PRELIMINARY ENGINEERING REPORT

2019 WATER SYSTEM IMPROVEMENTS

CONTRACT 12 – NEW WATER TREATMENT PLANT & IMPROVEMENTS

CONTRACT 13 – WATER MAIN REPLACEMENT

FOR THE

SANDY HOOK WATER DISTRICT
Serving Our Community

SANDY HOOK WATER DISTRICT
474 Howards Creek Road
Sandy Hook, Kentucky 41171

STATE OF KENTUCKY
BRYAN K. LOVAN
13540
LICENSED PROFESSIONAL ENGINEER

Digitally signed by Bryan K. Lovan, PE, PLS
Date: 2022.07.05 13:40:35 -04'00'

BE Project No. 19003

February 2020

STATE OF KENTUCKY
BRYAN K. LOVAN
13540
LICENSED PROFESSIONAL ENGINEER
12-18-20

PREPARED BY:

BLUEGRASS ENGINEERING PLLC

222 East Main Street, Ste. 1 • Georgetown, KY 40324

SECTION 1 PROJECT PLANNING

1.01 LOCATION

The service area of Sandy Hook Water District is the entire county of Elliott. The proposed project consists of replacement of the existing water treatment plant to a new location on Howard Creek Road 1,800 feet north of the current water treatment facility, replacement of approximately 20,000 linear feet of water main, and rehabilitation of an existing water storage tank.

The Wrigley water storage tank is a 105,000-gallon glass-lined tank located near the 11-mile marker of KY-Highway 7 south of the Elliott/Morgan county line. This is the water storage tank which serves the entire southern portion of Sandy Hook's water system. This tank provides service for the populated areas of KY Highway 7 from Sandy Hook to areas in Northern Morgan County. The project will also include work at the existing Wrigley Pump Station located near the 3-mile marker of KY Highway 7 to augment the repairs on the water tank by installing new Variable Frequency Drive (VFD's) units to the existing pumps.

The final component of this project will be the water main replacement of approximately 20,000 feet of problematic 4" PVC waterline in the KY Highway 556 and KY Highway 755 area affecting about 50 residences.

1.02 ENVIRONMENTAL RESOURCES PRESENT

The major environmental features within the proposed area for the water main replacement project feature a variety of landforms and topographic changes from extremely steep to relatively flat terrain. The gradual undulating terrain allows for potable water to be transported with limited booster stations. Water pressures range from 30 psi to over 150 psi in sections of the system. Many of the branch lines are within valleys and ridgelines in particular along the eastern boundary of the county.

The proposed new treatment plant site is located along the valley floor of Howards Creek, tributary to the Little Sandy River. The site is relatively flat terrain and will be located above the local floodplain.

No known historic sites are noted in the planning area.

1.03 POPULATION TRENDS

As of the population census for 2010, there were 7,852 people in Elliott County with 2,773 households and an average household size of 2.45 persons per household.

The current and past population for the City of Sandy Hook as well as Elliott County is presented in Table 1.03-1.

Table 1.03-1 Past Population

Population	1990	2000	2010	2017 (Estimated)
City of Sandy Hook	548	678	675	614
Balance of Elliott County	5,907	6,070	7,177	6,894
Total Population	6,455	6,748	7,852	7,508

Information from the Kentucky State Data Center, University of Louisville, Urban Studies Institute gives the projected population of Elliott County through the year 2040 is presented in Table 1.03-2.

Table 1.03-2 Population & Household Projection

Population Projection	Year				
	2020	2025	2030	2035	2040
Elliott County	7,633	7,542	7,382	7,176	6,917
Total Households	2,975	3,072	3,100	3,095	3,020
Average Household size	2.21	2.10	2.03	1.96	1.92

The population for Elliott County based on the 2010 Census was 7,852 persons with an average person per household of 2.45. The projected population for the year 2020 is estimated at 7,633 with an average household size of 2.21 and is projected to decrease to 1.92 persons per household by the year 2040 according to the University of Louisville - Kentucky Data Center. Using the average persons per household over the next twenty years as 2.06, this estimate will be used for determining the demand for water usage projections within this planning document.

Historical records from the water treatment plant (WTP) for the amount of treated water produced to serve customers of the Sandy Hook Water District's system show that the average demand (water produced) per customer varies from approximately 136 gallons per day per customer (GPD/Customer) to approximately 155 GPD/Customer. The peak day demand averages about 130% of the average day demand, and the minimum day demand is about 65% of the average day demand.

Information for the year 2019 show that the month of February was the maximum month of record having an average day of treated water produced of 298,000 gallons (total month's production of 6,881,000 gallons). While the maximum day of record is near the plant's capacity of 0.374 MGD, there are hydraulic restrictions and finished water quality issues that limit the treatment plant's ability to effectively produce 374,000 gallons per day of potable water.

The current average household population based on the 2010 census is 2.45 persons per household for Elliott County. The total number of customers for the District's water system as of December 31, 2019 is approximately 1,350. The estimated population that is served by the current water system is presented in Table 1.03-3

Table 1.03-3 Total Population Served by Sandy Hook Water District

Total Population Served by Sandy Hook Water District			
	Number of Customers (2)	Population Served (1)	Average Water Produced (3)
Sandy Hook Water District	1,350	3,300	201,500

(1) The population served is based on 2.45 persons per customer.
(2) Total number of customers as of December 31, 2019
(3) Average Water Produced as of August 31, 2019

1.04 COMMUNITY ENGAGEMENT

The District will be holding a public meeting inviting all individuals affected by this project. This meeting will communicate the need for the project and the resulting system improvements that will be accomplished through the project.

SECTION 2 EXISTING FACILITIES

2.01 LOCATION

The Sandy Hook Water District is in Elliott County, Kentucky near the county seat of Sandy Hook, and located along the Little Sandy River in eastern Kentucky. The project topographic maps are included at the end of this report and illustrates the various locations of this project (Appendix A).

2.02 HISTORY

The Sandy Hook Water District operates a 0.374 MGD water treatment plant (WTP) and a water distribution system serving approximately 1,350 customers. The raw water source is groundwater and consists of eight groundwater wells, with five wells currently abandoned or inactive. The three active wells provide the WTP with the source water and the wells may be operated simultaneously during peak demand or individually during periods of low demand.

The District only uses three of the eight groundwater wells. Three wells are low volume producing and a fourth well was discovered to have natural gas in the well and is not usable.

The WTP consists of three greensand pressure filters with a gas chlorinator system for disinfection in addition to feeding fluoride as required by regulations, potassium permanganate for iron and manganese removal, and a corrosion inhibitor (Aquadene) for sequestering the iron and manganese in the distribution system. The WTP has a below ground clearwell of 25,000-gallon capacity and two high service pumps that deliver the potable water to the distribution system.

The distribution system has four storage tanks with a total volume of 525,000 gallons and approximately 110 miles of water lines ranging in size from two inch to eight inch.

The storage tanks and associated capacities are listed below:

Tank Name	Capacity
Town Tank	160,000
Cemetery Tank	160,000
Brown Ridge Tank	100,000
Wrigley Tank	105,000

2.03 CONDITION OF EXISTING FACILITIES

The following information was based on an evaluation of the existing treatment plant and the treatment processes.

A. Water Treatment Plant Building

The existing water treatment plant was originally constructed between 1959 and 1960 with the construction of three groundwater wells and pressure filters. This plant has gone through several expansions and additions. All of the building structures are pre-engineered metal buildings and are showing signs of corrosion, metal fatigue, and general wear and tear.

The original structure was constructed in 1959 and now only houses the high service pumps, chemical feed equipment, laboratory facilities. This building is lacking the needed space for proper separation of processes and equipment.

The structure which houses the vertical pressure filters was constructed in 1992 with an addition constructed in 2005 adding the third pressure filter.

The entire plant site is restricted in access and does not have the available space for receiving and off-loading of material and chemicals. The existing building housing the filters has an overhead electric power line that is located directly above the building, limiting any possibility for expanding or building a new structure on the existing property.

B. Pressure Filters

The existing water treatment plant has three vertical pressure filters and are seven (7) foot in diameter. The pressure filters are piped to allow for each filter to be individually operated and the ability to remove one filter from service and still treat the influent groundwater.

The filter media is a dual media comprised of greensand and anthracite with a gravel support bed. Greensand is a black filter media used for removing soluble iron, manganese, hydrogen sulfide from groundwater supplies, which has been used since the 1950's in the United States. Historically, the use of greensand product was utilized through two distinct processes, the intermittent regeneration, and the continuous regeneration process. The existing treatment plant utilizes the continuous regeneration method.

The advantages of a greensand process over aeration and filtration are; single pumping (as the process generally employs pressure filtration), reliability, flexibility, and a high-quality effluent coupled with ease of operation. Operational options including intermittent regeneration and continuous regeneration are uncomplicated in both their design and operation, resulting in efficient and reliable methods for iron and manganese removal.

As the pressure filters operate, the pressure drop increases as the filter bed becomes contaminated with the insoluble products. After either a predetermined number of gallons or when the headloss reaches a preset value, the filters are backwashed to remove the filtered particulates.

The backwash waste water is piped to the backwash lagoons to allow for the settled precipitates to dry before being disposed.

C. Backwash Sand Filters (Backwash Lagoons)

Filter backwash waste water from iron and manganese removal plants shall be discharged to sand filters with a total filter area sufficient to adequately dewater the solids removed from the filters. The "red water" filter shall have sufficient capacity to contain, above the level of the sand, the entire volume of wash water produced by washing all of the production filters in the plant, unless the production filters are washed on a rotating schedule and the flow through the production filters is regulated by true rate of flow controllers.

The existing water treatment plant has two backwash lagoons with a total surface area of 1,125 square feet. The two sand filters allow for only one filter to be removed from service at any time and still function as needed.

D. Clearwell Storage - Chlorine Contact

The existing 5,000-gallon clearwell storage serves as a wetwell for the high service pumps and another 20,000-gallon clearwell is below the filter building. As the point of chlorination in treatment plants is moved back in the process to avoid excessive formation of disinfection by products, subsequent to the THM rule, clearwells have become increasingly important in the disinfection process. Another creative use of the clearwell is to provide finished water storage to allow the plant to be shut down during water quality or other types of emergencies. A large or multiple clearwells may also allow for off-peak pumping to reduce electrical costs.

The current clearwell capacity is approximately 25,000 gallons; however, only approximately 20,000 gallons is considered usable storage volume. This is about 5.3% of the plant's rated capacity (0.374 MGD). Kentucky Division of Water General Design Criteria currently recommends that systems store at least

15% of the daily production in storage facilities. The existing water treatment facility should have at least 56,160 gallons at 0.374 mgd production to meet the recommended 15% storage.

E. Disinfection

The existing chlorination system for disinfection is a gaseous chlorine feed system for application prior to the pressure filters. Chlorine gas is supplied to the plant in 150 lb cylinders with on-site storage not to exceed 1,500 lbs. For quantities greater than 1,500 lbs, the District would be required to perform a Risk Management Plan. A separate storage room, meeting the ventilation requirements of Ten State Standards is provided.

The existing chemical feed system is manually adjusted and automatically flow paced by a flow meter located downstream of the treated water located on the discharge side of the high service pumps. It is recommended that the method of disinfection system have 30 days of storage in order to meet Ten State Standards, with automatic transfer, scale, and chemical feed system to inject chlorine as required.

F. Fluoride

Fluoride in the form of a liquid or powder is commonly fed to drinking water supplies to increase the fluoride level in the water to promote public dental health. Sodium fluoride (NaF) is an inorganic compound that is colorless or white solid and is readily soluble in water. Sodium fluorosilicate (Na2SiF6) is the sodium salt of fluorosilicic acid and is a powder or very fine crystal that is easier to ship than fluorosilicic acid. It is also known as sodium silicofluoride.

Caution shall be used in handling and storage of this chemical and is necessary because of the aggressive nature of this chemical.

The existing feed system utilizes the powder form of fluoride and is fed into the clearwell immediately following the filters. The metering pumps allow for manual adjustment or flow-paced by a flow meter located downstream of the filters.

G. Potassium Permanganate

Potassium permanganate is another treatment chemical used to provide oxidation for the removal of iron and manganese from groundwater sources. The chemical is typically associated with a pressure or gravity sand filter process to aid in contaminant removal.

The existing feed system utilizes the powder form of potassium and is fed into the raw water prior to the pressure filters. The metering pumps allow for manual adjustment or flow-paced by a flow meter located upstream of the filters.

H. Corrosion Inhibitor

Aquadene SK-7103 is a phosphate based dry blend chemical specially formulated to control iron, manganese, scale, and corrosion problems in drinking water systems. These products are also used as a sequestrant to isolate and hold unwanted impurities from depositing into the water system. Controlling staining (red water caused by iron-based impurities and black water caused by manganese-based impurities), controlling copper, and controlling lead release to the public are the primary applications of phosphate-based products.

The existing feed system utilizes the powder form of the corrosion inhibitor and is fed immediately downstream of the high service pumps and prior to entering into the distribution system. The metering pumps allow for manual adjustment or flow-paced by a flow meter located downstream of the high service pumps.

I. High Service Pumps

Two high service pumps are provided to pump treated water to the system users. One of the high service pumps serves as a spare. The pumps were designed to convey up to 0.374 MGD to the distribution system; however, due to the age of the pumps they are only capable of pumping approximately 200,000 to 250,000 GPD.

2.04 WATER/ENERGY/WASTE AUDITS

No water, energy, or waste audit has been conducted on the existing water treatment plant or distribution system to date.

For most water treatment plants between 80% and 90% of energy consumed is for pumping of either raw water or distributing finished water. The District practices energy conservation when it is necessary to replace old or damaged motors with newer more efficiently designed motors and pumps.

SECTION 3 NEED FOR PROJECT

The current water treatment facility has been allowed to fall into disrepair necessitating either the renovation or replacement of the facility. Replacement has been chosen as the current location does not allow for any future growth and has proven to be problematic. Chemical delivery trucks must back down the county road in order to have room to deliver the necessary products. This is a narrow county road and the existing property surrounding the plant hinders any ability to expand on the existing site for the treatment facility.

The Wrigley water storage tank is an eighteen (18) year old, 105,000 glass-lined standpipe 47 feet tall and a diameter of 20 feet. The interior resealing is necessary for the continued operation of this very important structure. Based on the last tank inspection report performed in May of 2014 (Appendix B), it was recommended to reseal the interior seams and random corrosion areas. These repairs are necessary for its continued use. This is the primary water storage facility for the southern portion of Sandy Hook's water system. Loss of this would compromise the populated areas of KY Highway 7 from Sandy Hook to areas in Northern Morgan County. In addition, variable frequency drives (VFDs) will be added to the pump motors at the primary pump station that supplies this tank and will allow work to be conducted on the tank while maintaining safe drinking water to all affected residents by providing adequate pressure in the lines while the tank is out of commission. Installation of the VFDs will also improve the overall performance of the pump station in energy costs and produce much less stress on current waterlines.

Water main replacement around the Sandy Hook area along KY Highway 556 and KY Highway 755 is also needed to replace existing water lines that are constantly problematic. This project will replace approximately 20,000 feet of problematic 4" PVC waterline affecting about 50 residences. The current water main has numerous small leaks and requires near-constant repairs in order to keep the main in service. The new main will be located adjacent to the abandoned water line location and reconnection to the same customer meters.

Additionally, should project funds be available the project may include maintenance to existing wells, well testing, a new well, or additional water main replacement.

3.01 HEALTH, SANITATION, AND SECURITY

The proposed project will replace the existing WTP, replace problematic water mains, and the rehabilitation of an existing water tank.

The glass-lined tank was last inspected in 2014 and the results of that inspection showed the interior of the tank to be in a "fair" condition. In the report it noted some corrosion along the seams with slight pinholes that would only continue to increase in depth if not corrected in a reasonable amount of time. The tank also is losing its sealant which allows for additional corrosion if not resealed. The sacrificial anodes are non-existent. Failure to rectify these aforementioned tank issues with continue to allow the tank to corrode and thus reduce the chlorine residual in the tanks as the rust areas break down the chlorine. The new anodes will allow any negative ions to be absorbed by the anodes instead of the tank. These actions will provide better quality of water to the customers as the chlorine residuals will remain stronger.

The replacement of approximately 20,000 LF of problematic water main is required as the District continues to repair broken pipe in a challenging area of deep ravines or valleys and large drainage areas. These water main breaks not only interrupt service to the effected customers, but continues to force the District to issue boil water advisories until the proper testing of the water is complete. This could also create low pressure in the effected areas which has the potential for contamination from surface water entering leaking joints or broken water mains.

A new water treatment plant will replace an aged facility that was first built in 1960, upgraded in 1986 and 1992, with the replacement of various equipment in 2004. The new plant will allow all electrical items to be brought to code, and potentially replace powder fluoride with the safer liquid fluoride replacing the more hazardous granular fluoride. The new plant will be designed to have all the latest OSHA equipment to safeguard and protecting the employee from potential accidents. The old plant's location is very difficult for the delivery of chemicals as there is no access for the delivery truck to turn around. All current deliveries are made by the drivers having to back down a county road for several hundred feet. The new location will provide easier access for chemical deliveries and less potential of accidents on and off the site. The new plant site will also be located in a more secure area of Howards Creek Road. The new site will also bring additional security to the main well (#8) as it will be located on the new plant property and thus will have the same updated security as the new plant.

3.02 AGING INFRASTRUCTURE

The existing water treatment plant was initially constructed in 1960 with a capacity of approximately 100,000 GPD. The existing plant consisted of two 7-foot diameter pressure vessels, a 5,000-gallon below-ground clearwell, two sand filter beds, three groundwater wells, laboratory, two high service pumps, and chemical feed system for disinfection and fluoridation. In 1992 modifications and updates were installed as two new pressure filters and a 20,000 gallon below ground clearwell was installed with a new extended filter building. This also included additional piping, telemetry, and filter media. In 2004 modifications and updates were installed adding a third pressure filters with a new extended filter building and a new groundwater well.

The water treatment plant building has deteriorated due to age. New treatment processes are not needed, but new equipment and controls and the building needs to be replaced to adequately house the equipment and materials for treatment.

3.03 REASONABLE GROWTH

Growth has not been considered a significant factor in the need for the proposed project. As the District's customer base has increased in the last 30 years, the need to replace these older water mains and aging water treatment plant to offer sustained water service to its customer base is a priority.

Reasonable growth and a slight increase in customers can be expected over the next 20 years. Based on population projections, the current trend for Elliott County indicates a decline in population. However, based on the steady increase in water customers over the past 10 years indicate an increase of approximate 1% per year. It may be concluded that by the year 2040 the WTP will need the capability to produce up to 0.500 MGD of water by the proposed plant for the existing and potential water customers of Elliot County and surrounding areas. Furthermore, it may be concluded that demand is more likely to be higher than lower and therefore making an abundant water supply a significant component of any water treatment plant site selection criteria is very important.

SECTION 4 ALTERNATIVES CONSIDERED

4.01 Description

The current treatment plant is operating properly and efficiently for the past several years. The facility has been allowed to fall into disrepair necessitating either the renovation or replacement of the facility or take “no action.”

The District considered several alternatives included upgrading the existing water treatment plant at the current location with full renovations. This would include replacing all hardware damaged by chlorine as well as replacement of the chlorine system, electrical system, pumps and building to contain the same equipment. This option was considered not viable due to the lack of adjacent property and existing overhead electrical service that would have to be relocated. The accessibility to the existing plant site is also inadequate. Due to the lack of adequate space and maneuverability, material and chemical delivery trucks must navigate backwards down the existing county road in order to have room to deliver the necessary products. This is a narrow county road and the existing property surrounding the plant hinders any ability to expand on the existing site for the treatment facility.

If the "no action" alternative was taken, the treatment plant would continue to fall into disrepair and prohibit any options for expansion to serve future customers in the next 20 years.

The alternative presented in this report was full replacement of the facility at another location allowing adequate accessibility for the building and treatment processes, as well as, material and chemical deliveries and future expansion.

4.02 Design Criteria

The design criteria that will be used on the project includes hydraulic analysis of the existing system to evaluate if adequate pressures are realized throughout the distribution system along with examining flushing velocities. By properly sizing the distribution mains to be installed the District will provide improved service to its customer base while also maintaining potable water of high quality.

The capacity of the proposed treatment plant was determined by reviewing historical population data for the past 20 years, water produced by the plant over the last seven (7) years, and projecting the population and customer growth over the next 20 years.

4.03 Map

Maps of the project area showing the extent of the water system improvements project are located at the end of this report as shown in Appendix A.

4.04 Environmental Impacts

An environmental report detailing the potential impacts of this project is being undertaken. Once the report is finalized any potential impacts will be taken into consideration and any necessary remediation measures will be taken to avoid any negative impact to the environment.

4.05 Land Requirements

Land requirements associated with this project will include the purchase of property on Howards Creek Road for the construction of the new water treatment plant. This is in close proximity to the existing treatment plant and District office so a minimal amount of infrastructure will need to be constructed due to the new WTP site location. This project will also include the need for private easements and encroachment permits from the Kentucky Department of Transportation. The District currently has an option on the proposed plant site, and the easements and permits will be obtained prior to any construction beginning.

4.06 Potential Construction Problems

As with any water main replacement project, a potential problem occurs with the existing infrastructure that is in place. It is imperative to maintain water service to all customers during construction and avoid the existing water main. Also, when an existing tank is temporarily removed from service for maintenance it is a priority to maintain adequate pressures by modifications to the existing pump station that serves this particular tank.

4.07 Cost Estimates

A preliminary project cost estimate is included at the end of this report (Appendix C).

SECTION 5 SELECTION OF AN ALTERNATIVE

5.01 Life Cycle Cost Analysis – Water Treatment Plant

The probable present worth cost analysis for the selected alternative is presented in this section. The selected alternative was evaluated on the basis of a finished water rated capacity of 0.500 mgd for the capital construction cost. The operation and maintenance (O&M) cost was evaluated on the basis of an initial flow rate of approximately 0.374 mgd with an increased capacity up to 0.500 mgd at the end of the 20-year period.

There were several components of the WTP that are considered common for all options. These common components include chlorination equipment, fluoridation equipment, pH adjustment equipment, generator, waste backwash pumps, laboratory equipment and furniture, high service booster pumps, clearwells, and on-site sanitary waste treatment. The costs for these items and the piping, electrical and supervisory control and data acquisition (SCADA), and heating, ventilation, and air conditioning (HVAC) considered necessary for each process was considered basically the same for each individual alternative.

The opinion of probable present worth costs was developed for the selected alternative. The total present worth costs include the capital costs, the present worth of life cycle operation and maintenance (O&M) costs, and the present worth of salvage value of equipment and structures at the end of the life cycle. The life cycle of this project was assumed to be 20 years and a discount rate of 7% was used.

The categories used in the O&M cost were chemical cost, electric cost, filter media replacement, and miscellaneous and maintenance expenses. Personnel staffing of the treatment plant on each treatment option was included and assumed that the staffing level would be the same for all plants.

The advantage to the construction of modular vertical pressure filter treatment units is that this allows for additional capacity to be easily installed, in very short time frame, as demand changes. The capital expense of the units may be delayed until there is a need and capital is available. This concept of saving capital cost on the initial phase of construction could also be applied to the additional groundwater wells, the size of the process building, the second clearwell, additional high service pumps, and additional chemical storage capacity needed for the higher capacity plant. The actual cost savings would need to be further investigated during the final design portion of the project in order to reduce the total cost to the available funds for the project.

O&M costs for the treatment plant include the costs of yearly O&M for the life cycle of the project (20 years). O&M costs include electrical, chemical costs, and filter media replacement costs. The total O&M costs may range from approximately $328,300 to $538,000 per year for the years 2020 and 2040, respectively.

The average annual O&M cost for the life cycle of this project is approximately $433,100. The opinion of probable present worth costs is approximately $7,448,000. A more detailed analysis is included in the Appendix C.

5.02 Life Cycle Cost Analysis – Water Distribution System

In the selection of the preferred alternative for this part of the project, the life cycle cost of the materials to be utilized has been considered. The main material to be utilized is for the water mains. The water main will be of PVC material and recent studies estimate a service life of up to 100 years. This length of service life provides for lower operating and maintenance costs to be realized by the District.

5.03 Non-Monetary Factors

The non-monetary factors considered are the ability to provide service to the existing customer base. With a new water treatment plant and reliable water mains, the existing customer base will have improved service and a higher quality product due to the elimination of existing problematic water mains.

SECTION 6 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

6.01 Preliminary Design

A. New Water Treatment Plant Building – Design Parameters

1. Exterior - General

The building will be a pre-engineered steel building structural frame with perimeter architectural concrete masonry exterior single walls. Location of the building's major components, including windows, louvers, grilles, and finish material, will be designed to match the building structure style and enhance the visual aesthetics of the structure.

The roofs will consist of structural standing seam metal roof panels. The roof will be sloped to provide drainage.

The building structure will have a design load in accordance with the Kentucky Building Code (Latest Revision).

2. Floors

Building floors will be pitched to floor drains in process areas, generally at a slope of 3/16 inches per foot. Process area floors will be coated with an appropriate coating system. Floors in the laboratory, chemical feed rooms, and office will be tiled or epoxy coated concrete.

3. Walls

Process building exterior walls will be constructed of material to match the building style and interior walls will be constructed of concrete block. All interior walls will be painted with epoxy paint for the block walls and acrylic latex paint will be used for gypsum board walls/ceilings and/or metal liner panels. Walls will be designed in accordance with the Kentucky Building Code.

4. Ceilings

Ceilings in process areas will generally be exposed trusses and coated with epoxy paint. A suspended acoustical ceiling or gypsum board ceiling will be provided throughout the laboratory, chemical feed rooms, and office portions of the building.

5. Doors

Hollow metal doors and frames with an epoxy paint finish will be used in most areas of the process buildings. Coated metal doors and frames may be used in chemical storage areas, if chemical compatibility is a concern with metal doors.

6. Windows

All exterior windows will be the vinyl clad fixed or casement type. Interior windows in process buildings will be aluminum fixed type. Interior windows in the laboratory and office portions of the building will be hollow metal-framed borrowed-light-type windows. Exterior windows will have 1-inch insulating glass.

7. Grating

Fiberglass rectangular bar-type serrated or anti-slip top grating will be used in all areas requiring grating.

8. Mechanical Process and Plumbing

The treatment plant process will generally be designed in accordance with KDOW Administrative Regulations Title 401, Chapter 8: Public Water Supply.

9. Heating and Ventilating

The heating, ventilation and air-conditioning systems will generally be designed in accordance with the BOCA National Mechanical Code/1996 and NFPA Chapter 820.

Ventilation systems for hazardous locations and chemical facilities will generally be designed and balanced to achieve a negative static pressure relative to adjacent spaces.

In order to minimize premature corrosion of electrical equipment, the electrical equipment and electrical control rooms will be provided with a separate ventilation system. In general, supplying air into the room with gravity relief will be used to achieve this pressure relationship.

Dehumidification will be provided in areas where condensation is likely, such as piping galleries.

B. New Pressure Filters, Piping, & Controls

The new water treatment plant will have three vertical pressure filters, seven (7) foot in diameter and room for an additional three filters to be constructed in the future, as needed. The pressure filters will be piped to allow for each filter to be individually operated and the ability to remove one filter from service and still maintain the rated capacity of the treatment plant. The initial capacity of the WTP is 0.374 MGD.

The vertical pressure filters will be constructed of carbon steel, ASME code stamped, and incorporate a combined air/water backwash system, which provides superior media cleansing and greatly reduced backwash water volume. Each filter vessel shall include stainless steel backwash collection trough, filter media selected specifically for the raw water (GreensandPlus™ media). PVC header-lateral air wash distributor, graded support gravels, PVC header-lateral underdrain with non-metallic gravel-retaining nozzles, concrete subfill as required, and shall be factory finish-painted vessel interior; tank exterior blasted and primed and an epoxy finish coat for the exterior.

Additional components and services included as follows: Fully automated PLC control system and panel, system valves, including electrically actuated butterfly valves for filter backwash, ductile iron filter face piping, air wash blower package system, loss of head pressure gauge panel, with pressure switches, backwash rate of flow meter, and factory service representative of installation, inspection, media installation supervision, startup and operator training

The backwash waste water is piped to the backwash lagoons to allow for the settled precipitates to dry before being disposed.

C. New Backwash Sand Filters (Backwash Lagoons)

Waste filter wash water from the plant will be piped to the sand filters with a total filter area sufficient to adequately dewater applied solids. The "red water" filter shall have sufficient capacity to contain, above the level of the sand, the entire volume of wash water produced by washing all of the production filters in the plant, unless the production filters are washed on a rotating schedule and the flow through the production filters is regulated by true rate of flow controllers.

The new treatment plant will have two new backwash lagoons with a total surface area of 1,250 square feet and space available for two additional lagoons to be constructed in the future, as needed. The two sand filters allow for only one filter to be removed from service at any time and still function as needed.

Additionally, the raw water piping shall be constructed to allow for pre-flushing of the wells for a predetermined time to allow for any settled particles or contaminants to be discharged prior to entering the pressure filters.

D. Above ground Clearwell Storage - Chlorine Contact

Chlorine contact can be provided in either a tank built especially for chlorine contact or by baffling and control of water levels in the clearwell. Use of the clearwell for chlorine contact reduces its usable storage volume. For the sake of economy, it is recommended that part of the clearwell be used for chlorine contact.

Kentucky Division of Water General Design Criteria currently recommends that systems store at least 15% of the daily production in storage facilities. This water treatment facility should have at least 75,000 gallons at 0.500 MGD production to meet the recommended 15% storage. One 80,000 gallon, above-ground, glass-lined tanks are recommended to provide adequate storage with space available for the second tank in the future.

The clearwell storage tank will serve as a wetwell for the high service pumps. As the point of chlorination in treatment plants was moved back in the process to avoid excessive formation of disinfection by products, subsequent to the THM rule, clearwells have become increasingly important in the disinfection process. Another creative use of the clearwell is to provide finished water storage to allow the plant to be shut down during water quality or other types of emergencies.

E. Chemical Treatment

It is proposed to provide pre- and post-chemical treatment of the water via liquid or powder feed chemicals and these chemicals are added to the treated water to meet the requirements for potable water quality in the post-treatment phase of the treatment process. The treated water will first be disinfected to destroy any disease-causing organisms such as bacteria and viruses. Gaseous chlorine is proposed to meet the disinfection requirements for the proposed WTP. Following addition of chlorine gas for disinfection purposes, potassium permanganate will also be added to the chlorinated water. The chemicals will be added in the raw water following the chlorine injection. A static mixer will be specified to provide adequate mixing of the chemicals prior to the pressure filters and finished water storage. The chemical feed systems for the four (4) feed chemicals will include the same components and will be located in the process building.

1. Disinfection

Disinfection of the treated water is necessary to provide an effective disinfection residual within the distribution system for safe drinking water. It is recommended that a free chlorine disinfectant be used because it is common water treatment practice and provides needed disinfection at less cost and system complexity compared to other methods of disinfection.

While virus inactivation is not currently required for the groundwater source, it is recommended that the water treatment facility provide a free chlorine residual following treatment. The US EPA guidance manual for Compliance with the Filtration Disinfection Requirements for Public Water Systems Using Surface Water Sources suggest that a contact time of 6 mg/L – min (at a water temperature of 50°F, pH between 6 and 9 SU) be used to achieve 4-log virus inactivation.

The primary disinfection method for the proposed WTP will consist of chlorination using a free chlorine residual. Chlorine will be added in gaseous form. The liquid form of sodium hypochlorite is not cost effective at this capacity. A maximum design dosage of 6 mg/l is anticipated for the pre-filtered process water. The storage will be designed to accommodate the ultimate design flow of 0.500 MGD. However, at the initial design flow of 0.374 MGD, a feed rate of 7 to 10 pounds of chlorine gas per day will be required for disinfection.

The feed system will be of the dual cylinder type with automatic switchover of the gas cylinders. Each cylinder will be place on a scale to weigh the amount of gas used per day.

Regardless of the regulations, operators will need to maintain a free chlorine residual within the distribution system to promote compliance with the Total Coliform Rule. The intent of the proposed design is that additional free chlorine be added ahead of each connection point served by the water treatment facility at concentrations to comply with the Total Coliform Rule.

In addition, chlorine is another treatment chemical used to provide oxidation for the removal of iron and manganese from groundwater sources.

2. Fluoride

Hydrofluosilicic acid will be added in the post treatment phase as a means of inhibiting dental problems in the community served by the water system. The blended water will receive a maximum design dosage of 0.8 mg/l. Based on this design dosage, and hydrofluosilicic acid solution strength of 23.5%, approximately 0.7 gpd and 1.5 gpd of hydrofluosilicic acid will be required at the initial and ultimate design flow conditions, respectively.

To meet the required 30 days of bulk storage at ultimate flow conditions, the storage capacity needed is approximately 50 gallons. Hydrofluosilicic acid is typically bulk delivered in the form of 55-gallon drums or 300 gallons totes. In order to be cost effective, the bulk tank will be sized to receive a full delivery of chemical and will be greater than the 30 days storage. Space will be provided for a 400-gallon double-wall containment tank.

The day tank will be of the vertical cylinder type, be constructed of polyethylene, and will have a capacity of 35 gallons. The feed pumps will be of the variable speed, peristaltic type design. Two (2) feed pumps will be required. Each pump will have a pumping capacity of 0.05 to 0.10 gph at a minimum turndown ratio of 1 to 100. The pumps will be equipped with variable speed controls to adjust the chemical feed rate in proportion to the flow.

Caution shall be used in handling and storage of this chemical and is necessary because of the aggressive nature of this chemical.

3. Potassium Permanganate

Potassium permanganate is another treatment chemical used to provide oxidation for the removal of iron and manganese from groundwater sources. The chemical is typically associated with a pressure or gravity sand filter process to aid in contaminant removal.

Potassium permanganate will be added in the pre-treatment phase to provide oxidation for the removal of iron and manganese from groundwater sources. The raw water will receive a design dosage of up to 0.5 mg/l. Based on this design dosage, and the solution strength of 1.5%, approximately 3 to 8 gpd of potassium permanganate will be required at the initial and ultimate design flow conditions.

To meet the required 30 days of bulk storage at ultimate flow conditions, the storage capacity needed is approximately 250 gallons. Potassium permanganate is typically bulk delivered in the form of 55-pound pails of granular crystalline powder. To meet the 30 days storage, space for up to five pails will be made available.

The chemical feed system will be designed to handle the various dry chemicals via a volumetric feeder used for the water and wastewater treatment processes. These rugged-duty feeders employ dissimilar speed, double concentric auger metering mechanism for unequalled performance and trouble-free operation used for non-free flowing materials, with a conditioning auger and 50-gallon dissolving tank.

The dissolving tank are available with a variety of baffle configurations to ensure complete mixing of the chemical and optimum detention time. They can also be provided with certain accessories to produce constant strength solutions or slurries, or to meet other special requirements. Typical optional equipment includes solenoid valves, level probes, rotameters, etc.

The dissolving tank will serve as the day tank with a capacity of 50 gallons. The feed pumps will be of the variable speed, peristaltic type design. Two (2) feed pumps will be required. Each pump will have a pumping capacity of 0.2 to 0.5 gph at a minimum turndown ratio of 1 to 100. The pumps will be equipped with variable speed controls to adjust the chemical feed rate in proportion to the flow.

4. Corrosion Inhibitor

Corrosion inhibitor is typically added to help reduce the corrosivity of the water with respect to controlling iron, manganese, scale, and corrosion problems in drinking water systems. Sequestration is a form of treatment in which a chemical, known as a sequestrant, is added to groundwater. The chemical forms a bond with iron and manganese ions, allowing them to remain in solution. Sequestration for drinking water treatment of iron and manganese is generally limited to sources where the iron is less than 0.6 mg/L and the manganese is less than 0.1 mg/L. Sequestration of source water concentrations above these values may result in aesthetic issues in the distribution system and is generally not allowed by regulators; however, this chemical will be injected after treatment where the iron and manganese are at the lower levels and allowing them to remain in solution in the distribution system

Aquadene SK-7103 is a phosphate based dry blend chemical specially formulated to control iron, manganese, scale, and corrosion problems in drinking water systems. These products are also used as a sequestrant to isolate and hold unwanted impurities from depositing into the water system. Controlling staining (red water caused by iron- based impurities and black water caused by manganese-based impurities), controlling copper, and controlling lead release to the public are the primary applications of phosphate-based products.

Based on quality of the treated waters, it is anticipated that the water will require a maximum design dosage of 0.5 mg/L. Using this design dosage, approximately 3 to 8 gpd of corrosion inhibitor will be required at the initial start-up and ultimate flow conditions.

To meet the required 30 days of bulk storage at ultimate flow conditions, the storage capacity needed is approximately 250 gallons. Aquadene SK-7103 is typically bulk delivered in the form of 50-pound pails of granular crystalline powder. To meet the 30 days storage, space for up to five pails will be made available.

The chemical feed system will be designed to handle the various dry chemicals via a volumetric feeders used for the water and wastewater treatment processes. These rugged-duty feeders employ dissimilar speed, double concentric auger metering mechanism for unequalled performance and trouble-free operation used for non-free flowing materials, with a conditioning auger and 50-gallon dissolving tank.

The dissolving tank are available with a variety of baffle configurations to ensure complete mixing of the chemical and optimum detention time. They can also be provided with certain accessories to produce constant strength solutions or slurries, or to meet other special requirements. Typical optional equipment includes solenoid valves, level probes, rotameters, etc.

The dissolving tank will serve as the day tank with a capacity of 50 gallons. The feed pumps will be of the variable speed, peristaltic type design. Two (2) feed pumps will be required. Each pump will have a pumping capacity of 0.2 to 0.5 gph at a minimum turndown ratio of 1 to 100. The pumps will be equipped with variable speed controls to adjust the chemical feed rate in proportion to the flow.

5. Chemical Shipping, Handling, and Storage

Because of the required storage volumes, the bulk storage tanks may not accommodate normal tanker truck loads. Partial truck, barrel, or tote deliveries would be necessary. Tote contents would be transferred into bulk storage tanks at the water treatment facility. Secondary containment curbs or containment tanks will be provided for each chemical feed system.

All chemicals should be handled in a manner in conformance with the respective Material Safety Data Sheets (MSDS). Scales for the liquid day tanks or gas cylinders will be used to provide daily chemical usage totals for the plant.

All chemical feed pump materials will be consistent with the type and quantity of chemical to be supplied.

Additional chemical feed systems mentioned with each treatment process system description will be provided to meet the treatment requirements recommended by the system manufacturers.

F. High Service Pumps

Two high service pumps will be provided to pump treated water to the system users with space for a third pump in the future. One of the pumps will act as a spare. The pumps will be designed to convey up to 400 to 500 GPM (peak day-peak hour) to the distribution system. Space for a third, future pump will also be provided. If the ultimate design flow of the WTP increases to 0.500 MGD or greater, the third pump would be added and the existing pumps would be upgraded or replaced to provide sufficient pumping capacity.

The high service pumps will be located in the new process building. The high service pumps provide transport of the finished water from the clearwell to the distribution system. The new high service pumps will be vertical multistage centrifugal pumps. The high service pumps will be installed with variable frequency drives (VFDs). Pumps will be manifold to provide adequate redundancy and reliability. Two high service pumps will be constructed initially with the remaining third pump coming on line as the system demand increases.

An electromagnetic flow meter will be provided on the high service pump discharge piping for flow measurement and recording.

The design of the pumps will be based on the hydraulic modeling of the distribution system that will be done as part of the distribution system design. The high service pumps will be equipped with isolation and check valves and associated piping designed for the appropriate conditions, to deliver water to the distribution system. Emergency power will be provided to the high service pumps from the plant standby power system.

G. Emergency Power

Standby power will be provided by a new outdoor propane generator set in a weatherproof enclosure. The generator will be capable of supplying all running loads required when the plant is operating at minimal capacity. The generator is intended for standby use during a power outage only. When power from the utility is lost due to a planned or unplanned interruption, the generator will start and the automatic transfer switch (ATS) will close to the "emergency" bus. Upon restoration of utility power, the ATS will close to the "normal" bus. Large motor loads will be provided with time delays to stagger their starts. This will prevent the generator from becoming overloaded due to high motor inrush currents upon startup.

A liquid propane storage tank will be provided with fuel capacity for three days of continuous full load operation. A heavy-duty exhaust silencer and muffler will be provided for the generator and will also have walls on the sides for further sound attenuation. Generator status signals will also be sent to the control room computer for logging and display although no generator control will be provided at the control room computer.

6.02 Project Schedule

The proposed project schedule is:

1. Secure Letter of Conditions from USDA RD – June 2020
2. Secure Land/Easement/Encroachment Permits – August 2020
3. Division of Water Submittal – August 2020
4. Advertise for Bids – November 2020
5. Contract Award/Construction – February 2021
6. Substantial Completion – February 2022
7. Final Completion – March 2022

6.03 Permit Requirements

This section describes the permits required for the water treatment plant, well field, and water distribution system network.

A. WATER TREATMENT PLANT

The Kentucky Division of Water has the legal authority for the permit approval from the statute KRS 224.10-110 and the regulations at <u>401 KAR 8:100</u>. Approval to construct a Public Water Supply Facility is required prior to construction. Approval is required prior to installation of any new facilities or works, or alteration or reconstruction of any existing facilities in any public or semi-public water supply and must be approved by the Kentucky Division of Water, Water Infrastructure Branch.

Permitting requirements for the proposed project will be conducted under these regulations and the jurisdiction the Kentucky Division of Water, as well as, local applicable building codes. If a project is being funded by a municipality, water district or other publicly owned treatment works, permit fees are not applicable.

The KDOW will be responsible for the review and issuance of the construction and applicable discharge permits associated with the water treatment plant design, construction, and operation. KDOW will require that complete plans and specifications be submitted for final design plan review. In addition to plans and specifications, thorough design calculations must be submitted along with the necessary paperwork from the Owner. The Kentucky Infrastructure Agency State Revolving Fund (SRF) will require that additional documents be incorporated with the final design submission to the KDOW in order to obtain construction approval with funding from the state agency. Note the Sandy Hook Water District will be looking to other agencies such as Rural Development (RD) and Community Development Block Grant Program (CDBG) for additional funding. As such their requirements will also need to be inserted in the documents.

The review by KDOW does not require any fees for municipally owned water systems. Upon completion of the plan review, the KDOW Water Infrastructure Branch will issue a Letter of Approval for the construction of the water treatment plant.

A permit will be required for the discharge of treatment wastes from the proposed facility. The KPDES permit will allow for the discharge of the treatment process wastes. The KDOW's Surface Water Permits Branch will be responsible for supplying the necessary permit requirements, reviewing the permit application, and issuance of the KPDES permit.

B. FLOODPLAIN PERMITTING

The KDOW is authorized through KRS 151 to manage development in floodplains. Any type of development in, along, or across a stream requires a floodplain permit from the Division. Typical activities requiring a permit include, but are not limited to, residential & commercial structures, stream crossings, fill, stream alterations & relocations, and small stream impoundments. State floodplain development requirements are outlined in 401 KAR 4:060.

The KDOW Floodplain Management Section has the primary responsibility for the approval or denial of proposed development and other activities in the floodplain of all streams in the Commonwealth. Permits are issued for proposed actions in floodplains that meet all state floodplain statutes, regulations, and standards. Additionally, the Floodplain Management section ensures that permitted development in floodplains complies with applicable requirements and limitations.

A portion of the WTP site is located within a designated floodplain. All proposed work and site activities will be coordinated with and approved by KDOW prior to any construction activity.

C. 401 WATER QUALITY CERTIFICATION

The 401 Water Quality Certification Program of KDOW is the Commonwealth's review and authorization of selected federal license and permits. Any person, firm, or agency (including federal, state, and local government agencies) planning to work or place dredged or fill material in waters of the Commonwealth should contact Kentucky Division of Water, Water Quality Certification Section to obtain applicable permits. Federal licenses and permits subject to 401 Water Quality Certification include Clean Water Act 404 permits for discharge of dredged or fill material issued by the USACE, Federal Energy Regulatory Commission (FERC) hydropower licenses, and Rivers and Harbors Act 9 and 10 permits for activities that have a potential discharge in navigable waters issued by the USACE. A 401 Water Quality Certification from the Commonwealth of Kentucky also affirms that the discharge will not violate Kentucky's water quality standards.

A 401 Water Quality Certification will be obtained for all construction activities for the project prior to any construction activity.

D. WELL FIELD

Permitting requirements for any new or proposed well field construction shall be conducted under the regulations and jurisdiction of the Kentucky Division of Water. All new groundwater wells will be constructed in accordance with 401 KAR 6:310 - Water well construction practices and standards. Kentucky Division of Water – Watershed Management Branch is responsible for the administration of the water well and monitoring well certification program, develop and oversee compliance with water well and monitoring well drilling regulations, and to research and develop knowledge of, and protection for, the state's groundwater resources.

E. DISTRIBUTION SYSTEM NETWORK

1. Kentucky Division of Water Permitting

Permitting requirements for the proposed distribution system construction will be conducted under the regulations and jurisdiction of the Kentucky Division of Water. KYDOW will require complete plans and specifications be submitted for review and in addition to plans and specifications, thorough hydraulic calculations of the distribution system must be submitted along with the necessary forms.

Stream crossing permits from the KYDOW Floodplain Management will not be required as long as the water mains are constructed as subfluvial pipe crossings in accordance with Administrative Regulation 401 KAR 4:050, Section 2.

2. Highway Encroachment Permit and Crossings

The proposed water mains will be constructed across and along the rights-of-way of KY Highway 755, and KY Highway 556. The transmission main will be installed by boring and encasement under all state highway rights-of-way.

For placement of the transmission mains within the state right-of-way, an encroachment permit will be required for construction in Elliott County. The encroachment permit will be filed with the Flemingsburg Regional Office of the Kentucky Transportation Cabinet for crossing all state-maintained highways. The regional office will be contacted and involved during the design process to coordinate the location of the pipeline within their right-of-way.

Any transmission main work along Howards Creek Road or other county roads will entail an encroachment permit from the Elliott County Fiscal Court.

F. PROPERTY ACQUISITIONS

The property for the proposed water treatment plant is currently under contract with an option to purchase. This property will be purchased using local or District funds.

For any new property to be acquired for any permanent interest such as fee simple title, land contracts, permanent easements, long-term leases, and right-of-ways the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (URA) and the Relocation Act Amendments of 1987 will be followed.

G. OPERATOR CERTIFICATION REQUIREMENTS

Water treatment plants or systems shall be classified as one of four classes, in accordance with 401 KAR 8:030, Section 6, subsections (2) and (3). This classification will be based on the cabinet-assigned design capacity for finished water production that the treatment plant is able to produce in twenty-four (24) continuous hours of production, taking all limiting factors into consideration, and the treatment process employed.

The Kentucky Administrative Regulations requires that each public water system with water treatment and distribution be operated under the supervision of a certified operator in direct responsible charge of the system. There are four separate classes of water treatment plant operators (Classes I, II, III, and IV) and two subclasses (A and B). The subclass designation depends on the type of treatment process. According to KAR 8:030 Section 6, Subclass A water treatment plant treats surface water or groundwater under the direct influence of surface water; or groundwater not under the direct influence of surface water that uses gravity filtration. Subclass B water treatment plant treats groundwater not under the direct influence of surface water and uses a filtration process other than gravity filtration; or groundwater not under the direct influence of surface water that does not use filtration processes.

A Class II water treatment plant has an assigned treatment capacity of 50,000 gallons per day or more but less than 500,000 gallons per day. A Class II water distribution system serves a population equal to or greater than 1,500 but less than 15,000.

The proposed treatment facility and distribution system is anticipated to be a Class IIB facility.

H. STAFFING REQUIREMENTS

Staffing requirements as indicated below are based on the treatment plant being a Class IIB facility. The initial capacity of the proposed plant is expected to be less than the full 0.500 MGD plant and will be designed accordingly to allow for expansion by adding more vertical pressure filter units. It is anticipated that the construction of the WTP will be phased with the initial capacity of approximately 0.374 MGD.

Below is a listing of the plant and distribution system operators and certificate numbers:

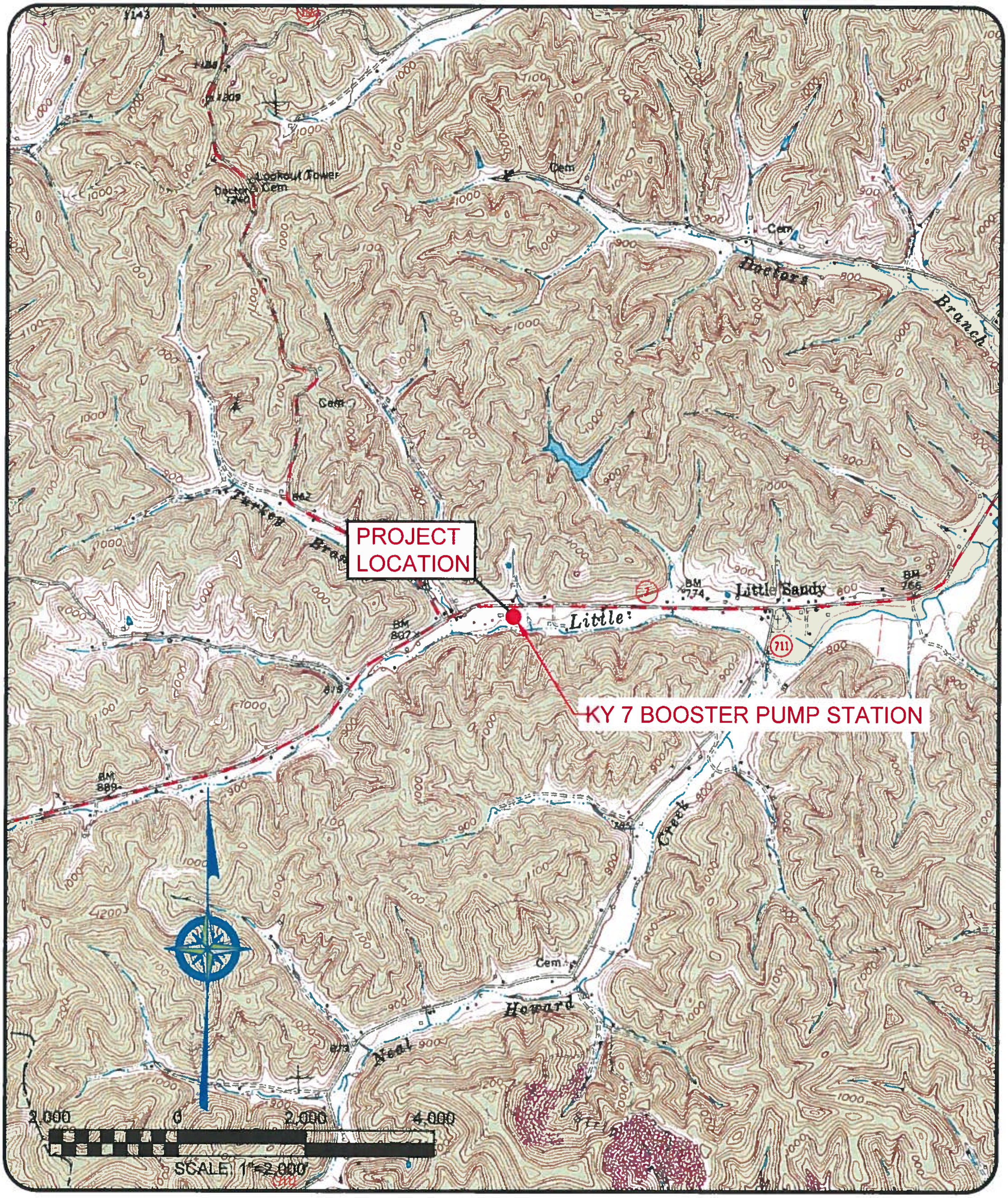
Sandy Hook Water District Water Treatment Plant
PWSID # 0320383

Name	Type of License	License Number	Classification Level
Kevin R. Winkleman	Water Treatment Plant / Distribution	17073 25276	III-B III-D
Joe Adkins	Water Treatment Plant	27154	II-B

6.04 Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

A preliminary project cost estimate is included at the end of this report (Appendix C).

APPENDIX A – TOPOGRAPHICAL MAPS

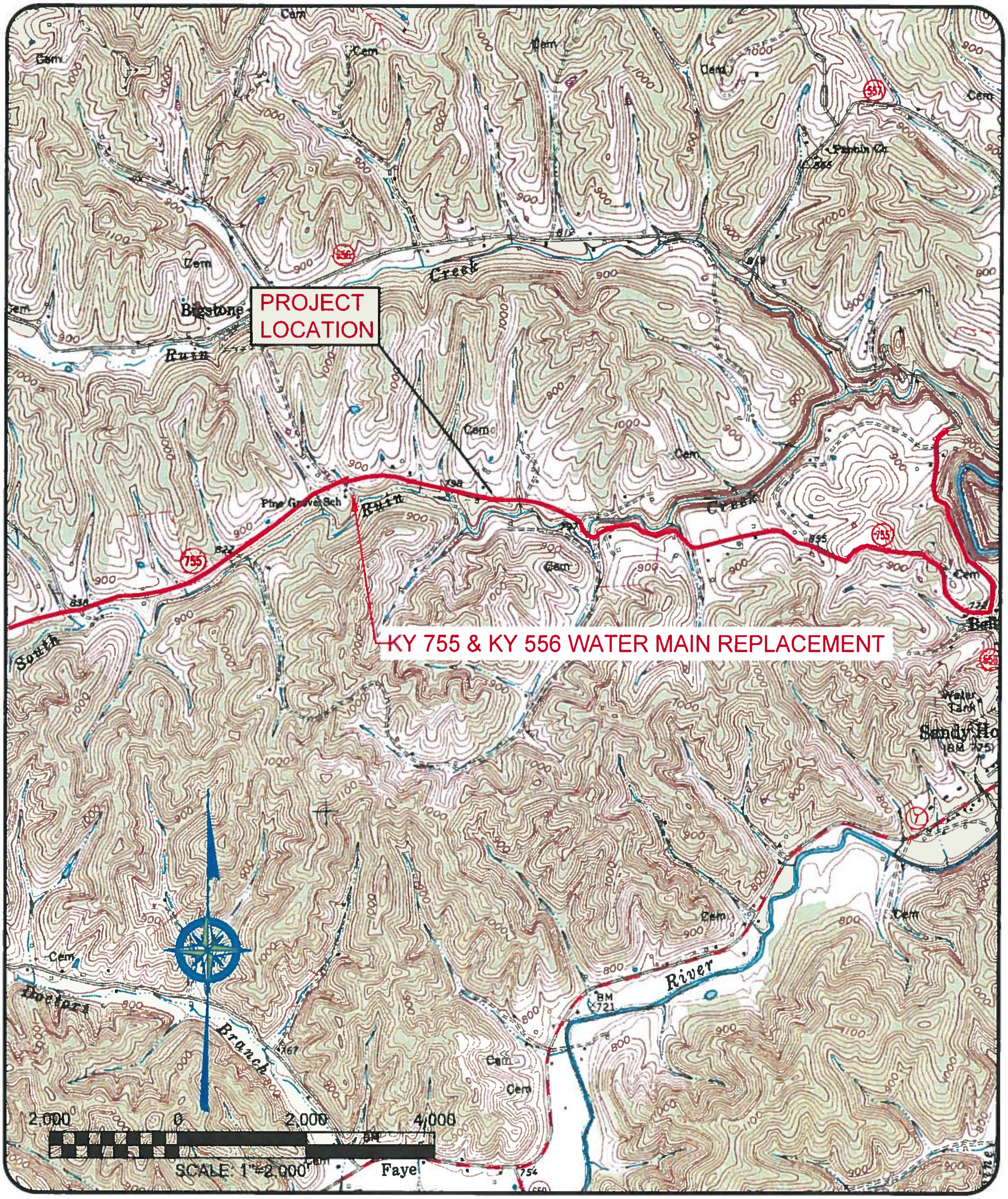


B:\PROJECTS\Sandy Hook Water District\19003 - 2019 Water System Improvments\Drawings\DOW Exhibit.dwg BE 3/29/19

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

WATER SYSTEM IMPROVEMENTS
FOR
SANDY HOOK WATER DISTRICT

Project No.	19003
Date	04/2019
Dwg. No.	1

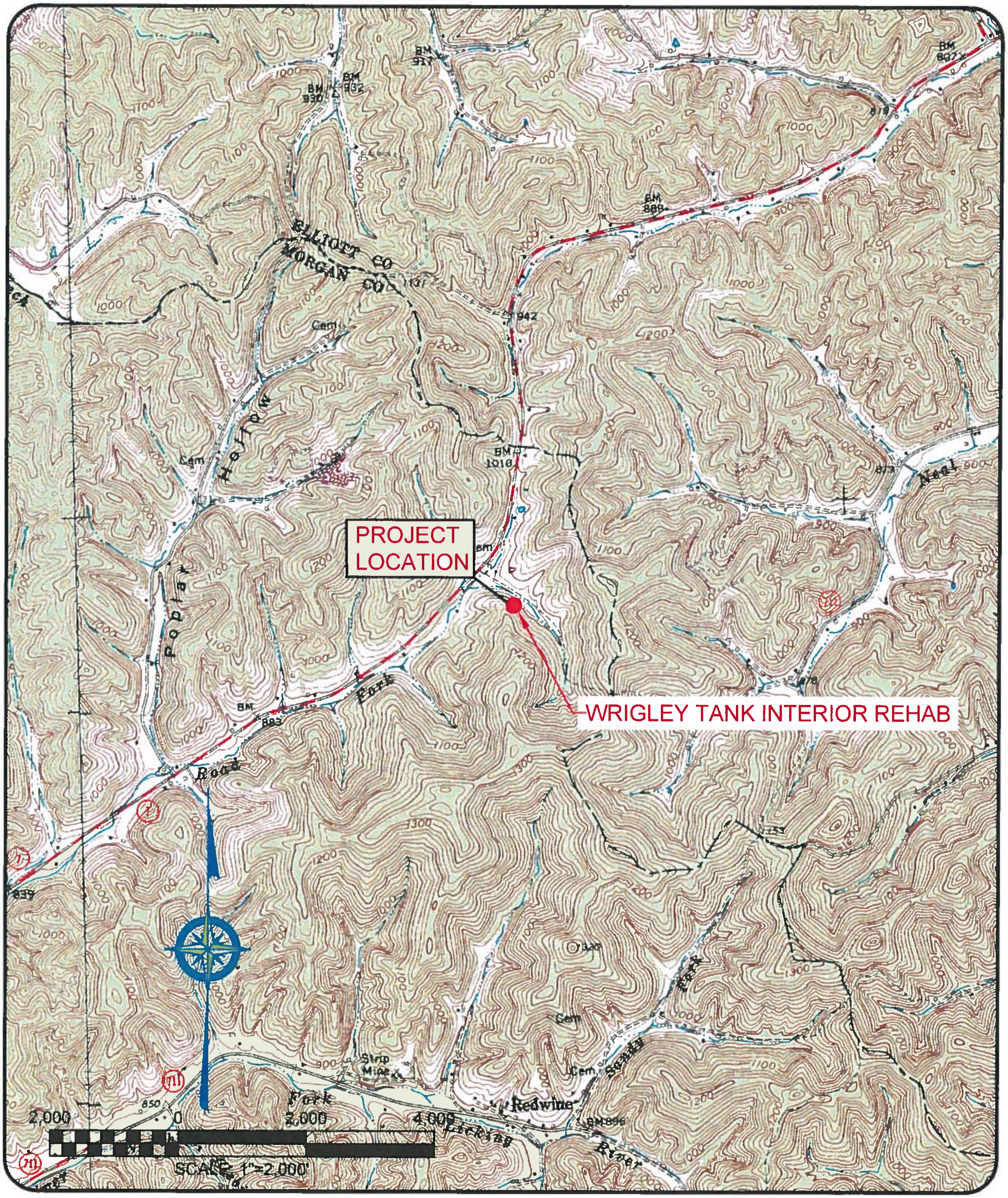


B:\PROJECTS\Sandy Hook Water District\19003 - 2019 Water System Improvements\Drawings\DOW Exhibit.dwg BE 3/29/19

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

WATER SYSTEM
IMPROVEMENTS
FOR
SANDY HOOK WATER DISTRICT

Project No. 19003
Date 04/2019
Dwg. No. 2

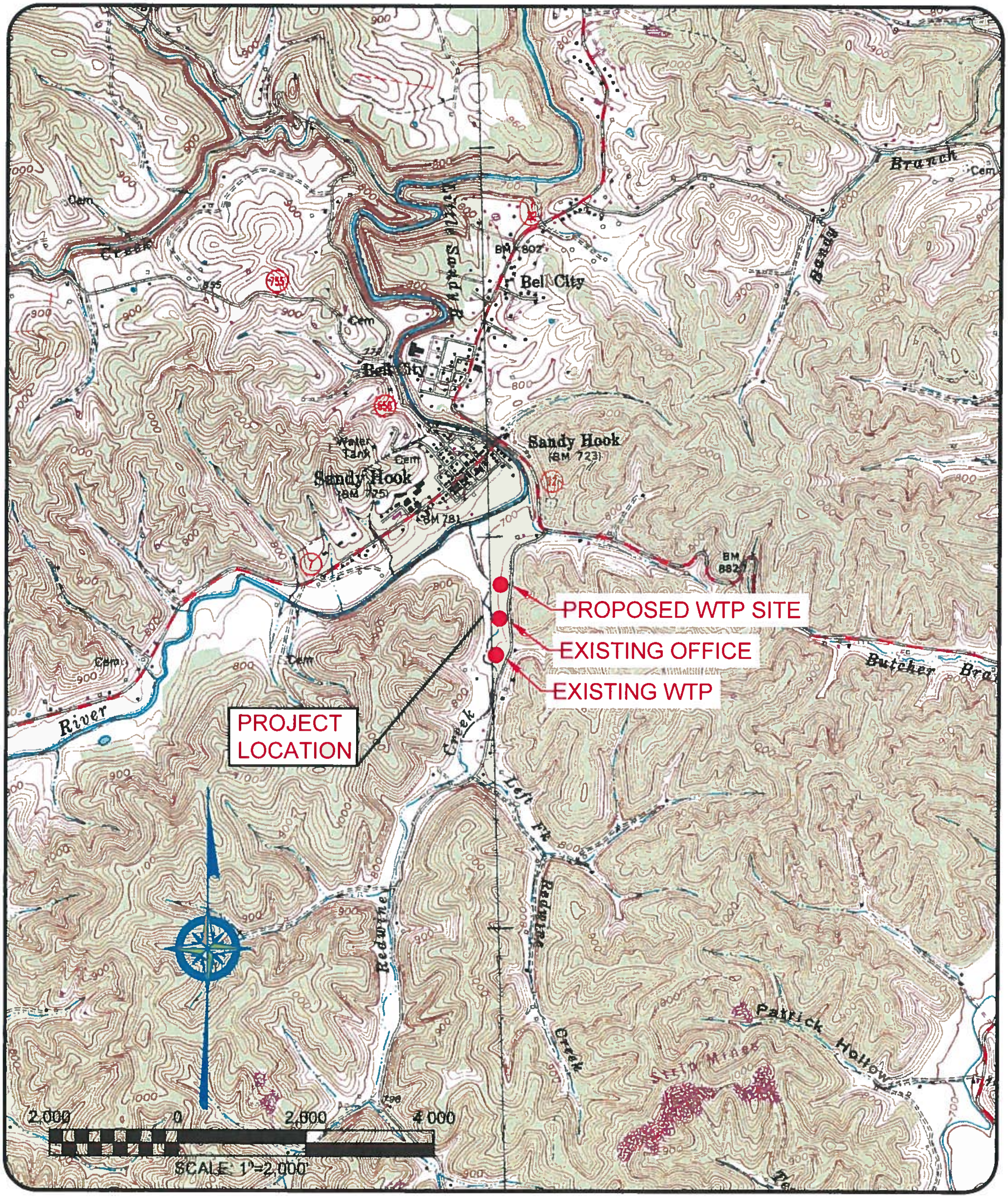


B:\PROJECTS\Sandy Hook Water District\19003 - 2019 Water System Improvments\Drawings\DOW Exhibit.dwg BE 3/29/19

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

WATER SYSTEM IMPROVEMENTS
FOR
SANDY HOOK WATER DISTRICT

Project No.	19003
Date	04/2019
Dwg. No.	3



WATER SYSTEM IMPROVEMENTS FOR SANDY HOOK WATER DISTRICT

BLUEGRASS ENGINEERING PLLC

222 East Main Street, Ste. 1 • Georgetown, KY 40324

Project No.	19003
Date	04/2019
Dwg. No.	4

B:\PROJECTS\Sandy Hook Water District\19003 - 2019 Water System Improvments\Drawings\DOW Exhibit.dwg BE 3/29/19

APPENDIX B – WRIGLEY TANK INSPECTION REPORT

May 2014

Wrigley Tank

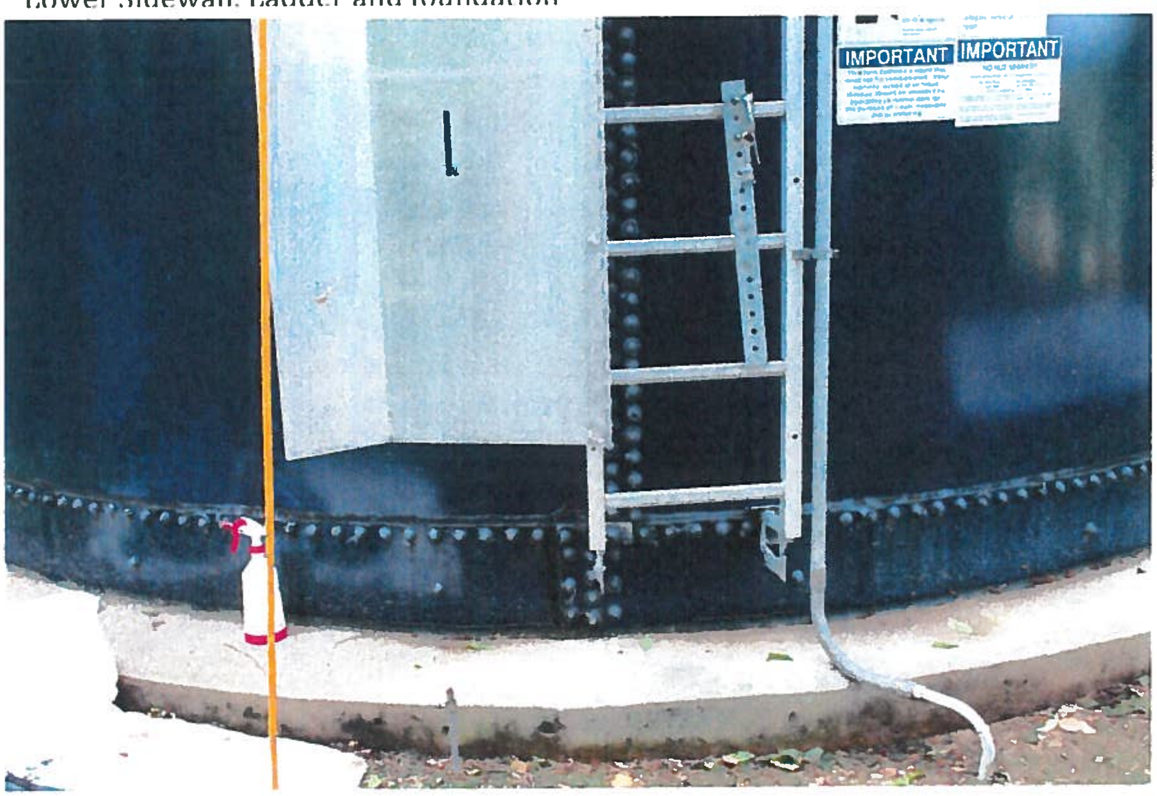
100,000 Gal Glass Lined Tank

Sandy Hook Water District

HORIZON QC

Sidewall and Ladder Sections

Lower Sidewall, Ladder and foundation



Roof Area and Vent

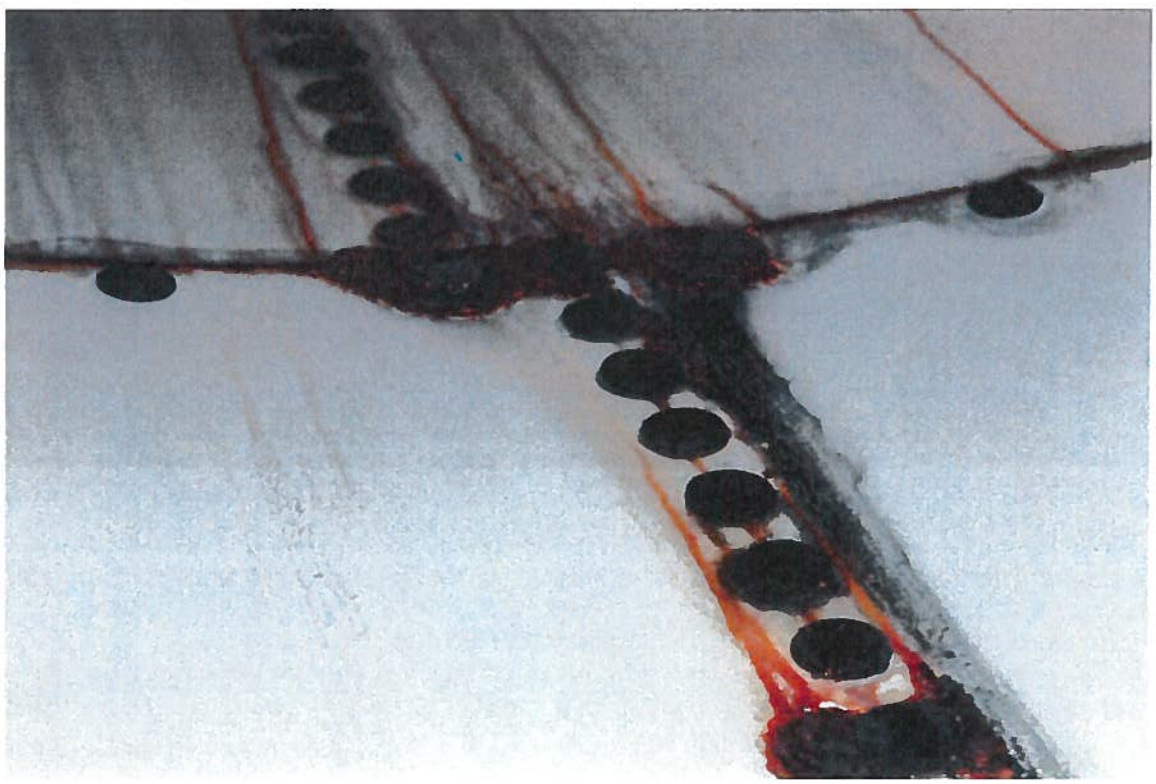
Roof Vent

Roof Manway

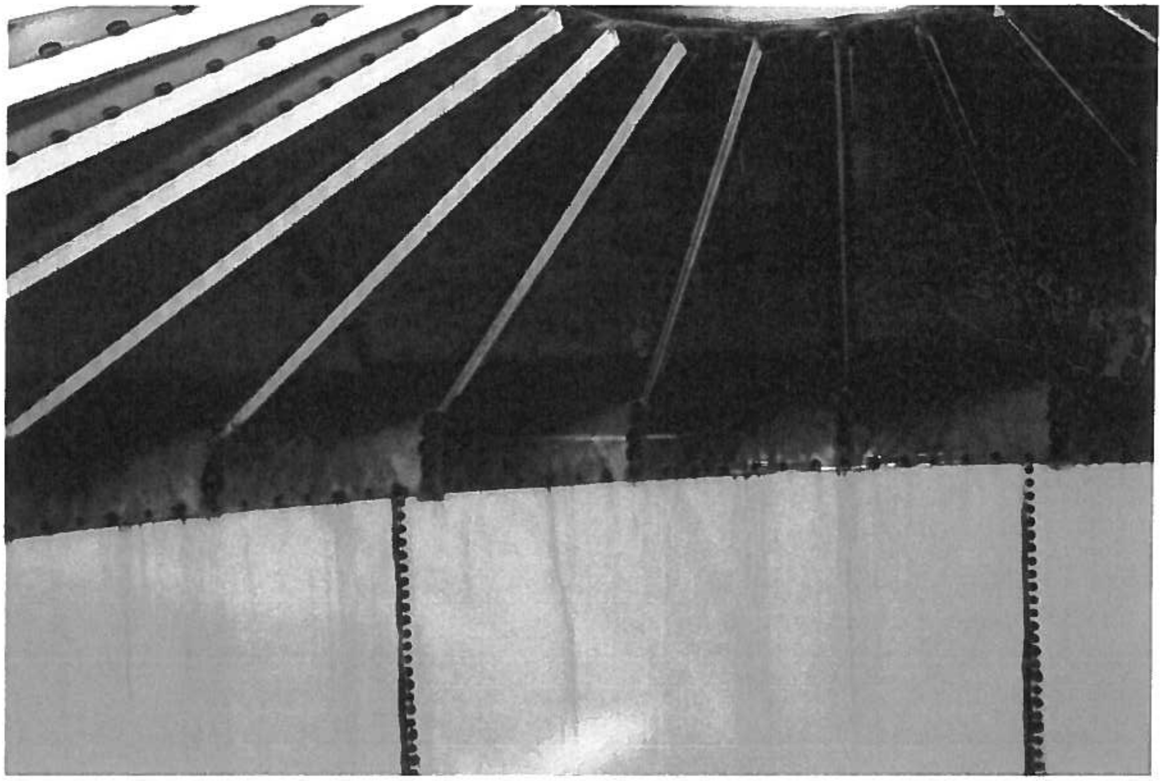
Sidewall Manway

Interior

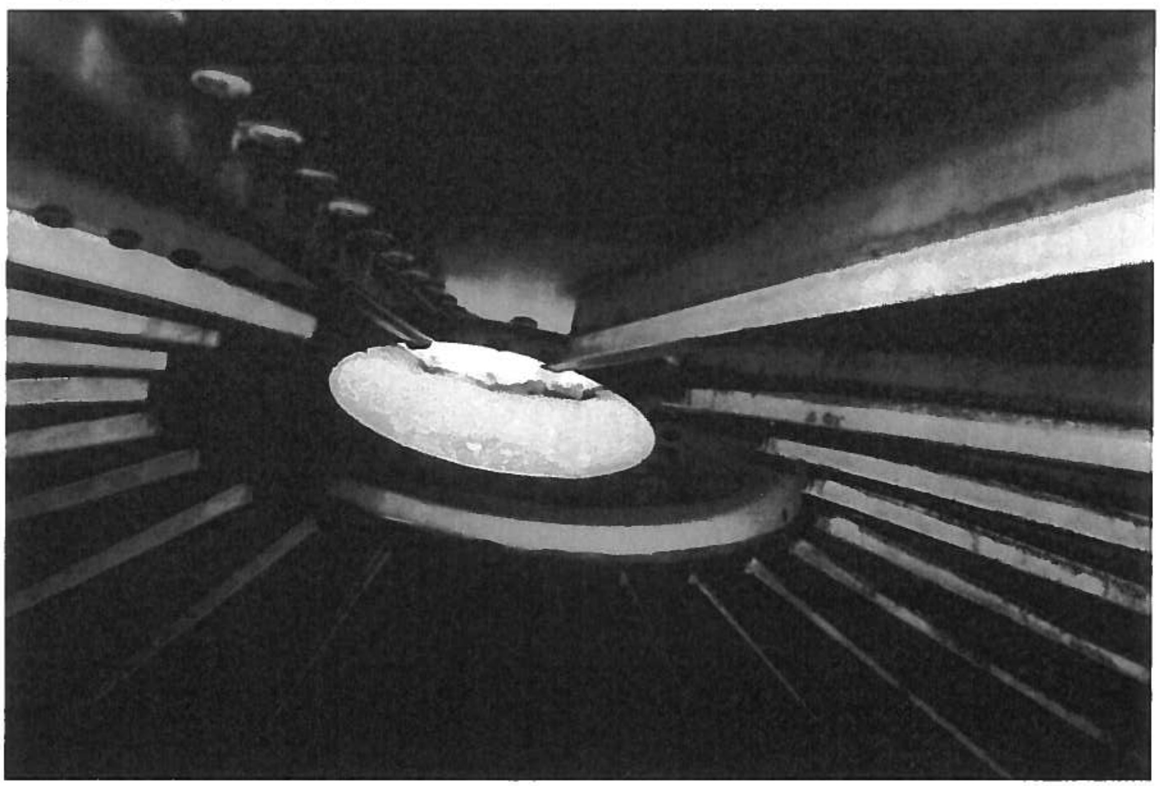
Interior Sidewall



Interior Ceiling and Sidewall



Interior Ceiling and Vent



Sandy Hook Water District
Wrigley Tank
105K Gal. Glass Lined Water Storage Tank

To: Sandy Hook Water District
Kentucky Engineering Group

Attn: Riley Sumner – Kentucky Engineer Group

Copies: Horizon QC File

From: Mike Topp Horizon QC
Graham Clark QC

Date: May 2014

On May 22, 2014, Horizon QC inspected the 105,000-gallon glass lined water storage tank. The purpose of the inspection was to evaluate the exterior and interior glass lining and mastic protective coating, tank structure, sanitary conditions, and safety related issues. The tank's interior was inspected while in service.

This report summarizes Horizon QC's (Horizon's) observations and recommendations of the standpipe water storage tank (105K Glass Lined Water Storage tank). Photographs from this evaluation are provided in Attachment A.

BACKGROUND

The date of tank's construction was 2002. The manufacturer of the tank was Aquastore. Tank dimensions are 28' in diameter and 47' tall.

The tank is located in Elliot Co, Kentucky; and found several miles from the City of Sandy Hook off of KY 7. The tank site is situated off of an unimproved gravel road behind a farm. The tank site is boarded on all four sides with timber and is fenced. The site is accessible by vehicles but has limited parking.

OBSERVATIONS

Horizon QC (Horizon) visually inspected the water tank for corrosion related issues, obvious structural problems, and safety related problems. The inspection covered the interior and exterior portions of the tank. The interior of the tank was inspected while in service. The following observations were noted: Condition Scale: Excellent-Good-Fair-Poor

Interior

- Overall condition of the interior should be considered fair. Minor corrosion along bolt heads and seems.
- Interior concrete floor was not inspected.
- The perimeter of tank to base connection did not show any signs of leaks.
- No visible defects or damage to the glass found on the sidewall panels.
- Random pinhole corrosion found on the sheet edge.
- Bolt heads are in fair condition with some random corrosion areas throughout the tank.
- Interior man-way was not visible.
- Interior inlet pipe is in good condition.
- Interior outlet is in good condition with minor corrosion along edges.
- No interior ladder was found.
- Interior roof vent is in good condition. No signs of any defects or damage, (Aluminum).
- Roof/sidewall seems have random pinhole corrosion on seems and boltheads. No visible signs of cracks, leaks or damage.
- Ceiling section has random corrosion along the sidewall/ceiling connection and bolt heads.
- Indicator float is not functioning. Remains hung up near the top section.
- No biological matter was seen inside the tank.

Exterior

- Overall condition can be considered good.
- Foundation is in good condition; no deterioration of the concrete. Vegetative growth has been kept low around the foundation.
- Base/sidewall seam is in good condition. No signs of leaks or cracks in the glass.
- The sidewall glass panels are in excellent condition.
- Sidewall bolt connections have some visible corrosion resulting from mastic deterioration.
- Sidewall panel sheet edge is in good condition.
- All hazard-warning signs are still present on the tank.
- Sidewall wind stiffener is in good condition. No visible signs of damage.
- Sidewall ladder is in good condition. No visible signs of damage.
- Roof Vent is in excellent condition. Screen in place and functional.
- Roof man way hatch is in good condition.
- Roof walkway and handrail is in good condition (aluminum). No signs of any damage.
- Roof panels are in excellent condition. No corrosion or damage was visible.
- Roof panel bolts and nuts have visible corrosion.
- Overflow pipe is in good condition (aluminum) no damage was visible.
- Sidewall man ways (2 -24 inch) are in good condition, no corrosion on nuts/bolts.
- Site perimeter is clean and properly maintained with vegetation kept low.

Recommendations

Interior

At present the protective glass coated and mastic protective coating that exists throughout the interior remains in fair condition. The random corrosion spots along the seams and bolt heads are the most obvious. Corrosion in these areas will only continue without a new mastic coating being applied to a clean metal substrate. These spots appear to be shallow in pit depth, but will likely increase in depth if not corrected in the next few years.

The age and condition of the interior does ***not*** warrant immediate remediation, however some action must be taken with the next 1-3 years before corrosion damage to the steel becomes significant.

When remediation does occur, Horizon suggests the following for remediation:

1. High-pressure power wash the interior. After interior cleaning - power tool clean all corrosion spots. **(SSPC SP-3).**

    1. High-pressure power wash the interior to remove sediment and staining.
    2. **SSPC SP-3** surface preparation for all corrosion spots.
    3. Apply NSF approved mastic to all cleaned spots.
    4. Repair float for indicator board.
    5. Install new sacrificial anodes.

Exterior

At present the exterior glass lined system is in good condition with an adequate amount of protection to the underlying substrate.

Horizon presents the following methods of remediation for consideration:

1. All failing spots should be power tool cleaned bare **(SSPC-SP-3)** and coated with mastic coating. (Sika Flex 1a or CIM)
2. Repair Level Indicator Board

APPENDIX C – CONSTRUCTION COST ESTIMATE

BLUEGRASS ENGINEERING PLLC

Client:	Sandy Hook Water District
Project:	2019 Water System Improvements
Date:	1/27/2020

Construction Costs

Item #	Description	Quantity	Unit	Unit Cost	Item Cost
1	Interior Reseal of Wrigley Tank	1	LS	$ 30,000	$ 30,000
2	Installation of VFD's in KY 7 Pump Station	1	LS	$ 26,000	$ 26,000
3	Replace Existing Problematic Water Main KY 556/KY 755	20,000	LF	$ 22.50	$ 450,000
4	Reconnect Existing Meters to New Water Main	60	EA	$ 350	$ 21,000
5	New 300,000 GPD Treatment Plant - New building for office,	1	LS	$ 2,600,000	$ 2,600,000
	chlorine and filter media. New high service pumps,				
	chlorine equipment, new filter tanks, new drying beds,				
	electrical, piping, concrete, site work, fencing, access				
	road, clearwell (above ground 50,000 tank) and water				
	main.				
Total - Construction Cost					$ 3,127,000

Non-Construction Costs

Contingencies	$ 312,700
Administrative Expenses	$ 30,000
Interest	$ 76,000
Legal Expenses	$ 20,000
Land, Appraisals, Easements	$ 75,000
Planning- CDBG Admin	$ 50,000
Engineering Fees - Design	$ 179,300
Engineering Fees - Construction Administration	$ 45,000
Engineering Fees - Inspection	$ 160,000
Engineering Fees - PER, Environmental, Geo-tech, Boundry Survey, and AIS Cert.	$ 105,000
Total - Non-Construction Costs	$ 1,053,000
Total - Project Costs	$ 4,180,000

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

Client:	Sandy Hook Water District, Sandy Hook, KY
Project:	New Water Treatment Plant
Date:	2/11/2020

Construction Costs

DESCRIPTION	QUANTITIES	UNIT	UNIT COST	ESTIMATED COST
New 500,000 GPD Treatment Plant				$ -
New 50' x 72' PEMB	3,600	SF	$ 180.00	$ 648,000
80,000 AG Clearwell	1	LS	$ 150,000.00	$ 150,000
Vertical Pressure Filters	1	LS	$ 350,000.00	$ 350,000
Relo-Rehab Vertical Pressure Filters	1	LS	$ 90,000.00	$ 90,000
General Piping	1	LS	$ 120,000.00	$ 120,000
High Service Pumps	3	LS	$ 27,500.00	$ 82,500
Backwash Pumps	2	LS	$ 17,500.00	$ 35,000
Storage Building	3,600	LS	$ 45.00	$ 162,000
General Site Piping, Fencing, Paving, et	1	LS	$ 150,000.00	$ 150,000
Backwash Lagoons	4	LS	$ 25,000.00	$ 100,000
Chemical Feed	3	LS	$ 35,000.00	$ 105,000
Mobilization	1.5%			$ 30,000
General Requirements	5.0%			$ 90,000
Clear & Grub	1.0%			$ 15,000
Earthwork	2.5%			$ 45,000
Erosion Control	1.3%			$ 25,000
Quality Control	0.5%			$ 10,000
Misc. Elec. / Telemetry	1	LS	$ 40,000	$ 40,000
GC OH & P	16.0%			$ 352,500
SUBTOTAL – CONSTRUCTION COST				**$ 2,600,000**
Construction Contingencies (10%)				$ 260,000
Legal, Administration, Engineering & Specialty Services (25%)				$ 650,000
TOTAL – WTP PROJECT COST				**$ 3,510,000**
ANNUAL – OPERATION, MAINTENANCE & REPLACEMENT COST [1]				$ 433,100
TOTAL – O, M, & R PRESENT WORTH COSTS [2]				$ 4,588,000
SALVAGE VALUE [3]				$ (650,000)
PRESENT WORTH COSTS - WTP [4]				**$ 7,448,000**

Notes:

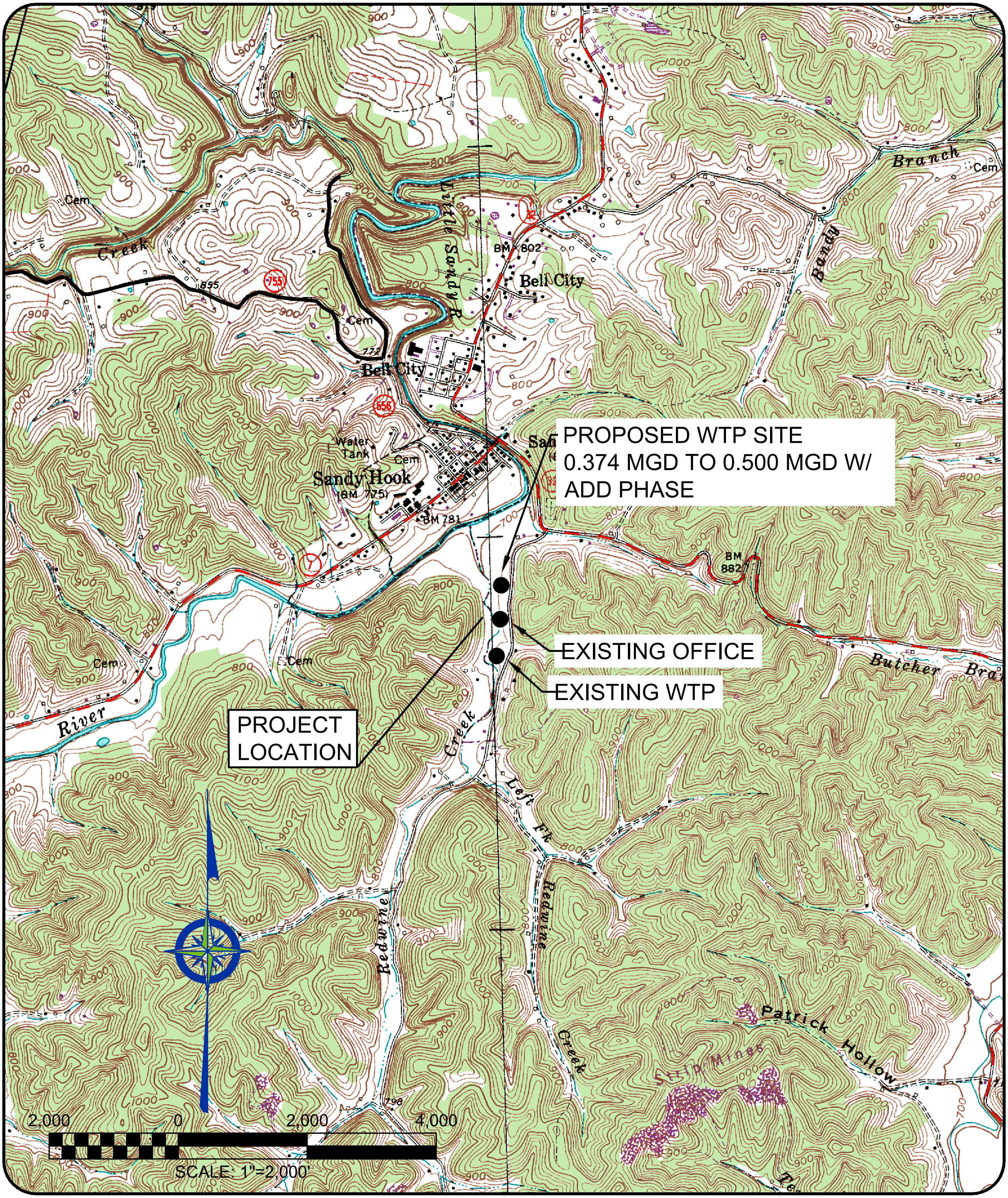
[1] Annual operation, maintenance & replacement costs includes media replacement costs and operation & maintenance costs

[2] Total O, M & R costs are calculated for 20 years at 7% interest rate.

[3] No marketable salvage value is available for the equipment after its service life.

[4] Present worth costs are based upon 20 years at 7% interest rate

APPENDIX D – PRELIMINARY WATER TREATMENT PLANT DRAWINGS AND SITE PLAN LAYOUT

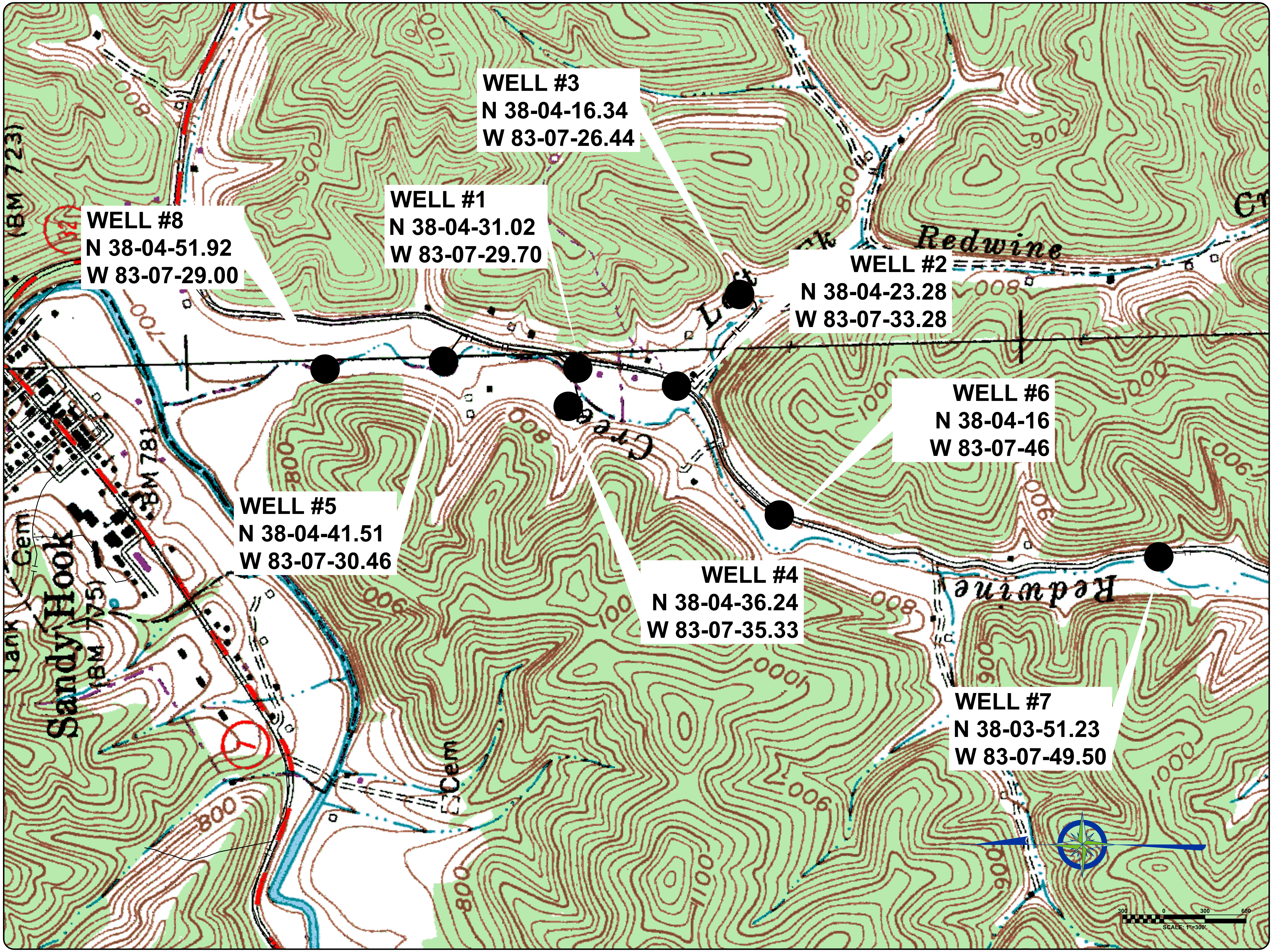


B:\PROJECTS\Sandy Hook Water\19003 - 2019 Water System Improvements\DWG\DOW Exhibit.dwg BE 6/12/20

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

WATER SYSTEM IMPROVEMENTS FOR SANDY HOOK WATER DISTRICT

Project No.	19003
Date	06/2020
Dwg. No.	Exhibit 1



THIS DRAWING HAS BEEN PREPARED AT THE SCALE INDICATED. REPRODUCTION OF THIS DRAWING MAY INTRODUCE INACCURACIES OF THE LISTED SCALE. THE GRAPHIC SCALE BAR SHALL BE USED TO DETERMINE THE ACTUAL SCALE.

IT IS A VIOLATION OF LAW FOR ANY PERSON TO ALTER THIS DRAWING WITHOUT WRITTEN PERMISSION FROM BLUEGRASS ENGINEERING, PLLC AND ACTING UNDER THE DIRECTION OF A LICENSED ENGINEER.

NO.	DATE	REVISIONS	BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

GROUNDWATER WELL LOCATIONS

SANDY HOOK WATER DISTRICT — Serving Our Community

BLUEGRASS ENGINEERING PLLC — 222 East Main Street, Ste. 1 • Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

EXHIBIT 2

THIS DRAWING HAS BEEN PREPARED AT THE SCALE INDICATED. REPRODUCTION OF THIS DRAWING MAY INTRODUCE INACCURACIES OF THE LISTED SCALE. THE GRAPHIC SCALE BAR SHALL BE USED TO DETERMINE THE ACTUAL SCALE.

BE 7/09/20

B:\PROJECTS\Sandy Hook Water\19003 - 2019 Water System Improvments\DWG\Contract 12 - WTP\19003-12-C-1-01.dwg

NO.	DATE	REVISIONS	BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

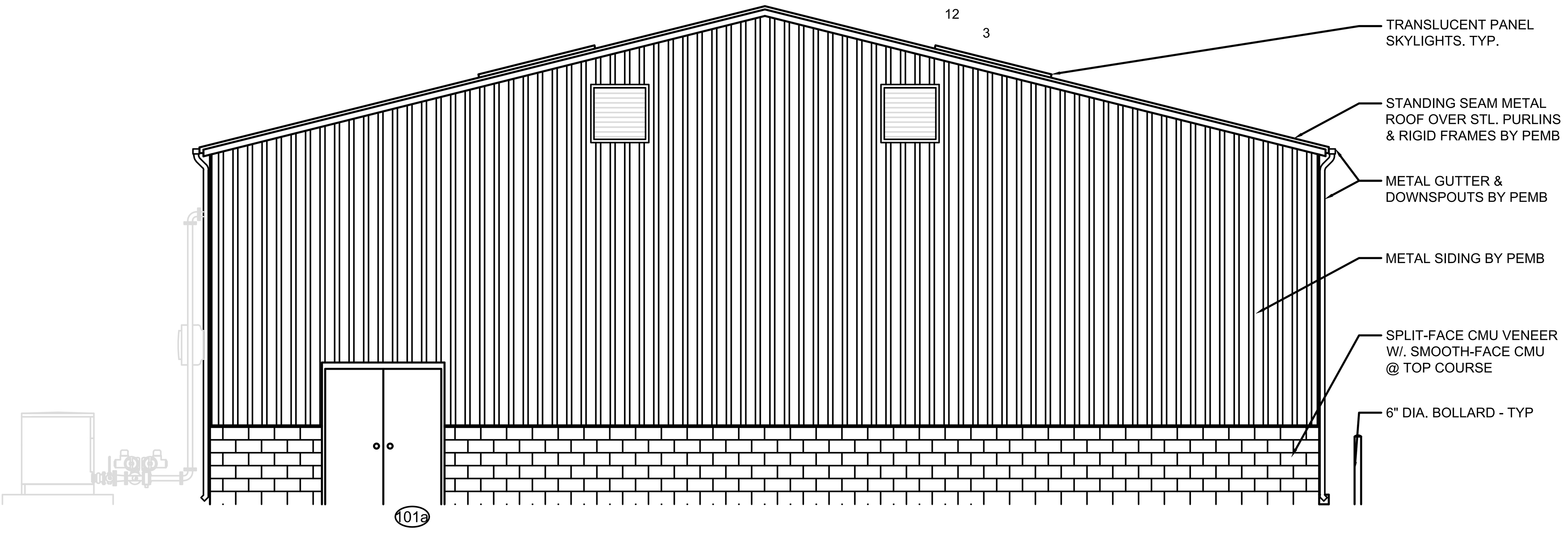
AERIAL PLAN
OVERALL SITE PLAN - AERIAL VIEW

SANDY HOOK WATER DISTRICT
Serving Our Community

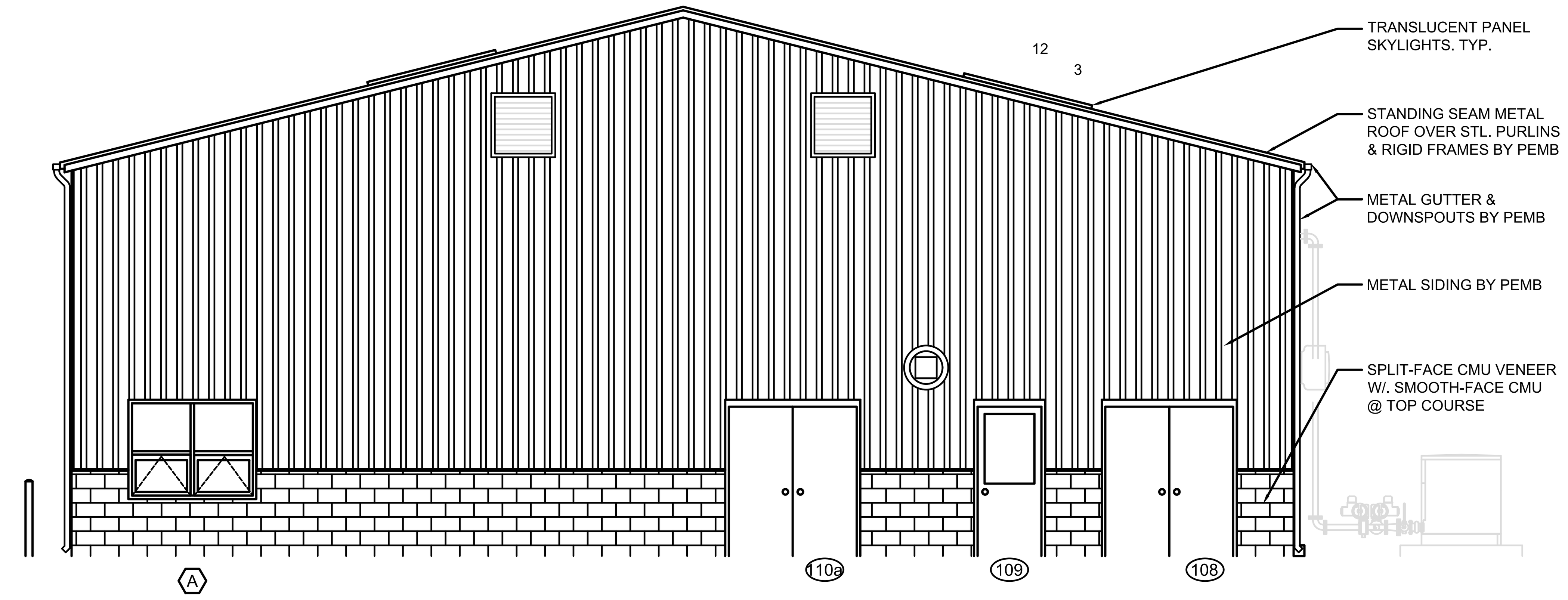
BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

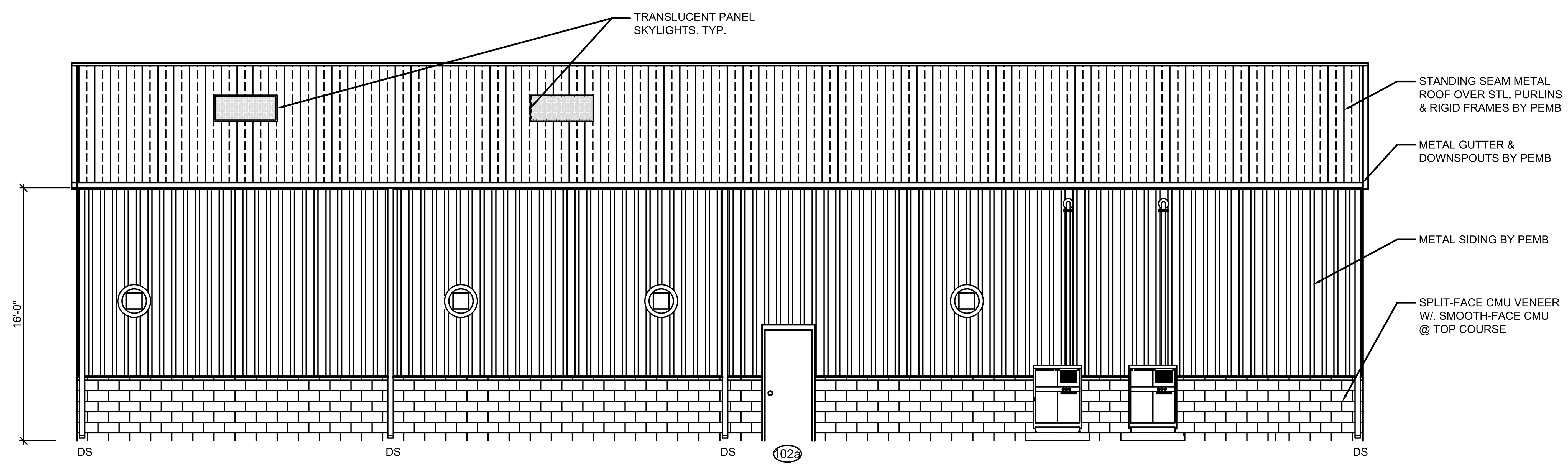
EXHIBIT 3



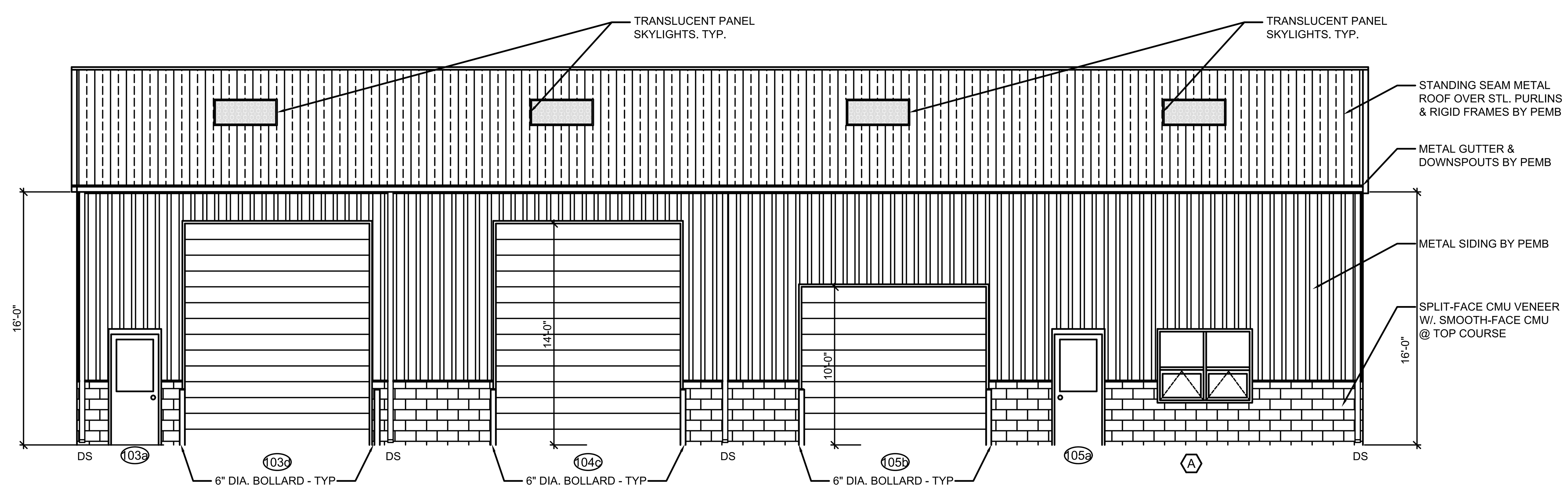
A NORTH ELEVATION
A-04 SCALE: 3/16" = 1'-0"



B SOUTH ELEVATION
A-04 SCALE: 3/16" = 1'-0"



C EAST ELEVATION
A-04 SCALE: 3/16" = 1'-0"



D WEST ELEVATION
A-04 SCALE: 3/16" = 1'-0"

THIS DRAWING HAS BEEN PREPARED AT THE SCALE INDICATED. REPRODUCTION OF THIS DRAWING MAY INTRODUCE INACCURACIES OF THE LISTED SCALE. THE GRAPHIC SCALE BAR SHALL BE USED TO DETERMINE THE ACTUAL SCALE.

B:\PROJECTS\Sandy Hook Water\19003 - 2019 Water System Improvements\DWG\Contract 12 - WTP\Files from JEA\Sandy Hook Water District-6-15-20.dwg BE 7/09/20

NO.	DATE	REVISIONS	BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

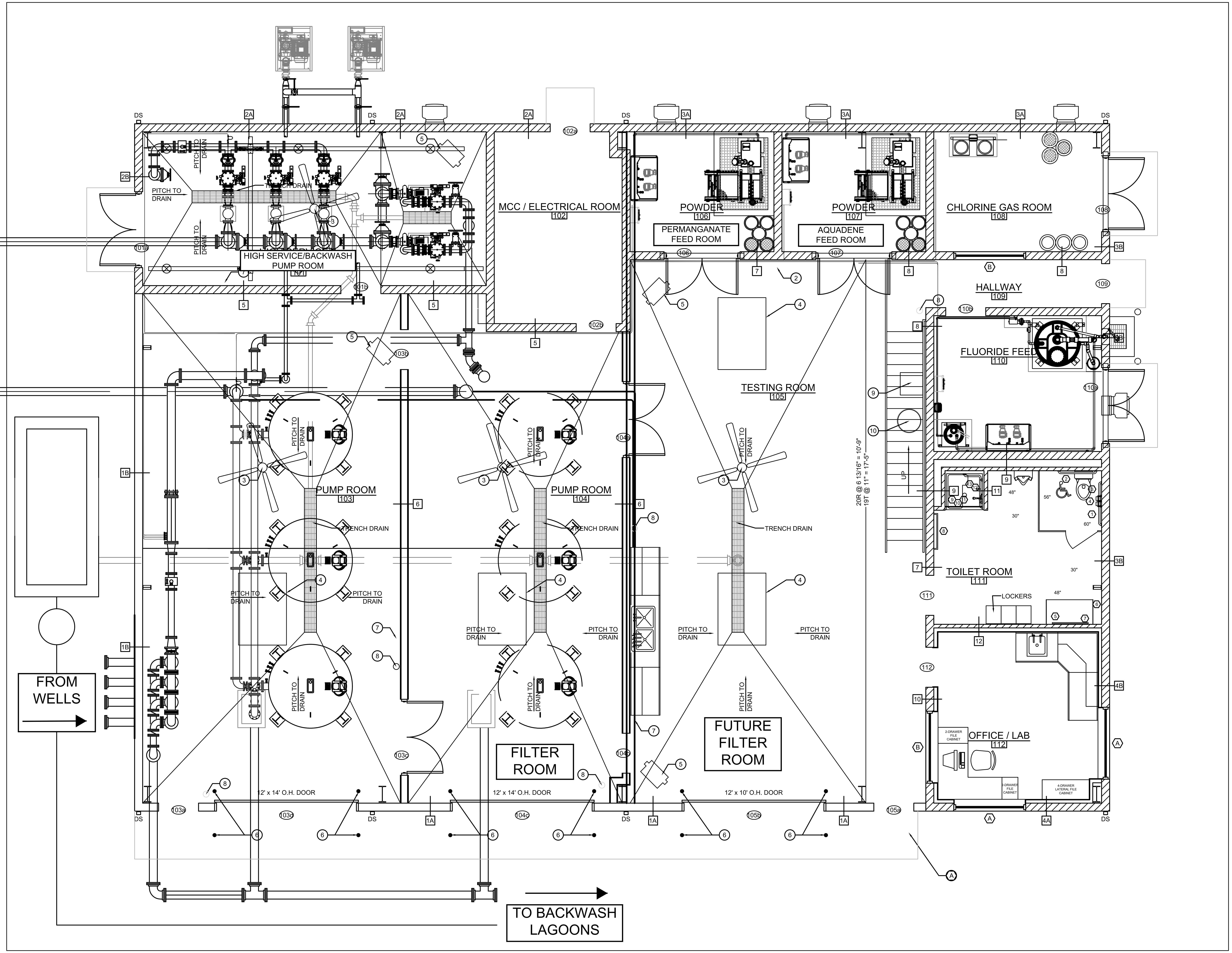
BUILDING ELEVATIONS

SANDY HOOK WATER DISTRICT
Serving Our Community

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

EXHIBIT 4



NO. | DATE | REVISIONS | BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

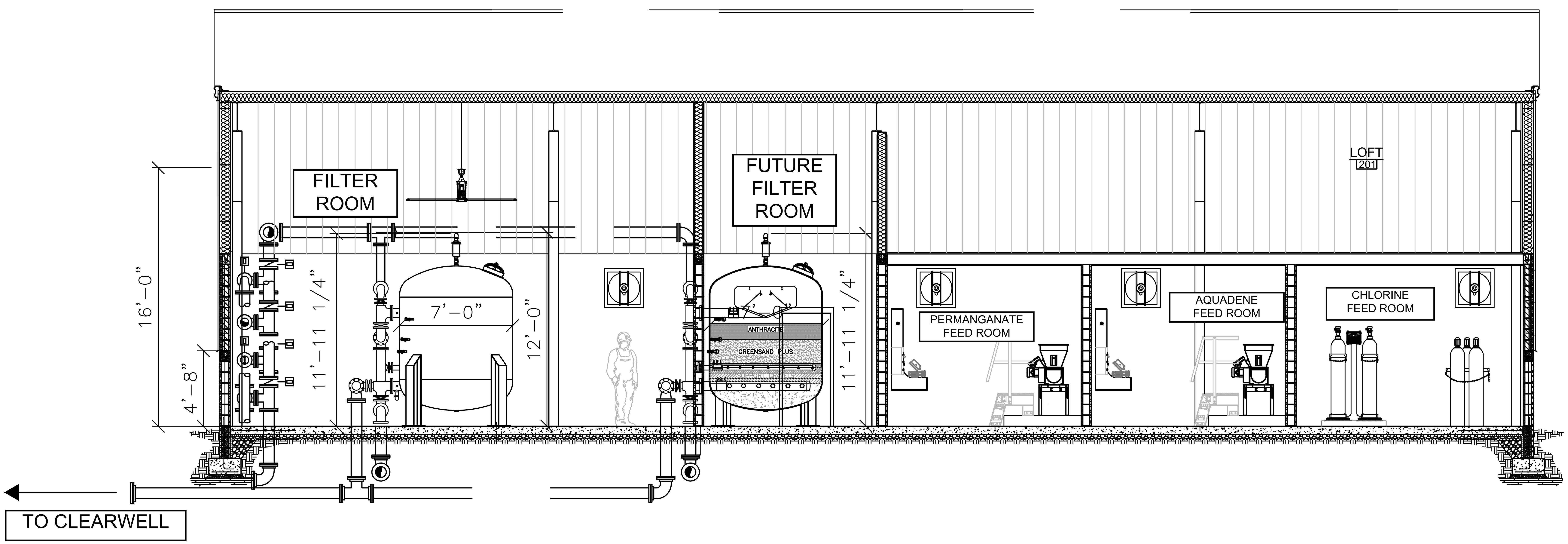
PRELIMINARY FLOOR PLAN

SANDY HOOK WATER DISTRICT
Serving Our Community

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

EXHIBIT 5



THIS DRAWING HAS BEEN PREPARED AT THE SCALE INDICATED. REPRODUCTION OF THIS DRAWING MAY INTRODUCE INACCURACIES OF THE LISTED SCALE. THE GRAPHIC SCALE BAR SHALL BE USED TO DETERMINE THE ACTUAL SCALE.

IT IS A VIOLATION OF LAW FOR ANY PERSON TO ALTER THIS DRAWING WITHOUT WRITTEN PERMISSION FROM BLUEGRASS ENGINEERING, PLLC AND ACTING UNDER THE DIRECTION OF A LICENSED ENGINEER.

NO.	DATE	REVISIONS	BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

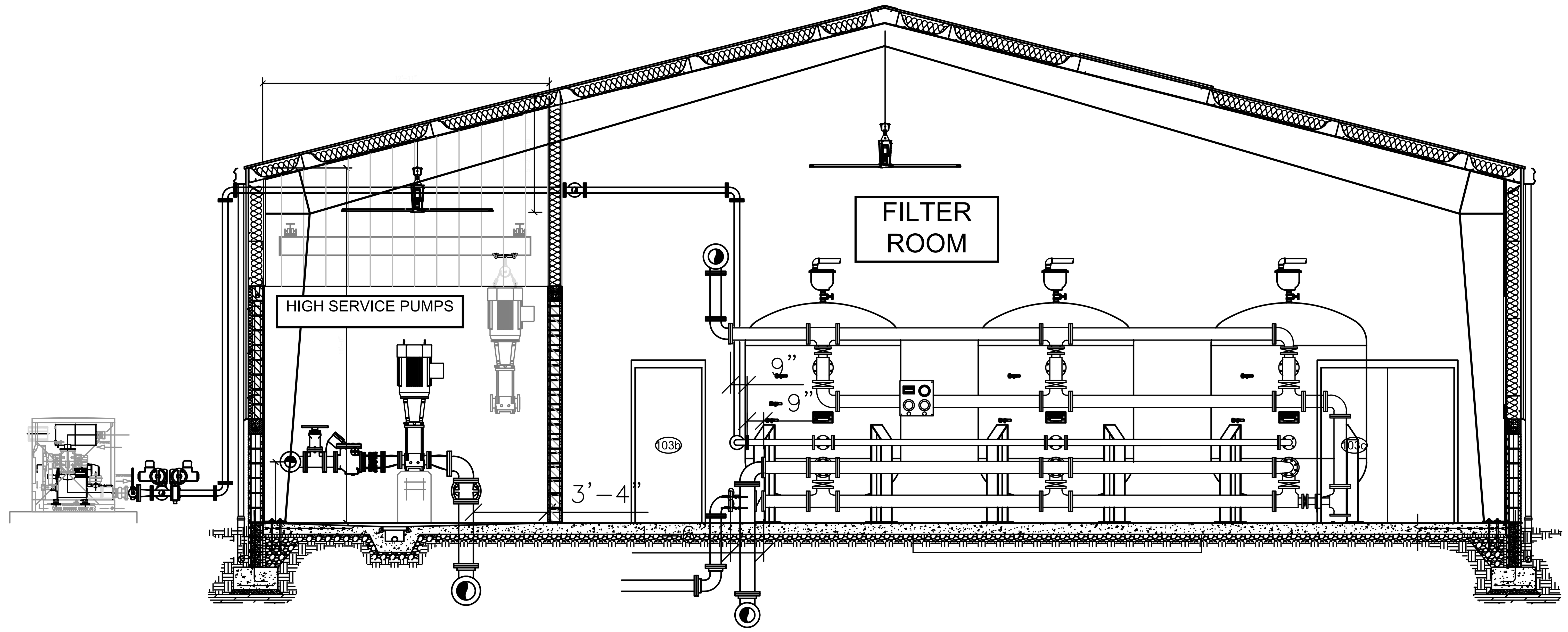
PRELIMINARY FLOOR PLAN - SECTION VIEW

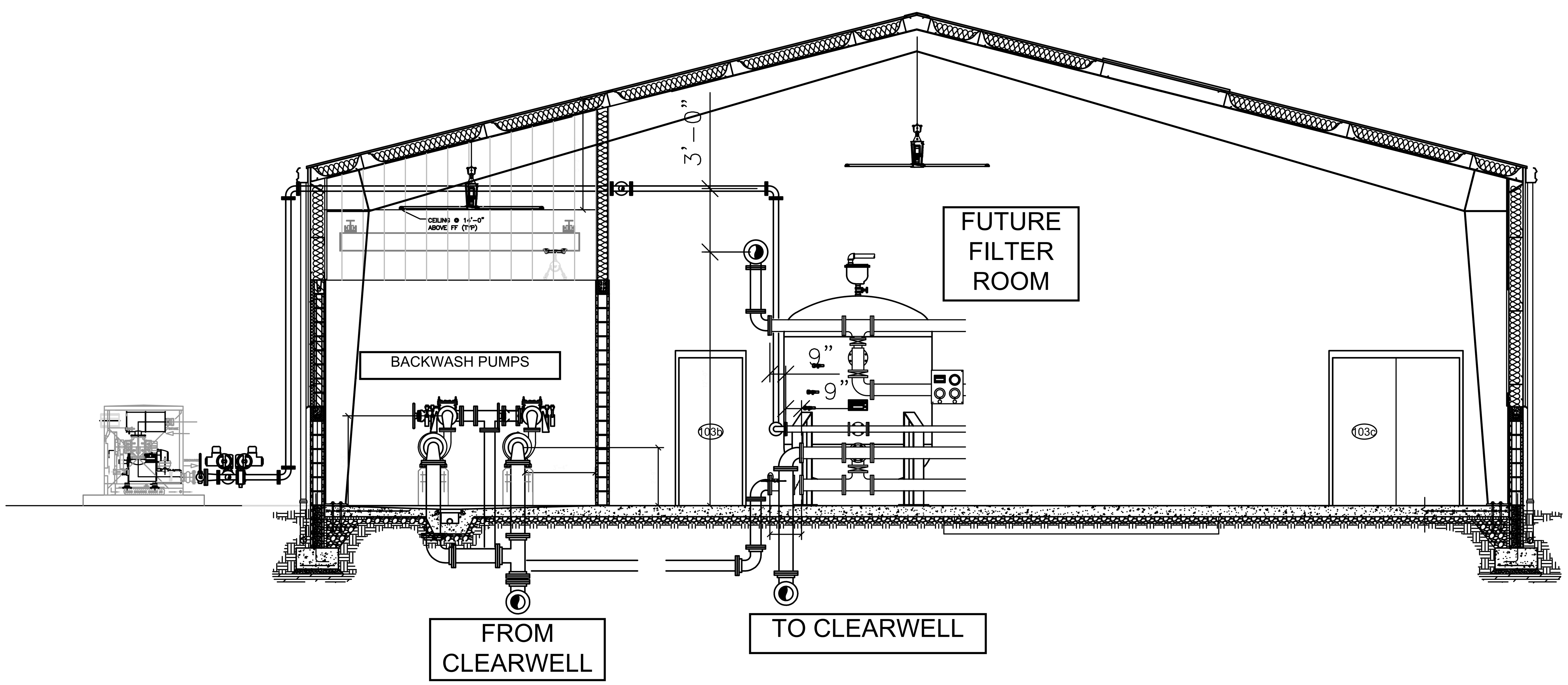
SANDY HOOK WATER DISTRICT
Serving Our Community

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 - Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

EXHIBIT 6





NO.	DATE	REVISIONS	BY

2019 WATER SYSTEM IMPROVEMENTS
CONTRACT 12 - WATER TREATMENT PLANT IMPROVEMENTS

PRELIMINARY FLOOR PLAN - SECTION VIEW

SANDY HOOK WATER DISTRICT
Serving Our Community

BLUEGRASS ENGINEERING PLLC
222 East Main Street, Ste. 1 • Georgetown, KY 40324

PROJECT #:	19003
DATE:	OCTOBER 2019
PROJECT MGR:	LRS
DRAWN BY:	BKL
CHECKED BY:	BKL

EXHIBIT 7