70
2030	$ 24,543,312.24	$ (1,225,720.02)	$ 981,732.49	$ (2,207,452.51)	$ 25.70
2031	$ 23,317,592.22	$ (1,274,748.82)	$ 932,703.69	$ (2,207,452.51)	$ 25.70
2032	$ 22,042,843.40	$ (1,325,738.77)	$ 881,713.74	$ (2,207,452.51)	$ 25.70
2033	$ 20,717,104.63	$ (1,378,768.32)	$ 828,684.19	$ (2,207,452.51)	$ 25.70
2034	$ 19,338,336.30	$ (1,433,919.06)	$ 773,533.45	$ (2,207,452.51)	$ 25.70
2035	$ 17,904,417.25	$ (1,491,275.82)	$ 716,176.69	$ (2,207,452.51)	$ 25.70
2036	$ 16,413,141.43	$ (1,550,926.85)	$ 656,525.66	$ (2,207,452.51)	$ 25.70
2037	$ 14,862,214.57	$ (1,612,963.93)	$ 594,488.58	$ (2,207,452.51)	$ 25.70
2038	$ 13,249,250.65	$ (1,677,482.48)	$ 529,970.03	$ (2,207,452.51)	$ 25.70
2039	$ 11,571,768.16	$ (1,744,581.78)	$ 462,870.73	$ (2,207,452.51)	$ 25.70
2040	$ 9,827,186.38	$ (1,814,365.05)	$ 393,087.46	$ (2,207,452.51)	$ 25.70
2041	$ 8,012,821.32	$ (1,886,939.66)	$ 320,512.85	$ (2,207,452.51)	$ 25.70
2042	$ 6,125,881.67	$ (1,962,417.24)	$ 245,035.27	$ (2,207,452.51)	$ 25.70
2043	$ 4,163,464.42	$ (2,040,913.93)	$ 166,538.58	$ (2,207,452.51)	$ 25.70
2044	$ 2,122,550.49	$ (2,122,550.49)	$ 84,902.02	$ (2,207,452.51)	$ 25.70
2045	$ (0.00)	$ (2,207,452.51)	$ (0.00)	$ (2,207,452.51)	$ 25.70

* --- Estimated tax rates are based on a twenty-year $45,365,000 bond at 5 percent interest and a constant Assessed Valuation of $8,588,758.

** --- Based on the projects being financed with BANs during construction (2020-2024)

FIGURES



KEY TO NASSAU COUNTY PUBLIC WATER SUPPLIERS

AQUA	AQUA OF NY	FV	FREEPORT (V)	MF	MITCHEL FIELD	RWD	ROSLYN W.D.
AQUA	AQUA OF NY	FVWD	FARMINGDALE (V)	MLWD	MANHASSET-LAKEVILLE W.D.	SFWD	SOUTH FARMINGDALE W.D.
AQUASC	AQUA OF NY SEA CLIFF	GCC	CITY OF GLEN COVE	MNE	MILL NECK ESTATES	SPV	SANDS POINT (V)
AWD	ALBERTSON W.D.	GCPWD	GARDEN CITY PARK W.D.	MV	MINEOLA (V)	UWD	UNIONDALE W.D.
BGWD	BOWLING GREEN W.D.	GCV	GARDEN CITY (V)	MWD	MASSAPEQUA W.D.	WAGNN	W.A. OF GREAT NECK NORTH
BV	BAYVILLE (V)	GWD	GLENWOOD W.D.	OBWD	OYSTER BAY W.D.	WAWN	W.A. OF WESTERN NASSAU
BWD	BETHPAGE W.D.	HVWD	HEMPSTEAD (V)	OWV	OLD WESTBURY (V)	WHGWD	WEST HEMPSTEAD W.D.
CGWD	CATHEDRAL GARDENS W.D.	HWD	HICKSVILLE W.D.	PV	PLANDOME (V)	WPV	WILLISTON PARK (V)
CPWD	CARLE PLACE W.D.	JWD	JERICHO W.D.	PWD	PLAINVIEW W.D.	WWD	WESTBURY W.D.
EMWD	EAST MEADOW W.D.	LIAW	LONG ISLAND AMERICAN WATER CORP	PWWD	PORT WASHINGTON W.D.		
EWPWD	EAST WILLISTON PARK W.D.	LVWD	LOCUST VALLEY W.D.	RCV	ROCKVILLE CENTRE (V)		
FSWD	FRANKLIN SQUARE W.D.	LWD	LEVITTOWN W.D.	RF	ROOSEVELT FIELD		

Figure 2-1

GARDEN CITY PARK WATER DISTRICT LOCATION MAP

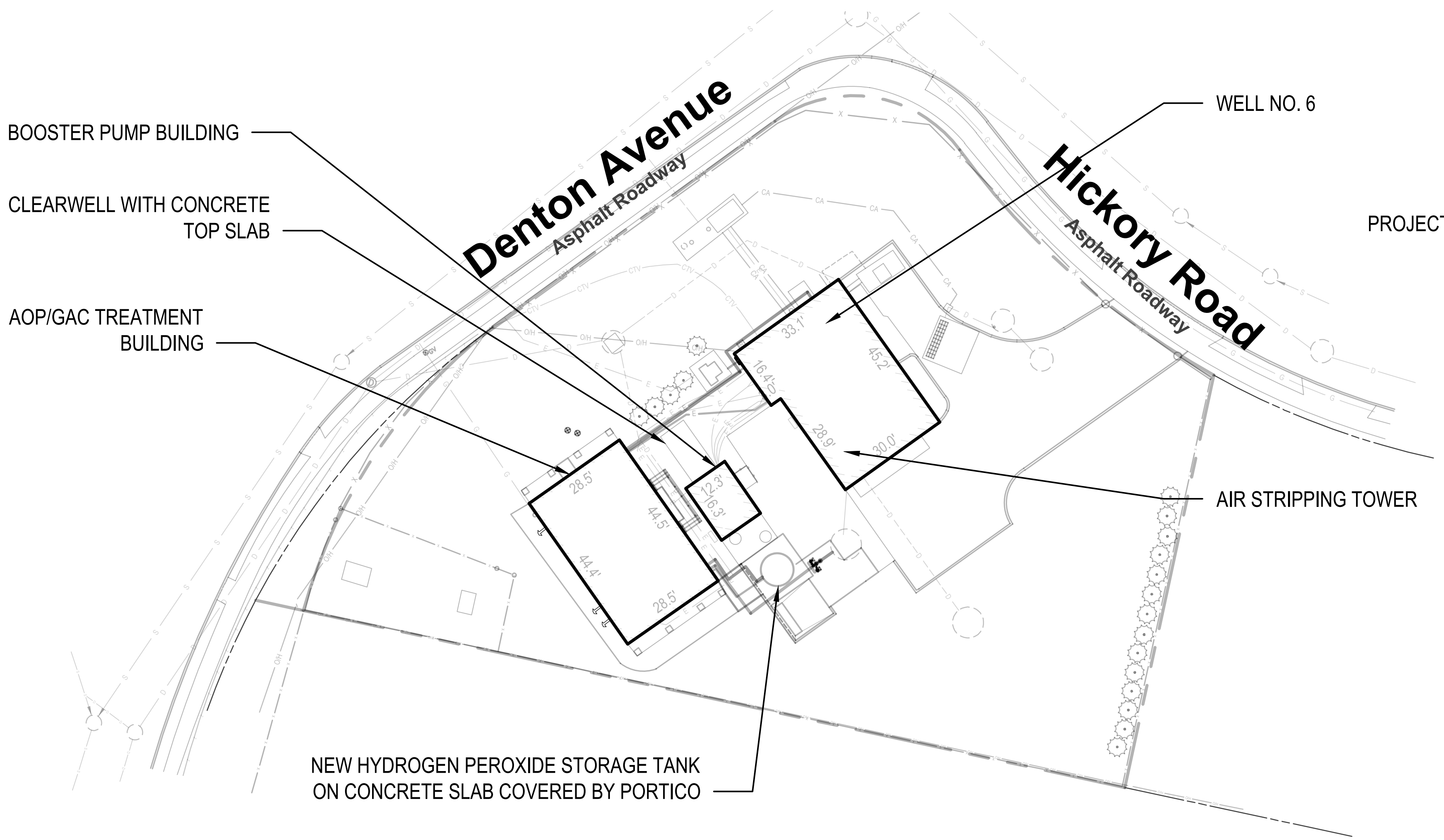
SCALE: 1" = 20,000'±

H2M

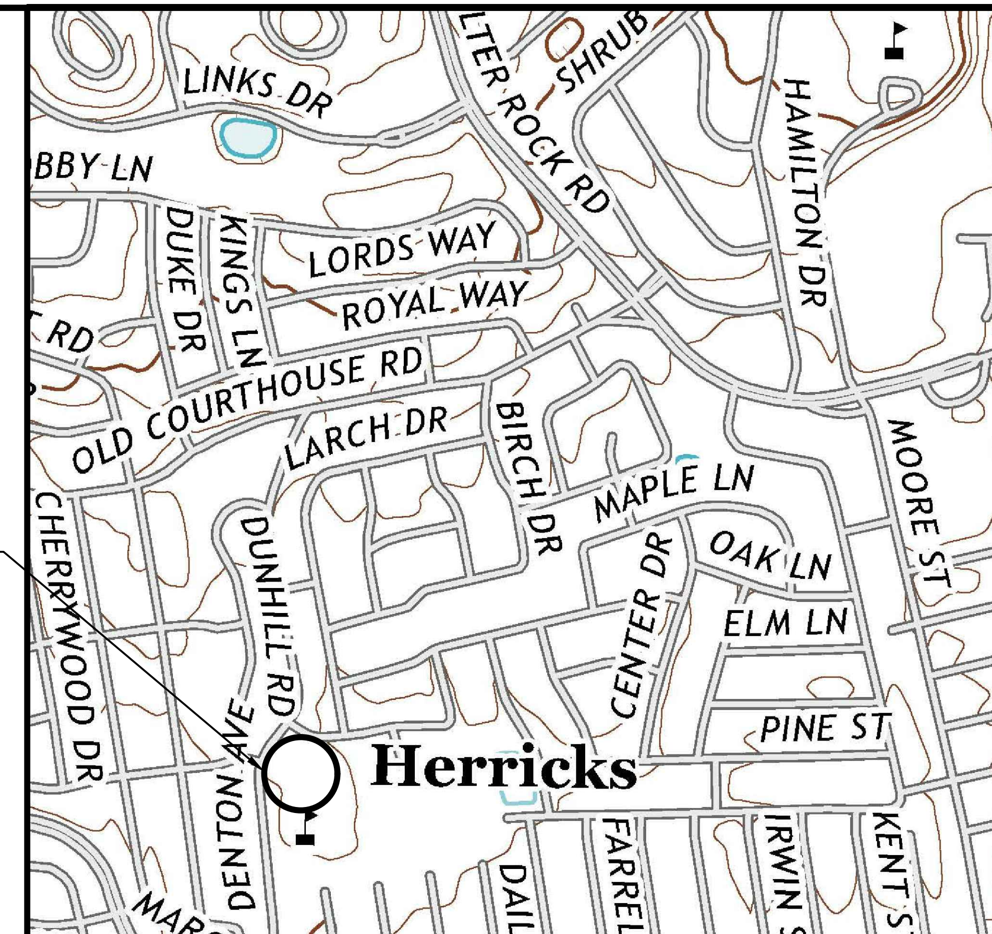
architects + engineers

538 Broad Hollow Road
Melville, NY 11747

M:\gis\GCPK\1202\NC WD Map.mxd



1 Site Plan
SCALE: 1"=40'
N

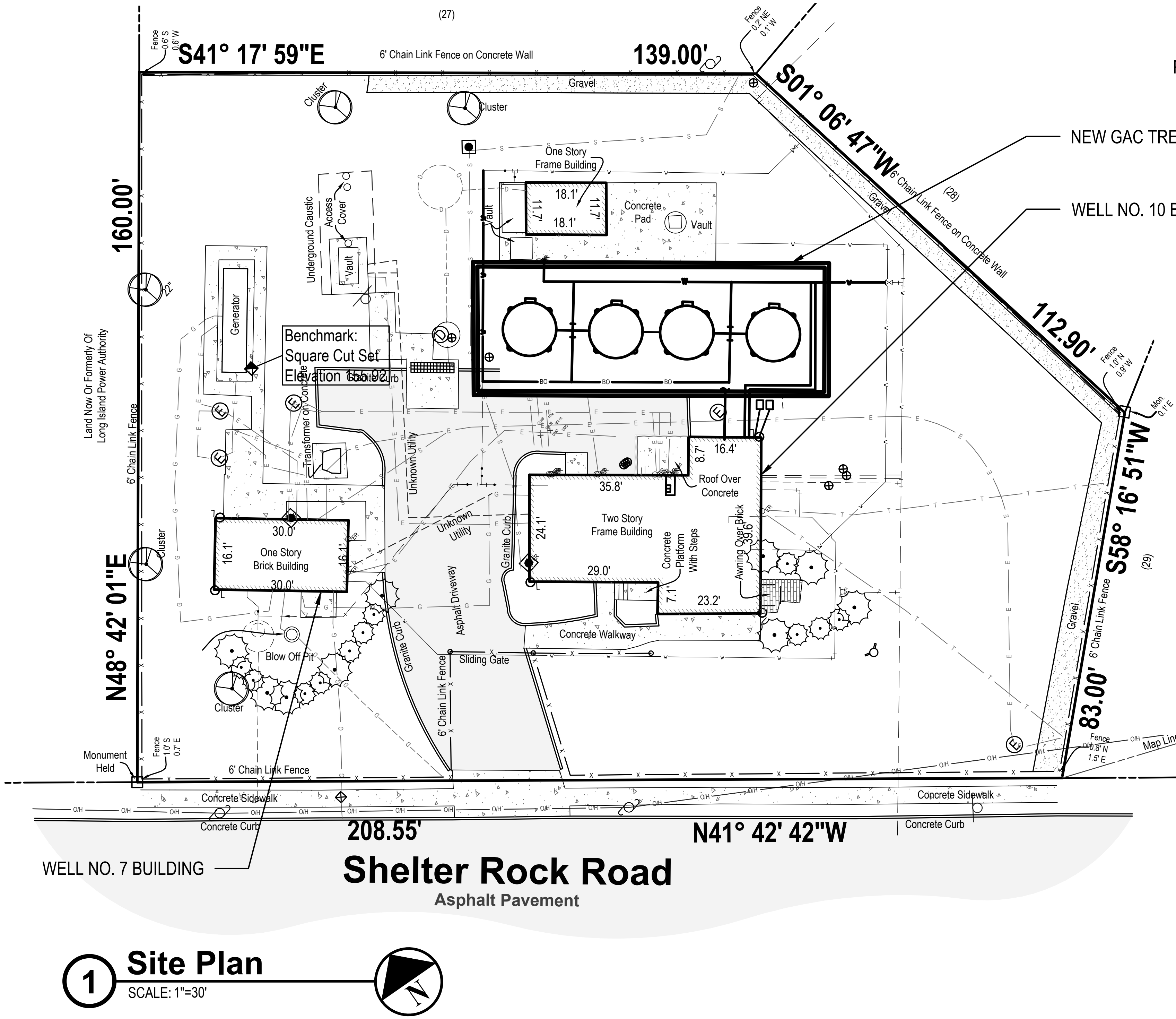


LOCATION MAP
SCALE: 1"= 900'
N

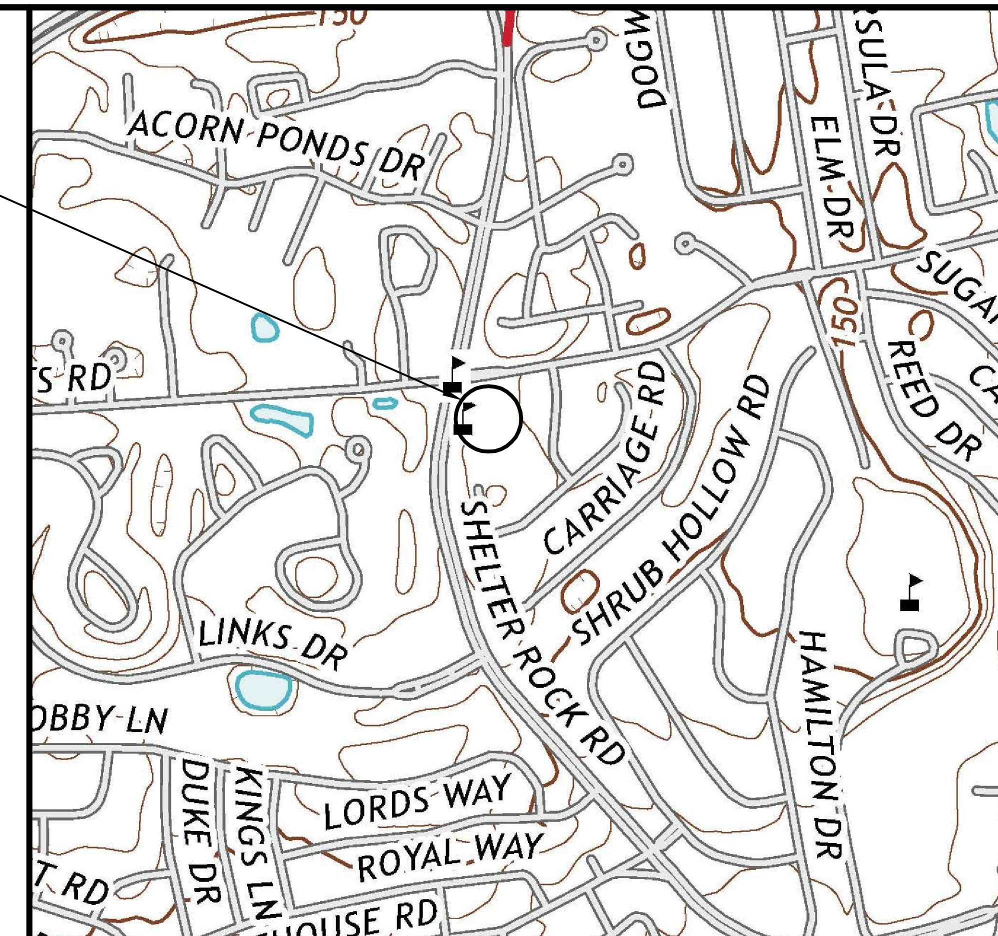
FIGURE 2-2
GARDEN CITY PARK WATER DISTRICT
DENTON AVENUE
PLANT NO. 6

Garden City Park Water District	Project # **GCPK2001**	H2M architects + engineers www.h2m.com
	DATE: **MAY 2020**	

X:\GCPK (Garden City Park Water District) - 10410\GCPK2001 - 2020 Bond Report\02-BIM-CADD\Bond Report\Plant 6 Site Plan.dwg Last Modified: May 07, 2020 - 12:53pm Plotted on: May 07, 2020 - 12:57pm By sgolden



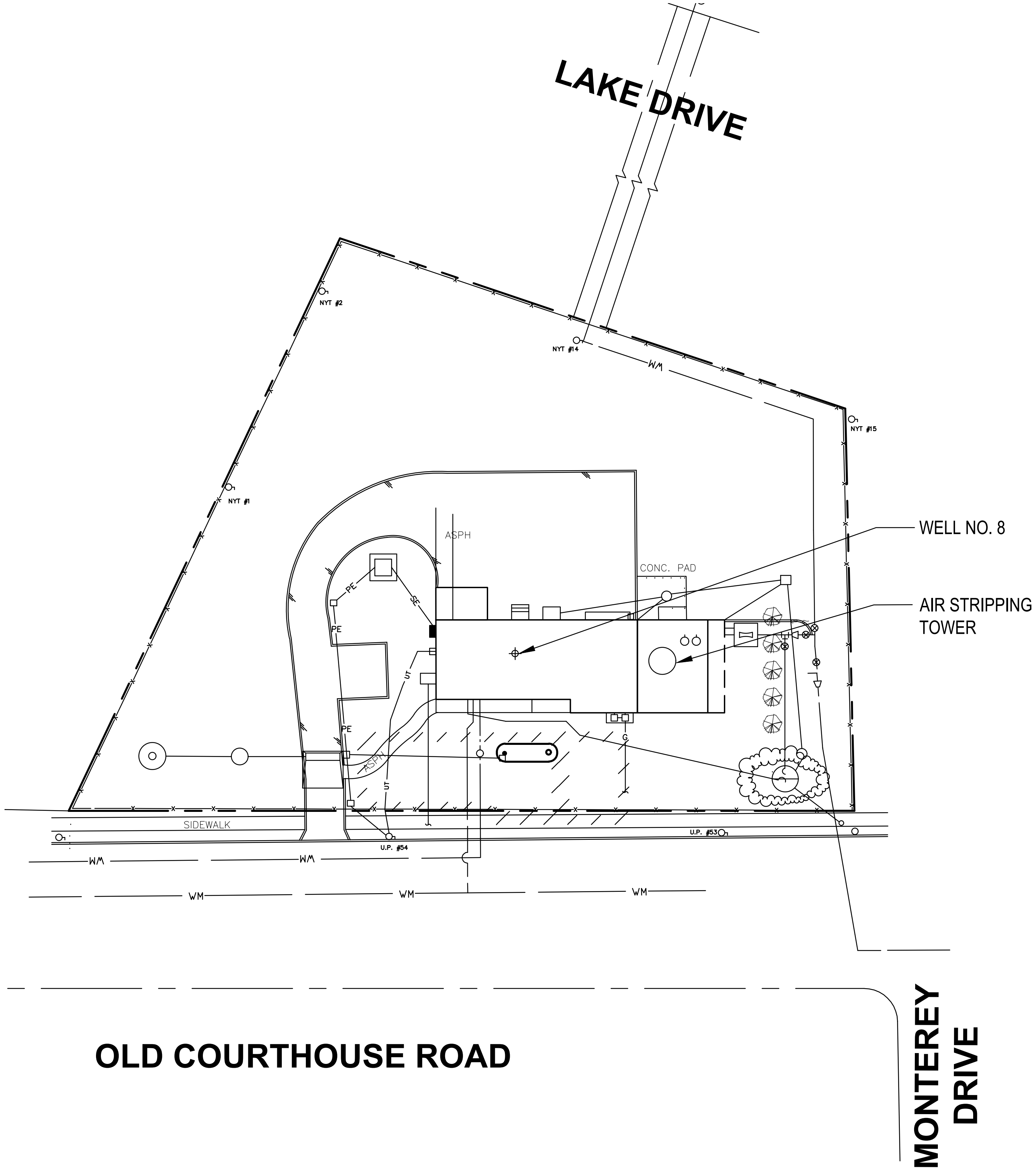
1 Site Plan
SCALE: 1"=30'



LOCATION MAP
SCALE: 1"= 900'

FIGURE 2-3
GARDEN CITY PARK WATER DISTRICT
SHELTER ROCK ROAD
PLANT NO. 7/10

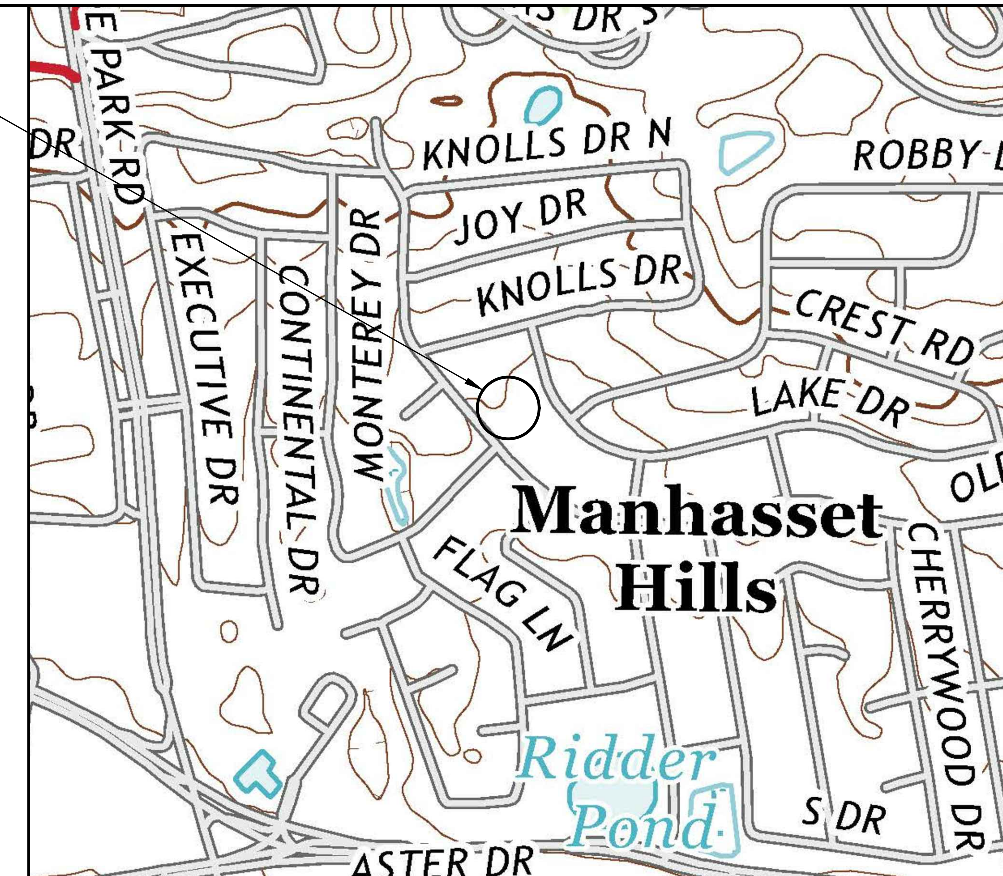
Garden City Park Water District	Project # GCPK2001	H2M architects + engineers
	DATE: MAY 2020	www.h2m.com



SITE PLAN

SCALE: 1"= 40"

PROJECT LOCATION

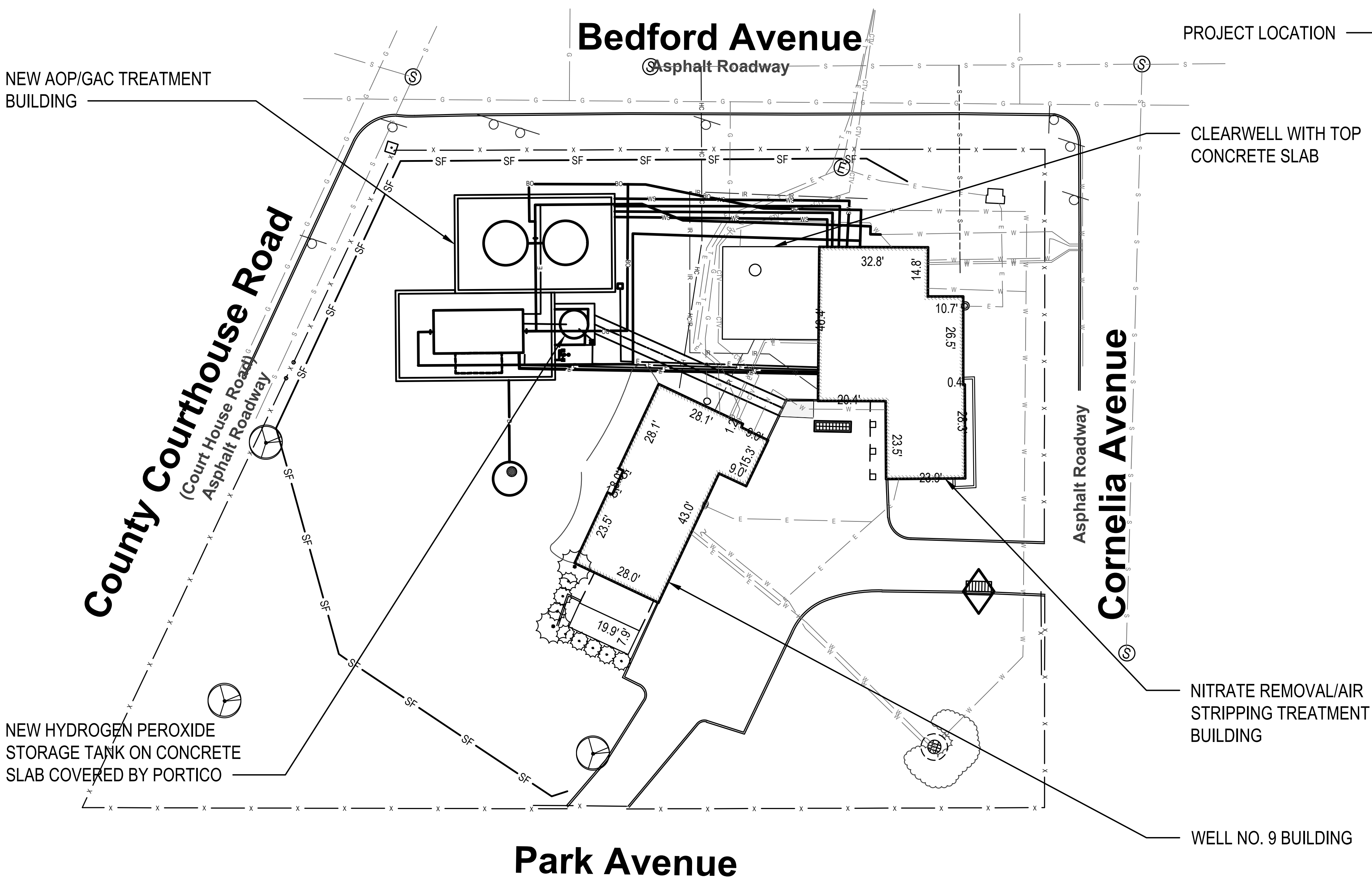


LOCATION MAP

SCALE: NTS

FIGURE 2-4
GARDEN CITY PARK WATER DISTRICT
OLD COURTHOUSE ROAD
PLANT NO. 8

Garden City Park Water District	Project # **GCPK2001**	H2M	architects + engineers
	DATE: **MAY 2020**		www.h2m.com



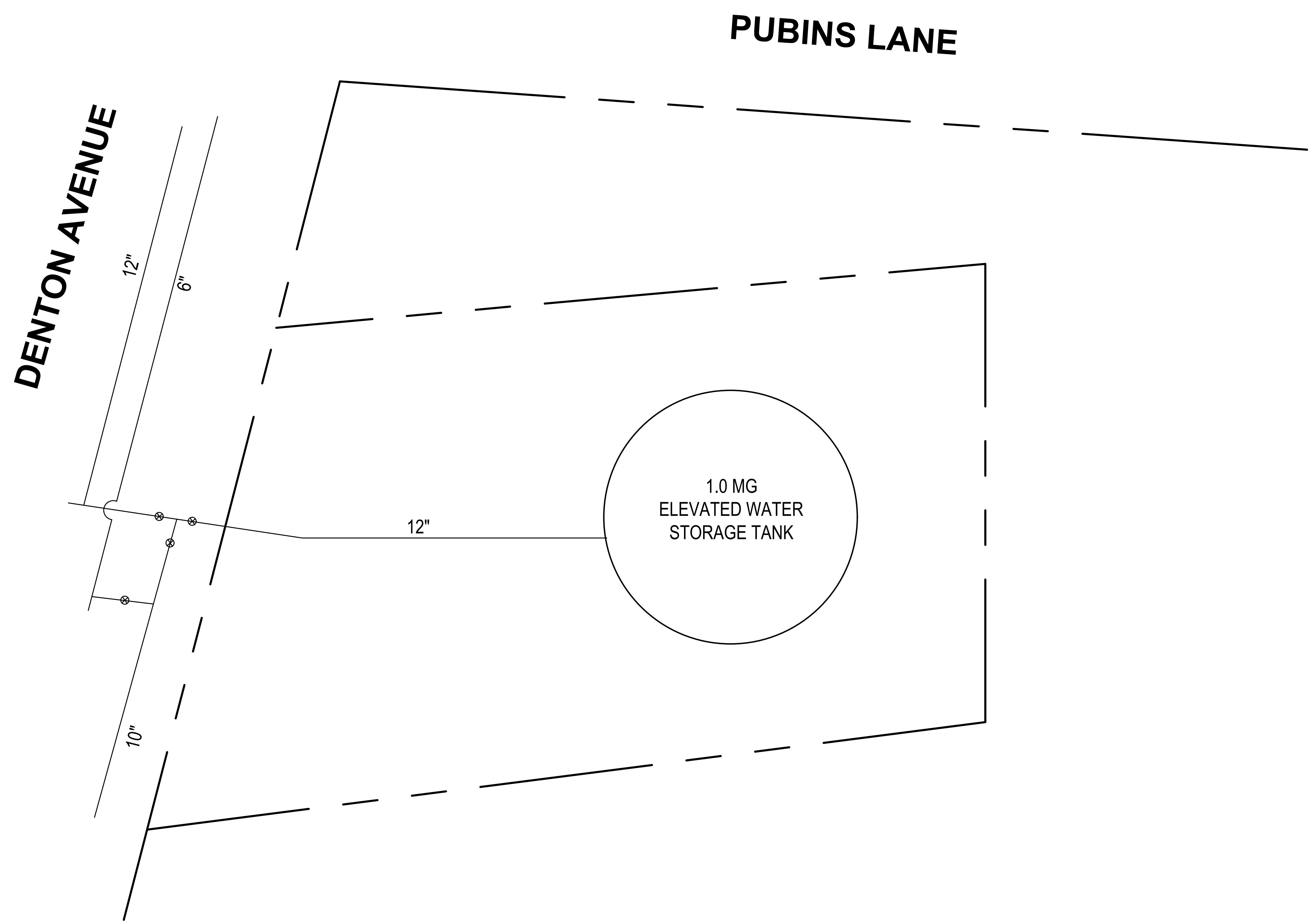
1 Site Plan
SCALE: 1"=40'

PROJECT LOCATION

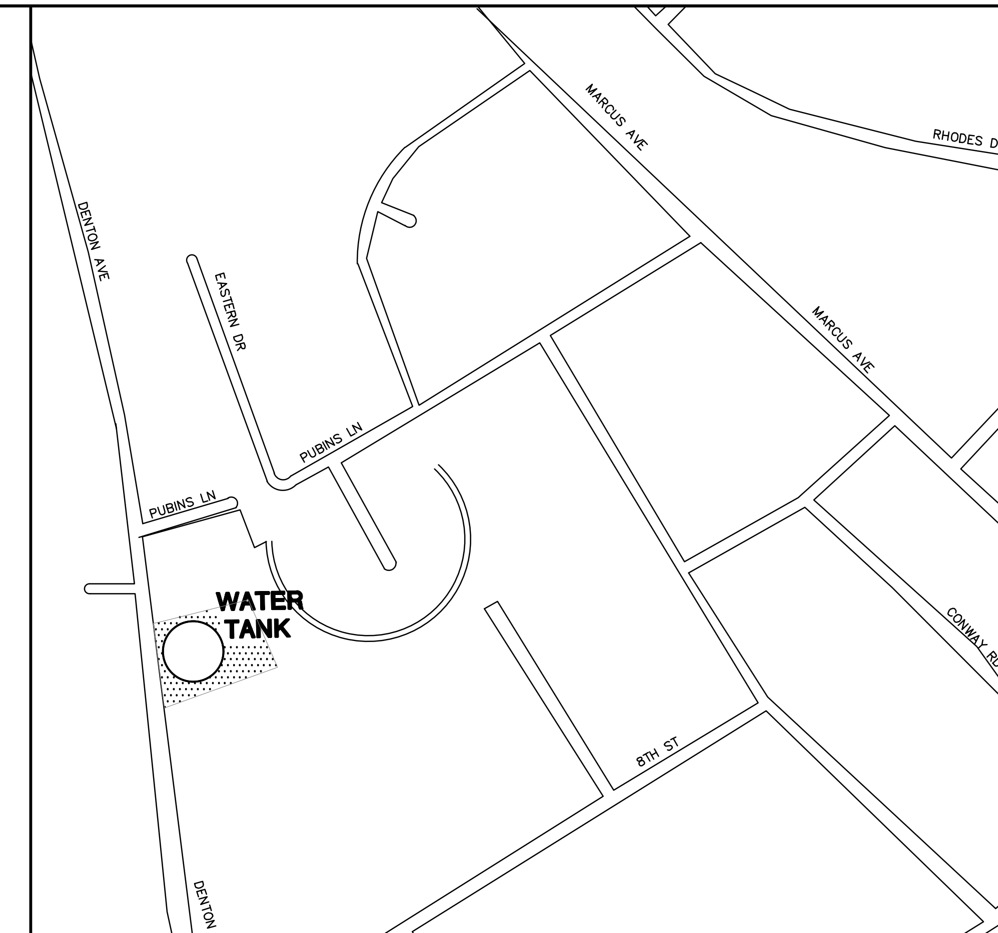
LOCATION MAP
SCALE: 1"= 900'

FIGURE 2-5
GARDEN CITY PARK WATER DISTRICT
BEDFORD AVENUE
PLANT NO. 9

Garden City Park Water District	Project # GCPK2001	H2M architects + engineers www.h2m.com
	DATE: MAY 2020	



SITE PLAN
SCALE: 1" = 50'



LOCATION MAP
SCALE: 1"= 800'

FIGURE 2-6
GARDEN CITY PARK WATER DISTRICT
DENTON AVENUE
WATER STORAGE TANK

Garden City Park Water District	Project # GCPK2001	H2M architects + engineers www.h2m.com
	DATE: MAY 2020	

MAP OF

GARDEN CITY PARK WATER DISTRICT

NASSAU COUNTY, NEW YORK

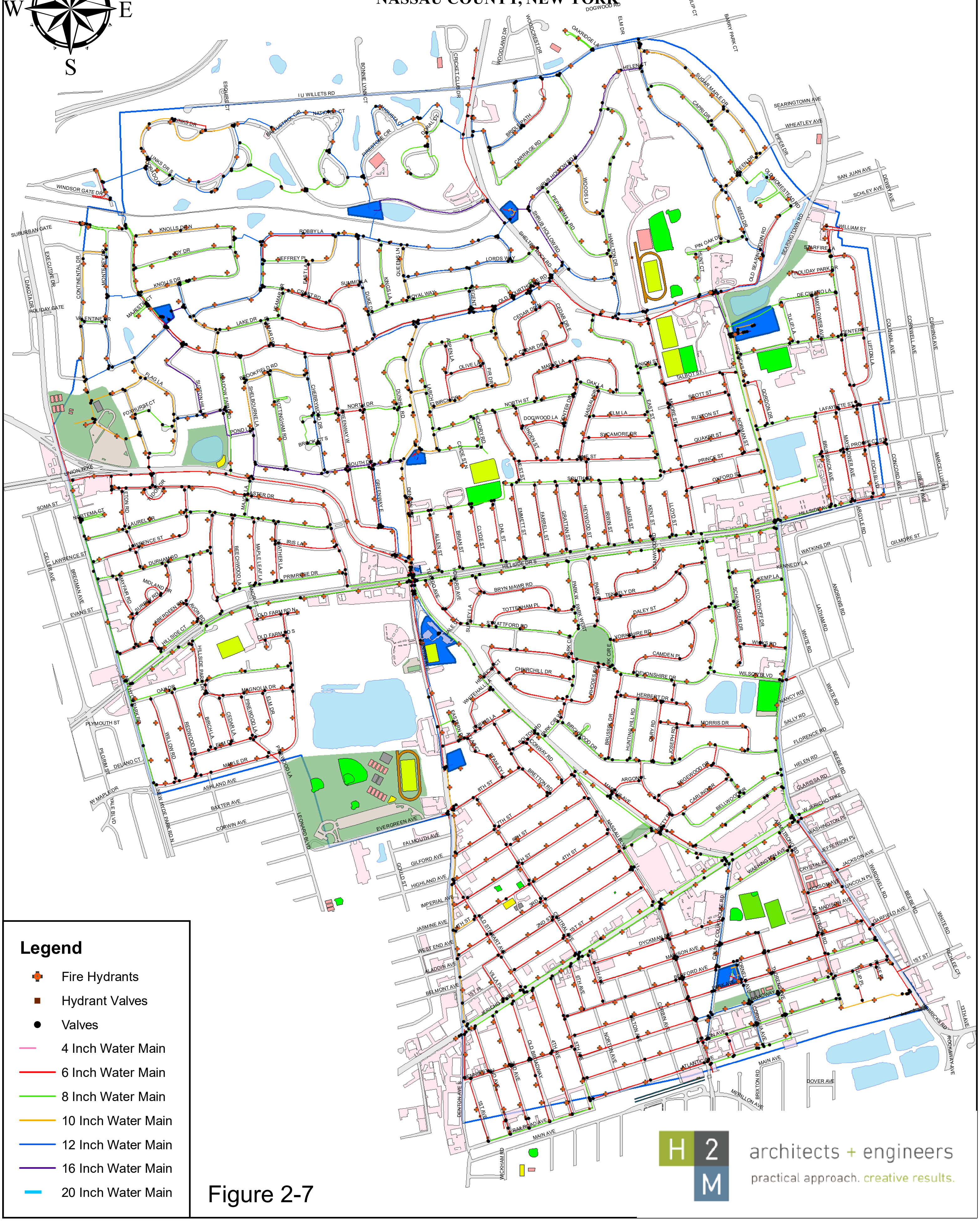


Figure 2-7

APPENDIX A

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Garden City Park Fd

County New York (Metro)(Nassau), State New York (Metro) (31) Witnessed by: Insurance Services Office Date: Nov 7, 2014

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$ INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	RESID.	FLOW -AT 20 PSI NEEDED **	AVAIL.	REMARKS***	MODEL TYPE
1		Armstrong Rd & Broadway	Garden City Park Water District, Main	920	0	0	920	70	41	4500	1200		
1.1		Armstrong Rd & Broadway	Garden City Park Water District, Main	920	0	0	920	70	41	4500	1200		
1.2		Armstrong Rd & Broadway	Garden City Park Water District, Main	920	0	0	920	70	41	3500	1200		
10		Hillside Ave & New Hyde Park Rd	Garden City Park Water District, Main	410	0	0	410	60	50	4500	850		
10.1		Hillside Ave & New Hyde Park Rd	Garden City Park Water District, Main	410	0	0	410	60	50	2500	850		
11		Hillside Ave & Manor Ct	Garden City Park Water District, Main	790	0	0	790	62	34	7500	1000		
11.1		Hillside Ave & Manor Ct	Garden City Park Water District, Main	790	0	0	790	62	34	3500	1000		
12		Marcus Av & New Hyde Park Rd	Garden City Park Water District, Main	580	0	0	580	60	28	1750	650		
13		Third Ave & Railroad Av	Garden City Park Water District, Main	170	0	0	170	70	60	1000	400		
14		Nottingham Rd & Nottingham CT	Garden City Park Water District, Main	1150	0	0	1150	68	46	750	1800		
2		Hamilton Dr. High School	Garden City Park Water District, Main	1150	0	0	1150	56	48	5000	2600		
2.1		Hamilton Dr. High School	Garden City Park Water District, Main	1150	0	0	1150	56	48	1000	2600		
3		Herricks Rd & Shelter Rock Rd	Garden City Park Water District, Main	1190	0	0	1190	64	62	5500	6300		
3.1		Herricks Rd & Shelter Rock Rd	Garden City Park Water District, Main	1190	0	0	1190	64	62	750	6300		
4		Armstrong Rd & Washington Rd	Garden City Park Water District, Main	1000	0	0	1000	70	32	5000	1200		
4.1		Armstrong Rd & Washington Rd	Garden City Park Water District, Main	1000	0	0	1000	70	32	4500	1200		

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Garden City Park Fd

County New York (Metro)(Nassau), State New York (Metro) (31) Witnessed by: Insurance Services Office Date: Nov 7, 2014

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM				PRESSURE PSI		FLOW -AT 20 PSI		REMARKS***	MODEL TYPE
				INDIVIDUAL HYDRANTS			TOTAL	STATIC	RESID.	NEEDED **	AVAIL.		
4.2		Armstrong Rd & Washington Rd	Garden City Park Water District, Main	1000	0	0	1000	70	32	4500	1200		
4.3		Armstrong Rd & Washington Rd	Garden City Park Water District, Main	1000	0	0	1000	70	32	2000	1200		
5		Atlantic Ave & Thorens Av	Garden City Park Water District, Main	670	0	0	670	70	52	3500	1200		
5.1		Atlantic Ave & Thorens Av	Garden City Park Water District, Main	670	0	0	670	70	52	3500	1200		
6		Center St & Tulip La	Garden City Park Water District, Main	820	0	0	820	66	54	3500	1700		
7		Denton Ave & Hickory Rd	Garden City Park Water District, Main	1060	0	0	1060	68	62	3500	3300		
8		Hillside Av & Herricks Rd	Garden City Park Water District, Main	1140	0	0	1140	66	56	4500	2600		
8.1		Hillside Av & Herricks Rd	Garden City Park Water District, Main	1140	0	0	1140	66	56	4500	2600		
8.2		Hillside Av & Herricks Rd	Garden City Park Water District, Main	1140	0	0	1140	66	56	4000	2600		
8.3		Hillside Av & Herricks Rd	Garden City Park Water District, Main	1140	0	0	1140	66	56	3000	2600		
9		Central Av & 3rd St	Garden City Park Water District, Main	1030	0	0	1030	66	54	3000	2100		
9.0		Central Av & 3rd St	Garden City Park Water District, Main	1030	0	0	1030	66	54	3500	2100		
9.1		Central Av & 3rd St	Garden City Park Water District, Main	1030	0	0	1030	66	54	3000	2100		

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

GARDEN CITY PARK WATER DISTRICT

HYDRANT FLOW TEST RESULTS

Armstrong Road
H2M Project No.: GCPK 16-51

Test Date: April 27, 2016

Personnel: Dustin J. Rigos (H2M), Waqas Saeed (H2M), Field Personnel (GCPK)

Plant No.9: ONLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
Armstrong Road & Jackson Avenue	580	
Test Hydrant Location	Static (psi)	Residual (psi)
Armstrong Road & Washington Ave.	68	64

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

- Q_A - Available fire flow at 20 psi. residual
- Q_F - Actual full flow measured during test
- h_a - Pressure drop to 20 psi. residual
- h_f - Pressure drop measured during test

Q_A = 580 gpm x $\frac{(68\text{ psi} - 20\text{ psi})^{.54}}{(10\text{ psi})^{.54}}$ = **1,350 gpm**

*Note: The recorded pressure drop during the test was 4 psi, however for the accuracy of the available fire flow equation a pressure drop of 10 psi is utilized in accordance with NFPA 291.

Plant No.9: OFFLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
Armstrong Road & Jackson Avenue	530	
Test Hydrant Location	Static (psi)	Residual (psi)
Armstrong Road & Washington Ave.	68	57

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

- Q_A - Available fire flow at 20 psi. residual
- Q_F - Actual full flow measured during test
- h_a - Pressure drop to 20 psi. residual
- h_f - Pressure drop measured during test

Q_A = 530 gpm x $\frac{(68\text{ psi} - 20\text{ psi})^{.54}}{(68\text{ psi} - 57\text{ psi})^{.54}}$ = **1,200 gpm**

GARDEN CITY PARK WATER DISTRICT

HYDRANT FLOW TEST RESULTS

Atlantic Avenue
H2M Project No.: GCPK 16-51

Test Date: April 27, 2016

Personnel: Dustin J. Rigos (H2M), Waqas Saeed (H2M), Field Personnel (GCPK)

Plant No.9: ONLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
180 Atlantic Ave.	880	
Test Hydrant Location	Static (psi)	Residual (psi)
195 Atlantic Ave.	66	56

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

Q_A - Available fire flow at 20 psi. residual
Q_F - Actual full flow measured during test
h_a - Pressure drop to 20 psi. residual
h_f - Pressure drop measured during test

$Q_A = 880 \text{ gpm} \times \frac{(66 \text{ psi} - 20 \text{ psi})^{.54}}{(66 \text{ psi} - 56 \text{ psi})^{.54}} =$ **2,000 gpm**

Plant No.9: OFFLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
180 Atlantic Ave.	700	
Test Hydrant Location	Static (psi)	Residual (psi)
195 Atlantic Ave.	66	51

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

Q_A - Available fire flow at 20 psi. residual
Q_F - Actual full flow measured during test
h_a - Pressure drop to 20 psi. residual
h_f - Pressure drop measured during test

$Q_A = 700 \text{ gpm} \times \frac{(66 \text{ psi} - 20 \text{ psi})^{.54}}{(66 \text{ psi} - 51 \text{ psi})^{.54}} =$ **1,650 gpm**

GARDEN CITY PARK WATER DISTRICT

HYDRANT FLOW TEST RESULTS

Broadway
H2M Project No.: GCPK 16-51

Test Date: April 27, 2016

Personnel: Dustin J. Rigos (H2M), Waqas Saeed (H2M), Field Personnel (GCPK)

Plant No.9: ONLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
120 Broadway	1220	
Test Hydrant Location	Static (psi)	Residual (psi)
150 Broadway	62	52

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

- Q_A - Available fire flow at 20 psi. residual
- Q_F - Actual full flow measured during test
- h_a - Pressure drop to 20 psi. residual
- h_f - Pressure drop measured during test

$$Q_A = 1220 \text{ gpm} \times \frac{(62 \text{ psi} - 20 \text{ psi})^{.54}}{(62 \text{ psi} - 52 \text{ psi})^{.54}} =$$ **2,650 gpm**

Plant No.9: OFFLINE

I. TEST RESULTS:

Flow Hydrant Location	Flow (gpm)	
120 Broadway	1030	
Test Hydrant Location	Static (psi)	Residual (psi)
150 Broadway	62	42

II. AVAILABLE FIRE FLOW AT 20 PSI RESIDUAL (NFPA 291): $Q_A = \frac{Q_F \times (h_a^{.54})}{(h_f^{.54})}$

- Q_A - Available fire flow at 20 psi. residual
- Q_F - Actual full flow measured during test
- h_a - Pressure drop to 20 psi. residual
- h_f - Pressure drop measured during test

$$Q_A = 1030 \text{ gpm} \times \frac{(62 \text{ psi} - 20 \text{ psi})^{.54}}{(62 \text{ psi} - 42 \text{ psi})^{.54}} =$$ **1,550 gpm**

GARDEN CITY PARK WATER DISTRICT

C-FACTOR TEST RESULTS

Fulton Avenue
H2M Project No.: GCPK 16-51

Test Date: April 27, 2016

Personnel: Dustin J. Rigos (H2M), Waqas Saeed (H2M), Field Personnel (GCPK)

I. TEST RESULTS*:

Flow Hydrant Location		Flow (GPM)
Fulton Ave. Between Thorens Ave. & Armstrong Rd.		530
Test Hydrant Location	Static (psi)	Residual (psi)
1) Easement w/o Herricks Road	66	12
2) 198 Armstrong Road	66	10

Distance between test hydrant#1 and test hydrant#2 = 440’

II. C-FACTOR CALCULATION

$$C = \frac{(4.52 Q_F^{\ 1.85})^{.5405}}{(f\, d^{4.87})^{.5405}}$$

C - Coefficient of friction
Q_F - Actual full flow measured during test (gpm)
f - friction loss in psi per foot
d - Inside diameter of piping.

f = 2 psi / 440 feet = .0045 psi/ft.

$$C = \frac{(4.52 * 530^{1.85})^{.5405}}{(.0045 * 10^{4.87})^{.5405}} =$$

C = 52

*Note: Well 9-1 was not in operation at the time of this test.