

Water Capacity and Distribution System Study

On Behalf of:

Town of Plainfield
Department of Public Works
986 South Center Street
Plainfield, IN 46168

Presented to:

Executive Director of Development Services
Executive Director of DPW
Town Council Members

Prepared By:

Butler, Fairman & Seufert, Inc.
8450 Westfield Blvd., Suite 300
Indianapolis, IN 46240-8302



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Executive Summary

The purpose of this study is to supplement the Town of Plainfield's Water Capital Improvements Plan (Water CIP) with a focused evaluation of the anticipated development within the system and the impacts that development may have on the Town's Water System. The size and location within the system of the anticipated developments will largely dictate the sequence and timeline needed to implement the improvements identified in the Water CIP.

Existing System Evaluation and Future System Demands

- The Plainfield Water Works System includes 3 water treatment plants, 3 elevated storage tanks, 1 ground storage tank, and 3 booster stations spread throughout 5 independent Pressure Zones
- The Plainfield Water Works System has a rated capacity of 10 million gallons per day (MGD)
- The single highest demand day from the past 2 years for the Plainfield Water Works System was 7.88 MGD indicating that there is 2.12 MGD of available capacity remaining
- The single highest demand day represents that 79% of the rated capacity of the system is being utilized and at 90% IDEM may issue an early warning order which could implement a water connection ban and halt potential growth
- Should they be fully realized, demands associated with estimated prospective development and future allocated developments for Plainfield will exceed the system's rated capacity

Recommended Implementation and Timing of System Modifications and Capital Improvement Projects

- Improvements Sequenced during 2024
 - Completion of the DOC Connection on Moon Road as identified in the Water CIP. This project provides a redundant feed to the DOC Water System that can be utilized in emergencies and will help facilitate the rehabilitation of the DOC WTP.
 - Swinford WTP Filter Media Replacement and air scour backwash procedure implantation.
- Improvements Sequenced during 2025
 - Completion of the Swinford WTP Reaction Reservoir Rehabilitation to provide a permanent solution to the structural deficiencies of the suspended plant floor.
 - Modification of the existing Carr Road Pressure Zone to include the western portion of the current Ronald Reagan Pressure zone. This includes changes to system valves and hydrant flushing.
 - Completion of the Moon Road Water Main Extension project as identified in the Water CIP. This project completes the 16-inch water main along Moon Road and allows for better distribution from the Southwest WTP.
 - Rehabilitation of the wells, filters, and aerator at the DOC WTP. This allows the supply from the DOC Water System to continue to serve the DOC facility rather than utilizing supply from the Plainfield Waterworks System.
 - Expansion of the Southwest WTP to increase capacity from 2 MGD to 4 MGD as identified in the Water CIP. This project allows for the Town to be ready for future demands associated with future prospective and allocated developments. The project will also preserve the ability of the plant to provide an additional approximate 2 MGD on an instantaneous basis for emergency situations.

- Improvements Sequenced during 2026
 - In conjunction with the Southwest WTP expansion, increase the pressure leaving the plant to 90 psi. Additional system valves will likely be needed to reduce pressure in certain areas and to allow additional flow from the Southwest Pressure Zone to enter the Standard Pressure Zone.
 - Modification of the Carr Road Pressure zone to remove the northwest side of the system and incorporate the area into the Southwest Pressure Zone rather than relying on the Carr Road Booster Station. This includes changes to system valves and hydrant flushing.
 - Modification of the Southwest Pressure Zone to allow a controlled supplement of flow into the Standard Pressure Zone in order to meet future development needs. This includes the installation of a pressure reducing valve and increasing the pressure leaving the Southwest WTP to 100 psi.
- Improvements Targeted after January 2026
 - Completion of the Northwest Water Storage Facility project as identified in the Water CIP. It is recommended that this project consist of an elevated water storage tank to provide redundancy to the Southwest Pressure Zone.

Tentative Recommended Project Sequence and Schedule

Project Name	Planning Budget	2024				2025				2026				2027			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
DOC Connection on Moon Road	\$600 K																
ILEA Expansion Opening	N/A																
Sw inford WTP Filter Media Replacement	\$1.5 M																
Sw inford WTP Reaction Reservoir Rehabilitation	\$2.9 M																
Carr Road Pressure Zone Modification - Phase 1	\$175 K																
Moon Road Water Main Extension	\$1.75 M																
Carr Road Pressure Zone Modification - Phase 2	\$325 K																
DOC WTP Rehabilitation	\$2.7 M																
Southw est WTP Expansion	\$11.0 M																
Southwest Pressure Zone Modifications	\$100 K																
Potential Niagara Expansion	N/A																
Northw est Water Storage Facility	\$5.75 M																



Shading Indicates Allow able Schedule Float

Shading Indicates Estimated Project Duration and Target Completion Date

Shading Indicates Schedule Controlling Event

Chapter 1 – Introduction

The purpose of this study is to supplement the Town of Plainfield's Water Capital Improvements Plan (CIP) with a focused evaluation of the anticipated development within the system and the impacts that development may have on the Town's water system. The size and location within the system of the anticipated developments will largely dictate the sequence and timeline needed to implement the improvements identified in the Water CIP.

The last known comprehensive study of the Town of Plainfield's water system was completed in 2004 in the form of an update to the original "Master Plan for Water Distribution System (...)" dated April 1987. At that time population estimates and water demands were projected out to 2025. Based upon recent data these population estimates and projected water demands have been found to be incredibly accurate. As development continues and customer demand increases, it is important for the Town of Plainfield to be proactive in the expansion of its Water System to meet additional projected growth. The 2022 "Water System Capital Improvements Plan" included projects estimated to cost nearly \$80 million intended to enhance the system and are targeted for completion within 3 to 5 years.

Since 2022, several high water demand development projects have begun construction, and additional concepts for high water demand development projects have been presented to the Town for consideration. Because of the nuanced and complex nature of the distribution system, it is necessary to evaluate these demands within their respective individual pressure zones. Simply evaluating future developments by comparing system production rates to demand rates will provide an incomplete understanding of problems that could result. This study was completed in conjunction with a computerized model of the water system analyzed with WaterCAD software produced by Bentley. Potential developments were contemplated within the modeling software to better understand the required sequence and timing of the capital improvement projects previously identified.

Chapter 2 – Existing Conditions

Plainfield Water System

The Town of Plainfield operates and maintains two Public Water Systems as identified by the Indiana Department of Environmental Management (IDEM); the Plainfield Water Works System and the Plainfield Re-Entry Educational Facility System (often referred to as the Plainfield DOC System). This study focuses on the Plainfield Water Works System as the Plainfield DOC System serves only the State of Indiana's Department of Corrections Facility. Throughout this study where there are references to the distribution system, those references are referring to the Plainfield Water Works System unless stated otherwise.

PWS 5232020 – Plainfield Water Works

Plainfield Water Works is the primary public water system for the majority of residents within Guildford and Liberty Townships of Hendricks County. See Figure 1 on Sheet 6 for an overview figure. The Plainfield Water Works System has a rated capacity of 10.0 MGD (million gallons per day). The primary infrastructure of the system consists of:

- Three Water Treatment Plants
 - Anderson WTP (4 MGD)
 - Swinford WTP (4 MGD)
 - Southwest WTP (2 MGD)
- Two Aquifers
 - Tipton Complex, White River
 - Tributaries Outwash
- Four Storage Tanks
 - Quaker Boulevard Elevated Storage Tank (1 million gallons)
 - Carr Road Elevated Storage Tank (500,000 gallons)
 - Ronald Reagan Elevated Storage Tank (1 million gallons)
 - Southwest WTP Ground Storage Tank (750,000 gallons)
- Three Booster Stations
 - Carr Road Booster Station
 - Liberty Booster Station
 - Ronald Reagan Booster Station

The Plainfield Water Works distribution system currently operates with 5 separate pressure zones; the Standard Pressure Zone, Southwest Pressure Zone, Carr Road Pressure Zone, Ronald Reagan Pressure Zone, and Liberty Pressure Zone. These zones generally operate independently of each other except in emergencies. This means that the pressure within one zone typically does not impact the pressure within another zone. The delineation of these zones is achieved with booster stations and check valves and the zones are generally dictated by their location as it relates to each Water Treatment Plant. While the zones remain independent during normal operation, redundancy is provided through automatic check valves that will open to supplement pressure from an adjacent pressure zone if needed.

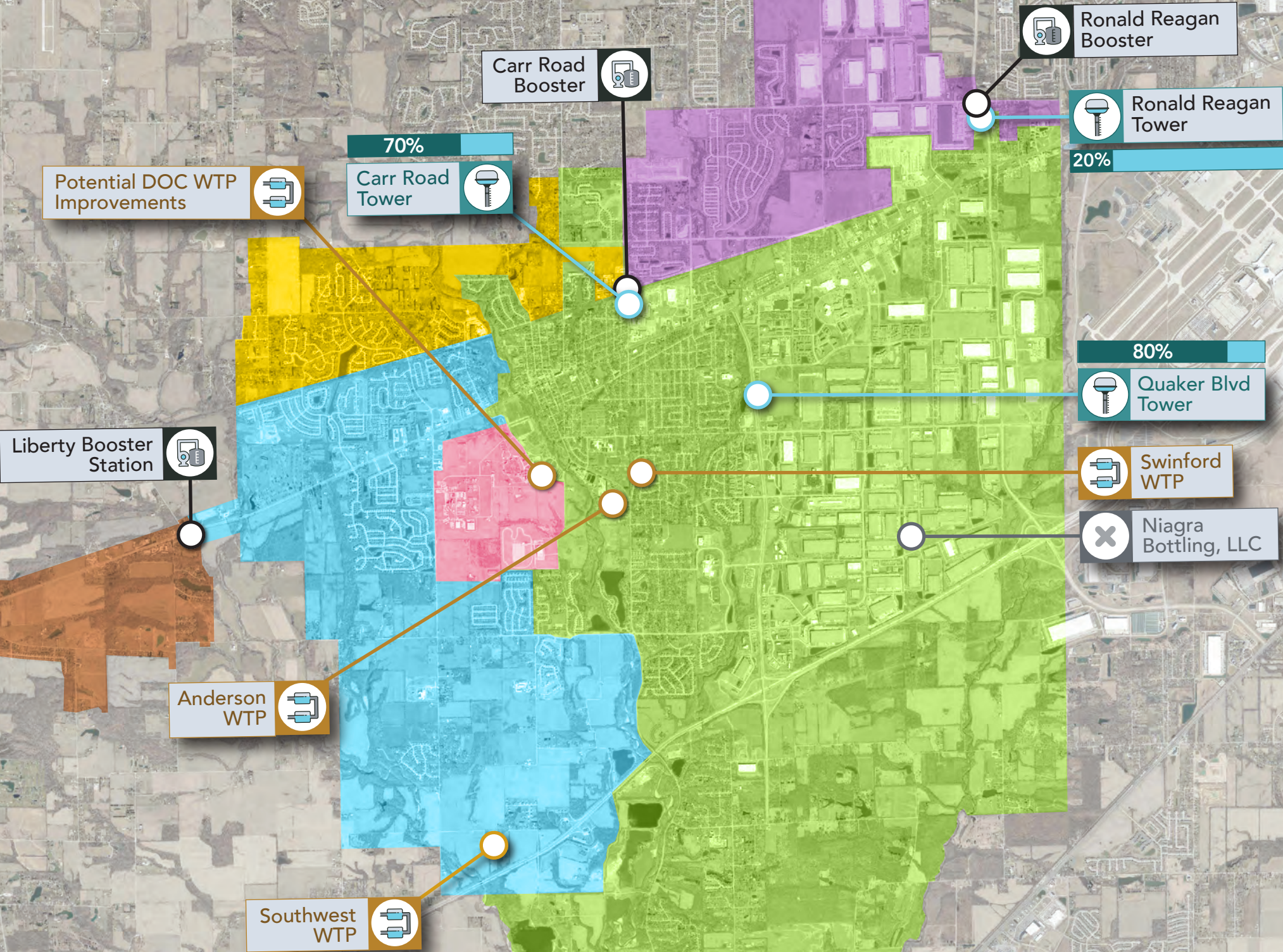
WATER ZONES

- Carr Road
- Department of Corrections
- Liberty / Belleville
- Ronald Reagan
- Southwest
- Standard Pressure

Water Tower

Booster Station

WTP



DRAWN: P. Claire
CHECKED: J. Meyer
DATE: 03/18/2024

WATER CAPACITY AND DISTRIBUTION SYSTEM STUDY
FIGURE 1 - EXISTING PRESSURE ZONES

PLAINFIELD, INDIANA

HORIZONTAL SCALE	
1"=5000'	
VERTICAL SCALE	
SHEET	
7	OF 34
PROJECT	

\\bfsn241\Users\695900.9800\9833\Project\Development\Design\Drawings\Exhibits\6959-9833-Bose File.dwg Peter Claire Plot: 3/20/2024 10:40 AM Save: 3/20/2024 10:39 AM

BFS NO. 695900.9833

\\bism241\users\695900.9800\9833\ProjectDevelopment\Design\Drawings\Exhibits\6959-9833-Bose File.dwg Peter Claire Plot: 3/20/2024 10:40 AM Save: 3/20/2024 10:39 AM

LEGEND

Carr Road Pressure Zone

Liberty Pressure Zone

Ronald Reagan Pressure Zone

Southwest Pressure Zone

Standard Pressure Zone

DOC Water System

Check Valve

Pressure Reducing Valve

DRAWN: P. Claire

CHECKED: J. Meyer

DATE: 03/18/2024

WATER CAPACITY AND DISTRIBUTION SYSTEM STUDY

FIGURE 2 - CHECK VALVES AND PRESSURE REDUCING VALVES

PLAINFIELD, INDIANA

HORIZONTAL SCALE

1"=5000'

VERTICAL SCALE

SHEET

8

OF

34

PROJECT

BIS NO. 695900.9833

PWS 5232007 – Plainfield Re-Entry Educational Facility

This system is commonly referred to as “DOC” as it serves the State of Indiana’s Department of Corrections facility. The water treatment plant is considered a public water system but the entirety of the mains outside of the plant are considered private and are owned and maintained by the State of Indiana. The primary infrastructure of the system consists of:

- One Water Treatment Plant
 - DOC WTP (616,000 gallons per day)
- One Elevated Storage Tank
 - DOC Elevated Storage Tank (500,000 gallons)

The DOC Water Treatment Plant has an estimated capacity of 993,000 GPD but is limited by well production to approximately 616,000 GPD based on a current combined well output of 428 GPM. During peak demand times, the wells can be supplemented with flow from the Plainfield Water Works system. The elevated storage tank at the prison has a capacity of 500,000 gallons.

Capacity of Overall Water System

The simple definition of available capacity for a water system is a comparison of the rated capacity of the system versus the actual customer demand. For the Plainfield Water Works System, the single highest demand day from the past 2 years occurred during October 2023 and was 7.88 MGD. This would indicate an available production capacity of 2.12 MGD. The single highest demand day also represents that 79% of the rated capacity of the system is being utilized. The Indiana Administrative Code (IAC) defines the permitted usage of a system’s daily capacity to be 90%. Once a system exceeds 90% of its daily capacity the State may impose restrictions, including-connection bans. A connection ban would halt further development within the Town. Therefore, there is an estimated 1.12 MGD of available capacity that may be allocated to development without risking state imposed restrictions.

327 IAC 8-3-4.2 (b) The commissioner may issue an early warning order to a public water system if the public water system's highest daily pumpage, as reported over the previous two (2) year period, on the public water system's monthly report of operations, on record with the department, exceeds ninety percent (90%) of the public water system's capacity.

While the simple definition is enough to determine the available capacity for smaller less complex systems, the size and nature of Plainfield Water Works requires a more complex analysis to appropriately determine the available capacity. As the system contains multiple pressure zones, the available capacity is different depending on the location within the system.

Estimated Capacity of Individual Pressure Zones

Standard Pressure Zone

- 8.0 MGD available from the Anderson WTP and Swinford WTP

Southwest Pressure Zone

- 2.0 MGD available from the Southwest WTP

Carr Road Pressure Zone

- Booster Station Pump Capacity of 2.5 MGD
- Supplied from available capacity of the Standard Pressure Zone

Ronald Reagan Pressure Zone

- Booster Station Pump Capacity of 4.8 MGD
- Supplied from available capacity of the Standard Pressure Zone

Liberty Pressure Zone

- Booster Station Pump Capacity of 1.75 MGD
- Supplied from available capacity of the Southwest Pressure Zone

DOC Water System

- 616,000 GPD available from DOC WTP
- The Standard Pressure Zone can supply the DOC WTP with additional capacity when demand is high.

Distribution System Evaluation of Existing Conditions

The purpose of a water distribution system is to convey the finished water from the water treatment plants to the customer in a manner that is suitable for use. Whether or not the water is suitable is largely a question of both water quality, which could be affected by the age of the water, and the pressure of the water. Issues with water quality associated with water age, more commonly known as water turnover, have not been an observed problem within Plainfield Water Works and that is not anticipated to change. The sequence of high service pump operation at the water treatment plants is structured in a way to naturally facilitate turnover within the system, which is ideal. Providing consistently suitable pressure within the system is a focus of concern as the water demand approaches the system capacity.

Pressure fluctuates in a water main due to elevation changes and friction losses. Water pressure can be thought of as a column of water. The taller the column of water is, the more pressure will be observed at the bottom of the column. Elevation changes affect the pressure within a water main because as the reference point rises within a column of water the observed pressure, which is the force of the weight that water exerts, decreases. Likewise, as the reference point goes down within a column of water, the force created by the weight of the water above increases and so does the pressure. The same principle applies to the water distribution system and can be observed with the water elevation inside of the elevated storage tanks, or water towers. These structures hold an elevated volume of water up in the air to provide consistent pressure and storage in case of large instantaneous demands such as a fire or water main break. The water level within a water tower is representative of the water pressure within the system at that location. When the water level inside a water tower becomes low, the pressure within the distribution system is also low within its operating range. While ground elevation changes exist across the service area of the Plainfield Water Works system, they are gradual and not of significant determinant to the performance of the system.

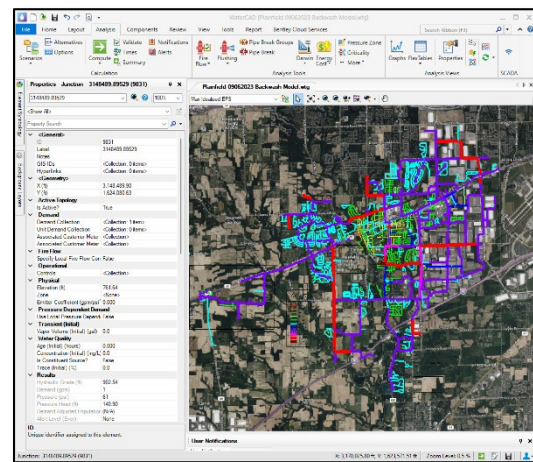
Pressure changes in the water main are more commonly attributed to friction loss than elevation changes. This decrease in pressure occurs as the potential energy in the form of pressure is expended as the fluid flows against friction forces and viscous forces within the water. The amount of friction loss depends on several factors including the size of the pipe, the amount of

flow through it, and the distance the fluid must travel. Simply put it is more difficult to send the same amount of water through a narrow straw versus a big straw. Areas within a distribution system that are the furthest from the water treatment plants are generally more susceptible to pressure loss.

Evaluating the amount of pressure loss in a section of pipe for a given flow amount can be calculated by hand. The Hazen-Williams equation is often employed in this effort. A coefficient is selected that represents the level of friction expected based on the material profile of the pipe, the distance of the section of pipe is defined, and the rate of water demand which can be expressed as gallons per minute is known. These inputs are used to determine the expected amount of pressure that will be lost.

The task of conceptualizing the pressure losses through even a small system of interconnecting pipes of various sizes with changing demand rates and production rates is complex and would take an extended amount of computations to accomplish. Plainfield Water Works has an estimated 270 miles of water main and more than 9,300 service connections. Understanding the dynamic nature of water pressure within a system that size is not possible by hand. For this reason, computer modeling is used to complete a seemingly infinite number of computations and checks to deliver usable results.

BF&S has been retained in the past by the Town to complete and periodically update a system-wide water model of the Plainfield Water Works. The model saw its last comprehensive update in 2019. Since then, small updates have been made to include new higher-demand customers. As a part of this study, the water model was fully updated to the presumed current existing conditions. The benefits of the model in the work of master planning are invaluable. Countless scenarios and conditions can be vetted safely with forecasted results of what would be expected to happen in reality.



The metric selected for comparative evaluations between scenarios and conditions is the water level within the elevated water storage tanks. All three elevated water storage tanks are located within the Standard Pressure Zone as shown in Figure 1. Other metrics were evaluated including minimum and maximum pressures within the extents of the system, water velocities within the mains, and production rates at the treatment plants to name a few. The amount of available data is almost endless, which is why it is important to identify a consistent metric to be measured against all scenarios evaluated.

Each scenario evaluated had the same base parameters. The scenarios were all modeled for 48 hours consisting of “back-to-back” peak demand days. The purpose of this selection was to stress the system to expected existing conditions. A non-peak demand day model does not offer much

useful information as any utility installation or system is designed to operate at the worst, or most demanding, conditions expected. The baseline existing conditions peak day model showed the system being strained but operating effectively as it normally does. The first scenario included in this study is a peak day demand serviced by the existing water system. The results are shown in Figure 3. One takeaway from this model is that the Ronald Reagan Elevated Storage Tank suffers from lower-than-desired water levels. This is evident by the water plants being able to replenish the volume of water within the Quaker Boulevard and Carr Road towers, but Ronald Reagan Elevated Storage Tank remains at a lower level. This trend is consistent with DPW operator's accounts of high-demand days.

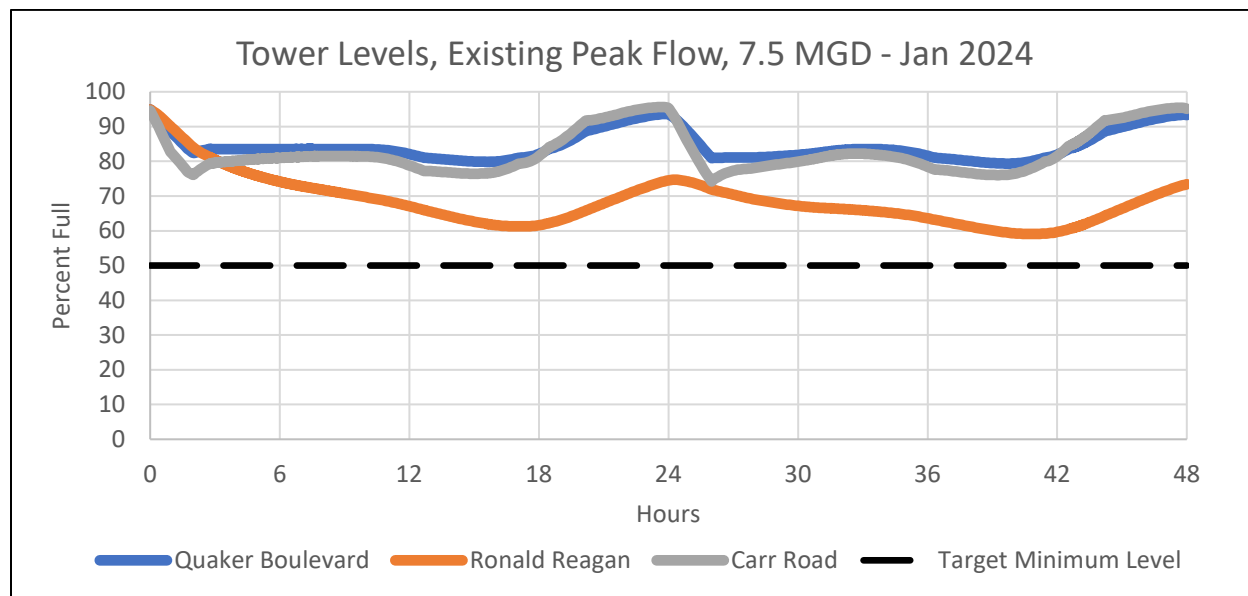


Figure 3 – WaterCAD Modeling Results of Water Tower Levels for an Existing Peak Day

Chapter 3 – Future Conditions

From the perspective of the water system, demand in the form of development should be broken down into two categories. The first type is allocated development, which is development that has been approved but the water demand has not yet been realized. The second type is prospective development. This is development that has not yet materialized but can be inferred based on population growth and trends or estimated based on information presented to the Town. Allocated development can be estimated using the required methodology outlined in 327 IAC 8-3.3-2 which defines typical daily water demands for specific types of development or through other forms of reliable data such as actual demands from similar facilities. This is accomplished by evaluating different types of building uses into a common unit of measure so that the water demand can be compared. For example, a single-family residential house is estimated to use 500 gallons per day. The metric of the estimated water demand from a single-family residential house is the basis of the Equivalent Dwelling Unit (EDU). An EDU is equal to 500 gallons of water demand per day. These estimates can be considered conservative, as in likely higher than actual demand when it is realized, but a conservative estimate is prudent when considering future water demands as the rated capacity of the system is a set number.

Water is allocated by the Town through the Civil/Site Infrastructure Plan Review process. Through this process, water demand is estimated per the Indiana Administrative Code and documented on a State Form 49008 for each development. The amount of water allocated to future developments that has not yet been connected to the system totals 2,376 EDUs or 1.19 MGD. For the purposes of this study, it has been assumed that the developments in Table 1 will be completed by January of 2025.

Allocated Demands (those that have been approved by the Town)

Standard Pressure Zone

- **Hobbs Station PUD – 1,049 EDUs or 525,000 GPD**
Mixed use development including a maximum of 250,000 square feet of office space, 150 room hotel, 650 residential units, 70,000 square foot of retail space, and 250 senior housing units
- **Bomar Estates PUD – 757 EDUs or 379,000 GPD**
Residential housing development including a maximum of 80 single family residential units, 60 paired villas, 306 townhomes, and 315 apartment units
- **Stanley Terrace – 62 EDUs or 31,000 GPD**
Residential housing development including 24 townhomes and 36 apartment units
- **Fairwood Section 4 – 60 EDUs or 30,000 GPD**
Residential neighborhood including 60 single family residential units
- **Winding Way – 40 EDUs or 20,000 GPD**
Residential housing development including 6 duplexes and 30 townhomes
- **Family Promise – 13 EDUs or 7,000 GPD**
Residential neighborhood including 13 single family residential units
- **Village at Plank Road, Phase 1A – 91 EDUs or 4,600 GPD**
Residential housing development including 117 apartment units

Southwest Pressure Zone

- **Trescott Sections 1, 2, and 3 – 181 EDUs or 91,000 GPD**
Residential neighborhood including 181 single family residential units

Carr Road Pressure Zone

- No allocated development demand

Ronald Reagan Pressure Zone

- No allocated development demand

Liberty Pressure Zone

- Fox Creek Sections 1 and 2 – 122 EDUs or 61,000 GPD
Residential neighborhood including 181 single family residential units

DOC Pressure Zone

- Indiana Law Enforcement Academy – 273 EDUs or 136,800 GPD

Expected Development	EDU	Water MGD
Hobbs Station PUD	1,049	0.52
Bo-Mar Estates PUD	757	0.38
Stanley Terrace	62	0.03
Fairwood Section 4	60	0.03
Winding Way	40	0.02
Family Promise	13	0.01
Trescott Section 1	50	0.03
Trescott Section 2	53	0.03
Trescott Section 3	79	0.04
Fox Creek Section 1	62	0.03
Fox Creek Section 2	60	0.03
Village at Plank Road 1A	91	0.05
Total	2,376	1.19

Table 1 – Expected Development Water Demand within Plainfield Water Works

Prospective Demands (known conceptual plans)

Standard Pressure Zone

- Niagara Bottling, LLC is a long-standing high-volume customer of water averaging 910,335 GPD over a 2-year rolling period. Niagara is interested in adding another production line at their facility and have inquired with the Town on the availability of an additional water supply of 500,000 GPD.

Liberty Pressure Zone

- A conceptual development around the Deer Creek Golf Course has been presented to the Town for preliminary feedback. This concept consists of a 1,000 acre residential community with potential mixed use commercial units. Preliminary estimates include 1,500 EDUs or 750,000 GPD

DOC Water System

- A prospective capacity allocation of the Plainfield Water Works System is the decommissioning of the DOC Water Treatment Plant and consolidating the DOC system into the Plainfield Water Works public water system. The current pressure filters at the DOC Water Treatment Plant were installed in the mid-1990s and have not been taken out of service since then. These filters appear to require extensive refurbishment including new interior protective coating and filter media replacement. The aerator was last rehabilitated around 2010 and likely needs maintenance. These reasons are contributing

factors in the consideration of decommissioning the DOC water treatment plant and transferring its water demand to the Plainfield Water Works system.

Prospective development can be estimated in a variety of ways including forecasted population growth, presumption of future land uses, and trendlines of observed development over time. The amount of prospective development within the Town of Plainfield can be graphically estimated by creating a trendline based on the 1.19 MGD of allocated development between its expected completion in January 2025 and today. These future water demand values and trends are illustrated in Figure 4. This figure shows the highest demand days over the previous 5 years. In January 2025 an orange circle represents a future average highest demand day with the 1.19 MGD of allocated development. The orange line on the graph extending from that point represents the rate of prospective development demand increases over time. The yellow circle and yellow dashed line are similar to the orange, but with the potential Niagara expansion included in the highest demand day total. In 2026 the chart shows a 2.0 MGD increase in rated capacity which will be a result of the Southwest Water Treatment Plant Expansion, which will be covered in a subsequent section of this study.

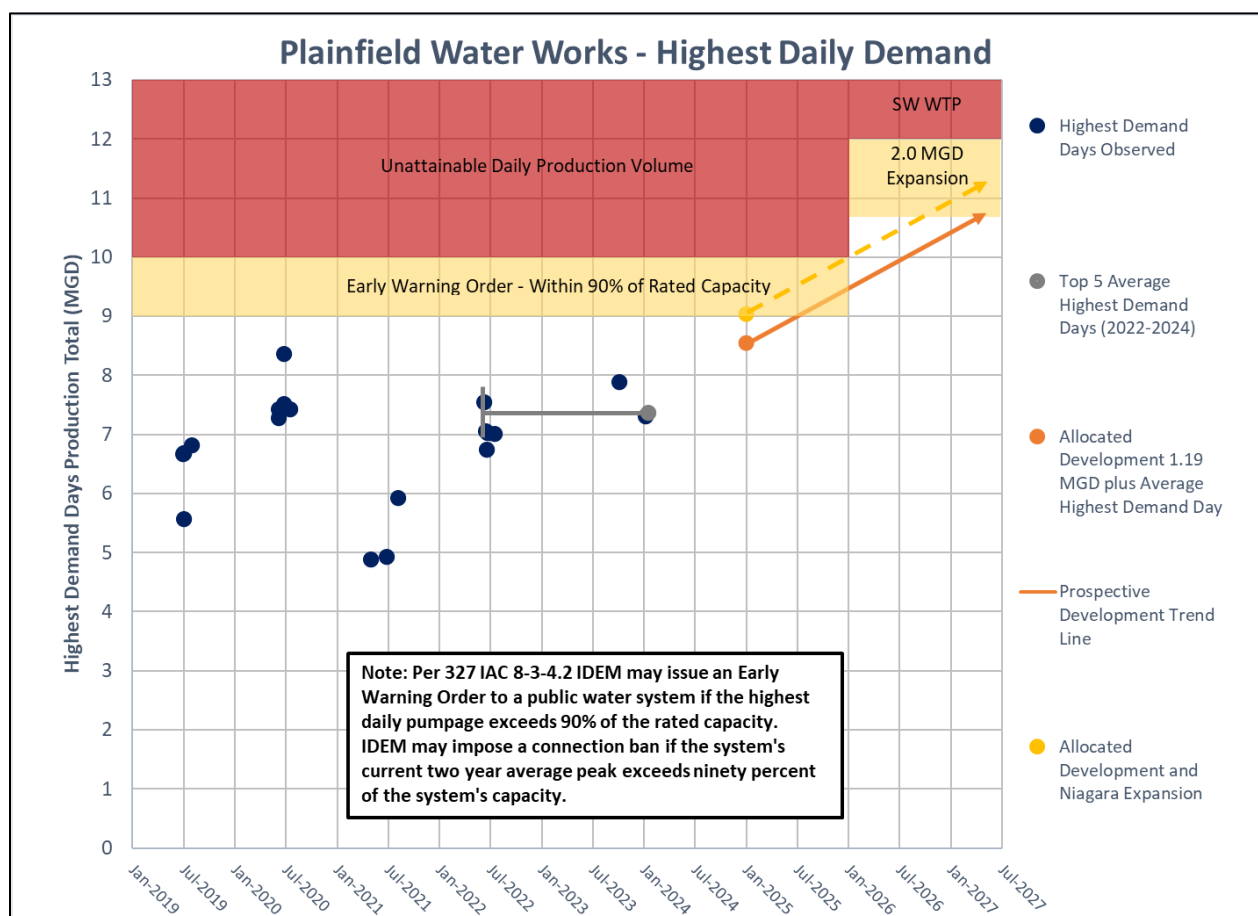


Figure 4 – Plainfield Water Works System Capacity and Future Demand Projection

Distribution System Evaluation of Future Conditions

The existing conditions computer water model was updated to include all of the allocated development water demand. This increased the peak demand day to around 8.4 MGD by as soon as January of 2025. What is readily apparent with these results shown in Figure 5 is that the performance of the Ronald Reagan Tower shows a significant decline. The demand placed on the water storage volume within the Ronald Reagan Tower outpaces the water system's ability to replenish it. Therefore, improvements to the distribution system are recommended to rectify the forecasted problem.

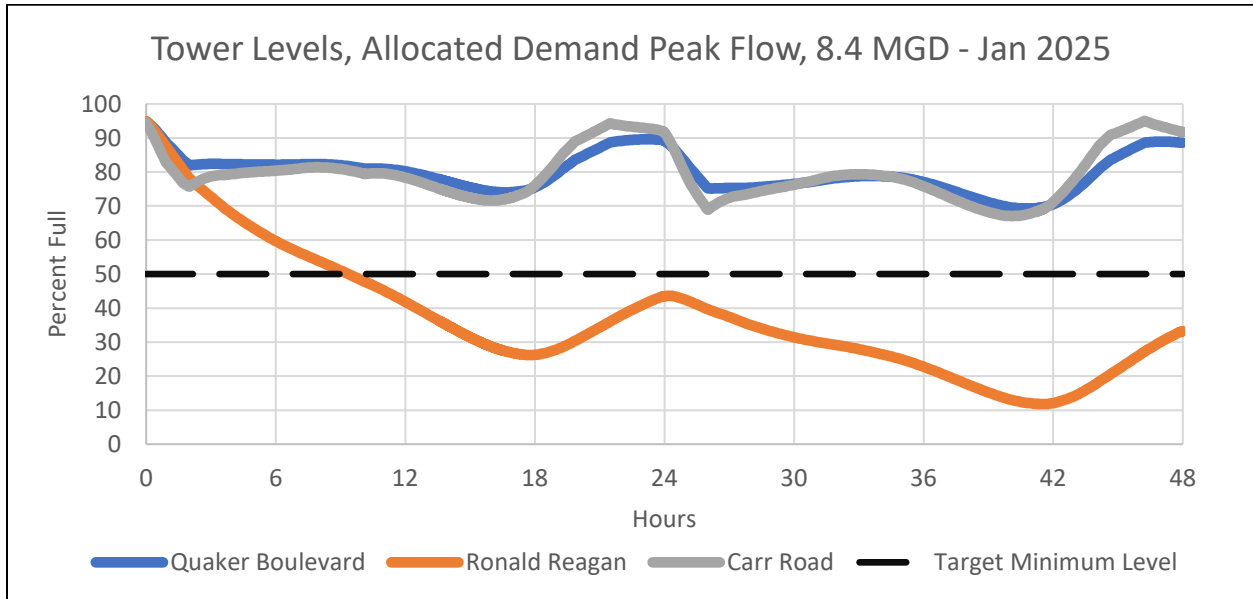


Figure 5 – WaterCAD Modeling Results of Water Tower Levels for the Future Allocated Demand Peak Day

Chapter 4 –Evaluation of Potential Improvements

Standard Pressure Zone

Improvements to the distribution system are needed to prevent the poor performance of the Ronald Reagan Elevated Storage Tank under future conditions shown in Figure 5. The Ronald Reagan Elevated Storage Tank is in a unique position within the distribution system by being located at the boundary of the Ronald Reagan Pressure Zone and the northeast



extents of the Standard Pressure Zone. The elevated storage tank is part of the Standard Pressure Zone. Two conditions impact the water level performance of the storage tower. The first condition is that the Ronald Reagan Elevated Storage Tank is the furthest water tower from the water treatment plants within the Standard Pressure Zone. This distance results in friction losses that the pumps at the plants are unable to overcome without adverse effects. Currently, the system operates with both Swinford WTP and Anderson WTP producing water based on the level within either the Quaker Boulevard Elevated Storage Tank or the Carr Road Elevated Storage Tank. Both tanks are nearly equally distant from the plants and generally perform similarly to one another. This first contributing factor to the Ronald Reagan Elevated Storage Tank's level performance is illustrated in Figure 3 and Figure 5 as both Quaker and Carr tanks are in sync with each other and performing adequately by maintaining at least 50% capacity.

The second contributing factor to the water level performance inside the Ronald Reagan Elevated Storage Tank is the operation of the booster station inside of the tower pedestal. This booster station currently pressurizes the Ronald Reagan Pressure Zone with water supplied from the elevated storage tank. The Ronald Reagan Pressure Zone is at a slightly higher ground elevation than the Standard Pressure Zone and therefore requires energy input to maintain a serviceable distribution system. FAA airspace restrictions limited the height of the tower necessitating this configuration. As the water pressure within the Standard Pressure Zone naturally replenishes the water level within the elevated storage tank, the booster station draws off of this volume to supply the Ronald Reagan Pressure Zone. This setup has worked well and provided the Town with almost 15 years of service. However, the introduction of the dense mixed-use housing developments within Hobbs Station and Bo-Mar Estates appears to be too much for this setup to adequately serve.



Two possible solutions were evaluated to remedy the projected decline in performance of the water level within the Ronald Reagan Elevated Storage Tank. The first solution considers using altitude valves at the bases of the Carr Road Tower and Quaker Boulevard Tower. An altitude valve works by remaining open until a predetermined backpressure level is sensed. Once the predetermined backpressure level is sensed, the altitude valve closes until the main pressure level subsides below the backpressure and then the valve opens again. In practice, this allows the distribution system pressure to exceed the pressure offered by the water level with the tower. In other words, the theoretical column of water pressure in the distribution system is taller than the column of water pressure inside the tower. This is important because it prevents the tower from an overflow condition while maintaining a higher pressure within the system. With these altitude valves the water treatment plant pumps could then operate based on the water level of the Ronald Reagan Tower without overtopping Carr Road Tower and Quaker Boulevard Tower. The theory behind this approach is sound, and notwithstanding some drawbacks, it likely does benefit the system and the Ronald Reagan Tower on a non-peak day. However, when this approach is subjected to peak day demands within the water model the benefits are marginal, but the drawbacks are significant. The issue of friction losses becomes apparent as the pressure within the distribution system around the water plants in central Plainfield rises above 100 PSI. During the highest peak demand, the plant high service pumps become ineffective and are unable to push water because the pressures are higher than their rated capacity. Damage to pumps and plant equipment is likely to occur. Furthermore, the increase of pressure within the oldest parts of town poses dangers of increased risk of water main breaks and damage to customers' plumbing and appliances. For these reasons, altitude valves are not recommended.

The second possible solution evaluated is to repurpose the Carr Road Booster Station to supply the west portion of the Ronald Reagan Pressure Zone. This has the effect of reducing the volume of water that the Ronald Reagan Booster Station is required to pump. The water level performance of the Ronald Reagan Tower is thereby benefited by less water being drawn off for the northern pressure zone.

The Carr Road Booster Station was designed in late 2000 with the purpose of exporting water from the Plainfield Water Work's system to a neighboring utility. It was renovated in 2010 with a firm pumping capacity of 2.5 MGD at 90 PSI. Plainfield no longer exports water, has not done so in



many years, and will likely not do so again in the foreseeable future. The Carr Road Booster Station currently pressurizes the northwest section of town as shown in Figure 1. This northern portion of the Saratoga area and neighborhoods north of CR 350 South are at a slightly higher elevation than the remainder of the Southwest Pressure Zone. Historically, low-pressure complaints have arisen out of this area and therefore a 16-inch transmission main was constructed in 2018 to allow the Carr Road Booster Station to raise the pressure in this region. Today the Carr Road Booster Station operates around 15% of its designed capacity.

The Carr Road Booster Station could be capable of sending higher-pressure water north along Carr Road as it used to do in the 2000s while exporting water. This would require minor reconfigurations of valves and piping in front of the booster station. An existing pressure-reducing valve inside of the roundabout at Township Line Road and Carr Road shown in Figure 2 would need to be removed to send water east into the Ronald Reagan Pressure Zone. Two new closed isolation valve locations would be required. The first isolation valve would be required at the intersection of Bradford Road and Devonshire Avenue. The Devonshire neighborhood is proposed to be located in the Ronald Reagan Pressure Zone and the entrance to the Settlement neighborhood is proposed to be in the Carr Road Pressure Zone. The second closed isolation valve would be required at the intersection of Bo Street and Harper Drive. Specifically located on the main along Smith Road between the water main branch running east along Harper Drive into the Hobbs Station development and the tapped water main connection that runs west along Bo Street into the Bo-Mar Estates Development.

The Carr Road Booster Station has capacity to supply both the western portion of the existing Ronald Reagan Pressure Zone and the current Carr Road Pressure Zone on the northwest side of town for the amount of allocated development demand considered. For this reason, the northwest portion of Town remains in the Carr Road Booster Station service area in the model results shown in Figure 6 which is projected to occur in January 2025. Once more prospective development demand occurs within this pressure zone, the capacity of water will likely be too much for the current version of the Carr Road Booster Station to accommodate. However, other potential distribution system modifications would allow for additional development and will be detailed later in the study. At this point, the focus is the water level performance of the Ronald Reagan Tower and for this solution to be effective, the overall demand load on the Ronald Reagan Booster Station must be reduced. In the event of a booster station emergency such as an equipment failure or power outage, the boundary of both the booster station pressure zones and the Standard Pressure Zone contain existing check valves. If either booster station goes offline, the check valves automatically open and allow the water to flow in from the Standard Pressure Zone.

The WaterCAD modeling results of the reconfigured Carr Road Pressure Zone and Ronald Reagan Pressure Zone are shown in Figure 6. The performance of the Ronald Reagan Tower is much improved and is consistent with the other towers. The target of maintaining 50 percent tank capacity is achieved.

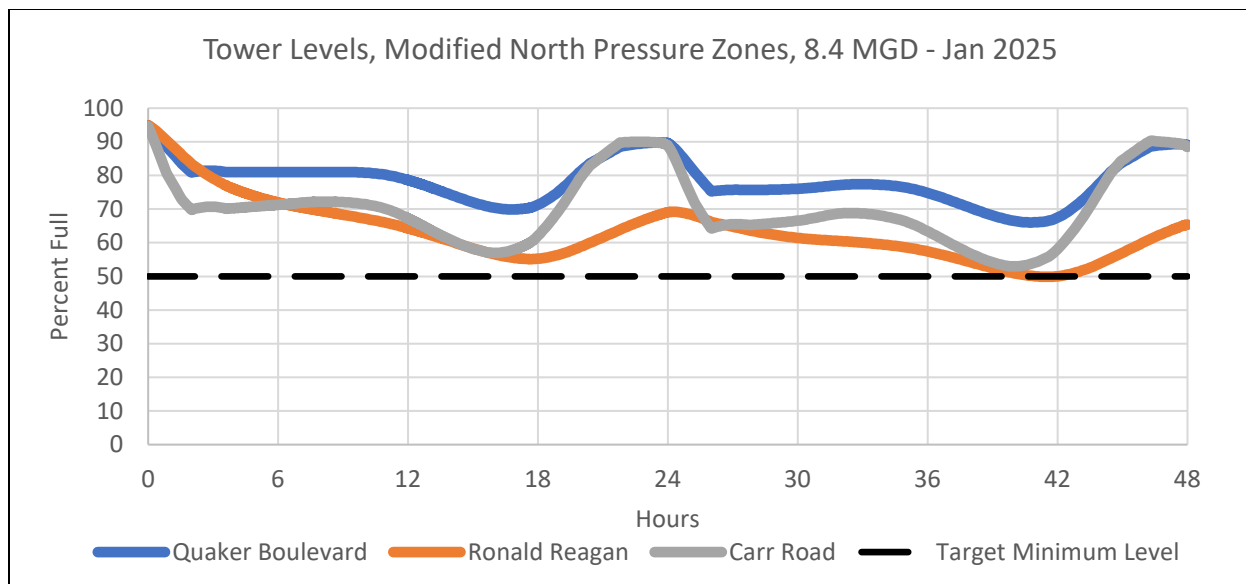


Figure 6 – WaterCAD Modeling Results of Water Tower Levels for the Future Allocated Demand Peak Day with Carr Road Booster Station Modifications

Southwest Pressure Zone

Southwest Water Treatment Plant Expansion

Improvements to the Southwest Pressure Zone are necessary to increase the Town's water system capacity to keep pace with prospective development. A major milestone project that is underway for the Town of Plainfield is the design of the Southwest Water Treatment Plant. The plant was designed in 2001 with a constructed capacity of 2.0 MGD but was purposefully sized to be able to expand to a 4.0 MGD capacity when the need arose. This expansion size was selected because wellfield testing at that time indicated that the aquifer in this area could produce up to 4.0 MGD. The expansion will also preserve the ability of the plant to provide an additional approximately 2.0 MGD on an instantaneous basis for emergency situations. The design of the plant and wellfield expansion is underway and is expected to be operational by the beginning of 2026. Because the water demands of existing customers and the expected allocated development demand are already approaching 90 percent of the system's rated capacity, this study will only evaluate the potential Niagara expansion after the Southwest Water Treatment Plant has completed its expansion. This necessity to only consider the Niagara expansion after the Southwest WTP expansion is illustrated graphically with the prospective development trend line in Figure 4.

The Southwest Water Treatment Plant makes up the supply for the Southwest Pressure Zone. The plant was designed conservatively with its rated capacity possible at 100 PSI. Currently, the plant operates the discharge of finish water into the system at 80 PSI. Because the Southwest Pressure Zone does not have an elevated water



storage tank to gauge water levels, computer hardware at the plant and variable frequency drives automatically adjusts the high service pump(s) output to maintain the desired pressure set point.

The Southwest Pressure Zone is separated from the Standard Pressure Zone by two check valves. In normal operation, the Southwest Pressure Zone is at a slightly higher pressure than the Standard Pressure Zone at the check valve locations. In this condition, the check valves remain closed and form the boundary of the pressure zone. In an emergency such as a fire, water main break, or plant failure, the resulting higher pressure of the Standard Pressure Zone would automatically open the check valves and supply this area with water. Expanding the production capacity at Southwest alone would not provide any benefit to the other pressure zones as the check valves would remain closed in normal operation. Because of this, a pressure-reducing valve was modeled in addition to the existing check valve at its current location at the intersection of Hadley Road and Hall Road shown in Figure 2. This would allow the higher-pressure water in the Southwest Pressure Zone to flow into the Standard Zone at a selected reduced pressure. The check valve remains important for times when the Southwest WTP backwashes. At all other times, the check valve would normally remain closed. It should be noted that transferring too little water is of no benefit to the Standard Pressure Zone, but transferring too much water is detrimental to the Southwest Pressure Zone. Careful operation of the proposed pressure-reducing valve would be necessary in the initial setup.

Increasing the selected discharge pressure of the Southwest Water Treatment Plant is necessary to transfer a meaningful volume of water into the Standard Pressure Zone. This transfer of water from the Southwest Pressure Zone to the Standard Pressure Zone allows for additional prospective developments to be considered, such as the Niagara Expansion. This model used a discharge pressure set point of 90 PSI at the Southwest Water Treatment Plant to obtain the results. It should be noted that the International Plumbing Code (IPC) requires private pressure-reducing valves to be installed on service connections when the pressure exceeds 80 PSI. The topography of the Southwest Pressure Zone is such that the vast majority of customers would experience pressure below 80 PSI due to elevation changes. While some customers will have water pressure exceeding the 80 PSI threshold, this is done for the benefit of the water system as a whole. The responsibility of providing a private pressure-reducing valve to reduce one's service connection pressure is that of the customer.

The previous section detailing the Carr Road Pressure Zone modifications noted that eventually, prospective development in either the northwest area of town or the reclaimed western section of the Ronald Reagan Pressure Zone would become too much demand for the current version of the booster station to serve. Because the Southwest Water Treatment Plant expansion is proposed to discharge water at a higher pressure, the use of the Carr Road Booster Station would no longer be necessary to boost pressure in the northwest area of town. In addition to the higher pressure at the treatment plant, the Moon Road Water Main Extension capital improvement project will benefit the water pressure within that area. This is possible by reducing the amount of pressure loss from the plant by including a more direct and larger diameter water main for the flow to follow. These changes result in the northwest section of town becoming part of the Southwest Pressure Zone. This proposed change is reflected in Figure 7 on Sheet 21.

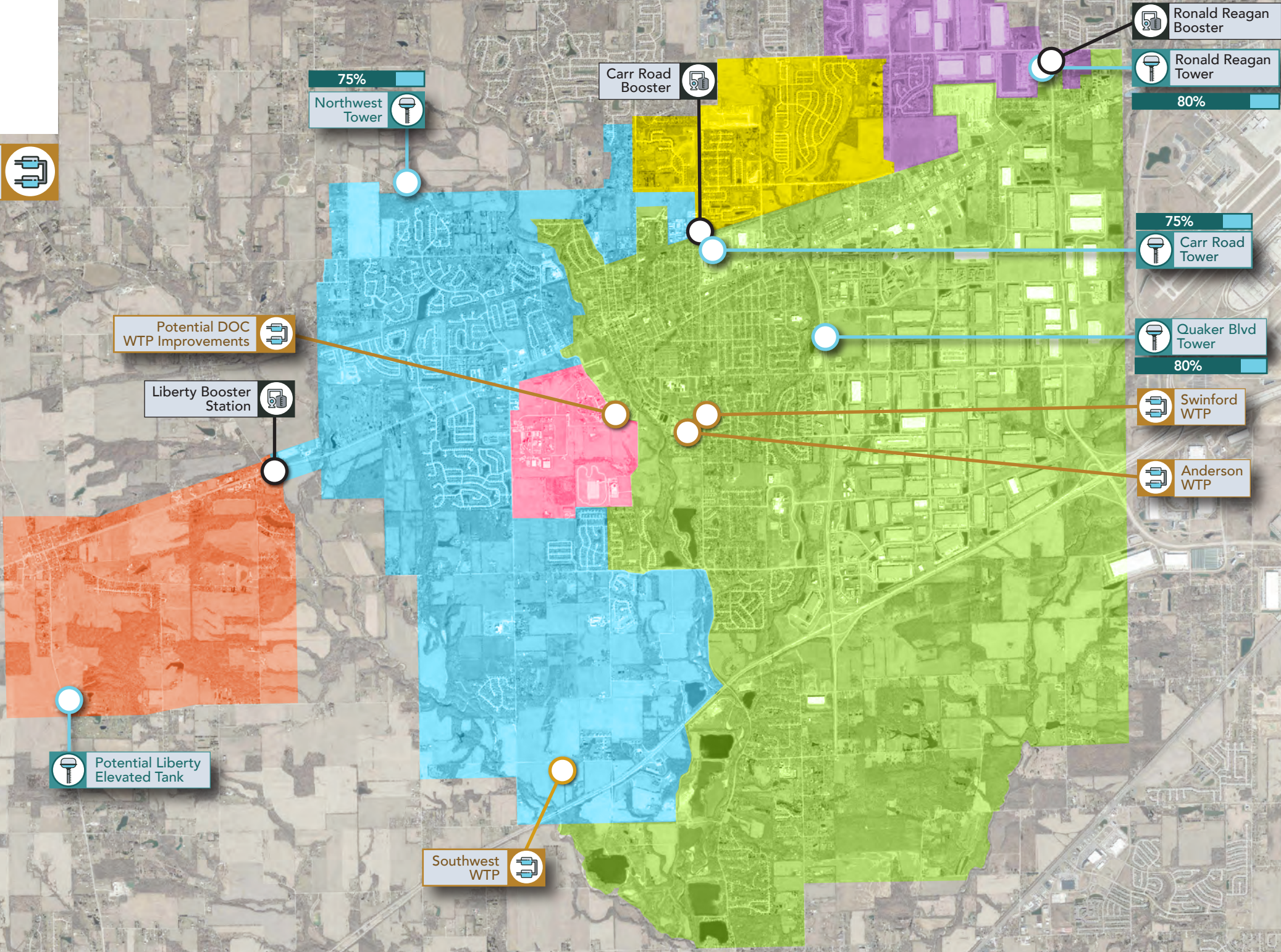
WATER ZONES

- Carr Road
- Department of Corrections
- Liberty / Belleville
- Ronald Reagan
- Southwest
- Standard Pressure

Water Tower

Booster Station

WTP



DRAWN: P. Claire
CHECKED: J. Meyer
DATE: 03/18/2024

WATER CAPACITY AND DISTRIBUTION SYSTEM STUDY
FIGURE 7 - PROPOSED PRESSURE ZONES TARGETED BY JANUARY 2026

PLAINFIELD, INDIANA

HORIZONTAL SCALE	
1"=5000'	
VERTICAL SCALE	
SHEET	
22	OF 34
PROJECT	

\\bfsn241\docs\695900\9833\Project\Development\Design\Drawings\Exhibits\6959-9833-Bose Title.dwg Peter Claire Plot: 3/20/2024 10:35 AM Save: 3/20/2024 10:34 AM

BFS NO. 695900.9833

The extent of the Moon Road Water Main Extension capital improvement project is shown in Figure 8. The existing 16-inch water main in front of the plant would be extended from CR 750 South to the existing 16-inch water main in front of the Hickory Woods subdivision at Bitternut Ln. These changes cumulate into a pressure performance of the northwest section of the town being almost equal, but they are slightly lower than that provided by the Carr Road Booster Station. The potential water storage capital improvement project within the Southwest Pressure Zone will further increase the pressure performance and will be detailed in the following section of this study. It should be noted that no longer boosting the northwest side pressure with the Carr Road Booster Station will require a new connection or valve modification to continue water service along Andico Road.



Figure 8 – Overview of the Moon Road Water Main Extension Capital Improvement Project

The prospective development capacity allocation for Niagara Bottling LLC was described in Chapter 3 in the context of a system-wide capacity evaluation. A more detailed evaluation of the potential increase in capacity demand determined that the Southwest WTP expansion is required for this prospective development demand to be served. The Niagara facility is located in the southwest region of the Standard Pressure Zone as shown in Figure 1. The water model was progressed to include the previously detailed Carr Road Pressure Zone modifications, the expansion of the Southwest Water Treatment Plant, the Moon Road Water Main Extension Project, and the additional capacity demand of 500,000 GPD requested by Niagara. The results of the model are shown in Figure 9 and the target of maintaining 50 percent tank capacity is met. This is projected to be a possibility in January of 2026.

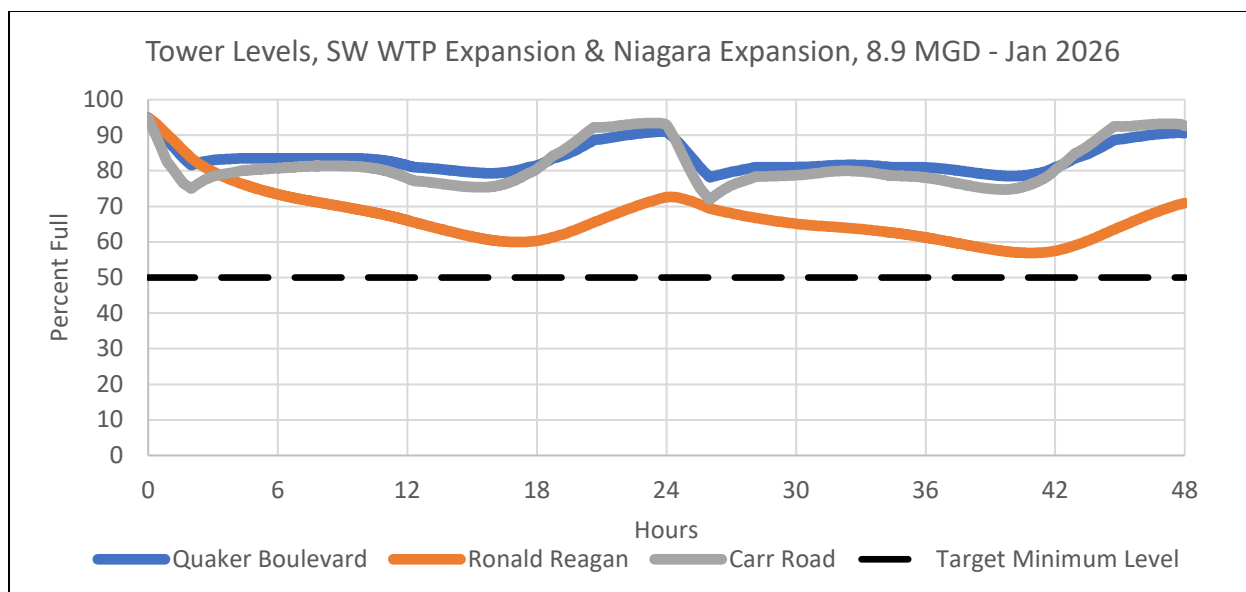


Figure 9 – WaterCAD Modeling Results of Water Tower Levels for the Southwest WTP Expansion and Niagara Expansion in Previously Modeled System Shown in Figure 7

The water level within the towers is shown to be at acceptable levels during the peak demand of 8.9 MGD with the various modifications discussed to this point. Pressures within the system are also acceptable with static pressure remaining above 50 PSI for nearly all locations within the water distribution system which is similar to the existing condition. The water pressure in far northwest regions drops to a minimum of 45 PSI. Figure 10 below illustrates the production demand observed at each water treatment plant. This figure intends to highlight that Anderson and Swinford are operating at near maximum capacity. Southwest WTP operates above 2.0 MGD and utilizes the expanded capacity of its expansion but also has headroom for additional development that will likely occur to the west of Town. Production rates are staggered with ‘step’ like changes for Anderson WTP and Swinford WTP based on the water level within the Quaker Boulevard Tower. The production rate at Southwest WTP is more dynamic as it maintains a consistent 90 PSI discharge pressure into the system. Both Anderson WTP and Swinford WTP have a modeled two-hour shutdown window to allow for backwash during the 48-hour model runtime. The Southwest WTP backwash was not included in this 48-hour model window as it is anticipated to be performed once every three days. However, other modeling trials that test a Southwest WTP backwash regimen under these conditions show similar results with no adverse effects noted.

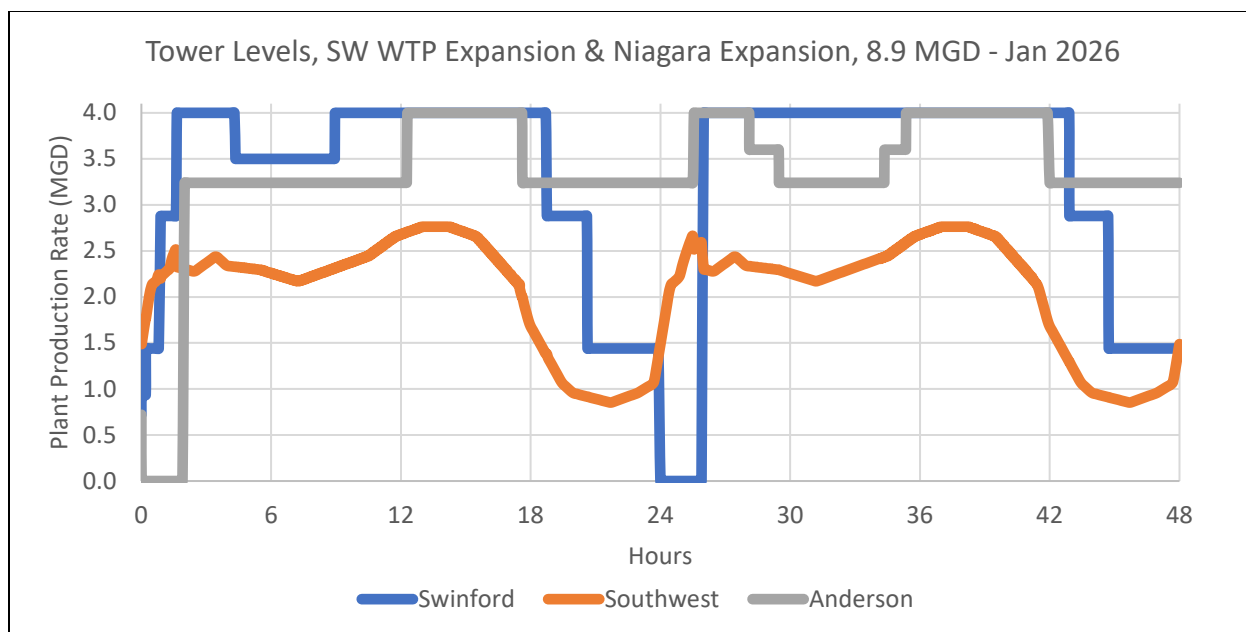


Figure 10 – WaterCAD Modeling Results of Plant Production Rates for the Southwest WTP Expansion and Niagara Expansion in Previously Modeled System Shown in Figure 7

Water Storage

The idea of designing a water storage facility in the northwest extent of the Plainfield Water Works system has been considered for some time. This concept was documented in the 2004 Water Master Plan update and was studied in a recent report titled “Northwest Water Storage and Drainage Improvements” written by BF&S in 2019. The report detailed that additional storage was needed and that a ground storage tank and booster station offered the most advantages to the demonstrated need for the system. The benefits of a ground storage tank and booster station over an elevated storage tank are that construction duration is shorter and the overall cost of maintenance is less. They can operate either continuously or intermittently. However, these types of installations can only operate continuously at a boundary between pressure zones. This is because water is drawn off the lower-pressure zone, stored in the ground storage tank, and then pumped into the higher-pressure zone. The pumps cannot be interconnected to the inflow of the tank or an endless cycle of circulating water through the pump would ensue. The prospective locations for the water storage facility are not located at a suitable pressure zone boundary. This prohibits such a ground storage tank and booster station facility from operating continuously. Additionally, a pressure zone boundary-type setup only benefits the higher-pressure zone. It should be the intent of the capital improvement project to benefit the entire Southwest Pressure Zone for added redundancy during peak demand times and plant backwash.

The other operation mode of a ground storage tank and booster station is intermittent. This relies on the ground storage tank refilling its storage capacity during nonpeak times which is commonly in the early morning hours. During this refill period, the booster station is offline. Once the refill period is over or the ground storage tank is full, the booster station can become active again and contribute to the distribution system until it is either out of stored water or the scheduled refill period takes effect. These installations can be useful in some instances but there are drawbacks

in their complex operation. One such drawback is the dynamic nature of the static pressure for the booster pressure zone. When the booster station is not operational a noticeable decrease in water pressure will be observed. Another drawback is the energy inefficiency. This setup requires that all of the potential energy in residual pressure be removed so that the water can be stored on the ground at atmospheric pressure. The energy is then added back to the water as it is pressurized through the booster station. With the understanding that the Southwest WTP has the designed capability to operate at 100 PSI, an investment in an energy-inefficient facility may not be the best use of resources.

The need for additional water storage and increased redundancy for future prospective development in the Southwest Pressure Zone of Town still requires a solution. A traditional elevated water storage tank was modeled as an alternative to the ground storage tank concept. This elevated water storage tank was sized at 1.0 MG as described in the 2019 water storage report. Figure 11 shows the modeling results of introducing an elevated water storage tank in the northwest area of town within the Southwest Pressure Zone. The introduction of the water tower offers operational flexibility in the pumping process at the Southwest WTP. Instead of pumping finish water to maintain a set pressure point, the plant pumps water according to preselected water levels within the Northwest Water Tower. This is similar to how Anderson WTP and Swinford WTP operate. The location of the proposed water tower is preliminary and is shown in Figure 7.

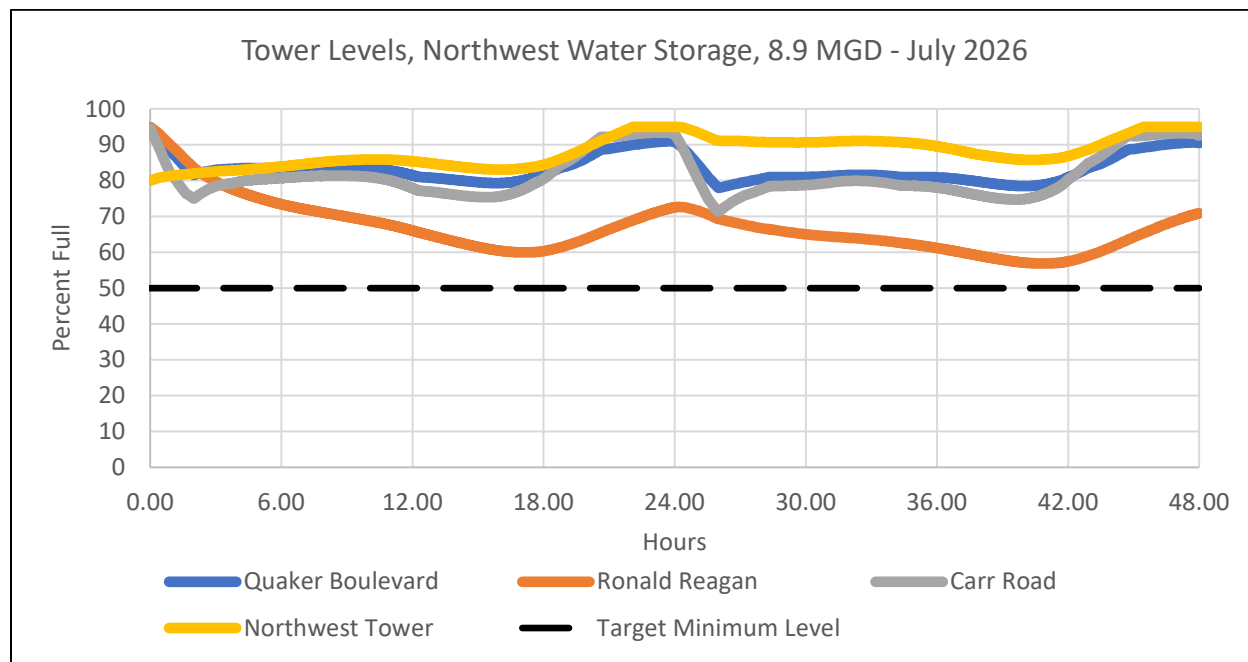


Figure 11 – WaterCAD Modeling Results of the Introduction of an Elevated Water Storage Tank in the Southwest Pressure

Carr Road Pressure Zone

The Carr Road Pressure Zone is proposed to have two stages of modifications. The first stage of modification is to expand the Carr Road Pressure Zone to encompass roughly half of the existing Ronald Reagan Pressure Zone while maintaining its current area on the northwest side of town. This expansion is expected to improve the water level performance of the Ronald Reagan Elevated Storage Tank within the Standard Pressure Zone. This is possible by reducing the volume of water demanded by the Ronald Reagan Booster Station which is supplied by the Ronald Reagan Elevated Storage Tank in the Standard Pressure Zone. This modification is expected to be necessary by January 2025.

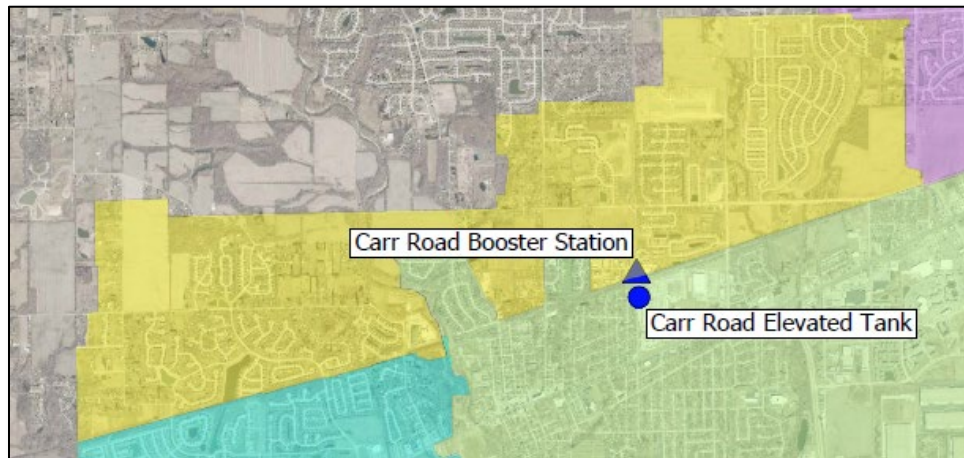


Figure 11 – Carr Road Pressure Zone Modification Phase 1 Targeted by January 2025

The second modification phase is to remove the existing Carr Road Pressure Zone boundary area from the zone by July 2026. This is necessary for operation of the Northwest Water Storage Facility which will be supplied by the Southwest WTP. See Figure 7 for the proposed Carr Road Pressure Zone boundary with this modification.

Ronald Reagan Pressure Zone

The Ronald Reagan Pressure Zone is proposed to be modified by January 2025 by reducing its size by approximately half. This is necessary to improve the water level performance in the Ronald Reagan Elevated Storage Tank within the Standard Pressure Zone. This is possible by reducing the volume of water demanded by the Ronald Reagan Booster Station which is supplied by the Ronald Reagan Elevated Storage Tank in the Standard Pressure Zone.

Liberty Pressure Zone

The Liberty Pressure Zone was recently improved with the construction of a new booster station to replace the now retired Liberty WTP. This booster station has the capacity of 1.75 MGD and boosts the water pressure from the Southwest Pressure Zone so that it can adequately serve areas of Liberty Township. Prospective development may necessitate the construction of an elevated water storage tank in this zone for redundancy and fire suppression.

DOC Water System

Improvements to the DOC Water Treatment Plant are necessary to keep the plant in good working order. The DOC Water Treatment Plant has been considered for decommissioning due to the rising maintenance needs and costs of operating the facility. This concept was a focus in the 2022 “Water System Capital Improvements Plan”. At that time the reality of the Plainfield Water Works system approaching its rated capacity was not realized. The overall concept and various DOC capital improvement projects included in that plan still have merit and



could be a viable option in the future. However, because of the immediate water demand needs within the next 3 to 5 years, the production capability of the plant should carry more value than previously considered. Decommissioning the DOC Water Treatment Plant would mean utilizing most of the remaining increased capacity at the Southwest Water Treatment Plant. This is due to the need to supply the DOC system from the proposed service line connection at Moon Road. If such a connection was used on a permanent basis, the elevated water storage tank at the prison would be problematic. The operating water elevation range is at a pressure lower than what the Southwest Pressure Zone currently operates. If an altitude valve was installed the water would likely not cycle through the tank as it would remain normally full with the valve closed. This lack of water turnover would be detrimental to the water quality in the DOC System.

The water demand within the DOC system is increasing each year. The Town of Plainfield is not knowledgeable on the day-to-day operations of the facility including the number of prisoners, etc., but the increased water demand has been well documented by Plainfield DPW. The peak water demand occurs during the winter months which is contrary to normal water system trends. This is believed to be due to the steam generation used for heating and various other things within the facility. In 2025 the Indiana Law Enforcement Academy expansion project is expected to be complete and will bring an additional 135,000 GPD of water demand.

The DOC Water Treatment Plant is fed from two wells within the Tipton Complex Aquifer System. These wells were installed in 1949 and are smaller in diameter than wells using modern drilling techniques according to the 2022 Layne Aquifer Desktop Study. At that time, it was noted that the wells were performing between 20 and 25 percent below their rated capacity. Plainfield DPW has tracked the well production rates and has observed that wells are decreasing in capacity at a noticeable rate. The wells ran individually have decreased in capacity by 30 percent since January 2022. The combined flow from the wells ran together has decreased in capacity by 7 percent since January 2022. These observed flow rates recorded by Plainfield DPW are documented in Table 2.

Table 2 – Observed DOC Well Production Rates January 2022 through January 2024

	Well Pump 1 GPM	Well Pump 1 Decline From Jan 2022	Well Pump 2 GPM	Well Pump 2 Decline from Jan 2022	Well Pump 1 & 2 GPM	Well Pump 1 & 2 Decline From January 2023
22-Jan	535		583			
23-Jan	396	-26%	403	-31%	458	
23-Apr	413	-23%	416	-29%	477	4%
23-Aug	391	-27%	390	-33%	438	-4%
23-Dec	379	-29%	393	-33%	432	-6%
24-Jan	372	-30%	378	-35%	428	-7%

Overlaying the DOC system demand with the well's production rates illustrates an impending capacity problem for the DOC Water Treatment Plant. The plant does have a backup connection to the Standard Pressure Zone of Plainfield Water Works. Currently, on high-demand days, the DOC WTP must be supplemented with water from the Standard Pressure Zone to meet the demand as the DOC Wells cannot produce enough water. If no action is taken it should be expected that this backup water supplement will become routine.

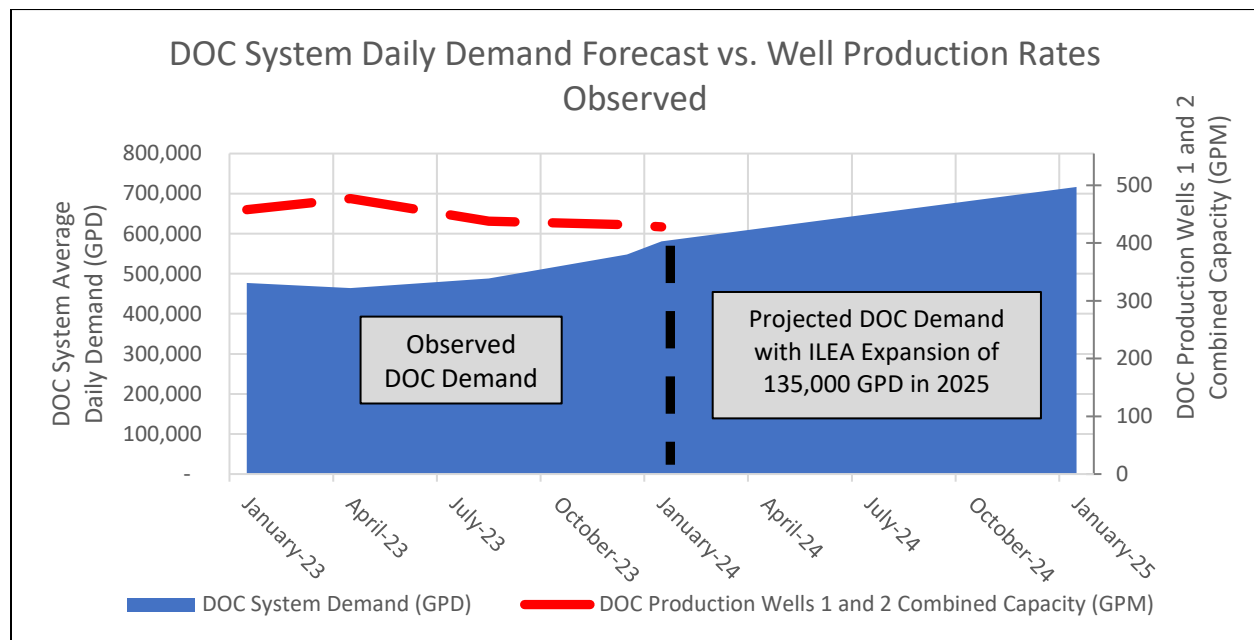


Figure 13 – Observed and Projected DOC WTP System Demand in Comparison to the Plant Well's Production Capacity

Potential improvements to the DOC Water System include:

1. The rehabilitation of the existing wells or construction of new wells to replace the failing existing wells if repairs are not feasible. The current wells are 75 years old and of a smaller diameter than current industry standards. The specific cause of the observed reduction in capacity is not known. Plainfield DPW is reportedly investigating their condition with an evaluation from a well specialist. The vertical pressure filters at the water treatment plant

can treat nearly 1.0 MGD. Investigating the combined flow capacity of the wells from the supplying aquifer should be considered. Increasing the water supply to match the plants potential production rate more closely should be a priority in consideration of the expected 700,000 GPD system demand by January 2025. It is unclear if the current combined well flow rate is limited by the aquifer or hydraulic limitations of the well pump motors.

2. The vertical pressure filters at the treatment plant are due for refurbishment and repairs. After operating on nearly a 30-year cycle the entirety of the filter internals needs maintenance. This includes media replacement, internal piping replacement, interior lining removal via sandblasting, and new interior lining painting.
3. The aerator has been in service since 2010. The internal trays and components of the aerator need maintenance and replacement. An evaluation of the aerator's ability to handle an increased plant flow rate of 1.0 MGD should be considered.
4. The existing high service pumps have capacity ratings of 600 GPM and 700 GPM. This equals a firm capacity of 864,000 GPD. Replacement high service pumps should be evaluated in consideration of increasing the plant's capacity to 1.0 MGD.

Chapter 5 – Recommendations (including timing and budget costs)

This study has identified necessary changes and improvements to the Plainfield Water System to keep pace with the future allocated development demand. Further modifications are recommended to allow the Town of Plainfield to continue fostering prospective development as the Town continues to grow. These improvements and modifications closely resemble several projects from the Town of Plainfield's Water Capital Improvements Plan (Water CIP) which is included in Appendix A. The size and location within the system of the anticipated developments has dictated the sequence and timeline needed to implement the improvements identified below.

DOC Connection on Moon Road

Recommended Total Project Budget: \$500,000 to \$600,000

Recommended Completion Date: Q4 2024

The purpose of the project is to connect the Indiana Department of Corrections (DOC) Water System to the 16-inch water main along Moon Road to provide greater reliability for the system within this area. The ability to supply the DOC system on an interim basis will allow for flexibility during the recommended DOC WTP rehabilitation. In 2004 during the construction of the 16-inch water main along Moon Road, a 12-inch tee was installed near the northern limits of the property at 814 Moon Road for this future connection. A meter vault with an 8-inch meter would be incorporated into the project. There is a strong possibility that the Indiana DOC will cover the costs of the project.

Estimated Construction Costs:	\$360,000
Estimated Construction Contingency:	\$35,000
Estimated Soft Costs:	\$100,000

Swinford WTP Filter Media Replacement

Recommended Total Project Budget: \$1.25 million to \$1.5 million

Recommended Completion Date: Q1 2025

The four pressure filters at the Swinford WTP are in need of maintenance. Previously completed filter inspections indicated that the filter media at Swinford WTP needed replacement. A 2022 inspection noted marble sized mudballs and an increased media height of 4-6 inches. Subsequent visual inspections show that the level of mud/debris is increasing. Laboratory analysis of the grain size shows that the anthracite media in all the Swinford filters was degraded. This project includes the replacement of the filter media, cleaning and inspection of the filters, and any necessary repairs needed to the filter internals. Upon completion, the use of the air scour capabilities on the filters should be explored to improve the filter's performance. It is recommended that backwash frequencies be reduced to once every three days if possible and the filter media be replaced at the Swinford WTP.

Estimated Construction Costs:	\$1,000,000
Estimated Construction Contingency:	\$250,000
Estimated Soft Costs:	\$50,000

Southwest WTP Reaction Reservoir Rehabilitation

Recommended Total Project Budget: \$2.4 million to 2.9 million

Recommended Completion Date: Q2 2025

The top of the Swinford WTP reaction reservoir doubles as the floor of the building. The reaction reservoir is a corrosive environment as it exists to allow chlorine contact time with raw water. The corrosive environment can cause accelerate the deterioration of concrete and exposed reinforcing steel. Upon the most recent periodic inspection completed in June of 2023, structural deficiencies were identified. A temporary support measure was put in place to support the structure with the understanding that a permanent solution is needed. The purpose of this project is to permanently solve the structural deficiencies of the floor of the Swinford WTP by constructing a new reaction reservoir outside of the building. This has the added benefit of requiring minimal downtime of the plant.

Estimated Construction Costs:	\$2,250,000
Estimated Construction Contingency:	\$250,000
Estimated Soft Costs:	\$100,000

Modification of the Carr Road Pressure Zone Phase 1

Recommended Total Project Budget: \$125,000 to \$175,000

Recommended Completion Date: January 2025

The purpose of modifying the boundary of the Carr Road Pressure Zone is to benefit the water level performance of the Ronald Reagan Elevated Storage Tank in the Standard Pressure Zone. Phase 1 of the modification includes the piping modifications in front of Carr Road Booster Station, the removal of an existing pressure-reducing valve at the intersection of Carr Road and Township Line Road, and the installation of isolation valves along Smith and Bradford Roads.

Estimated Construction Costs:	\$100,000
Estimated Construction Contingency:	\$10,000
Estimated Soft Costs:	\$35,000

Moon Road Water Main Extension

Recommended Total Project Budget: \$1.25 million to \$1.75 million

Recommended Completion Date: January 2025

The purpose of the project is to extend the existing 16-inch water main along Moon Road from Bitternut Lane at the south end of the Hickory Woods neighborhood to connect to the existing 16-inch water main along East CR 750 South. The 1,900 feet between the 16-inch water main at Bitternut Lane and the 16-inch water main along East CR 750 South is the only remaining gap of 16-inch water main between the Southwest Water Treatment and Main Street. This section of 16-inch water main will reduce the observed pressure losses from the Southwest WTP and will improve the system pressure performance on the northwest side of town. There is a high-pressure gas main conflict in the area that will require coordination to cross.

Estimated Construction Costs:	\$875,000
Estimated Construction Contingency:	\$90,000
Estimated Soft Costs:	\$240,000

Modification of the Carr Road Pressure Zone Phase 2

Recommended Total Project Budget: \$250,000 to \$325,000

Recommended Completion Date: January 2026

The purpose of modifying the boundary of the Carr Road Pressure Zone is to benefit the water level performance of the Ronald Reagan Elevated Storage Tank in the Standard Pressure Zone. Phase 2 of the modification includes the removal of the swing check valves on the northwest side of town, the reconnection of Andico Road to a distribution water main on Carr Road, and the interconnection of the 16-inch transmission main along the Vandalia Trail corridor to nearby distribution water mains.

Estimated Construction Costs:	\$200,000
Estimated Construction Contingency:	\$20,000
Estimated Soft Costs:	\$55,000

Rehabilitation of the DOC WTP

Recommended Total Project Budget: \$2.40 million to \$2.70 million

Recommended Completion Date: January 2026

The DOC Water Treatment Plant is in a declining state and needs to be rehabilitated to continue producing water for the DOC system. The scope of the recommended rehabilitation includes new or repaired wells, the refurbishment of the 9 pressure existing pressure filters, maintenance and evaluation of the existing aerator, and the evaluation of increased sized high service pumps. The scope of the well rehabilitation will be determined with an evaluation of a well specialist.

Estimated Construction Costs:	\$2,250,000
Estimated Construction Contingency:	\$250,000
Estimated Soft Costs:	\$90,000

Southwest WTP Expansion

Recommended Total Project Budget: \$9.00 million to \$11.00 million

Recommended Completion Date: January 2026

The Southwest Water Treatment Plant (WTP) was constructed in 2004. The Southwest WTP has the capability to pump up to 4 MGD for short durations utilizing storage but has a normal operating production capacity of 2 MGD. The plant was designed for future expansion and production testing has indicated that the Southwest Wellfield is capable of producing up to 4 MGD. Improvements that would be required to take the normal operating production capacity of the plant from 2 MGD to 4 MGD include a new aerator, a new filter pump, two horizontal pressure filters, a new 16-foot by 19-foot cast-in-place reaction reservoir, and various other building additions and site improvements. The Southwest Wellfield will correspondingly need to be upgraded to be able to produce 4 MGD. Testing has indicated that the wellfield will support an additional 3,200 GPM well. The project would include the installation of a new 3,200 GPM well, wellhouse, and around 6,000 feet of 12-inch raw water line to connect the new well to the plant including a jack and bore crossing of I-70 within a steel casing.

Estimated Construction Costs:	\$7,000,000
Estimated Construction Contingency:	\$700,000
Estimated Soft Costs:	\$1,950,000

Modifications of the Southwest Pressure Zone**Recommended Total Project Budget: \$60,000 to \$90,000****Recommended Completion Date: January 2026**

The Southwest WTP expansion will increase Plainfield's Water System capacity, but for this increase in capacity to be realized in the Standard, Carr Road, and Ronald Reagan Pressure Zones a modification to the Southwest Pressure Zone is necessary. It is recommended that a pressure-reducing valve be installed in addition to the existing check valve near the entrance of Bridlewood on Hadley Road. This will allow water from the higher pressure in the Southwest Pressure Zone flow in a controlled manner to the Standard Pressure Zone.

Estimated Construction Costs: \$50,000

Estimated Construction Contingency: \$10,000

Estimated Soft Costs: \$25,000

Northwest Water Storage Facility**Recommended Total Project Budget: \$4.75 million to \$5.75 million****Recommended Completion Date: After January 2026**

The purpose of the project is to improve the reliability of pressure in the Southwest Pressure Zone of the Plainfield Water System and redundancy for the Southwest Water Treatment Plant. The project would include the construction of a 1-million-gallon elevated storage tank in the northwest extent of the pressure zone.

Estimated Construction Costs: \$3,500,000

Estimated Construction Contingency: \$350,000

Estimated Soft Costs: \$950,000

APPENDIX – A

Water System Capital Improvements Plan



WATER SYSTEM CAPITAL IMPROVEMENTS PLAN

November 3, 2022

PREPARED BY:



**8450 Westfield Boulevard, Suite 300
Indianapolis, IN 46240-8302**

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- CHAPTER 4** SYSTEM MAINTENANCE
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- CHAPTER 6** POTENTIAL FUNDING SOURCES

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-

Town of Plainfield - Water System Capital Improvements
Program Management Summary Table

Project Designation	Project	Type			2022 Estimated Costs	Project Pricing by Year Started			Total Estimated Project Cost Based on Projected Year Started
		Distribution	Treatment	Other		2023 (2022+7%)	2024 (2022+15%)	2025 (2022+20%)	
1	Government Center – Area A Water Improvements	X			\$280,000	\$299,600	\$322,000	\$336,000	\$280,000
2	Government Center – Area B Water Improvements	X			\$400,000	\$428,000	\$460,000	\$480,000	\$400,000
3	Liberty Booster Station Improvements	X			\$1,310,000	\$1,401,700	\$1,506,500	\$1,572,000	\$1,310,000
4	East CR 750 South Water Main Extension	X			\$1,750,000	\$1,872,500	\$2,012,500	\$2,100,000	\$1,872,500
5	Water Works Operations Building at Anderson WTP			X	\$1,250,000	\$1,337,500	\$1,437,500	\$1,500,000	\$1,337,500
6	DOC Connection on Moon Road	X			\$600,000	\$642,000	\$690,000	\$720,000	\$642,000
7	Moon Road Water Main Extension from Hickory Woods to CR 750 South	X			\$1,750,000	\$1,872,500	\$2,012,500	\$2,100,000	\$1,872,500
8	Southwest Water Treatment Plant Expansion		X		\$7,000,000	\$7,490,000	\$8,050,000	\$8,400,000	\$8,050,000
9	Southwest Wellfield and Raw Water Line Improvements		X		\$4,000,000	\$4,280,000	\$4,600,000	\$4,800,000	\$4,600,000
10	Northwest Water Storage Facility and Water Main Extension	X			\$5,750,000	\$6,152,500	\$6,612,500	\$6,900,000	\$6,612,500
11	Avon Avenue Water Main Relocation	X			\$650,000	\$695,500	\$747,500	\$780,000	\$747,500
12	Franklin Wellfield Raw Water Line to DOC WTP		X		\$3,750,000	\$4,012,500	\$4,312,500	\$4,500,000	\$4,312,500
13	Demolition of Franklin WTP			X	\$40,000	\$42,800	\$46,000	\$48,000	\$46,000
14	Anderson Water Treatment Plant Expansion		X		\$20,000,000	\$21,400,000	\$23,000,000	\$24,000,000	\$24,000,000
15	Franklin and DOC Raw Water Line Extension to Anderson WTP		X		\$4,000,000	\$4,280,000	\$4,600,000	\$4,800,000	\$4,800,000
16	Replacement of DOC WTP with Booster Station	X			\$2,500,000	\$2,675,000	\$2,875,000	\$3,000,000	\$3,000,000
17	South CR 825 East Water Main Extension	X			\$5,000,000	\$5,350,000	\$5,750,000	\$6,000,000	\$6,000,000
18	Airtech Parkway Elevated Storage Tank and Water Main Extension	X			\$6,500,000	\$6,955,000	\$7,475,000	\$7,800,000	\$7,800,000
	Totals				\$66,530,000	\$71,187,100	\$76,509,500	\$79,836,000	\$77,683,000



CHAPTER 1

INTRODUCTION

The Water Capital Improvements Plan (CIP) provides a working blueprint for sustaining and improving the Town of Plainfield Water System. The Water CIP is a short-range plan which identifies potential capital projects for the Water Utility for the next 3 to 5 years. The Water CIP also provides for a preliminary planning schedule and identifies potential options for financing the projects identified within the plan. The Water CIP allows for a systematic evaluation of upcoming potential projects, the ability to assist with forecasting debt and the potential to consolidate projects to reduce borrowing costs, serves as a public relations and economic development tool, and puts a focus on preserving water infrastructure while ensuring efficient use of public funds. The projects identified in the Water CIP were developed through coordination with Town of Plainfield DPW Staff, Town of Plainfield Development Services Staff, and BF&S Engineers. See Figure 1 for a 2022 Water CIP Project Location Map.

Estimated project costs included in the Water CIP are based on 2022 dollars. In 2022 the construction industry is currently experiencing steeply rising materials prices, supply chain issues, and staffing difficulties which has caused an increase in project costs and longer construction schedules. As an example, the plastics industry has been one of the industry's most greatly impacted as it was hit in recent years with various issues including the pandemic, winter weather, hurricanes, factory fires, labor shortages, and even a ship blockage for the Suez Canal. These issues have created a logistics problem that has put constraints on the supplies of raw materials and led to production issues for manufacturing of PVC piping products. The steel and lumber industries have experienced similar problems and overall, the issues have led to project bid prices in the range of 10 percent to 30 percent higher than what were experienced the year before (see Attachment A). Accordingly, the total estimated project costs included in the Water CIP are intended to be utilized for high-level planning purposes and more detailed estimates should be developed during each project's design based on market conditions at that time. Recently, supply chain issues have impacted material lead times for items such as ductile iron pipe, control panels, and generators.

The recommended total project budgets have been developed based on several different factors including estimated construction costs, construction contingency, and soft costs. The estimated construction costs include the cost for a contractor to construct the actual project including labor and materials. The construction contingency has been estimated at around 10 percent of the estimated construction costs and accounts for unforeseen conditions such as poor soils. Soft costs include items such as engineering design, inspection, and Right-of-Way, and have generally been estimated at around 25 percent of the estimated construction costs.

The projects have been grouped together in categories in Chapters 2 through 5: Capital Projects Under Construction, Future Capital Projects, System Maintenance, and Planning Studies. Chapter 6 includes discussions of potential funding sources.



CHAPTER 2

CAPITAL PROJECTS UNDER CONSTRUCTION

The following projects are currently under contract and in the construction phase:

1. Government Center – Area A Water Improvements

Total Estimated Project Cost: \$280,000

Construction Start: 2021

The Government Center - Area A Water Improvements include the construction of 8-inch water main along Park Drive and 8-inch water main along Mill Street. These improvements coincided with the construction of the new Government Center and were completed in 2022. See Figure 2 for approximate limits.

2. Government Center – Area B Water Improvements

Total Estimated Project Cost: \$400,000

Construction Start: 2022

The Government Center - Area B Water Improvements include the construction of 8-inch water main along Center Street and 12-inch water main along Krewson Street. These improvements coincide with the construction of the new Performing and Fine Arts Center. See Figure 2 for approximate limits.

3. Liberty Booster Station Improvements

Total Estimated Project Cost: \$1,310,000

Construction Start: 2022

The purpose of the project is to enhance the reliability of the water system in the Bellville area. The proposed project includes the installation of a new Booster Station to replace the pumps at the former Liberty Water Treatment Facility. The new Booster Station will be a standalone pre-manufactured facility including 3 pumps, controls, HVAC, and a new generator. SCADA controls are to be integrated with the Town's existing system and a new radio and mast will be installed for communication. New 12-inch water main will connect the Booster Station to the existing water system north of the site. This project was incorporated as a Change Order into the Town's Water System AMR Guaranteed Savings Program with Ameresco (see Appendix A).

Guaranteed Maximum Price: \$1,230,000

Estimated Soft Costs: \$80,000



CHAPTER 3

FUTURE CAPITAL PROJECTS

The following projects are either in the design or conceptual phase:

4. East CR 750 South Water Main Extension (Sodalis Nature Park)

Recommended Total Project Budget: \$1.50 million to \$1.75 million

Projected Construction Start: 2023

The purpose of the project is to extend water main along East CR 750 South to the Sodalis Nature Park. The water main through the SR 267 corridor is planned to be sized with a 12-inch diameter to allow for future development. The remaining water main will be 4-inch extending to the Sodalis Nature Park for potable water use. It is not anticipated that fire suppression will be needed in this area. The project includes appurtenances such as flushing hydrants and combination air valves. Future water main projects will connect with the 4-inch main to provide loops and create a robust network on the south side of I-70. The water main is anticipated to be installed utilizing a trenchless method. Engineering Design and Right-of-Way Services for this project are under agreement and in process.

Estimated Construction Costs: \$1,250,000

Estimated Construction Contingency: \$125,000

Estimated ROW Costs: \$50,000

5. Water Works Operations Building at Anderson WTP

Recommended Total Project Budget: \$1.00 million to \$1.25 million

Projected Construction Start: 2023

The purpose of the project is to provide additional storage and working space for the Water Works Department at the Anderson WTP. The Water Works Operations Building is anticipated to include garage space, storage space, and office space. The project is anticipated to be funded from the Operations Budget.

Estimated Building Costs: \$800,000

Estimated Soft Costs: \$200,000

6. DOC Connection on Moon Road

Recommended Total Project Budget: \$500,000 to \$600,000

Projected Construction Start: 2023

The purpose of the project is to connect the Indiana Department of Corrections (DOC) Water System to the 16-inch water main along Moon Road to provide greater reliability for the system within this area. The DOC Water System is currently connected to the Plainfield Water System via a single 6-inch water main at the intersection of Mill Street and Buchanan Street to the east of the DOC facilities. An additional 12-inch connection between the DOC Water System and the Plainfield Water System on the west side of the DOC facilities would create a loop and provide redundancy for the DOC Water System. In 2004 during the construction of the 16-inch water main along Moon Road, a 12-inch tee was installed near the northern limits of the property at 814 Moon Road for this future connection. A meter vault with an 8-inch



meter would be incorporated into the project. There is a strong possibility that the Indiana DOC will cover the costs of the project. See Figure 3 for approximate limits.

Estimated Construction Costs:	\$360,000
Estimated Construction Contingency:	\$35,000
Estimated Soft Costs:	\$100,000

7. Moon Road Water Main Extension from Hickory Woods to CR 750 South

Recommended Total Project Budget: \$1.25 million to \$1.75 million

Projected Construction Start: 2023

The purpose of the project is to extend the existing 16-inch water main along Moon Road from Bitternut Lane at the south end of the Hickory Woods neighborhood to connect to the existing 16-inch water main along East CR 750 South. The 1,900 feet between the 16-inch water main at Bitternut Lane and the 16-inch water main along East CR 750 South is the only remaining gap of 16-inch water main between the Southwest Water Treatment and Main Street. There is a high-pressure gas main conflict in the area that will require coordination to cross.

Estimated Construction Costs:	\$875,000
Estimated Construction Contingency:	\$90,000
Estimated Soft Costs:	\$240,000

8. Southwest Water Treatment Plant Expansion

Recommended Total Project Budget: \$6.00 million to \$7.00 million

Projected Construction Start: 2024

The Southwest Water Treatment Plant (WTP) was constructed in 2004. The Southwest WTP has the capability to pump up to 4 MGD for short durations utilizing storage but has a normal operating production capacity of 2 MGD. The plant was designed for future expansion and production testing has indicated that the Southwest Wellfield is capable of producing up to 4 MGD. Improvements that would be required to take the normal operating production capacity of the plant from 2 MGD to 4 MGD include a new aerator, a new filter pump, two horizontal pressure filters, a new 16-foot by 19-foot cast-in-place reaction reservoir, and various other building additions and site improvements. See Appendix B for the Southwest WTP Process Flow Diagram.

Estimated Construction Costs:	\$4,500,000
Estimated Construction Contingency:	\$450,000
Estimated Soft Costs:	\$1,250,000

**9. Southwest Wellfield and Raw Water Line Improvements****Recommended Total Project Budget: \$3.00 million to \$4.00 million****Projected Construction Start: 2024**

Should the Southwest Water Treatment Plant be expanded from 2 MGD to 4 MGD, the Southwest Wellfield will correspondingly need to be upgraded to be able to produce 4 MGD. Testing has indicated that the wellfield will support an additional 3,200 GPM well. The project would include the installation of a new 3,200 GPM well, wellhouse, and around 6,000 feet of 12-inch raw water line to connect the new well to the plant including a jack and bore crossing of I-70 within steel casing.

Estimated Construction Costs:	\$2,500,000
Estimated Construction Contingency:	\$250,000
Estimated Soft Costs:	\$700,000

10. Northwest Water Storage Facility and Water Main Extension**Recommended Total Project Budget: \$4.75 million to \$5.75 million****Projected Construction Start: 2024**

The purpose of the project is to improve the reliability of pressure in the northwest corner of the Plainfield Water System. The project would include the construction of a 1-million-gallon concrete ground storage tank and booster station. The concrete ground storage tank would likely be around 30 feet tall with a diameter of around 75 feet. The booster station is anticipated to be sized with design points that range from 400 GPM to 2,300 GPM to accommodate future growth in the area. The project would include a backup generator.

Estimated Construction Costs:	\$3,500,000
Estimated Construction Contingency:	\$350,000
Estimated Soft Costs:	\$950,000

11. Avon Avenue Water Main Relocation**Recommended Total Project Budget: \$550,000 to \$650,000****Projected Construction Start: 2024**

The purpose of the project is to relocate existing water mains to avoid conflict with a proposed replacement of the bridge over the Vandalia Trail with a three-sided box culvert and roadway improvements along Avon Avenue. The relocation would include approximately 500 feet of 12-inch water main along Avon Avenue and approximately 500 feet of 16-inch water main along the Vandalia Trail.

Estimated Construction Costs:	\$425,000
Estimated Construction Contingency:	\$45,000
Estimated Soft Costs:	\$115,000

12. Franklin Wellfield Raw Water Line to DOC WTP**Recommended Total Project Budget: \$2.75 million to \$3.75 million****Projected Construction Start: 2024**

The purpose of the project is to connect the Franklin Wellfield to the DOC WTP. The Franklin Wellfield has one well with a rated capacity of 500 GPM. The Franklin WTP no longer operates as a treatment



plant and has fallen into disrepair. A raw water line extension to the DOC WTP would provide redundancy for that plant in the short-term, with the goal of extending the raw water lines from the Franklin Wellfield and the DOC Wellfield to the Anderson WTP. The project would include the construction of approximately 6,500 feet of 10-inch raw water line from Franklin Park to the DOC WTP including a crossing of White Lick Creek.

Estimated Construction Costs:	\$2,000,000
Estimated Construction Contingency:	\$200,000
Estimated Soft Costs:	\$500,000

13. Demolition of Franklin WTP

Recommended Total Project Budget: \$20,000 to \$40,000

Projected Construction Start: 2024

The Franklin WTP is no longer in operation and has fallen into disrepair. The purpose of the project would be to demolish the existing Franklin WTP. All above ground structures would be removed at least two feet below grade and underground structures would be filled. The site could then be converted to additional park space.

14. Anderson Water Treatment Plant Expansion

Recommended Total Project Budget: \$15.00 million to \$20.00 million

Projected Construction Start: 2025

The Anderson Water Treatment Plant (WTP) is a 4 MGD facility that was constructed in 1997 with the ability for future expansion up to 8 MGD. Improvements to the Anderson WTP that would be required to expand the production capacity of the plant from 4 MGD to 8 MGD include a new aerator, additions to the reaction reservoir, two new high service pumps, four horizontal pressure filters, and various other building additions and site improvements. See Appendix C for the Anderson WTP Process Flow Diagram.

Estimated Construction Costs:	\$12,000,000
Estimated Construction Contingency:	\$1,200,000
Estimated Soft Costs:	\$3,300,000

15. Franklin and DOC Raw Water Line Extension to Anderson WTP

Recommended Total Project Budget: \$3.00 million to \$4.00 million

Projected Construction Start: 2025

The purpose of the project is to connect the Franklin and DOC Wellfields to the Anderson WTP. The Franklin Wellfield has one well with a rated capacity of 500 GPM and the DOC Wellfield has two wells, one with a rated capacity of 500 GPM and the other well is not rated but is also assumed to be 500 GPM. The project would include the extension of approximately 4,300 feet of 16-inch raw water line from the DOC WTP to the Anderson WTP including a crossing of White Lick Creek. The Franklin Wellfield is anticipated to be connected to the DOC WTP prior to this project in order to eliminate the Franklin WTP. The additional raw water will provide redundancy to the Anderson WTP.

Estimated Construction Costs:	\$2,100,000
Estimated Construction Contingency:	\$210,000
Estimated Soft Costs:	\$600,000

**16. Replacement of DOC WTP with Booster Station****Recommended Total Project Budget: \$1.75 million to \$2.50 million****Projected Construction Start: 2025**

The DOC WTP currently produces approximately 10 percent of the total water in the Plainfield Water System, but the plant is antiquated and limited in its ability to be expanded. Should the raw water lines feeding the DOC WTP be redirected to the Anderson WTP, the DOC WTP could be demolished after a booster station was constructed onsite to maintain pressures in the area. The existing above ground structures would be removed at least two feet below grade and underground structures would be filled.

Estimated Construction Costs:	\$1,250,000
Estimated Construction Contingency:	\$125,000
Estimated Soft Costs:	\$250,000

17. South CR 825 East Water Main Extension**Recommended Total Project Budget: \$4.00 million to \$5.00 million****Projected Construction Start: 2025**

The purpose of the project is to extend water main to the south end of the Town limits. It appears that the most viable option is to extend approximately 8,000 feet of 12-inch water main along South CR 825 East from East CR 750 South to County Line Road. Development potentials exist on the east side of CR 825 East where SR 267 could be extended that could provide an additional road corridor and allow for development to potentially participate in project funding.

Estimated Construction Costs:	\$2,900,000
Estimated Construction Contingency:	\$290,000
Estimated Soft Costs:	\$790,000

18. Airtech Parkway Elevated Storage Tank and Water Main Extension**Recommended Total Project Budget: \$5.50 million to \$6.50 million****Projected Construction Start: later than 2025**

The purpose of the project is to provide additional reliability and redundancy to the east side of the Water System. The project would include the construction of a 1-million-gallon ground water storage tank, booster station, and over 3,000 feet of 12-inch water main. The 12-inch water main would connect the existing 12-inch water main along Perry Road to the existing 12-inch water main along Airtech Parkway.

Estimated Construction Costs:	\$4,000,000
Estimated Construction Contingency:	\$400,000
Estimated Soft Costs:	\$1,100,000



CHAPTER 4

SYSTEM MAINTENANCE

Ongoing Annual Water Treatment System and Distribution System Maintenance

Recommended Total Project Budget: \$850,000

Projected Start: Annually

Maintenance and repairs must be completed at the Water Treatment Plants, throughout the Distribution System, at Boosters Stations, and at Water Storage Tanks. Plainfield budgets annually for contractual services, grounds maintenance, building maintenance, equipment repairs, and emergency repairs.

Lead/Galvanized Water Service Line Inventory

Recommended Total Project Budget: \$40,000 to \$50,000

Projected Start: 2022

In December of 2020, the EPA provided an update to their Lead and Copper Rule (LCR). The updated LCR requires water systems to follow new sampling procedures. One of those new sampling procedures is the requirement that systems must collect samples from homes with lead or galvanized service lines. The rule requires that all water systems must inventory their service lines on both the public and private side of the line by 2024 to ensure they are collecting the samples from the proper locations. Identifying the lines on the public side alone is a large task but factoring in the communication to inventory on the private side as well takes a considerable amount of effort. The Town of Plainfield has contracted with 120Water to complete the inventory study.

Many municipalities adopt a lead/galvanized service line replacement program where the municipality offers to cover the cost of either a partial line replacement (from the water main to the meter pit) or a full line replacement from the water main to the house. Performing work on private property can be an issue with full line replacements. Typically, the cost of replacing a lead or galvanized iron water services line is between \$5,000 to \$10,000 each.

Elevated Storage Tank Inspection Program

Recommended Total Project Budget: \$80,000 to \$100,000

Projected Start: 2023 through 2025

An integral part of keeping elevated water storage tanks in good working order is an inspection program. AWWA recommends water tanks be inspected every three to five years and typical industry practice is that inspections should occur a minimum of every 10 years. Inspections of both the inside and the outside of the tanks are crucial for maintenance. Inspection of the inside of a tank requires taking the unit offline and draining it. Inspection reports will recommend potential maintenance items such as sediment removal or recoating.

**SR 267 Elevated Storage Tank Exterior Recoating****Recommended Total Project Budget: \$800,000 to \$1.00 million****Projected Construction Start: 2025**

The 1-million-gallon elevated storage tank located to the east of Quaker Boulevard (SR 267) between Metropolis Parkway and Stafford Road was constructed in 1978. The 74-foot diameter welded steel tank sits on a 52-foot diameter fluted column. The interior and exterior of the steel tank were recoated in 2012.



CHAPTER 5

PLANNING STUDIES

Wellfield and Aquifer Study

Recommended Total Project Budget: \$100,000

Projected Construction Start: 2023

The purpose of the Wellfield and Aquifer Study is to evaluate the availability of groundwater for the Town of Plainfield. The goal of the study is to evaluate hydrogeologic conditions that are favorable for groundwater resource development. The initial phase of the study includes a tabletop review of existing data and reports. Future phases of the study could include test drilling, test pumping, groundwater sampling, and analysis of specific sites identified in the tabletop review. Aquifer performance testing can give insight into potential wellfield yield rates and sustainability of groundwater production. The Study could be expanded to monitor aquifer and surface water levels and quality to define seasonal variations and identify potential conflicts in use, discover ways to improve long-term water availability, improve efficiencies and expand aquifer yields, and consideration of aquifer recharge.

Wellfield and Aquifer Study for West District

Recommended Total Project Budget: \$15,000 to \$25,000

Projected Construction Start: 2023

The purpose of this study is to evaluate whether there is additional capacity to be developed for the West District in the area to the west of Belleville. The initial phase of the study would likely include a tabletop document review, but additional phases could include test drilling, testing pumping, groundwater sampling, and analysis activities should the tabletop document review indicate the potential for an additional water source.

Water System Master Plan Update

Recommended Total Project Budget: \$150,000

Projected Construction Start: 2023

The purpose of the Town's Water System Master Plan is to provide a comprehensive evaluation of the Water System with consideration of existing and future needs. The Water System Master Plan provides the Town with a guide for short-term and long-term water system improvements and is intended to act as a reference document to assist the Town as it evaluates the impacts of proposed developments and land use changes on the water system. Period updates to the Water Master Plan, typically recommended on 10-year intervals, keep the plan current to the Town's needs. The updated plan would establish design and planning criteria, provide an inventory of existing infrastructure, identify current and future water system deficiencies, prioritize potential infrastructure improvements, and provides recommendations for the Town to consider moving forward.

This would be accomplished through a review of the current water system; the delineation of planning areas for drinking water distribution system expansion; estimation of future water demands in the planning areas; evaluation of treatment, pumping, and storage needs; modeling of proposed improvements in WaterCAD, and budget cost estimates.



CHAPTER 6

POTENTIAL FUNDING SOURCES

CASH RESERVES

Cash Reserves are funds set aside to fund the operating and capital-related costs of the Water System. There are generally three main categories of cash reserves: operating, capital, and debt related. The purpose of Cash Reserves in the sense of operating is to absorb seasonal fluctuations, offset revenue losses, address timing issues with cash flows, pay for unexpected operating expenses, but Cash Reserves can also be set aside to fund future capital projects. Rate adjustments could be utilized to generate additional Cash Reserves.

WATER AVAILABILITY FEES

Water Availability Fees are a charge to a user for a new connection or additional water usage from an existing connection to the Plainfield Water System. Water Availability Fees are currently \$1,255 per equivalent dwelling unit. For example, a single-family housing development with 150 homes would generate \$188,250 of Water Availability Fees. Revenue in excess of operational expenses can add to the Cash Reserves. Through an Infrastructure Reimbursement Agreement, Water Availability Fees can also be used to offset costs to provide system improvements over what was needed for just the development.

MUNICIPAL BONDS (DIRECT DEBT)

Municipal Bonds are debt securities issued by municipal entities in order to finance capital projects such as infrastructure improvements. Municipal Bonds allow the issuer to borrow money in exchange for regular interest payments and the return of the original investment known as the principal. Municipal bonds repayment may be spread over many years. Generally, the interest on Municipal Bonds is exempt from federal income tax. Given the tax benefits, the interest rates for Municipal Bonds are usually lower than on taxable fixed-income securities such as corporate bonds. Rate adjustments could be utilized to pay back Municipal Bonds.

INDIANA FINANCE AUTHORITY (IFA) STATE REVOLVING LOAN FUND (SRF) PROGRAM

The SRF Program provides low-interest loans to Indiana communities for projects that improve water infrastructure. As loans are repaid, money is available to be used again for new financings, making the program a revolving fund. Municipalities are eligible to apply for water SRF project financing for source intake structures and wells, treatment plant facilities, water storage facilities, and transmission and distribution mains including water line extensions to existing unserved properties with water quality issues. SRF loans are a fixed-rate 20-year loan that are reset quarterly and are at or below 90 percent of the average 20-year AAA-rated, general obligation bond Municipal Market Data.

TAX INCREMENT FINANCING (TIF)

TIF is a means to subsidize development by diverting a portion of future taxes to help finance infrastructure improvements in the area needed for development to occur. A geographic area designated as a TIF District will collect property taxes in two ways: Base Revenues are taxes from existing properties within the TIF District that were there prior to the establishment of the TIF and Incremental Revenues are taxes collected in excess of the Base Revenues in the TIF. The Base Revenues are shared among various taxing agencies such as school districts and fire districts, but the Incremental Revenues are not shared and are put into a TIF Fund. The TIF Fund is then used to underwrite public infrastructure projects within the TIF District to help encourage development.



SPECIAL ASSESSMENTS

Special assessments are a charge that municipalities can assess against real estate parcels to fund public infrastructure projects. The charge is levied within a specific geographic limit known as a Special Assessment District. A special assessment may only be levied against parcels which have been identified as receiving a direct and unique benefit from the infrastructure project. In the case of a water infrastructure project, a typical benefit would be that when water service is provided, the nearby land often increases in value and becomes more developable.

PUBLIC-PRIVATE PARTNERSHIPS

Public-Private Partnerships are an alternative delivery method for construction infrastructure. Under a Public-Private Partnership, a municipality contracts with a private company to build or improve an infrastructure asset and then to maintain and operate that asset in exchange for a stream of revenue. The revenue stream can take the form of user fees received directly from the rate-paying user base or availability payments contractually delivered by the municipality. Public-Private Partnerships can be structured in numerous variations which include a financial component where the upfront capital costs can be privately sourced.

AMERICAN RESCUE PLAN

To support the immediate pandemic response, bring back jobs, and lay the groundwork for a strong and equitable recovery, the American Rescue Plan Act of 2021 established the Coronavirus State and Local Fiscal Recovery Funds, designed to deliver \$350 billion to municipal governments across the United States to bolster their response to the COVID-19 emergency and its economic impacts. One of the eligible uses of these funds is to invest in making improvements to vital water infrastructure. Money based on population from the Coronavirus State and Local Fiscal Recovery Funds was allocated directly to certain municipalities.

OFFICE OF COMMUNITY AND RURAL AFFAIRS (OCRA) DRINKING WATER PROGRAM

OCRA provides assistance in financing appropriate water and sewer infrastructure for municipalities that have planned and set priorities for long-term development. Grant amounts for communities with existing systems are based on current user rates with maximum grant amounts for projects over \$1 million capped at \$700,000. OCRA reviews the level of grant awarded based on the project scope, level of demonstrated need, and the financial resources of applicants. A local match of at least 20 percent is required for consideration of funding.

US ECONOMIC DEVELOPMENT FUND (EDA) GRANTS

In addition to the American Rescue Plan, the US EDA has additional grant funding opportunities that are updated each year. One example is the 2021 Build to Scale Program which builds regional economies through scalable startups and includes competitions that support entrepreneurship, acceleration of company growth and increase access to risk capital across regional economies. Per their website, the "EDA possesses broad and deep experience in successfully coordinating resources across multiple programs and special initiatives. Based upon this experience and EDA's historic track record of successful collaboration with a range of stakeholders (both federal and non-federal), the Office of Management and Budget (OMB) has designated EDA to lead the federal government's efforts to maximize the integration of economic development resources from all sources, including federal, state, local and philanthropic, to achieve more impactful and sustainable outcomes for communities across America."



FIGURE 1

2022 Water CIP Project Location Map

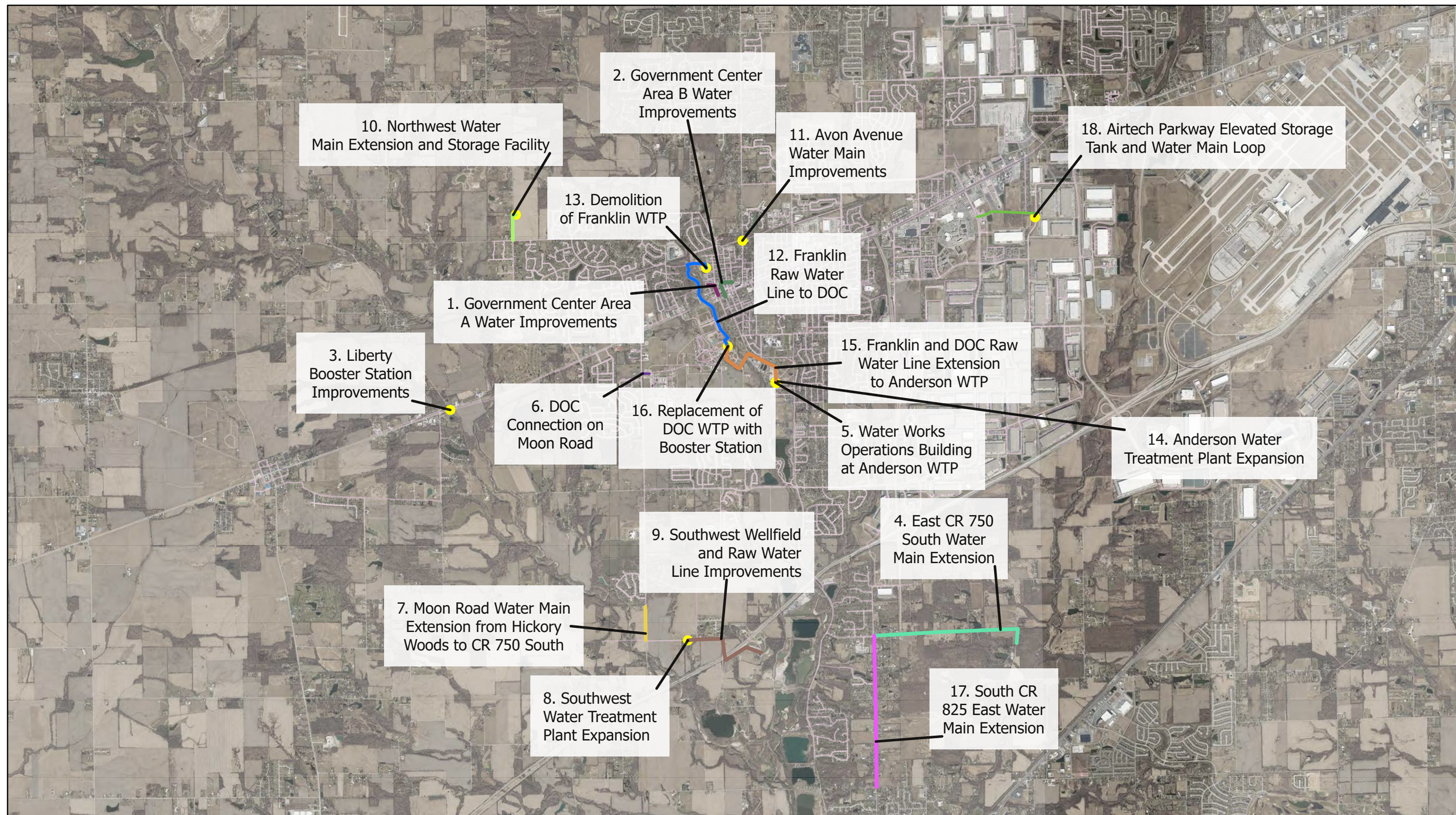




FIGURE 2

Plainfield Downtown Water Improvements Map

PLAINFIELD DOWNTOWN WATER IMPROVEMENTS

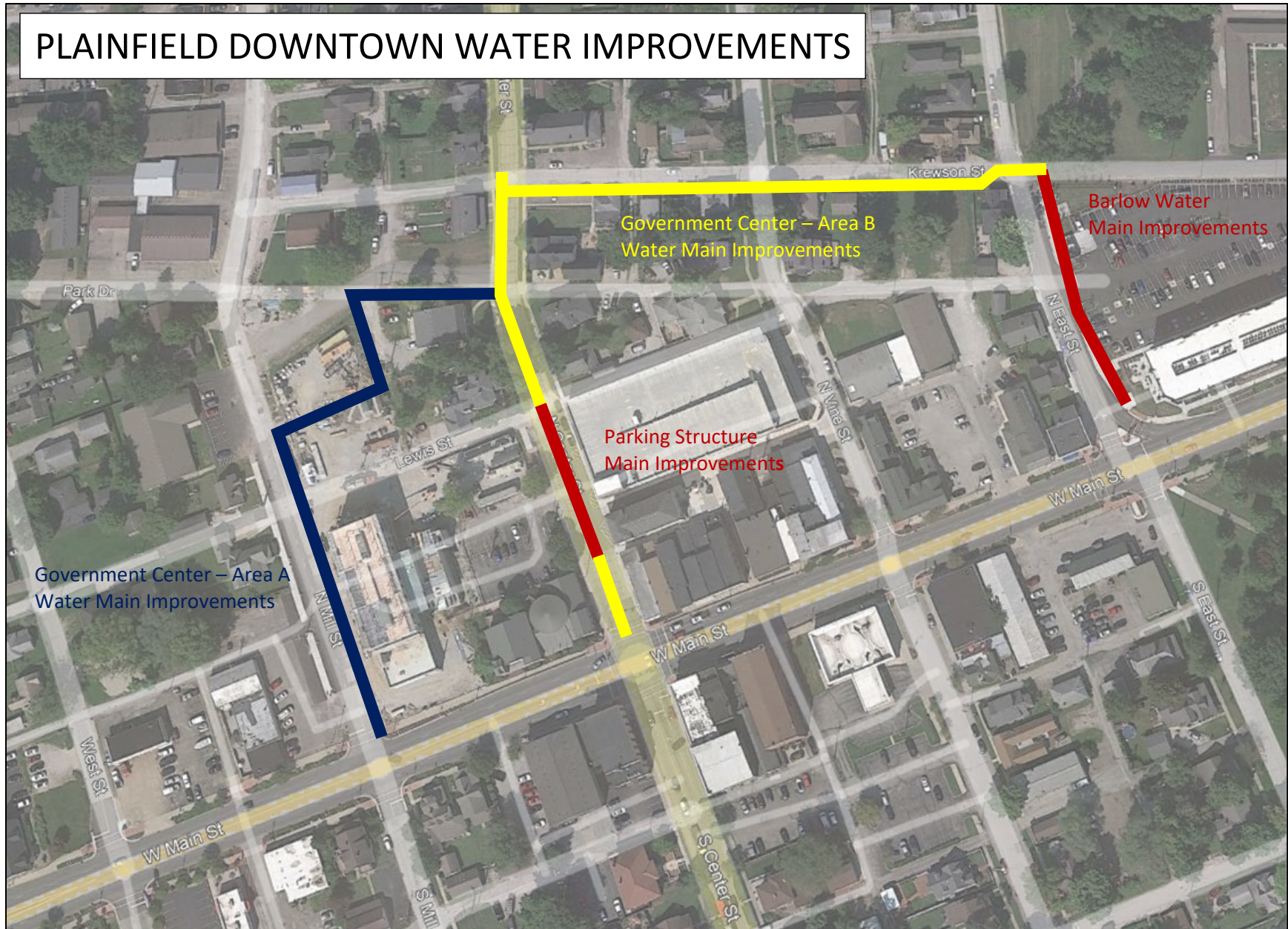
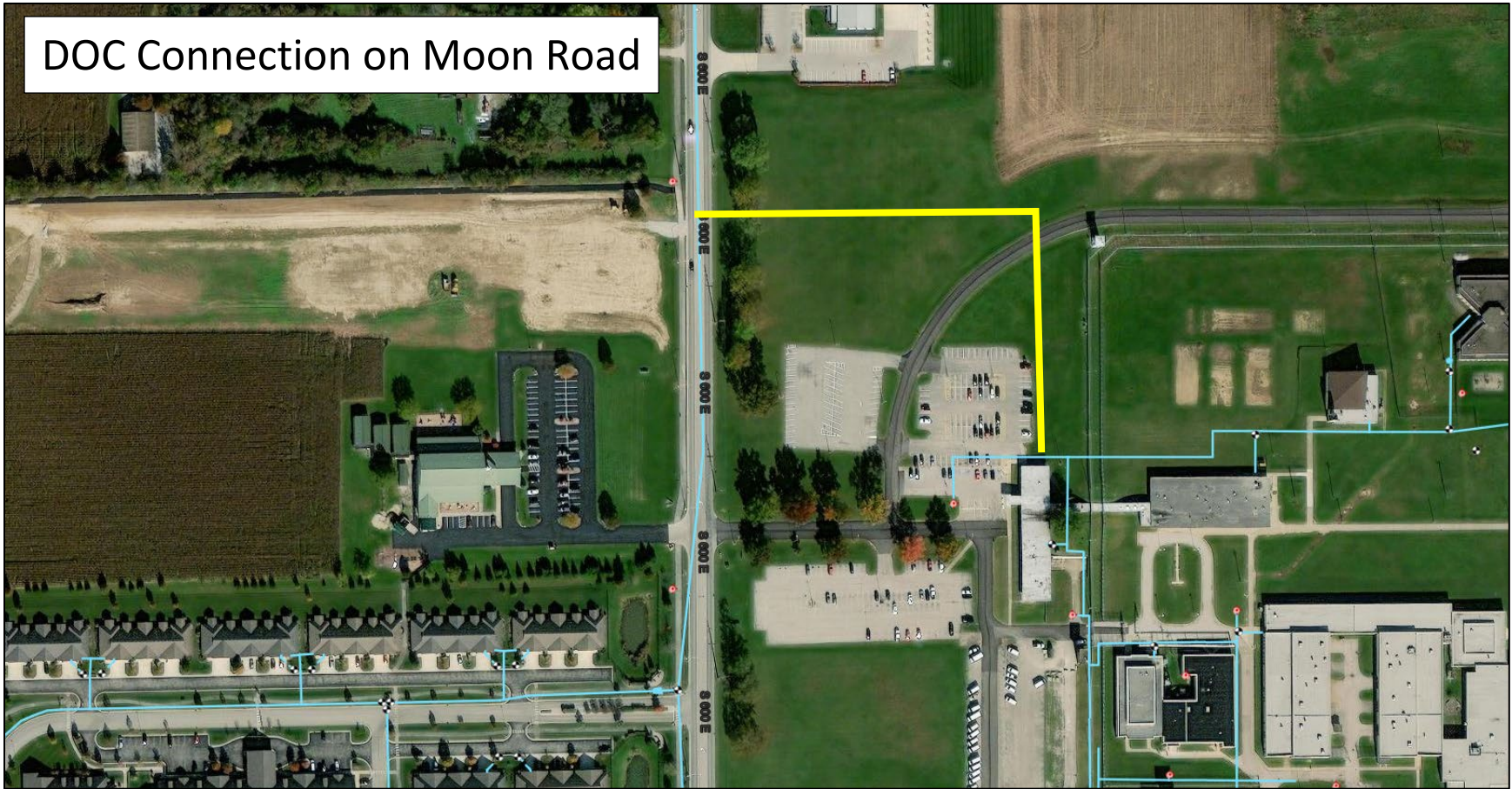




FIGURE 3

DOC Connection on Moon Road

DOC Connection on Moon Road





APPENDIX A

AMR GSC Program Change Order No. 2

Change Order**No. 2**Date of Issuance: 7/22/22Effective Date: 8/2/22

Project: Water System Automatic Meter Reading	Owner: Town of Plainfield, Indiana	Owner's Contract No.:
Contract:		Date of Contract: December 1, 2016
Contractor: Ameresco		Engineer's Project No.: 45300A.9838

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Increase to Contract Price based upon the attached Liberty Booster Station Proposal. \$100,000 of savings realized on previous phases of the Contract will be utilized to help fund these improvements.

Attachments (list documents supporting change):

Liberty Booster Station Proposal

CHANGE IN CONTRACT PRICE:**CHANGE IN CONTRACT TIMES:**

Contract Price Inclusive of CO No. 2:

\$2,836,964.00Original Contract Times: ☐ Working days ☒ Calendar days
Substantial completion (days or date): December 31, 2021Ready for final payment (days or date): December 31, 2021

Increase of this Change Order:

\$1,230,000.00

[Increase] [Decrease] of this Change Order:

Substantial completion (days or date): 392 daysReady for final payment (days or date): 544 days

Contract Price incorporating this Change Order:

\$4,066,964.00

Contract Times with all approved Change Orders:

Substantial completion (days or date): January 27, 2023Ready for final payment (days or date): June 28, 2023**RECOMMENDED:**By: [Signature]
Engineer (Authorized Signature)Date: July 22, 2022Approved by Funding Agency (if applicable):

ACCEPTED:

By: Robin G. Brandgard
0995BF6F9B57437...Date: 7/26/2022

ACCEPTED:

By: [Signature]
Contractor (Authorized Signature)Date: 8/2/22

Date: _____



5875 Castle Creek Pkwy N Dr #155
Indianapolis, IN 46250
ameresco.com

July 22, 2022

John Lightner, P.E.
Water Resources Engineer
Butler, Fairman & Seufert, Inc.

RE: Town of Plainfield
Liberty Booster Station

Dear John,

This memo will summarize the revised project proposal to install a new water pressure booster station for the Town of Plainfield. We seek your approval to continue moving the project forward and prepare a contract change order for review.

Scope Items Included:

The scope listed below includes everything we discussed during the initial development process and what was included in your preliminary design drawings.

- Furnish and install a factory fabricated water pressure booster station. Booster station shall have:
 - Three (3) 600 gpm pumps @ 223' TDH with VFDs and pressure monitoring
 - 480V distribution panels and 10kVA transformer
 - 12" water inlets and outlets
 - Electromagnetic water meter
 - Pressure gauges and sampling taps
 - LED light fixtures (including emergency lighting)
 - 2 Ton HVAC unit with electric heater (sidewall mounted)
 - Louvered air intake and exhaust fan (sidewall mounted)
 - PLC controls and wall mounted panel
 - Booster station shall be approximately 21' x 11'
 - Pitched green metal roof with standing seam finish. No gutters and/or downspouts will be provided
 - Double door access
 - Façade will be red brick (field installed)
 - Exterior LED light with photocell
 - Foundation design by booster station manufacturer
- Provide electrical connection to new booster station
- Integrate controls into SCADA controls for the town of Plainfield's existing system. Provide radio antenna for communication. A 40' mast for antenna is included.
- Provide site grading as required for installation of booster station. Restore landscaping of graded area similar to existing (plant grass).

Town of Plainfield – Liberty Booster Station

July 22, 2022

Page 2

- Provide new concrete foundation for new pressure booster station. Foundation shall be approximately 23' x 13'. Walkway and drive around station is not provided.
- Install new 12" water lines from existing 12" water mains to the north of the site. All new yard piping will be furnished by the Town of Plainfield. Ameresco will provide valves and fittings. New lines will terminate inside the new booster station. Restore landscaping of excavated area similar to existing (grass).
- Furnish and install a new diesel emergency generator near new booster station
 - Generator shall be 150 kW
 - Temporary generator will not be provided during equipment lead time for delivery
 - Provide generator docking station
- Provide a new equipment pad for new emergency generator
- Furnish and install new automatic transfer switch (outside) for generator and utility power.
- Provide new pad for utility transformer
- Extend existing aggregate access drive to in front of new booster station. Parking bollards will not be provided.
- No fence will be provided around the booster station
- Functional Testing of new pump station to ensure proper operation
- Plan review and submittal review is by engineer of record
- Permitting
- One-year parts and labor warranty
- No special wages included
- No electrical utility fees and or costs are not included

Cost

Ameresco has reviewed the project with the Town of Plainfield's trusted contractors. To accomplish the entire scope listed above, **we propose a price of \$1,230,000.**

Direct costs =	\$957,000 (includes credits for submittals)
Ameresco Cost =	\$141,000
Ameresco Fees (12%) =	\$132,000

Please note that the current bidding climate is very volatile due to nationwide price escalation of construction materials. In order to secure pricing, it is important to execute change orders as soon as possible (within 30 days). In addition, equipment lead times are currently running 6-8 months for the pump station and 10 months for the generator.

Please let us know if you have any questions regarding any of the information outlined above.

Respectfully,

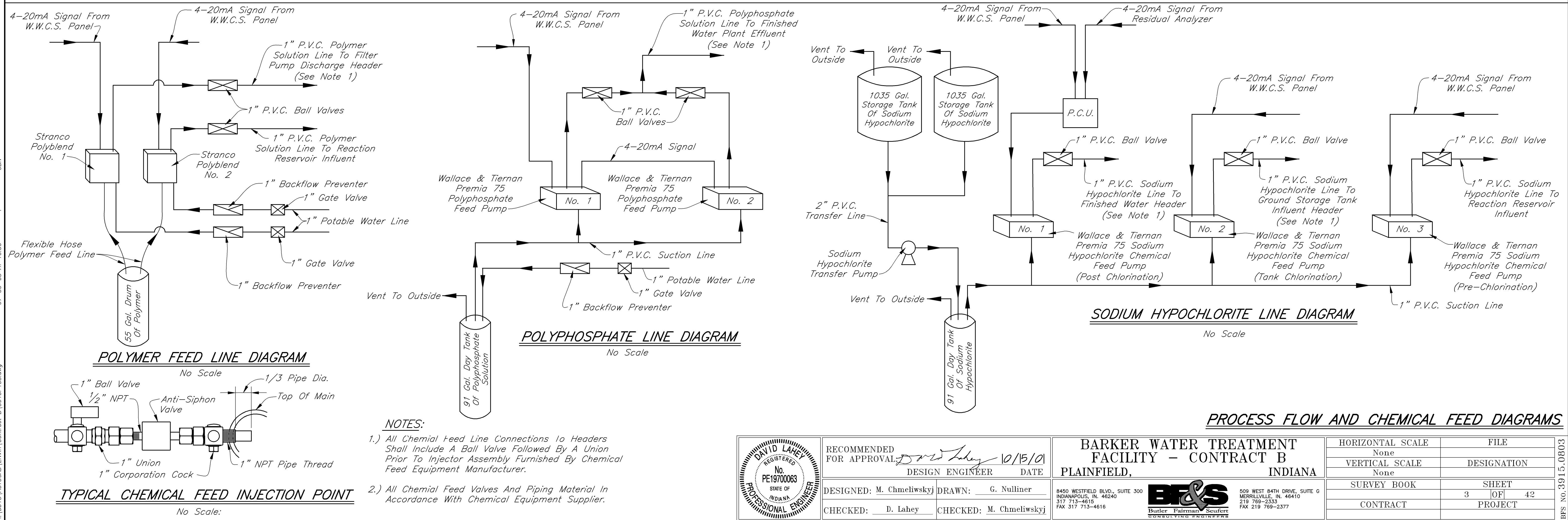
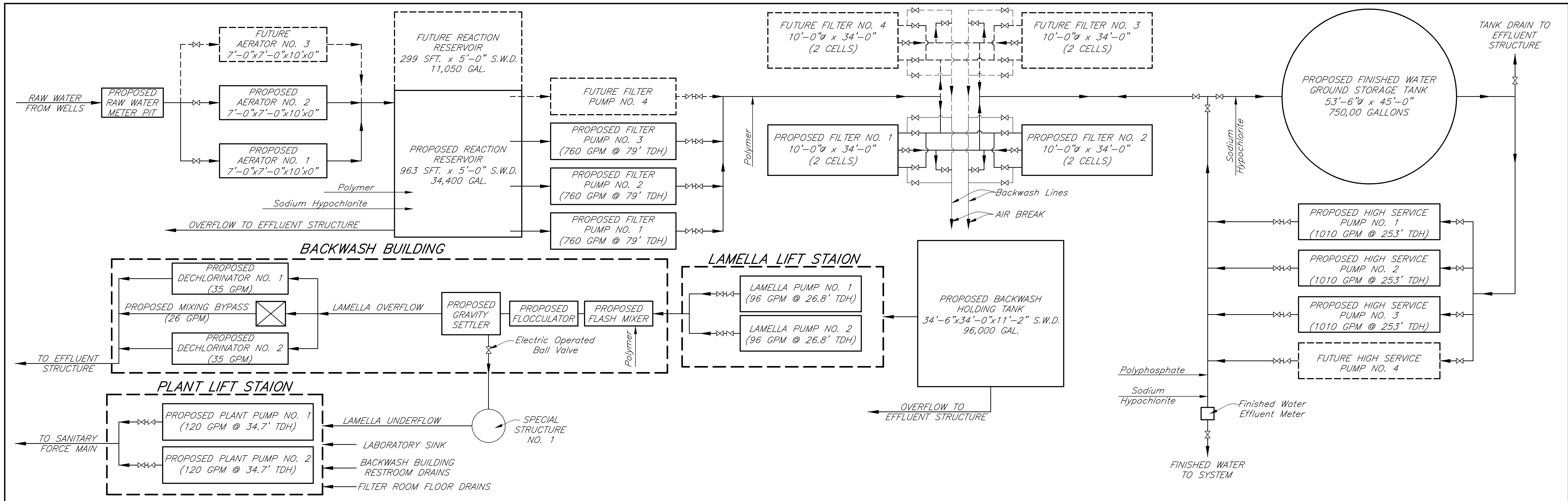
Mark Heirbrandt
Senior Account Executive
mheirbrandt@ameresco.com


Alex Barghout
Manager – Project Development Engineering
abarghout@ameresco.com



APPENDIX B

Southwest WTP Process Flow Diagram

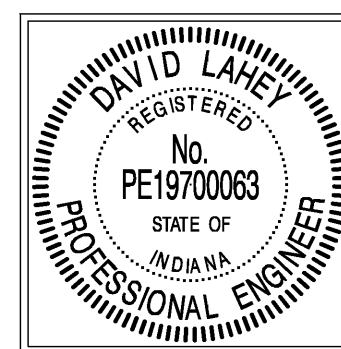


GBH

1

07-30-03 AT 10:56

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RECOMMENDED FOR APPROVAL	DESIGN ENGINEER	DATE
DESIGNED: M. Chmeliwskyj	DRAWN: G. Nulliner	
CHECKED: D. Lahey	CHECKED: M. Chmeliwskyj	

BARKER WATER TREATMENT FACILITY - CONTRACT B	PLAINFIELD, INDIANA
8450 WESTFIELD BLVD., SUITE 300 INDIANAPOLIS, IN. 46240 317 715-4615 FAX 317 713-4616	509 WEST 84TH DRIVE, SUITE G MERRILLVILLE, IN. 46410 219 769-2333 FAX 219 769-2377

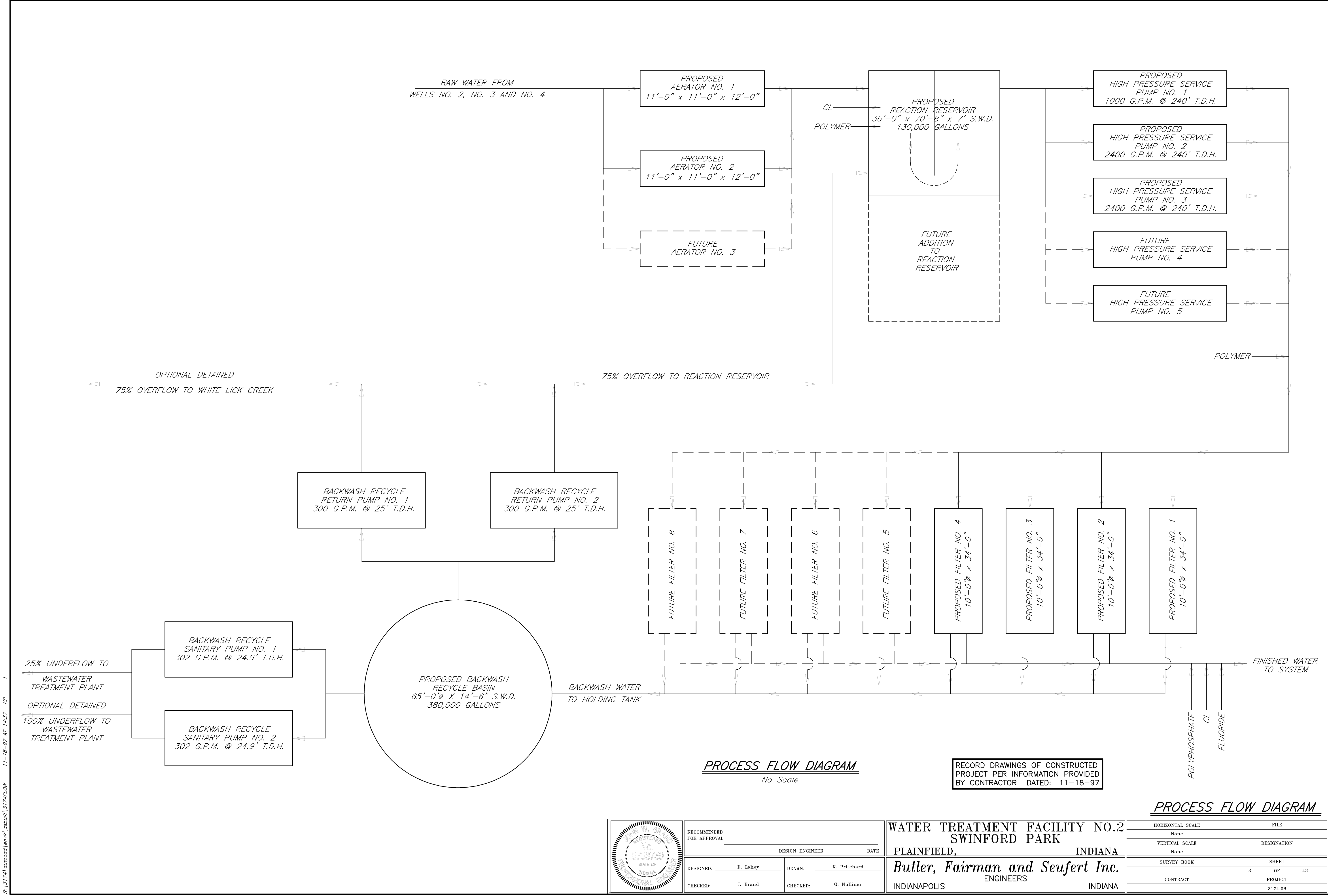
HORIZONTAL SCALE	FILE
None	
VERTICAL SCALE	DESIGNATION
None	
SURVEY BOOK	SHEET
CONTRACT	3 OF 42
	PROJECT

BPS NO. 3915-0803



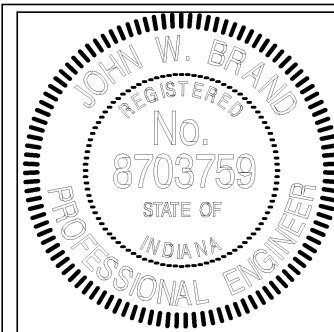
APPENDIX C

Anderson WTP Process Flow Diagram



PROCESS FLOW DIAGRAM
No Scale

PROCESS FLOW DIAGRAM



RECOMMENDED FOR APPROVAL	
DESIGN ENGINEER	
DATE	
DESIGNED: D. Lahey	DRAWN: K. Pritchard
CHECKED: J. Brand	CHECKED: G. Nulliner

WATER TREATMENT FACILITY NO.2	
SWINFORD PARK	
PLAINFIELD, INDIANA	
Butler, Fairman and Seufert Inc.	
ENGINEERS	
INDIANAPOLIS INDIANA	

HORIZONTAL SCALE	FILE
None	
VERTICAL SCALE	DESIGNATION
None	
SURVEY BOOK	SHEET
	3 OF 42
CONTRACT	PROJECT
	3174.08



ATTACHMENT A

AGC CONSTRUCTION INFLATION ALERTS

February 2022 & July 2022



AGC
THE CONSTRUCTION
ASSOCIATION

FEB

2022

CONSTRUCTION INFLATION ALERT

Two years after the coronavirus pandemic struck, the U.S. construction industry is still experiencing multiple impacts. Unprecedented increases in materials costs, supply-chain disruptions, and an increasingly tight labor market have made life difficult for contractors and project owners alike.

Beginning in March 2021, the Associated General Contractors of America (AGC) has posted several editions of the *Construction Inflation Alert*, a document to inform project owners, government officials, and the public about these impacts on construction. The current version is the fifth update of that Alert—an indication that the situation is far from “normal.”

Although the overall economy posted exceptionally strong growth in 2021 and appears to be headed for further expansion, the construction industry has experienced a much more uneven recovery. Until recently, lagging demand for numerous types of nonresidential construction prevented many contractors from fully passing on their added costs. Successive outbreaks of Covid-19 have disrupted production and delivery of goods, labor availability, and the mix of projects. This combination of supply chain bottlenecks, unpredictable costs and delivery times, and smaller bid price increases threatens to push some firms out of business.

This report is intended to provide all parties with better understanding of the current situation, the impact on construction firms and projects, its likely course in the next several months, and possible steps to mitigate the damage. The document will be revised to keep it timely as conditions change; download it at AGC Construction Inflation Alert | Associated General Contractors of America.

Please send comments and feedback to AGC of America’s chief economist, Ken Simonson, ken.simonson@agc.org.

www.agc.org

Record cost increases

Contractors experienced record increases for materials costs in 2021. While some costs have subsided in recent months, others have continued to rise or have become volatile in both directions—a threat in its own way.

Around the middle of each month, the Bureau of Labor Statistics (BLS) posts producer price indexes (PPI) for thousands of products and services at www.bls.gov/ppi. Most of these are based on the prices that sellers say they charged for a specific item on the 11th day of the preceding month. Producers include manufacturers and fabricators, intermediaries such as steel service centers and distributors, and providers of services ranging from design to trucking.

BLS aggregates these prices into index numbers that cover an entire category of products, such as a weighted average of all concrete products, as well as indexes for the mix of goods and services purchased by industries such as construction. The index readings themselves do not translate into a price found in the market, but the percentage change in an index number from one period to another indicates the amount of price increase or decrease that has occurred.

The PPI for inputs to new nonresidential construction is a weighted average of the goods and services purchased for every type of new construction other than housing. It does not include a contractor's own labor costs, equipment purchases, or direct imports but does cover an importer's or distributor's markup on imported goods.

This index rose by a record amount in 2021. As shown in Figure 1, the index soared 24.1% from June 2020 to June 2021 before moderating slightly. From December 2020 to December 2021, the increase still totaled 19.6%—a huge jump from the 4.4% rise posted in 2020 and the 1.8% gain in 2019.

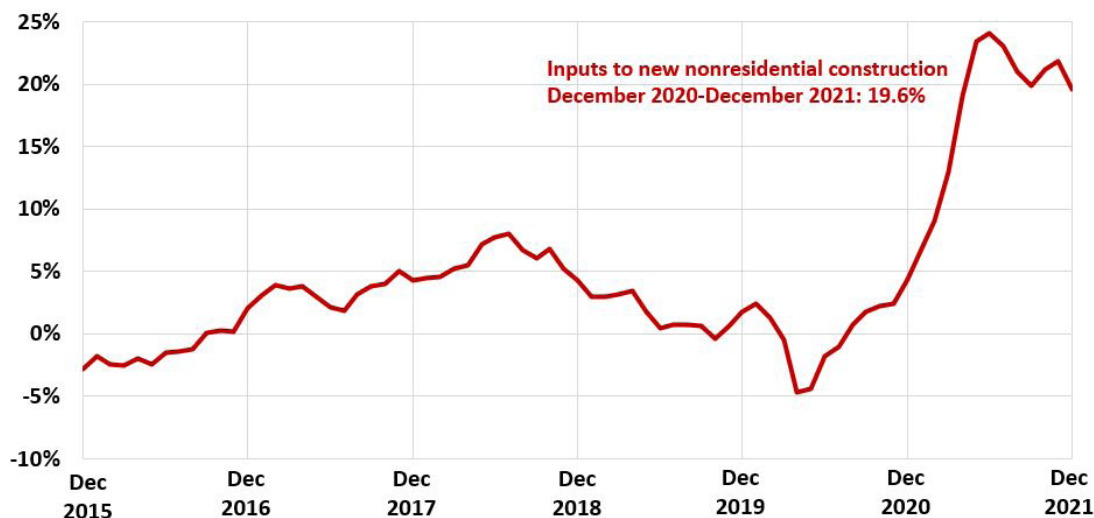
24.1%

The producer price index soared 24.1% from June 2020 to June 2021. By December, the increases had moderated slightly but still totaled 19.6% for the year.

Figure 1

Change in prices for inputs to construction

Year-over-year change in PPI, 2015 – 2021, not seasonally adjusted



Source: Bureau of Labor Statistics, producer price indexes, www.bls.gov/ppi

No category of construction has escaped the extreme cost escalation. BLS posts PPIs for inputs to highways and streets; commercial, healthcare, industrial, power and communications, education and vocational, and other miscellaneous nonresidential structures; and for single- and multifamily construction. From December 2020 to December 2021, the increases in these input cost indexes ranged from 14.6% for new multifamily construction to 20.7% for commercial structures.

Contributors to runaway costs

What has contributed to these extreme cost increases? In brief: nearly everything, as shown in Table 1. From December 2020 to December 2021, the PPI for steel mill products more than doubled, rocketing up 127.2%. There were double-digit increases in the PPIs for plastic construction products, 34.0%; aluminum mill shapes, 29.8%; copper and brass mill shapes, 23.4%; gypsum products, 20.7%; lumber and plywood, 17.6%; architectural coatings (paint), 13.9%; and asphalt felts and coatings, 11.8%.

Even items that did not end the year with double-digit gains had unusually large increases. The PPI for concrete products jumped 8.5% from December 2020 to December 2021, the largest rise in 15 years. The index for flat glass also posted an 8.5% gain (from November 2020 to November 2021), a 40-year high, before finishing the year with an increase of 7.3%.

In addition to materials that go into structures, prices for items and services used by contractors soared. For instance, contractors pay for huge amounts of diesel fuel—purchased directly to run contractors' own trucks and offroad equipment, as well as indirectly in the freight charges or explicit fuel surcharges for myriad deliveries of goods and equipment, and the hauling away of dirt, debris, and equipment. The PPI for diesel fuel leaped 54.9% from December 2020 to December 2021, while the index for truck transportation of freight climbed 17.7%.

Contractors also paid much more for equipment and parts. The PPI for construction machinery and equipment jumped 10.1% in 2021, and the index for truck and bus (including off-the-highway) pneumatic tires rose 11.2%.

As shown in Table 1, all of these increases far exceeded the changes a year earlier.

\$3.95

The retail price of diesel fuel reached a nearly 8-year high of \$3.95 per gallon on February 7, an increase of \$1.15 or 41% from one year earlier.

Table 1

Price increases for construction inputs Year-over-year change in December PPI

Construction materials		
	2020	2021
Steel mill products	5.2%	127%
Plastic construction products	5.4%	34%
Aluminum mill shapes	-1.7%	30%
Copper and brass mill shapes	24%	23%
Gypsum products	3.6%	21%
Lumber and plywood	37%	18%
Architectural coatings	1.9%	14%
Asphalt felts and coatings	2.1%	12%
Used by contractors		
Diesel fuel	-2.8%	55%
Truck transport of freight	2.2%	18%
Construction machinery and equipment	1.1%	10%
Truck and offroad tires	0.3%	11%

Source: Bureau of Labor Statistics, producer price indexes, www.bls.gov/ppi

What happened to bid prices?

The extreme runup in so many input costs caused financial hardship for many contractors and subcontractors, especially for those whose purchases are concentrated in materials with extra-steep increases. Eighty-four percent of the contractors in the 2022 AGC/Sage Construction Hiring and Business Outlook Survey reported their firms had incurred unanticipated costs in 2021.

BLS posts several PPIs for new nonresidential construction and for subcontractors' pricing. Since every construction project is unique, it is not possible to collect prices for identical construction "products" in the same way as for most goods and services. Instead, the agency creates "bid price" PPIs (BLS refers to them as output price indexes) through a two-step process. Each quarter it receives data from construction cost-estimating firms as to the cost of a package of installed components or "assemblies" of a particular nonresidential building. Every month BLS asks a fixed group of contractors the amount of overhead and profit they would charge to erect that building. BLS combines the answers from a set of contractors to create PPIs for new warehouse, school, office, industrial, and healthcare building construction, along with a weighted average of these building types for an overall index for new nonresidential building construction. There are also indexes for maintenance and repair and for all types of nonresidential work performed by concrete, electrical, roofing, and plumbing contractors.

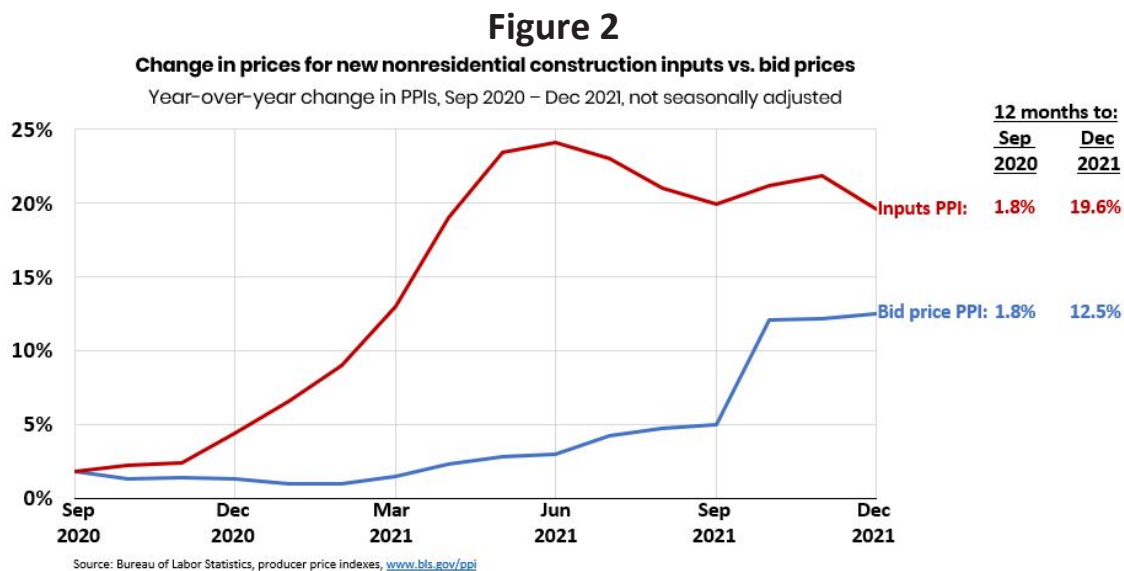


Figure 2 shows how the gap between input costs and bid prices widened dramatically beginning in September 2020. In that month, both price indexes increased 1.8% from the year-earlier level. Then, through mid-2021, the year-over-year increase in input costs outran the rise in bid prices by larger amounts each month. As noted above, input prices moderated in the second half of 2021, while bid prices rose more than in past years. But the 12.5% annual increase through December in the bid price PPI was far short of the 19.6% input-price increase. As a result, contractors were absorbing more and more of the cost increases.

Moreover, the bid-price index only indicates the price contractors propose for new starts. On projects for which they had already submitted a bid or begun work, contractors were stuck with paying elevated materials prices that they could not pass on.

Tariffs have also driven up some prices. In November, the Commerce Department doubled the tariff on Canadian softwood lumber from 9% to 18%. The 25% tariff on steel and 10% tariff on aluminum imposed by President Trump have largely been left in place so far by President Biden. In addition, President Trump imposed tariffs on thousands of products from China but created an exclusion process that enabled some items not produced in the U.S. to be imported without the tariff. The Biden administration largely suspended the exclusions, adding to the number of items with tariff-induced price increases.

Volatility vs. continuous cost increases

Despite the steep increase in most input prices last year, several of them slowed or reversed course during 2021. Price indexes for diesel fuel and lumber each more than doubled from mid-2020 to mid-2021 before ending the year higher by “only” 55% and 18%, respectively. The PPI for copper and brass mill shapes had a year-over-year gain of 65% earlier in 2021 but wound up “only” 23% higher than in December 2020.

Prices for each of these items have recently turned higher again. The futures price for lumber, as traded on the CME commodities exchange, tripled from a low in October to early January before partially retreating later in the month. The futures price for copper moved higher in January. The retail price of diesel fuel, as reported each Monday by the Energy Information Administration, reached a nearly eight-year high of \$3.95 per gallon on February 7, an increase of \$1.15 per gallon or 41% from one year earlier. These changes are likely to show up in PPIs in early 2022, and the fuel price increase will likely spread to higher prices for trucking, especially for deliveries of heavy items such as ready-mix concrete and rebar.

As of early February, it does not appear likely that input prices will set new records in 2022. But wide swings in both directions may continue. Such volatility can be as risky to contractors’ solvency as a steady change. Firms may submit bids based on the assumption that current prices will hold or slip further, only to be caught by a new upswing. And owners may pressure contractors to pass along recent price declines, not recognizing that current prices may not reflect the price a contractor already committed to pay for materials or the price it will pay months later when it places an order. There have also been recent cases of suppliers refusing to quote firm prices until time of shipment, at which point prices may greatly exceed the current price.

When will bid prices catch up?

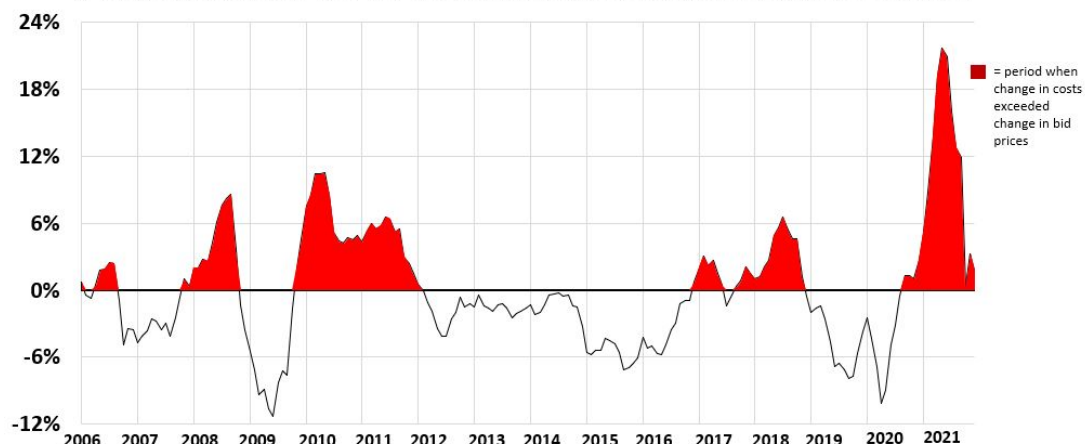
There is no fixed relationship between input costs and bid prices. For every firm and time period, the relationship depends on specific market conditions and expectations.

However, it is possible to look at past relationships. Figure 3 shows the difference between the year-over-year change in the PPI for materials costs for goods inputs to construction and the bid price index for new warehouses (the longest time series available).

Figure 3

Cost squeeze on contractors can last two years or more

Difference between year-over-year change in materials costs vs. bid prices, Jan 2006-Dec 2021



Source: Source: Bureau of Labor Statistics, www.bls.gov/ppi/, producer price indexes for goods inputs to construction (material costs) and new warehouse construction (bid prices)

The areas in red indicate periods in which the year-over-year change in the PPI for inputs to construction exceeded the PPI for new nonresidential building construction—specifically, warehouses. (Similar patterns exist for the other new-construction “bid price” indexes: the PPIs for new school, office, industrial and healthcare buildings.)

Materials costs outran bid prices for as long as 27 months from late 2009 to early 2012 and for nearly 24 months from late 2016 to late 2018. The current gap hasn’t lasted as long—yet—but the peak was twice as high as in previous episodes, indicating the pain for contractors was that much more intense.

Supply-chain issues

From the first days of the pandemic, availability and delivery times for materials have been never-ending headaches for construction firms. Problems began as early as February 2020, when factories in China and northern Italy were shut down, causing shortages of items as diverse as elevator parts, floor tiles, and kitchen appliances.

The following month, as the U.S. economy went into a steep dive, construction firms canceled orders and suppliers lost workers to Covid-19 or shut to comply with governors’ edicts. When orders rebounded, there were not enough workers, ships, port berths, containers, chassis, or trucking, rail, and warehouse workers to produce and move goods.

Adding to these pandemic-induced problems, a series of unusual mishaps interfered with output or delivery of numerous goods. The biggest impact for construction came from the deep freeze in Texas in February 2021 that damaged all of the petrochemical plants producing resins for a host of construction plastics. Damage to the electrical grid in Louisiana from Hurricane Ida last summer further interfered with the production of some plastics inputs. Wildfires and mudslides in British Columbia and soggy conditions in the Southeast have affected lumber production. The blockage of the Suez Canal and the abrupt closure of an Interstate highway bridge across the Mississippi River in 2021 are further examples of “one-off” events that have disrupted the supply chain.

Construction has also been affected by the much-publicized shortage of computer chips. Not only is the industry a major buyer of pickup trucks that are in short supply, but deliveries of construction equipment also have been held up by a lack of semiconductors.

With so many factors contributing to delays, it is not surprising that 72% of the respondents to AGC’s outlook survey reported that projects took longer than anticipated last year. As a result, 44% report that their firms are putting longer completion times into bids or contracts.

So far, there is little sign that the supply chain will consistently improve in 2022. While the lead time for some items has shortened, deliveries for many materials remain delayed or unpredictable. Dealers and contractors continue to report being informed shortly before an expected delivery that the item will not arrive for months or the quantity will be less than expected—and needed. Other items have shown up unexpectedly early, without warning, causing problems when they cannot be used, installed, or stored onsite.

273,000
Construction job openings at the end of 2021 totaled 273,000, a jump of nearly 30% from the end of 2020.

Worker availability

The construction industry lost 1.1 million employees from February to April 2020—a 15% decline in just two months and nearly half as many as in the industry’s five-year downturn from 2006 to 2011. While both residential and nonresidential construction employment rebounded somewhat in May 2020, employment stalled for more than a year after that among nonresidential firms—general and specialty trade contractors plus civil and heavy engineering construction firms. During that period, thousands of experienced workers moved into residential construction (homebuilding and remodeling), found jobs in other sectors, or left the workforce completely.

Nonresidential employment grew strongly in the last four months of 2021. But job openings increased even faster. Openings at the end of 2021 totaled 273,000, a jump of nearly 30% from the end of 2020, according to BLS’s Job Openings and Labor Turnover Survey. The total exceeded the 220,000 employees hired in December, implying that construction firms would have added twice as many workers as they were able to, if there had been enough qualified applicants.

In order to attract, retain, and bring back workers, construction firms are raising pay. Average hourly earnings in construction rose 5.8% from February 2021 to January 2022 for “production and nonsupervisory employees”—mainly hourly craft workers. But the average for such workers in the overall private sector climbed 6.9%. The implication is that construction companies will have to raise pay even more in the coming months to remain competitive.

What can contractors and owners do?

While contractors cannot unclog ports or rescind tariffs, they can provide project owners with timely and credible third-party information about changes in relevant material costs and supply-chain snarls that may impact the cost and completion time for a project that is underway or for which a bid has already been submitted.

Owners can authorize appropriate adjustments to design, completion date, and payments to accommodate or work around these impediments. Nobody welcomes a higher bill, but the alternative of having a contractor go out of business because of impossible costs or timing is likely to be worse for many owners.

For projects that have not been awarded or started, owners should start with realistic expectations about current costs and the likelihood of increases. They should provide potential bidders with accurate and complete design information to enable bidders to prepare bids that minimize the likelihood of unpleasant surprises for either party.

Owners and bidders may want to consider price-adjustment clauses that would protect both parties from unanticipated swings in materials prices. Such contract terms can enable the contractor to build in a smaller contingency to its bid, while providing the owner an opportunity to share in any savings from downward price movements (which are likely at some point, particularly for long-duration projects). The ConsensusDocs set of contract documents (www.consensusdocs.org) is one source of industry-standard model language for such terms. The ConsensusDocs website includes a price escalation resource center (<https://www.consensusdocs.org/price-escalation-clause/>).

The parties may also want to discuss the best timing for ordering materials and components. Buying items earlier than usual can provide protection against cost increases. But purchase before use entails paying sooner for the items; potentially paying for storage, security against theft and damage; and the possibility of design changes that make early purchase unwise.

Conclusion

The construction industry is in the midst of a period of exceptionally steep and fast-rising costs for a variety of materials, compounded by major supply-chain disruptions and a shortage of available workers—a combination that threatens the financial health of many contractors. No single solution will resolve the situation, but there are steps that government officials, owners, and contractors can take to lessen the pain.

Federal trade policy officials can act immediately to end tariffs and quotas on imported products and materials. With many U.S. mills and factories already at capacity, bringing in more imports at competitive prices will cool the overheated price spiral and enable many users of products that are in short supply to avoid layoffs and shutdowns.

Officials at all levels of government should review all regulations, policies, and enforcement actions that may be unnecessarily driving up costs and slowing importation, domestic production, transport, and delivery of raw materials, components, and finished goods.

Owners need to recognize that significant adjustments are probably appropriate regarding the price or delivery date of projects that were awarded or commenced early in the pandemic or before, when conditions at suppliers were far different. For new and planned projects, owners should expect quite different pricing and may want to consider building in more flexibility regarding design, timing, or cost-sharing.

Contractors need, more than ever, to closely monitor costs and delivery schedules for materials and to communicate information with owners, both before submitting bids and throughout the construction process.

Materials prices do eventually reverse course. Owners and contractors alike will benefit when that happens. Until then, cooperation and communication can help reduce the damage.

AGC resources

This document will be updated if market conditions warrant. Check <https://www.agc.org/learn/construction-data/agc-construction-inflation-alert> for the latest edition.

The AGC website, www.agc.org, has a variety of resources available to contractors, owners, and others wanting to know more about the construction industry.

AGC posts tables showing changes in PPIs and national, state, and metro construction employment each month at <https://www.agc.org/learn/construction-data>

AGC's Data DIGest is a weekly one-page summary of economic news relevant to construction. Subscribe at https://store.agc.org/Store/Store/StoreLayouts/Item_Detail.aspx?iProductCode=4401 or email chief economist Ken Simonson at ken.simonson@agc.org.

Construction documents are available for viewing and purchase from ConsensusDocs at www.consensusdocs.org, including the price escalation resource center, www.consensusdocs.org/price-escalation-clause/



AGC
THE CONSTRUCTION
ASSOCIATION

JULY

2022

CONSTRUCTION INFLATION ALERT

For more than two years the U.S. construction industry has been buffeted by unprecedented increases in materials costs, supply-chain bottlenecks, and a tight labor market. To help project owners, government officials, and the public understand how these conditions are affecting contractors and their workers, the Associated General Contractors of America (AGC) has posted frequent updates of the Construction Inflation Alert.

Several recent developments have raised the specter of a sharp slowdown or even a recession in the U.S. economy. Inflation is at a 40-year high, sapping consumers' purchasing power despite elevated wage increases. Major stock indexes have declined sharply—a frequent but not foolproof harbinger of recession. A growing number of companies have announced layoffs, although the job market remains vibrant, as indicated by large monthly employment increases, near-record job openings, and a persistently low unemployment rate.

However, a recession is far from certain. Demand for infrastructure, manufacturing, and power construction appears to be strong and likely to strengthen further, perhaps for several years to come. In any case, the cost of construction materials and labor does not generally move in sync with the overall economy. In short, owners should not assume that delaying projects will enable them to avoid volatility and disruptions in construction costs, delivery times, and labor supply, even if the economy slows significantly.

Meanwhile, Russia's ongoing attack on Ukraine and Western sanctions against Russia have disrupted production and transport of dozens of commodities. China's prolonged lockdown of Shanghai and other areas in an attempt to control the spread of covid has also affected production and shipping. New variants of covid, as well as a growing number of people with lingering or recurrent symptoms ("long-haul covid"), add to uncertainty about labor supply.

This version of the Alert is the seventh update since the first edition was posted in March 2021—an indication that the situation remains far from "normal." This document will continue to be revised to keep it timely as conditions affecting demand for construction, labor supply, and materials costs and availability change. Each new version is posted here: <https://www.agc.org/learn/construction-data/agc-construction-inflation-alert>

Please send comments and feedback, along with "Dear Valued Customer" letters or other information about materials costs and supply-chain issues, to AGC of America's chief economist, Ken Simonson, ken.simonson@agc.org.

www.agc.org

Recent changes in input costs

Previous editions of this guide have highlighted the extreme runup in materials costs that began in early 2020. More recently, prices have moved in divergent directions for different materials. But, on balance, they continue to climb at a much higher rate than the consumer price index.

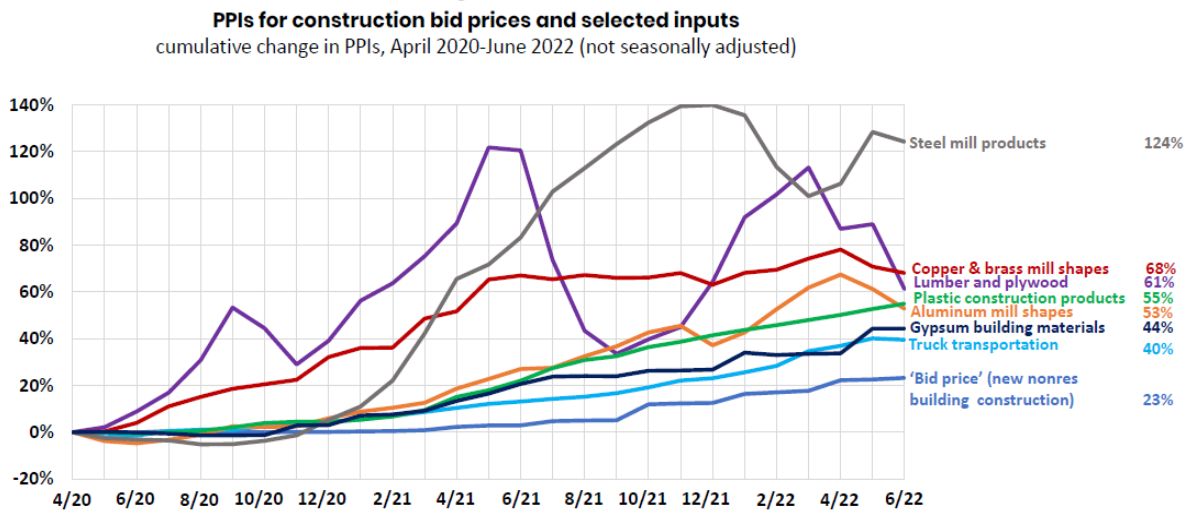
The extent of these increases is documented by the Bureau of Labor Statistics (BLS). BLS posts producer price indexes (PPIs) around the middle of each month for thousands of products and services (at www.bls.gov/ppi). Most PPIs are based on the prices that sellers say they charged for a specific item on the 11th day of the preceding month. Producers include manufacturers and fabricators, intermediaries such as steel service centers and distributors, and providers of services ranging from design to trucking.

Figure 1 shows the magnitude of the increases for seven widely used categories of construction inputs. From April 2020, the low point for prices of many goods during the early stage of the pandemic, to June 2022, the PPI for steel mill products more than doubled (up 124% in 26 months). There were increases of more than 60% in the indexes for copper and brass mill shapes (up 68%) and lumber and plywood (up 61%). PPIs rose by more than half for plastic construction products (up 55%) and aluminum mill shapes (up 53%). The index for gypsum products increased 44% and the PPI for truck transportation climbed 40%. Numerous other indexes rose by more than the 23% increase in the “bid price” index.

124%

The PPI for steel mill products rose 124% in 26 months

Figure 1



Source: Bureau of Labor Statistics, producer price indexes, www.bls.gov/ppi

Supply-chain issues

From the first days of the pandemic, availability and delivery times for materials have been never-ending headaches for construction firms. Problems began as early as February 2020, when factories in China and northern Italy were shut down, causing shortages of items as diverse as elevator parts, floor tiles, and kitchen appliances. Two years later, another round of covid-related restrictions in China disrupted production and shipping from that country.

Russia's attack on Ukraine, Western countermeasures against Russia, and diversions or blockages of cargo ships are impeding or cutting off supplies of items as diverse as pig iron used in steelmaking, neon for lasers used in semiconductor manufacturing and other applications, and Ukrainian clay used in producing ceramic tile exported to the U.S. from Italy and Spain. Some of these impacts are far down the supply chain from the actual construction item. For instance, a producer of electrical switchgear reported in May that the time for delivering products from its plant had doubled from 20 weeks to 40, in part because of difficulty acquiring a fire-retardant chemical produced in Europe that goes into a plastic resin used to make the housing for its switchgear.

Adding to these pandemic- and conflict-induced problems, a series of unusual mishaps interfered with output or delivery of numerous goods. The biggest impact for construction came from the severe freeze in Texas in February 2021 that damaged all of the petrochemical plants producing resins for a host of construction plastics. Damage to the electrical grid in Louisiana from Hurricane Ida last September further interfered with the production of some plastics inputs. Some cement plants have incurred unusually long outages, in part because of delays in sourcing replacement parts.

Contractors have also been affected by the much-publicized shortage of computer chips. Not only is the construction industry a major buyer of pickup trucks that are in short supply, but deliveries of construction equipment also have been held up by a lack of semiconductors.

Contractors have reported being quoted exceptionally long lead times and/or allocations (less-than-full shipments, generally tied to previously ordered quantities) for inputs as varied as electrical transformers, traffic signal equipment, highway striping paint, wallboard, insulation, windows, and roofing fasteners. Strong demand, plant outages, and truck driver shortages have meant long delays in completing ready-mix concrete pours in several states in the Southeast and West.

So far, there is little sign that the supply chain will consistently improve before 2023—or even 2024, in the case of some computer chips. While the lead time for some items has shortened, deliveries for many materials remain delayed or unpredictable. In fact, the expiration of labor contracts for West Coast longshore workers and rail workers nationwide could result in new disruptions of shipments later this year.

466,000

The number of job openings at the end of May, a record for the month

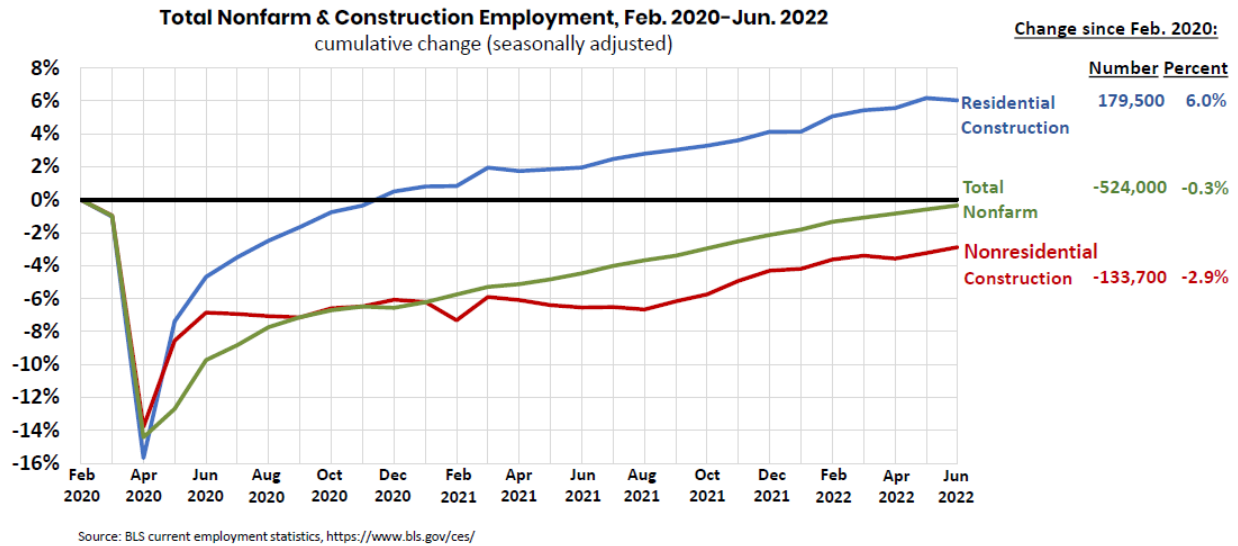
Labor supply and cost

Construction employment has bounced back well from the early months of the pandemic. However, construction firms are far short of the number of workers they have been seeking. They have partially closed the gap by getting more overtime from the workers they have, but this cannot continue indefinitely.

The construction industry lost 1.1 million employees from February to April 2020—a 15% decline in just two months. While both residential and nonresidential construction employment rebounded somewhat in May 2020, employment stalled for more than a year after that among nonresidential firms—nonresidential building and specialty trade contractors plus civil and heavy engineering construction firms. During that period, thousands of experienced workers moved into residential construction (homebuilding and remodeling), found jobs in other sectors, or left the workforce completely.

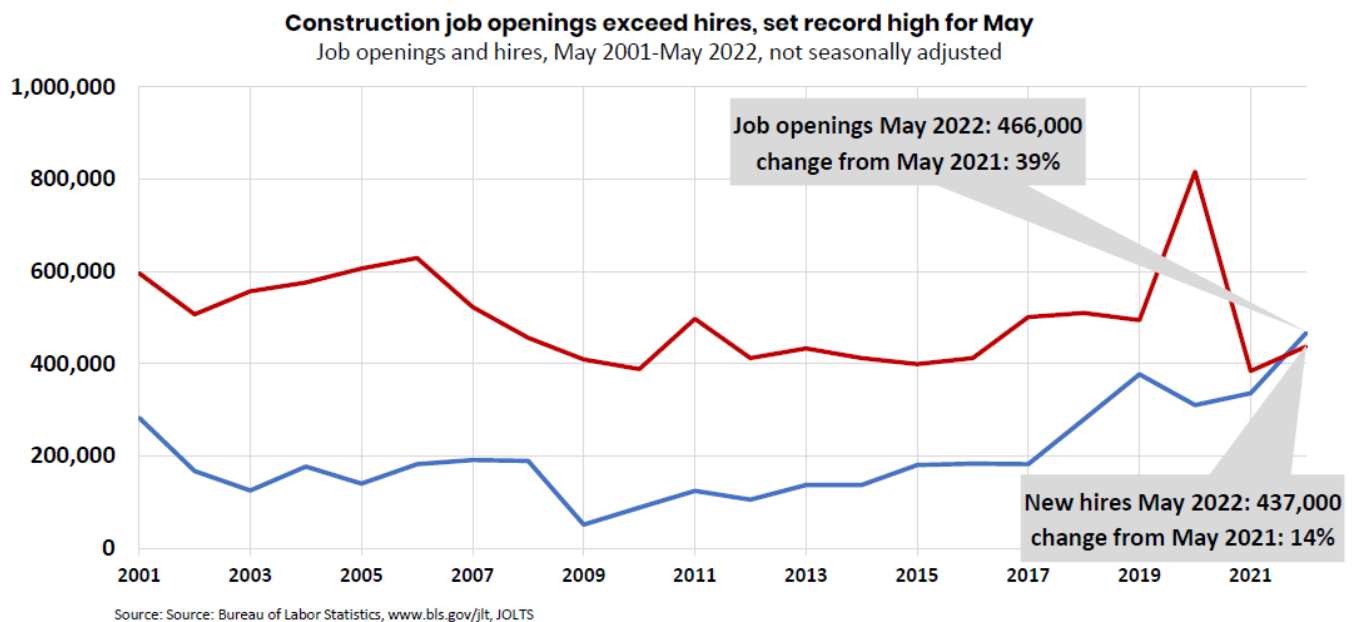
By June 2022, seasonally adjusted construction employment totaled 7,670,000—modestly higher than the 7,624,000 employed in February 2020. But there was a large shift between residential and nonresidential subsectors. Compared to February 2020 levels, residential construction firms had added nearly 180,000 workers, while employment in nonresidential construction was still down 134,000 employees or 2.9%, as shown in Figure 2.

Figure 2



There is strong evidence that the construction industry would have added many more workers if they had been available. Job openings in construction at the end of May totaled 466,000 (not seasonally adjusted), a jump of 130,000 or 39% from a year earlier and by far the largest May total in the 22-year history of the data, as shown in Figure 3. In fact, job openings exceeded the 437,000 workers hired in May, implying that construction firms would have hired twice as many workers that month as they were able to, if there had been enough qualified applicants.

Figure 3



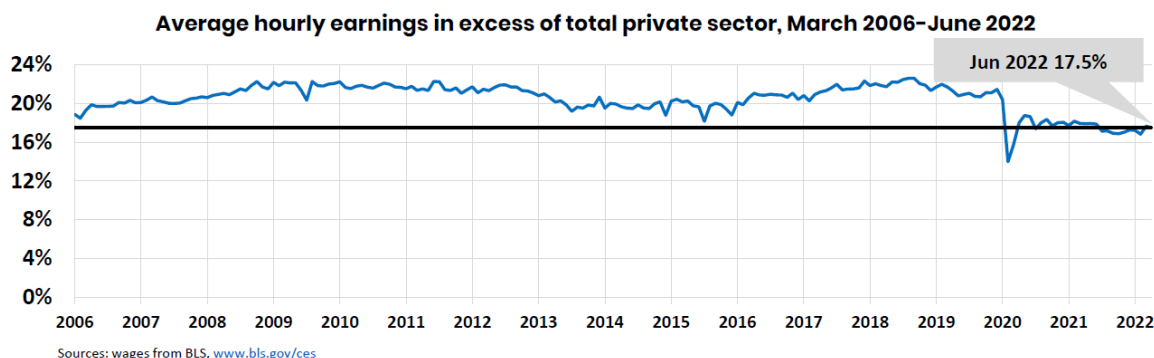
In order to attract, retain, and bring back workers, construction firms are raising pay. Average hourly earnings in construction for “production and nonsupervisory employees”—mainly hourly craft workers—rose 6.0% from June 2021 to June 2022. That compared with increases of 4.0% in the previous 12 months and 2.8% in the 12 months ending in June 2000.

Despite the acceleration in wages, construction pay has not risen as fast as in other industries. Historically, as shown in Figure 4, contractors paid a “premium” to attract workers willing to work in the conditions, locations, and hours required for construction. Specifically, average hourly earnings for production workers in construction typically averaged 20% to 23% more than for all private sector employees, up until the onset of the pandemic. This premium shrank to less than 18% since the start of the pandemic as restaurants, warehouses, delivery services, and other industries drastically increased pay. Other sectors were also able to offer greater flexibility regarding hours and worksites, including work from home, that are not possible for construction.

Figure 4

Wage premium for construction has shrunk

- “Premium” for construction wages relative to total private sector has shrunk from 20-23% pre-pandemic to 17.5% for production & nonsupervisory employees as other sectors boost pay, benefits and offer flexible hours and locations
- Implications: Contractors will have raise pay still more, pay more overtime, invest more in labor-saving software and equipment



These differences imply that construction wages will have to rise even more steeply to restore (and perhaps expand) the pay “premium.” In addition, it is likely that contractors will pay more overtime to make up for the workers they don’t have. They may also turn more to offsite production and onsite drones, robotics, 3-D printers, and other ways of reducing the number or skill level of the workers they employ.

Changes in bid prices

The extreme runup in so many input costs caused financial hardship for many contractors and subcontractors, especially for those whose purchases are concentrated in materials with extra-steep increases.

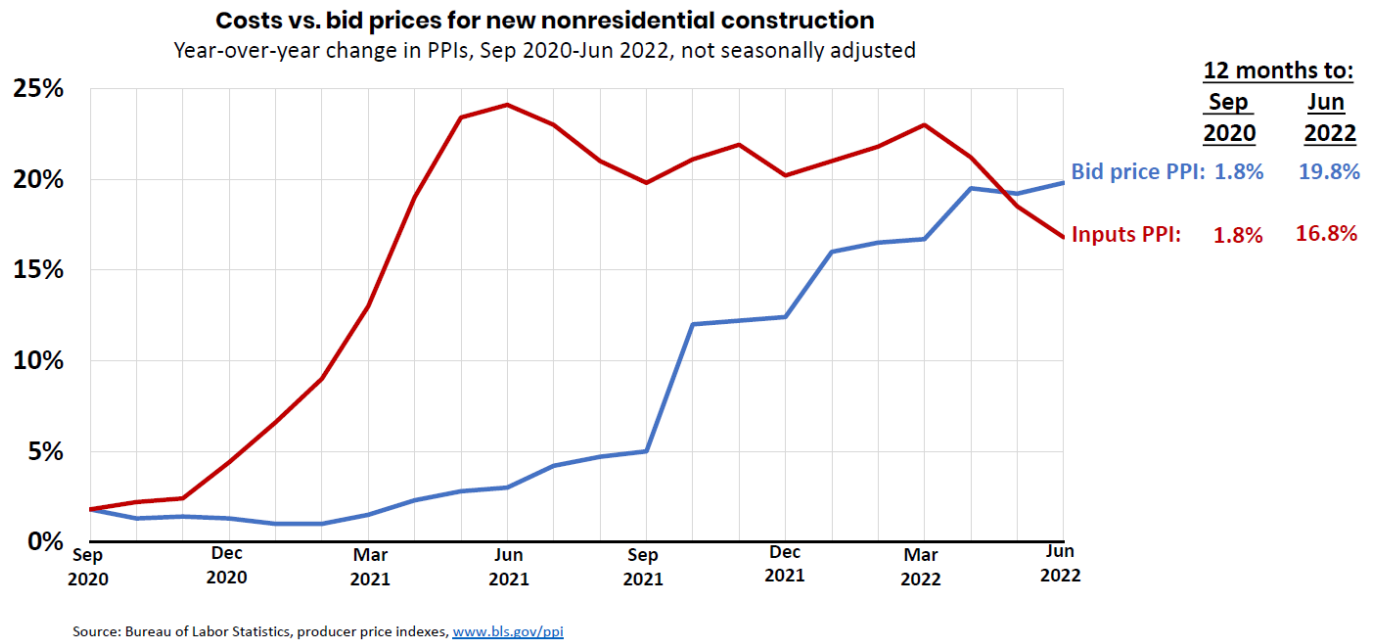
BLS posts several PPIs for new nonresidential construction. Since every construction project is unique, it is not possible to collect prices for identical construction “products” in the same way as for most goods and services. Instead, the agency creates “bid price” PPIs (BLS refers to them as output price indexes) through a two-step process. Each quarter it receives data from construction cost-estimating firms regarding the cost of a package of installed components or “assemblies” of a particular nonresidential building. Every month BLS asks a fixed group of contractors the amount of overhead and profit they would charge to erect that building—the same building that contractor was asked about previously. BLS combines the answers from a set of contractors to create PPIs for new warehouse, school, office, industrial, and healthcare building construction, along with a weighted average of these building types for an overall index for new nonresidential building construction.

BLS also creates PPIs for inputs to construction--weighted averages of the cost of materials and services purchased for every type of project.

As shown in Figure 5, the PPI for bid prices rose at the same rate as the PPI for inputs from September 2019 to September 2020, 1.8% year-over-year. The bid-price PPI continued rising at a modest rate through mid-2021, while the year-over-year change in input prices accelerated to more than 24% by June 2021.

Since mid-2001, the bid-price PPI also has accelerated considerably, as contractors attempt to pass on their rising materials and labor costs. By June 2022, the bid-price index was climbing at a 19.8% year-over-year rate, compared to 16.8% for the PPI for inputs to new nonresidential construction.

Figure 5



The bid-price index only indicates the price contractors propose for new starts. On projects for which they had already submitted a bid or begun work, contractors were stuck with paying elevated materials prices that they could not pass on.

What's next for bid prices?

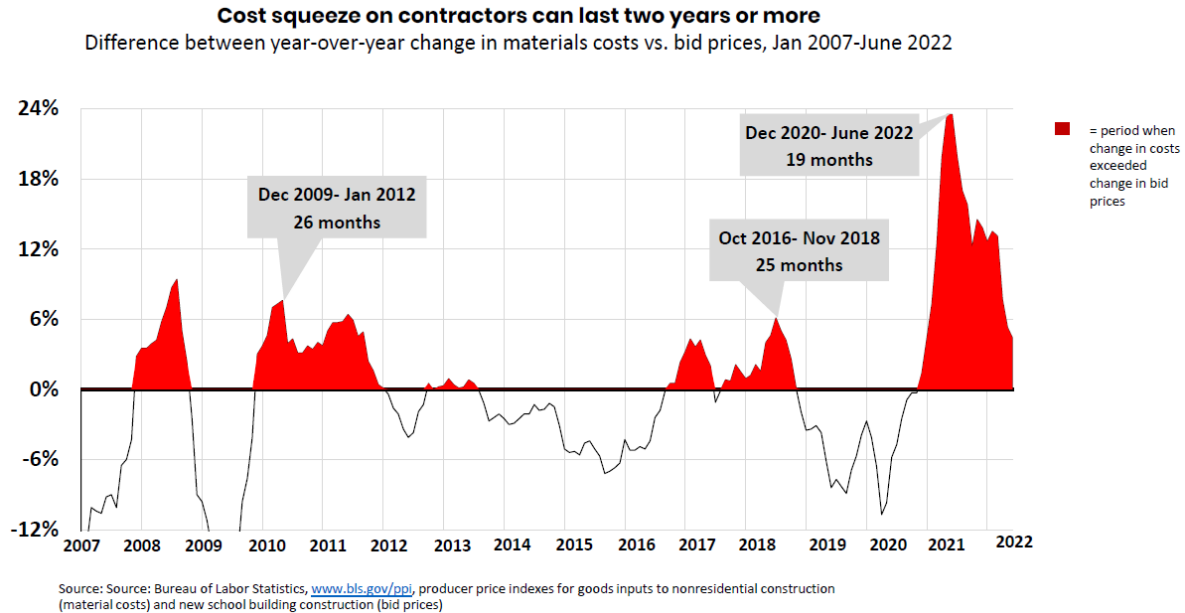
There is no fixed relationship between input costs and bid prices. For every firm and time period, the relationship depends on specific market conditions and expectations.

However, it is possible to look at past relationships. Figure 6 shows the difference between the year-over-year change in the PPI for materials costs for goods inputs to construction and the bid-price index for new school construction. The areas in red indicate periods in which the year-over-year change in the PPI for exceeded the bid-price PPI for schools. (Similar patterns exist for the bid-price indexes for new warehouse, office, industrial and healthcare buildings.)

Materials costs outran bid prices for as long as 26 months from late 2009 to early 2012 and for 25 months from late 2016 to late 2018. The current gap hasn't lasted as long but the peak was more than twice as high as in previous episodes, indicating the pain for contractors has been that much more intense.

26 months
The year-over-year change in materials costs may exceed the change in bid prices for 2 years or more

Figure 6



What can contractors and owners do?

Contractors can provide project owners with timely and credible third-party information about changes in relevant material costs and supply-chain snarls that may impact the cost and completion time for a project that is underway or for which a bid has already been submitted.

Owners can authorize appropriate adjustments to design, completion date, and payments to accommodate or work around these impediments. Nobody welcomes a higher bill, but the alternative of having a contractor go out of business because of impossible costs or timing is likely to be worse for many owners.

For projects that have not been awarded or started, owners should start with realistic expectations about current costs and the likelihood of increases. They should provide potential bidders with accurate and complete design information to enable bidders to prepare bids that minimize the likelihood of unpleasant surprises for either party.

Owners and bidders may want to consider price-adjustment clauses that would protect both parties from unanticipated swings in materials prices. Such contract terms can enable the contractor to include a smaller contingency in its bid, while providing the owner an opportunity to share in any savings from downward price movements (as has occurred recently with lumber, diesel fuel, and some metals prices). The ConsensusDocs set of contract documents (www.consensusdocs.org) is one source of industry-standard model language for such terms. The ConsensusDocs website includes a price escalation resource center (<https://www.consensusdocs.org/price-escalation-clause/>).

The parties may also want to discuss the best timing for ordering materials and components. Buying items earlier than usual can provide protection against cost increases. But purchase before use entails paying sooner for the items; potentially paying for storage, security against theft and damage, and insurance; and the possibility of design changes that make early purchase unwise.

Conclusion

The construction industry is in the midst of a period of exceptionally steep and fast-rising costs for a variety of materials, compounded by major supply-chain disruptions and difficulty finding enough workers—a combination that threatens the financial health of many contractors. No single solution will resolve the situation, but there are steps that government officials, owners, and contractors can take to lessen the pain.

Federal trade policy officials can act immediately to end tariffs and quotas on imported products and materials. With many U.S. mills and factories already at capacity, bringing in more imports at competitive prices will cool the overheated price spiral and enable many users of products that are in short supply to avoid layoffs and shutdowns.

The federal government can improve the labor supply by allowing employers to sponsor more foreign-born workers to fill positions for which there are not enough qualified applicants. In addition, the federal government should fund and approve more apprenticeship and training programs to enable students and career-switchers to acquire the skills needed for construction trades.

Officials at all levels of government should review all regulations, policies, and enforcement actions that may be unnecessarily driving up costs and slowing importation, domestic production, transport, and delivery of raw materials, components, and finished goods.

Owners need to recognize that fast-changing materials costs and availability require a quick decision regarding bids and requests for changes. For new and planned projects, owners should expect quite different pricing from previous estimates. They may want to consider building in more flexibility regarding design, timing, or cost-sharing.

Contractors need, more than ever, to closely monitor costs and delivery schedules for materials and to communicate information with owners, both before submitting bids and throughout the construction process.

Materials prices do eventually reverse course. Owners and contractors alike will benefit when that happens. Until then, cooperation and communication can help reduce the damage.

AGC resources

This document will be updated if market conditions warrant. Check for the latest edition at:
<https://www.agc.org/learn/construction-data/agc-construction-inflation-alert> for the latest edition

The AGC website, www.agc.org, has a variety of resources available to contractors, owners, and others wanting to know more about the construction industry.

AGC posts tables showing changes in PPIs and national, state, and metro construction employment each month at:
<https://www.agc.org/learn/construction-data>

AGC's Data DIGest is a weekly one-page summary of economic news relevant to construction. Subscribe at:
https://store.agc.org/Store/Store/StoreLayouts/Item_Detail.aspx?iProductCode=4401
or email chief economist Ken Simonson at ken.simonson@agc.org.

Construction documents are available for viewing and purchase from ConsensusDocs at www.consensusdocs.org, including the price escalation resource center, www.consensusdocs.org/price-escalation-clause/

APPENDIX – B

Layne 2022 Aquifer Desktop Study for Plainfield, Indiana



Ranney Collector Wells
6360 Huntley Road
Columbus, Ohio 43229

T 614-888-6263
graniteconstruction.com

June 6, 2022

Dennis Unterreiner
Deputy Director of Utilities
City of Plainfield Water Department
Plainfield, Indiana

RE: Aquifer Desktop Study for Plainfield, Indiana

Dear Mr. Dennis Unterreiner:

Layne Christensen Company (Layne) has completed a desktop hydrogeologic study (Study), using only existing information, to evaluate the feasibility of adding up to two (2) million gallons per day (MGD) of new groundwater supply to the City of Plainfield's (City) raw water system. The Study objectives were to:

- Review existing geologic and hydrogeologic studies to develop a summary of the available aquifers located near the City.
- Review well performance data provided by the City to estimate the current production capacity of each of the City's water supply wells.
- Review existing geologic and hydrogeologic information to evaluate the feasibility of installing add up to two (2) MGD of new groundwater supply to the City's water system.
- If adding two (2) MGD of groundwater is feasible, provide recommendations for a test hole drilling program.

A summary of Study results is provided below.

Data Reviewed and Evaluated

Layne conducted a background review of the geology and hydrogeology near the City using existing data. The data sources that were reviewed included:

- Indiana Department of Natural Resources (IDNR) Aquifer System maps.
- IDNR Water Well Record database.
- Boring logs, water quality and pumping test data from existing City wells.
- City well performance data.

Summary of Existing Water System and Wells

The City water system (Public Water Supply Identification Number (PWSID) 5232020) provides water service to approximately 8,800 customers from a total of three (3) active water treatment plants and nine (9) active water supply wells. The IDNR maintains a database of Significant Water Withdrawal Facilities (SWWF), defined as water withdrawal facilities that have the capability of withdrawing more than 100,000 gallons of groundwater or surface water in one (1) day. Per the data reviewed, the City currently maintains four (4) separate registered SWWFs (three of which are active). The SWWFs are describe below:

- Anderson Plant. This is the City's primary water supply and includes three (3) wells, wells 3, 4 and 7
- Swinford Plant – This plant is near the Anderson Plant and includes two (2) wells, wells 2 and 9.
- Department of Corrections (DOC). This facility is located close to the Anderson Plant and includes two (2) water supply wells.
- Southwest Plant. This facility is located southwest of town and includes two (2) wells.
- Liberty Plant – This facility currently acts as a booster station and does not contribute new water to the City's water supply. The plant has two (2) wells that are not active.

The location of the various SWWFs are shown on Figure 1.

City Well Performance Data

Well and pump performance testing reports from 2016, 2018, and 2020 were reviewed by Layne to evaluate the current operating condition, well specific capacity (gpm/ft of drawdown), and maximum flow rate for each of the City's wells. General well construction parameters and the results of the most recent well flow testing effort are summarized in Table 1. The flow test reports did not describe the pumping duration of the flow tests; therefore, the maximum test pumping rate was used as the maximum pumping rate for that well, provided the pumping water level was above the top of the well screen.

Using this approach, the total pumping capacity of the City's wells is approximately 12,000 gpm (17.2 MGD). This maximum pumping capacity does not include the negative impact of well interference drawdown and does not consider treatment capacity at the City's water treatment plants (WTPs). The wells with the highest pumping capacity are generally located at the Anderson Plant.

Aquifer Systems Near Plainfield

In 2003, the IDNR began developing county wide aquifer systems maps for the purpose of assessing Indiana's groundwater resources. This effort resulted in the development of county scale maps depicting both the unconsolidated aquifer systems and the bedrock aquifer systems for each county in Indiana.

For this Study, the aquifer system maps for Hendricks County were reviewed. Figure 1 illustrates the City's permitted Significant Groundwater Withdrawal Facilities (SGWF), along with the unconsolidated aquifer systems that those wells are completed in. The information presented on this figure was obtained from IDNR Aquifer Systems Map 69-A (IDNR, 2010), which is included as Attachment A. As shown on Figure 1, the City's water supply wells are completed in two aquifer systems:

1. Tipton Complex Aquifer System – This aquifer system is what supplies the Anderson Plant wells, the DOC wells, and the wells that supplied the inactive Liberty Plant.
2. White River and Tributaries Outwash Aquifer System – This aquifer system is what supplies the Southwest Plant wells.

Tipton Complex Aquifer System

The aquifer is described as a sequence that was produced by multiple glacial advances that deposited sequences of intertill sand and gravel layers that are typically overlain by thick clay units. The sand and gravel sequences are highly variable in depth, thickness and lateral extent and the total thickness of these unconsolidated deposits (sand, gravel and clay) is up to 250 feet.

Near the Anderson Plant, the base of this aquifer system is shale bedrock, which is encountered at a depth ranging from approximately 90 to 113 feet below ground surface (bgs). The boring logs for these wells are included as Attachment B. The aquifer near the Anderson Plant generally consists of sand and gravel deposits which are overlain by 25 to 40 feet of clay. The IDNR rated capacity for the Anderson Plant wells ranges from 1,250 to 2,500 gpm, which is considerably higher than the IDNR rated capacity for the City's other wells.

White River and Tributaries Outwash Aquifer System

The aquifer is described as a sequence that includes glacial outwash sands that are generally capped by a layer of clay and/or silt. The City's two water supply wells at the Southwest Plant are the only two SGWF wells completed in this aquifer system in Hendricks County. When initially constructed, one of these wells was test pumped for 24 hours at a flow rate of approximately 1,600 gpm with 36 feet of drawdown, and a corresponding specific capacity of approximately 44 gpm/ft.

Near the Southwest Plant, the base of this aquifer system is shale bedrock, which is encountered at a depth ranging from approximately 100 to 112 feet bgs. The boring logs for these two wells are included as Attachment C. The aquifer near the Southwest Plant generally consists of sand and gravel deposits which are overlain by 40 to 50 feet of clay.

Till Aquifer Systems

The information obtained from IDNR Aquifer Systems Map 69-A (IDNR, 2010), which is included as Attachment A, also describes the surficial geology of areas where the City's wells are not located. These include two units of glacial till, which are mapped as the Tipton Till Aquifer system (shown in yellow) and the Till Veneer Aquifer system (shown in purple). The Till Veneer Aquifer system is described as a thin layer of glacial till overlying bedrock and is not considered a viable aquifer for municipal wells. The Tipton Till Aquifer system deposits are similar to the Tipton Complex Aquifer system; however, the principal difference is that the deposits of sand and gravel in the Tipton Till Aquifer are generally thin (5 to 15 feet thick) and horizontally discontinuous.

Feasibility of Developing Additional Groundwater Supply

The primary objective of this Study was to provide an assessment of the feasibility for the City to develop an additional two (2) MGD of groundwater supply, which equates to approximately 1,400 gpm of new groundwater capacity. Based on our review of the unconsolidated geology near the City's wells, the addition of 2 MGD of new water supply appears to be feasible. This new water supply could be added to the City's existing system by drilling one (1) to two (2) new wells. The new wells should be located in areas that are described as being in either the Tipton Complex Aquifer system or in the White River and Tributaries Outwash Aquifer system.

Recommendations

The City should develop several target locations for future water supply well sites based on factors such as: proximity to existing infrastructure, excess treatment capacity at the City's WTPs. Two options exist for the construction of the new wells:

1. Replacement wells. The new wells could be constructed as replacement wells for some of the lower yielding wells. If this approach is considered, the DOC wells are the recommended

candidates for replacement. These wells were constructed in 1949 and are much smaller diameter than wells constructed using modern drilling techniques.

2. New well sites. If this option is selected, then wells would be constructed at locations where the City presently does not have a water supply well. These target locations should be reviewed with Layne personal to ensure that the locations are in one of the two aquifer systems identified above.

Once several target locations have been identified, a test drilling program should be undertaken to identify which locations have the thickest sequence of sand and gravel. Up to two (2) new well sites are recommended to provide the additional 2 MGD of water supply for the City. To identify these well locations, it is recommended that the test drilling program included four (4) to six (6) borings, which should be drilled until bedrock is encountered.

We appreciate the opportunity to assist the City in this important project. Please contact Brandon Butrum at 502-585-1241 or me at 913-321-5000 if you wish to discuss the information presented within this report further.

Cordially,
Layne Christensen Company

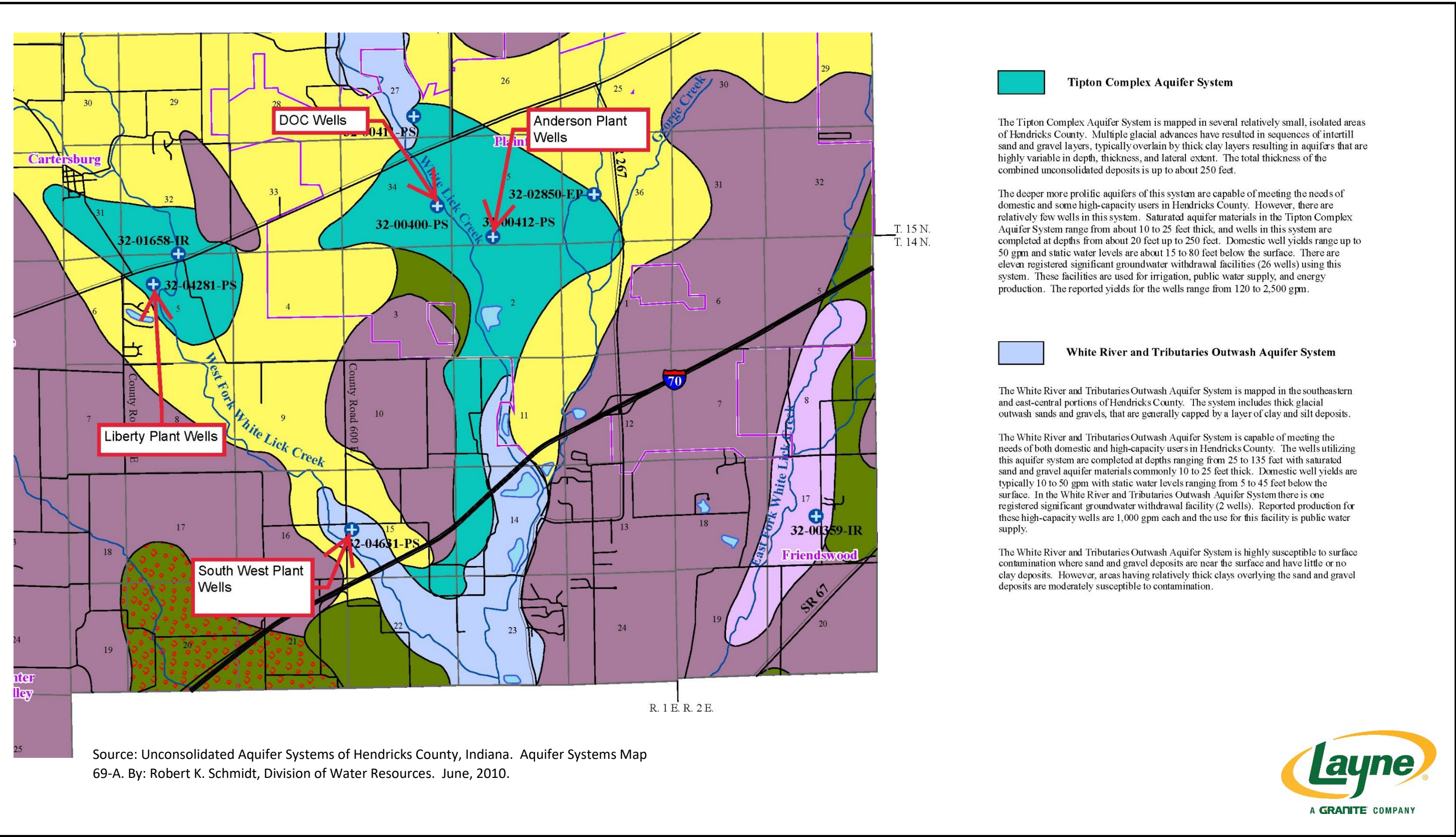
A handwritten signature in black ink, appearing to read 'Luca DeAngelis', with a long horizontal line extending to the right.

Luca DeAngelis, PE, PG
Senior Hydrogeologist

cc: Matt Reed, Layne – Ranney Collector Wells
Brandon Butrum – Layne Christensen

FIGURES

Figure 1: Plainfield Registered Significant Groundwater Withdrawal Facilities and the Unconsolidated Aquifer Systems of Hendricks County, Indiana



TABLES

Table 1: Summary of City of Plainfield Water Supply Wells and Current Well Performance

Well ID	WTP	WTP Status	IDNR Water Withdrawal Facility Number	Date Drilled	Depth (feet)	Screen Length (feet)	Top of Screen (feet bgs)	2020/2021 Pump Testing Results				IDNR Rated Capacity (gpm)	Well Log	UTM North	UTM East
								SWL (depth below TOC)	PWL (depth below TOC)	Test Flow Rate (gpm)	Specific Capacity (gpm/ft)				
Well 2	Anderson Plant	Active	00412	1961	105	15	90	47.2	79.5	845	26	1250	275328	4393600	552350
Well 3	Anderson Plant	Active	00412	1977	113	25	88	38.53	69.8	1,594	51	1750	187487	4393316	552272.6
Well 4	Anderson Plant	Active	00412	1992	107	25	82	41.42	59.5	2,466	136	2500	187542	4393400	552100
Well 7	Anderson Plant	Active	00412	2005	89	Unknown	Unknown	37.5	58.2	2,373	115	2300	Unknown	4393450	552050
Well 9	Anderson Plant	Active	00412	2006	90	15	75	50	71.6	1,595	74	1800	Unknown	4393600	552200
Southwest 5	SW Plant	Active	04631		100	Unknown	Unknown	31.1	47.9	909	54	1000	Unknown	4389050	550000
Southwest 6	SW Plant	Active	04631		108	30	78	27.9	47.8	1,073	54	1000	Unknown	4388900	550000
DOC Well 1	DOC	Active	00400	1949	106	24-25	82	37	52.2	535	35	400	187582	4393925	551275
DOC Well 2	DOC	Active	00400	1949	94	20	74	38.5	58.5	583	29	520	187577	4393875	551225
	Liberty Plant 1	Inactive	04281	1996	80	20	68	Not tested				1000	20462	4392800	547015
	Liberty Plant 2	Inactive	04281	1993	86	20	74	Not tested				1000	Unknown	4392700	547050

Notes:

SWL = Static Water Level

PWL = Pumping Water Level

TOC = Top of Casing

Total Tested Capacity
(gpm) 11,970
Total Tested Capacity
(MGD) 17.2

APPENDIX A
Hendricks County Aquifer Map



 Registered Significant Ground-Water Withdrawal Facility
 Stream
 County Road
 State Road & US Highway
 Interstate
 Municipal Boundary
 Lake & River

June 2010

APPENDIX B
Well Logs – Tipton Complex Aquifer

Record of Water Well

Well 3

Indiana Department of Natural Resources

Anderson Plant

Reference Number 187487	Driving directions to well 300 FEET WEST OF CENTER ST ANTE LINE AT SWINFORD PARK PLANT		Date completed Jun 24, 1977	
Owner-Contractor	Name	Address	Telephone	
Owner	TOWN OF PLAINFIELD			
Driller	LAYNE NORTHERN CO., INC.			
Operator	ROBERT COLLINS	License: null		
Construction Details				
Well	Use: Public Supply	Drilling method:	Pump type:	
	Depth: 113.0	Pump setting depth:	Water quality:	
Casing	Length: 83.0	Material:	Diameter: 24.0	
Screen	Length: 25.0	Material:	Diameter: 24.0 Slot size: .055	
Well Capacity Test	Type of test:	Test rate: 2000.0 gpm for 8.0 hrs.	Bail Test rate: gpm for hrs.	
	Drawdown: 23.0 ft.	Static water level: 16.0 ft.	Bailer Drawdown ft.	
Grouting Information	Material:	Depth: from to		
	Installation Method:	Number of bags used:		
Well Abandonment	Sealing material:	Depth: from to		
	Installation Method:	Number of bags used:		
Administrative	County: HENDRICKS		Township: 15N Range: 1E	
	Section: SE of the SE of the SW of Section 35		Topo map: PLAINFIELD	
	Grant Number:			
	Field located by:		on:	
	Courthouse location by:		on:	
	Location accepted w/o verification by:		on:	
	Subdivision name:		Lot number:	
	Ft W of EL: 2800.0	Ft N of SL: 175.0	Ft E of WL:	Ft S of NL:
	Ground elevation: 715.0	Depth to bedrock: 113.0	Bedrock elevation: 602.0	Aquifer elevation:
	UTM Easting: 552272.6		UTM Northing: 4393316.0	
Well Log	Top	Bottom	Formation	
	0.0	3.0	CLAY BR	
	3.0	10.0	SANDY BR CLAY	
	10.0	13.0	CRS SAND & YEL GRAV	
	13.0	24.0	GREY HARD CLAY	
	24.0	38.0	GREY CRS	
	38.0	41.0	FINE S&G GREY	
	41.0	52.0	CRS GRAV MD SAND	
	52.0	67.0	CLAY GREY GRITTY	
	67.0	76.0	MD S&G GREY	
	76.0	87.0	CRS S&G GREY	
	87.0	96.0	MD S&G GREY	
	96.0	102.0	FINE SAND GREY AND BLK	

102.0

113.0

MD S&G GREY

113.0

BLUE SH

CommentsWell 3

Record of Water Well

Indiana Department of Natural Resources

Well 4 Anderson Plant 16" Packer installed in 2021

Reference Number
22908

Driving directions to well

GO W OUT OF INDPLS ON 40 TO PLAINFIELD TO HWY OLD 267 S .2 MI
ON LF

Date completed @ top of
May 27, 1992 screen

Owner-
Contractor

Name

Address

Telephone

Owner

TOWN OF PLAINFIELD WATER
WORKS

206-W MAIN ST PLAINFIELD
IN

Driller

REYNOLDS INC

HWY 37 S P O BOX 186
ORLEANS IN

(812) 865-
3232

Operator

LESLIE G WILLIAMS

License: 547

Construction Details

Well

Use: Public Supply

Drilling method: Reverse Rotary

Pump type:

Depth: 107.0

Pump setting depth: 80.0

Water quality: CLEAR

Casing

Length: 82.0

Material:

Diameter: 18.0

Screen

Length: 25.0

Material: SS

Diameter: 18.0 Slot size: 60

Well Capacity Test

Type of test:

Test rate: 3000.0 gpm for 24.0 hrs. Bail Test rate: gpm for hrs.

Drawdown: ft.

Static water level: 44.95 ft.

Bailer Drawdown ft.

Grouting Information

Material:

Depth: from 0.0 to 25.0

Installation Method:

Number of bags used: 2.5

Well Abandonment

Sealing material:

Depth: from to

Installation Method:

Number of bags used:

Administrative

County: HENDRICKS

Township: 15N Range: 1E

Section: SE of the SE of the SW of Section 35

Topo map:

PLAINFIELD

Grant Number:

Field located by: EL

on: Sep 02, 1993

Courthouse location by:

on:

Location accepted w/o verification by:

on:

Subdivision name:

Lot number:

Ft W of EL:

Ft N of SL: 250.0

Ft E of WL: 2250.0

Ft S of NL:

Ground elevation: 716.0

Depth to bedrock: 107.0

Bedrock elevation:
609.0

Aquifer elevation:
609.0

UTM Easting: 552167.8

UTM Northing: 4393337.0

Well Log

Top

Bottom

Formation

0.0

5.0

CLAY

5.0

25.0

CLAY SAND GRAVEL

25.0

40.0

SAND GRAVEL

40.0

45.0

SAND GRAVEL CLAY

45.0

55.0

SAND GRAVEL

55.0

70.0

SAND GRAVEL CLAY

70.0

107.0

SAND GRAVEL BIG ROCK

107.0

107.6

BEDROCK CLAY

Comments

SKETCH MAP, MC609, WELL VERIFIED BY WATERWORKS EMPLOYEE, LOCATION S OF

Well 4

SWINFORD PARK & HIGH SCHOOL, WATER SUPT MARK STANSBURY 317-839-3490 OR 317-839-3566

Record of Water Well

Indiana Department of Natural Resources

Bore hole well 7 Anderson, Plant

Reference Number
406638

Driving directions to well

INTERSECTION OF STANLEY RD & CENTER RD

Date completed

Sep 13, 2005

Owner-
Contractor

Name

Address

Telephone

Owner

TOWN OF
PLAINFIELDANDERSON WELL FIELD TW-01-05-NW
PLAINFIELD, IN

Driller

DEAN WELL
DRILLING, INC1440 WEST HANNA AVE INDIANAPOLIS, IN (317) 787-
4146

Operator

JOHN AUFDERHEIDE License: 231

Company

PEERLESS MIDWEST

17110 WESTFIELD PARK DR SUITE 3
WESTFIELD, IN

Construction Details

Well

Use: Other

Drilling method: Rotary

Pump type:

Depth: 89.0

Pump setting depth: 0.0

Water quality: CLEAR

Casing

Length: 79.0

Material: PVC

Diameter: 6.0

Screen

Length: 10.0

Material: STAINLESS ST

Diameter: 6.0 Slot size: .050

Well Capacity Test

Type of test: Air

Test rate: 300.0 gpm for 2.0 hrs.

BailTest rate: gpm for hrs.

Drawdown: 55.0 ft.

Static water level: 21.0 ft.

Bailer Drawdown ft.

Grouting Information

Material: BENTONITE

Depth: from 0.0 to 75.0

Installation Method: PUMPING

Number of bags used: 5.0

Well Abandonment

Sealing material:

Depth: from to

Installation Method:

Number of bags used:

Administrative

County: HENDRICKS

Township: 15N Range: 1E

Section: SW of the SE of the SW of Section 35

Topo map:

PLAINFIELD

Grant Number:

Field located by: DRILLER

on: Sep 13, 2005

Courthouse location by:

on:

Location accepted w/o verification by:

on:

Subdivision name:

Lot number:

Ft W of EL:

Ft N of SL: 600.0

Ft E of WL: 18550.0 Ft S of NL:

Ground elevation: 715.0

Depth to bedrock: 90.0

Bedrock elevation:

625.0

Aquifer elevation:

UTM Easting: 552052.0

UTM Northing: 4393441.0

Well Log

Top

Bottom

Formation

0.0

5.0

GUMMY BROWN CLAY

5.0

10.0

MEDIUM-COARSE SAND & GRAVEL

10.0

16.0

SANDY BROWN CLAY

16.0

21.0

GRAVELY BROWN CLAY

21.0

27.0

COARSE ROUNDED SAND & GRAVEL

27.0

43.0

MEDIUM ROUNDED SAND & GRAVEL

43.0

52.0

SANDY BROWN CLAY

52.0

57.0

MEDIUM SAND & GRAVEL

57.0	63.0	SANDY BROWN CLAY
63.0	68.0	GRAVELY BROWN CLAY
68.0	90.0	MEDIUM SAND & GRAVEL
90.0	95.0	GREY SHALE

Comments

Bore hole well 7

Record of Water Well

Indiana Department of Natural Resources

Well 2 - Swinford Plant

Reference Number 275328	Driving directions to well 1110' EAST OF ST RD 267 AND 975' NORTH OF STANLEY RD	Date completed
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Owner-Contractor	Name	Address	Telephone
Owner	CITY OF PLAINFIELD		
Driller	LAYNE NORTHERN COMPANY, INC		
Operator	H.A. SMITH, JR	License: null	

Construction Details

Well	Use: Public Supply	Drilling method: Rotary	Pump type:
	Depth: 106.0	Pump setting depth:	Water quality:
Casing	Length: 75.0	Material:	Diameter: 48.0
Screen	Length: 15.0	Material:	Diameter: 18.0 Slot size: 6

Well Capacity Test	Type of test:	Test rate: 1480.0 gpm for hrs.	BailTest rate: gpm for hrs.
	Drawdown: 31.0 ft.	Static water level: 13.0 ft.	Bailer Drawdown ft.

Grouting Information	Material:	Depth: from to
	Installation Method:	Number of bags used:

Well Abandonment	Sealing material:	Depth: from to
	Installation Method:	Number of bags used:

Administrative	County: HENDRICKS	Township: 15N Range: 1E
	Section: NE of the SE of the SW of Section 35	Topo map: PLAINFIELD
	Grant Number:	
	Field located by:	on:
	Courthouse location by:	on:
	Location accepted w/o verification by:	on:
	Subdivision name:	Lot number:
	Ft W of EL: 2700.0	Ft N of SL: 1000.0
	Ft E of WL:	Ft S of NL:
	Ground elevation: 715.0	Bedrock elevation: 609.0
	Depth to bedrock: 106.0	Aquifer elevation: 609.0
	UTM Easting: 552308.0	UTM Northing: 4393575.0

Well Log

Top	Bottom	Formation
0.0	4.0	TOP SOIL
4.0	7.0	MUDDY SAND & GRAVEL
7.0	9.0	SOFT CLAY
9.0	17.0	HARD GRITTY CLAY & BOULDERS
17.0	31.0	SAND & GRAVEL
31.0	52.0	GRITTY CLAY, SANDY
52.0	57.0	HARD CLAY
57.0	60.0	MD CLAY
60.0	71.0	HARD GRITTY CLAY & BOULDERS
71.0	90.0	SANDY CLAY
90.0	106.0	SAND, GRAVEL & BOULDERS
106.0		SHALE

Comments

LOG CLASSIF 6/22/64; #3 PLAINFIELD WELL; TWO ANCILLARY SHEETS ARE
ASSOC;MC610;WELL COMPL. 5/14/64;COPIED FRM DRILLERS LOG 3/30/95;SEE MAP;

Well 2

Record of Water Well

Indiana Department of Natural Resources

Well 9 Swinford Plant

Reference Number 401950	Driving directions to well CORNER OF STANLEY RD & CENTER ST, 75' S OF STATE PARK & 500' N OF PLANT. HENDRICKS CO, ANDERSON WELL FIELD	Date completed Feb 03, 2006
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Owner-Contractor	Name	Address	Telephone
Owner	TOWN OF PLAINFIELD C/O BUTLER,	8450 WESTFIELD BLVD SUITE 300 INDIANAPOLIS, IN	(317) 713-4615
Driller	PEERLESS-MIDWEST, INC	55860 RUSSELL INDUSTRIAL KWAY MISHAWAKA, IN	(574) 254-9050
Operator	RUSELL BUCK	License: 913	

Construction Details

Well	Use: Public Supply Depth: 90.0	Drilling method: Reverse Rotary Pump setting depth:	Pump type: Water quality:
Casing	Length: 75.0	Material: STEEL	Diameter: 24.0
Screen	Length: 15.0	Material: STAINLESS ST	Diameter: 24.0 Slot size: .120

Well Capacity Test	Type of test: Air Drawdown: 21.79 ft.	Test rate: 2000.0 gpm for 24.0 hrs. Static water level: 18.22 ft.	BailTest rate: gpm for hrs. Bailer Drawdown ft.
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Grouting Information	Material: NEAT CEMENT Installation Method: TREMMIE PIPE	Depth: from 0.0 to 57.0 Number of bags used: 270.0
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Well Abandonment	Sealing material: Installation Method:	Depth: from to Number of bags used:
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Administrative	County: HENDRICKS Section: NW of the SE of the SW of Section 35 Grant Number: Field located by: Courthouse location by: Location accepted w/o verification by: Subdivision name: Ft W of EL: 1850.0 Ground elevation: 716.0 UTM Easting: 552043.0	Township: 15N Range: 1E Topo map: PLAINFIELD on: on: on: Lot number: Ft E of WL: Bedrock elevation: 626.0 UTM Northing: 4393664.0	Ft N of SL: 1300.0 Depth to bedrock: 90.0 Ft S of NL: Aquifer elevation:
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Well Log	Top	Bottom	Formation
	0.0	6.0	BROWN SANDY CLAY
	6.0	9.0	FINE-MED COARSE SAND & GRAVEL
	9.0	10.0	GRAVELLY GRAY CLAY
	10.0	13.0	FINE-MED COARSE SAND & GRAVEL
	13.0	20.0	GRAVELLY GRAY CLAY
	20.0	43.0	FINE-MED-COARSE GRAVEL, FINE-M
	43.0	51.0	GRAVELLY GRAY CLAY
	51.0	56.0	FINE-MED-COARSE SAND & GRAVEL
	56.0	65.0	GRAVELLY GRAY CLAY

65.0	75.0	FINE-MED-COARSE SAND, FINE-MED
75.0	90.0	FINE-MED GRAVEL, SOME MED-COAR
90.0		GRAVELLY BLUE SHALE

Comments

C SEE MAP; ADDITIONAL WELL ON PROPERTY

well 9

Record of Water Well

Indiana Department of Natural Resources

DOL well 2

Reference Number 187592	Driving directions to well	Date completed Jun 02, 1949	
Owner-Contractor Owner Driller Operator	Name INDIANA BOYS SCHOOL LAYNE NORTHERN CO., INC. JAMES NERS	Address License: null	Telephone
Construction Details			
Well	Use: Public Supply Depth: 94.0	Drilling method: Cable Tool Pump setting depth:	Pump type:
Casing	Length: 62.0	Material:	Water quality: Diameter: 16.0
Screen	Length: 20.0	Material:	Diameter: 8.0 Slot size: #5
Well Capacity Test	Type of test: Drawdown: 32.0 ft.	Test rate: 700.0 gpm for hrs. Static water level: 15.0 ft.	BailTest rate: gpm for hrs. Bailer Drawdown ft.
Grouting Information	Material: Installation Method:	Depth: from to Number of bags used:	
Well Abandonment	Sealing material: Installation Method:	Depth: from to Number of bags used:	
Administrative	County: HENDRICKS Section: NW of the NE of the SE of Section 34 Grant Number: Field located by: Courthouse location by: Location accepted w/o verification by: Subdivision name: Ft W of EL: 720.0 Ft N of SL: 2150.0 Ground elevation: 715.0 Depth to bedrock: UTM Easting: 551258.8		
	Township: 15N Range: 1E Topo map: PLAINFIELD on: on: on: Lot number: Ft E of WL: Ft S of NL: Bedrock elevation: Aquifer elevation: 621.0 UTM Northing: 4393908.0		
Well Log	Top	Bottom	Formation
	0.0	3.0	FILL
	3.0	4.0	DIRT
	4.0	8.0	GRAV
	8.0	10.0	CLAY
	10.0	12.0	GRAV
	12.0	55.0	CLAY
	55.0	92.0	MD GRAV
	92.0	94.0	CRS SAND
Comments	1000 FEET EAST OF BOILER ROOM		

Record of Water Well

Indiana Department of Natural Resources

Believed to be DOW well 1

Reference Number 187597	Driving directions to well		Date completed May 18, 1949	
Owner-Contractor	Name	Address	Telephone	
Owner	INDIANA BOYS SCHOOL			
Driller	LAYNE NORTHERN CO., INC.			
Operator	JAMES NESS	License: null		
Construction Details				
Well	Use: Test	Drilling method: Cable Tool	Pump type:	
	Depth: 106.0	Pump setting depth:	Water quality:	
Casing	Length:	Material:	Diameter:	
Screen	Length:	Material:	Diameter: Slot size:	
Well Capacity Test	Type of test:	Test rate: gpm for hrs.	Bail/Test rate: gpm for hrs.	
	Drawdown: ft.	Static water level: 15.0 ft.	Bailer Drawdown: ft.	
Grouting Information	Material:	Depth: from to		
	Installation Method:	Number of bags used:		
Well Abandonment	Sealing material:	Depth: from to		
	Installation Method:	Number of bags used:		
Administrative	County: HENDRICKS		Township: 15N Range: 1E	
	Section: NW of the NE of the SE of Section 34		Topo map: PLAINFIELD	
	Grant Number:			
	Field located by:		on:	
	Courthouse location by:		on:	
	Location accepted w/o verification by:		on:	
	Subdivision name:		Lot number:	
	Ft W of EL: 830.0	Ft N of SL: 2000.0	Ft E of WL:	Ft S of NL:
	Ground elevation: 715.0	Depth to bedrock: 104.0	Bedrock elevation: 611.0	Aquifer elevation:
	UTM Easting: 551227.1		UTM Northing: 4393872.0	
Well Log	Top	Bottom	Formation	
	0.0	4.0	FILL	
	4.0	8.0	GRAVEL	
	8.0	10.0	CLAY	
	10.0	12.0	GRAVEL	
	12.0	55.0	CLAY	
	55.0	65.0	MED. GRAVEL & SAND	
	65.0	92.0	MED. GRAVEL	
	92.0	97.0	SAND - CLOUDY	
	97.0	104.0	CLAY	
	104.0	106.0	SHALE	
Comments				

Record of Water Well

Indiana Department of Natural Resources

Believed to be Well that has never been completed

Reference Number 326318 **Driving directions to well** GO S ON CENTER ST TO CR600S GO W ON CR600S TO CR600E GO S ON CR600E TO CR750S WELL APPROX 500' SE OF JCT OF CR600E & 750S **Date completed** Mar 31, 1999

Owner-Contractor	Name	Address	Telephone
Owner	TOWN OF PLAINFIELD WATER UTIL.	986 S. CENTER ST., PLAINFIELD, IN	(317) 839-3490
Driller	REYNOLDS, INC.	3840 PROSPECT ST., INDPLS., IN	(317) 353-0199
Operator	MIKE BURTON	License: 1540	

Construction Details

Well	Use: Test	Drilling method: Bucket Rig	Pump type: Submersible
	Depth: 100.0	Pump setting depth: 87.0	Water quality: CLEAR
Casing	Length: 73.0	Material: CARBON ST.	Diameter: 16.0
Screen	Length: 30.0	Material: SS	Diameter: 16.0 Slot size: 0.100

Well Capacity Test Type of test: Pumping Test rate: 1568.0 gpm for 24.0 hrs. Bail Test rate: gpm for hrs.
 Drawdown: 35.6 ft. Static water level: 12.3 ft. Bailer Drawdown ft.

Grouting Information Material: CONCRETE Depth: from 40.0 to 0.0
 Installation Method: POUR, TREMIE Number of bags used: 4.0

Well Abandonment Sealing material: Depth: from to
 Installation Method: Number of bags used:

Administrative County: HENDRICKS Township: 14N Range: 1E
 Section: NW of the SW of Section 15 Topo map: PLAINFIELD
 Grant Number:
 Field located by: on:
 Courthouse location by: on:
 Location accepted w/o verification by: on:
 Subdivision name: Lot number:
 Ft W of EL: Ft N of SL: Ft E of WL: Ft S of NL:
 Ground elevation: Depth to bedrock: Bedrock elevation: Aquifer elevation:
 UTM Easting: UTM Northing:

Well Log	Top	Bottom	Formation
	0.0	5.0	SILTY SANDY LOAM
	5.0	15.0	BRN CLAY
	15.0	17.0	S&G
	17.0	31.0	GRAY CLAY
	31.0	48.0	S&G
	48.0	51.0	S&G, TRC GRAY CLAY
	51.0	56.0	GRAV W/COBBLES & SAND
	56.0	100.0	GRAV W/SAND

Comments HC

Record of Water Well

Indiana Department of Natural Resources

Believed to be Liberty Plant well 1 No longer in use

Reference Number	Driving directions to well	Date completed
360237	150' E OF CREEK APPROX 650' S OF US 40E	Nov 20, 1996

Owner-Contractor	Name	Address	Telephone
Owner	LIBERTY WATER CORP	CLAYTON, IN	
Driller	BASTIN LOGAN WATER SERVICES IN	239 W MONROE STREET FRANKLIN, IN	
Operator	DELFORD BUNN	License: null	

Construction Details

Well	Use: Public Supply	Drilling method: Cable Tool	Pump type:
	Depth: 80.0	Pump setting depth:	Water quality:
Casing	Length: 60.0	Material: .375	Diameter: 12.625
Screen	Length: 20.0	Material: WW	Diameter: 13.125 Slot size: .080

Well Capacity Test	Type of test: Pumping	Test rate: 603.0 gpm for 24.0 hrs.	Bail Test rate: gpm for hrs.
	Drawdown: 21.0 ft.	Static water level: ft.	Bailer Drawdown ft.

Grouting Information	Material: BENTONITE	Depth: from to
	Installation Method:	Number of bags used:

Well Abandonment	Sealing material:	Depth: from to
	Installation Method:	Number of bags used:

Administrative	County: HENDRICKS	Township: 14N Range: 1E
	Section: SW of the NE of the NW of Section 5	Topo map: PLAINFIELD
	Grant Number:	
	Field located by:	on:
	Courthouse location by:	on:
	Location accepted w/o verification by:	on:
	Subdivision name:	Lot number:
	Ft W of EL:	Ft N of SL:
	Ground elevation: 736.0	Ft E of WL: 1500.0 Ft S of NL: 700.0
	UTM Easting: 547075.0	Bedrock elevation: Aquifer elevation: 656.0
		UTM Northing: 4392900.0

Well Log	Top	Bottom	Formation
	0.0	3.0	TOP SOIL
	3.0	12.0	CRS GRAVEL
	12.0	37.0	GREY CLAY
	37.0	43.0	GREY CLAY, SOFT
	43.0	51.0	FINE,MD&CRS GRAV W/GREY CLAY
	51.0	61.0	FINE,MD&CRS S&G
	61.0	80.0	FINE, MD & CRS S&G

Comments PROJECT #1757-F; WELL #2;

Record of Water Well

Indiana Department of Natural Resources

Believed to be Liberty Plant well 2 No longer in use

Reference Number 360238	Driving directions to well 200' E OF CREEK. APPROX 250' S OF US40E	Date completed May 25, 1993
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Owner-Contractor	Name	Address	Telephone
Owner	LIBERTY WATER CORP	CLAYTON, IN	
Driller	BASIN LOGAN WATER SERVICES INC	237 W MONROE ST, FRANKLIN, IN	(317) 738-9295
Operator	DELFORD DUNN	License: null	

Construction Details

Well	Use: Public Supply	Drilling method: Cable Tool	Pump type:
	Depth: 86.0	Pump setting depth:	Water quality:
Casing	Length: 66.0	Material: 4956#/FT	Diameter: 12.75
Screen	Length: 20.0	Material: 304 SS/WW	Diameter: 11.25 Slot size: .080

Well Capacity Test	Type of test: Pumping	Test rate: 1007.0 gpm for 24.0 hrs.	BailTest rate: gpm for hrs.
	Drawdown: 40.57 ft.	Static water level: 6.3 ft.	Bailer Drawdown ft.

Grouting Information	Material:	Depth: from to
	Installation Method:	Number of bags used:

Well Abandonment	Sealing material:	Depth: from to
	Installation Method:	Number of bags used:

Administrative	County: HENDRICKS	Township: 14N Range: 1E
	Section: NE of the NE of the NW of Section 5	Topo map: PLAINFIELD
	Grant Number:	
	Field located by:	on:
	Courthouse location by:	on:
	Location accepted w/o verification by:	on:
	Subdivision name:	Lot number:
	Ft W of EL:	Ft N of SL:
	Ground elevation: 732.0	Ft E of WL: 2100.0 Ft S of NL: 600.0
	UTM Easting: 547270.0	Bedrock elevation: Aquifer elevation: 646.0
		UTM Northing: 4392975.0

Well Log	Top	Bottom	Formation
	0.0	1.0	TOP SOIL
	1.0	6.0	SOFT BROWN CLAY
	6.0	27.0	HARD GREY CLAY
	27.0	29.0	MD & CRS GRAVEL
	29.0	40.0	GREY CLAY & SMALL GRAVEL
	40.0	44.0	FINE, MD & CRS S&G
	44.0	51.0	DARK GREY CLAY
	51.0	61.0	FINE, MD & CRS GRAV, SOME SAND
	61.0	71.0	FINE, MD& CRS S&G
	71.0	86.0	FINE, MD & CRS S&G
	86.0		FINE SAND & SILT

APPENDIX C
Well Logs – White River and Tributaries Outwash
Complex Aquifer

Record of Water Well

Indiana Department of Natural Resources

Reference Number	Driving Direction to Well	Date Completed
326318	GO S ON CENTER ST TO CR600S GO W ON CR600S TO CR600E GO S ON CR600E TO CR750S WELL APPROX 500' SE OF JCT OF CR600E & 750S	3/31/1999

Owner-Contractor	Name	Address	Telephone
Owner	TOWN OF PLAINFIELD WATER UTIL.	986 S. CENTER ST., PLAINFIELD, IN	(317)839-3490
Driller	REYNOLDS, INC.	3840 PROSPECT ST., INDPLS., IN	(317)353-0199
Operator	MIKE BURTON	License: 1540	

Construction Details	Use: Test	Drilling Method: Bucket Rig	Pump Type: Submersible
Well	Depth: 100.0	Pump Setting Depth: 87.0	Water Quality: CLEAR
Casing	Length: 73.0	Material: CARBON ST.	Diameter: 16.0
Screen	Length: 30.0	Material: SS	Diameter: 16.0
	Slot Size: 0.100		

Well Capacity Test	Type of Test: Pumping	Test Rate: 1,568.0 gpm for 24.0 hrs.	Bail Test Rate: Not available
	Drawdown: 35.6 ft.	Static Water Level: 12.3 ft.	Bailer Drawdown: Not available

Grouting Information	Material: CONCRETE	Depth: From 40.0 To 0.0	
	Installation Method: POUR, TREMIE	Number of Bags Used: 4.0	

Well Abandonment	Sealing Material: Not available	Depth: From (not available) To (not available)	
	Installation Method: Not available	Number of Bags Used: Not available	

Administrative	County: HENDRICKS Range: 1E Topo Map: PLAINFIELD Field Located By: Not available Courthouse Location By: Not available Location Accepted w/o Verification By: Not available Subdivision Name: Not available Ft W of EL: Not available Ft E of WL: Not available Ground Elevation: Not available Bedrock Elevation: Not available UTM Easting: Not available	Township: 14N Section: NW of the SW of Section 15 Grant: Not available Field Located On: Not available Courthouse Location On: Not available Location Accepted w/o Verification On: Not available Lot Number: Not available Ft N of SL: Not available Ft S of NL: Not available Depth of Bedrock: Not available Aquifer Elevation: Not available UTM Northing: Not available
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Well Log

Top	Bottom	Formation
0.0	5.0	SILTY SANDY LOAM
5.0	15.0	BRN CLAY
15.0	17.0	S&G
17.0	31.0	GRAY CLAY
31.0	48.0	S&G
48.0	51.0	S&G, TRC GRAY CLAY
51.0	56.0	GRAV W/COBBLES & SAND
56.0	100.0	GRAV W/SAND

Record of Water Well

Indiana Department of Natural Resources

Reference Number 347023	Driving Direction to Well SEE BACK ; WS #2	Date Completed 4/26/2001	
Owner-Contractor Owner Driller Operator	Name TOWN OF PLAINFIELD WATER UTILI REYNOLDS INC JEFF JONES	Address 986 S CENTER ST PLAINFIELD IN 3840 PROSPECT ST INDPLS IN License: 923	Telephone (317)839-3490 (317)353-0199
Construction Details Well Casing Screen	Use: Home Depth: 112.0 Length: 76.0 Length: 40.0 Slot Size: .050	Drilling Method: Rotary Pump Setting Depth: 85.0 Material: PVC Material: PVC	Pump Type: Submersible Water Quality: CLEAR Diameter: 8.0 Diameter: 8.0
Well Capacity Test	Type of Test: Pumping Drawdown: 30.1 ft.	Test Rate: 596.0 gpm for 4.0 hrs. Static Water Level: 11.6 ft.	Bail Test Rate: Not available Bailer Drawdown: Not available
Grouting Information	Material: BENSELA Installation Method: POUR	Depth: From 25.0 To 0.0 Number of Bags Used: 12.0	
Well Abandonment	Sealing Material: Not available Installation Method: Not available	Depth: From (not available) To (not available) Number of Bags Used: Not available	
Administrative	County: HENDRICKS Range: 1E Topo Map: PLAINFIELD Field Located By: Not available Courthouse Location By: Not available Location Accepted w/o Verification By: Not available Subdivision Name: Not available Ft W of EL: Not available Ft E of WL: Not available Ground Elevation: Not available Bedrock Elevation: Not available UTM Easting: Not available	Township: 14N Section: NW of the SW of Section 15 Grant: Not available Field Located On: Not available Courthouse Location On: Not available Location Accepted w/o Verification On: Not available Lot Number: Not available Ft N of SL: Not available Ft S of NL: Not available Depth of Bedrock: Not available Aquifer Elevation: Not available UTM Northing: Not available	

Well Log

Top	Bottom	Formation
0.0	3.0	TOPSOIL
3.0	6.0	DRY BR SAND
6.0	11.0	BR SILTY CLAY
11.0	20.0	WET BR SAND
20.0	38.0	GRAY CLAY
38.0	46.0	GRAY CLAY W/TRACE GRAVEL
46.0	101.0	MED S W/GRAVEL
101.0	112.0	CRS GRAVEL

APPENDIX – C

National Water Services 2022 Filter Inspections



524 NE Third Street
P.O. Box 230
Paoli, Indiana 47454
Office: 812-723-2108
Fax: 812-723-5140

February 9, 2022

Facility: Plainfield Water
Project: Filter Inspections
Scott Betzner
Water Superintendent

NWS is pleased to provide you with this report on the filter inspections at the Anderson, Swinford, and Southwest plants. DOC was not completed during this round of testing per your request.

Anderson Plant

Both cells of all 4 filters were opened and inspected. Samples were collected from the West cell of each filter and submitted to an outside testing firm for sieve analysis with results attached. It should be noted that due to the size of the hatches installed a crane was needed to be able to reach the east end of the cells and lift the lids for access.

The media in all cells appeared to be clean, smooth, with little iron accumulation at the top or down into the media. Level of media was approximately 18" below the inlet piping in all cells.

No recommendations at this time for any of these filters.

Swinford Plant

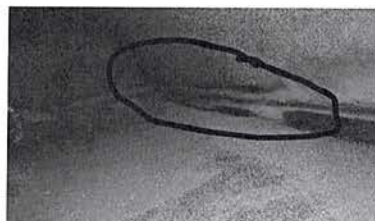
East and West cells opened in all four filters, one sample collected from each filter was sent out for general analysis, results are included. Manways were in reasonable condition, no degradation of the steel on the hatch and most gaskets were replaced.

There was evidence of small mud ball accumulation noted in each filter. Most were only small marble size but I have concerns of them remaining intact during the back wash process and then settling through the lifted anthracite and causing the beds to expand. This possibility is supported by the fact that the beds in filters 2, 3, and 4 appear to be approximately 4-6" higher than they should based on dimensional drawings at the plant.

Filter 1 is of concern due to apparent jetting along the north side of the east cell. The material collected at the site was rinsed and is shown at right. You can note the larger material looks to be from the second layer of sand (not the filter sand directly below the anthracite).



In addition to the larger grains noted there is also evidence of scouring of the sidewall when you note the lack of iron/manganese scale as in this picture looking toward the NW corner of the east cell of filter 1 which is where the larger grains were found.



After receiving the grain size analysis back it also appears that the anthracite media in ALL filters seems to be degraded. The Effective Size is on average 0.49mm and is generally 0.8-1.0mm and the Uniformity Coefficient,

generally in the 1.4-1.7 range is shown at 2.8-3.0. These numbers indicate that media is all smaller than normally accepted and has a great deal of fine material mixed with slightly larger grains.

Recommendations for the Swinford plant would be to plan a rehab on Filter 1 due to possible failure of the underdrain with the possibility for repairs. Then additional work should be planned for a media replacement in the other three filters after you have time to budget for the work.

Southwest Plant

Both cells of both filters were opened and visually inspected. Samples were collected from the east cell of the east filter and the west cell of the west filter, again for size analysis and is included with this report.

Media in all four cells was approximately 24" below the inlet piping – very consistent. Surfaces in all cells appeared to be smooth, not disturbed as with underdrain issues, and generally clean.

We did note a strong odor when the filters were opened but we are uncertain of the source and did not have a good indicator of the reason – it was not noted in any of the other filters at the other plants.

Recommendation at this time would be to do some additional water testing to be certain that the source water does not contain anything abnormal.

Sincerely,

**Phil Bonneau, CPG
National Water Services, LLC**

Attachments: Lab Sieve Analysis for all samples

BOWSER-MORNER, INC.

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117090
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Anderson 3W

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#12	1.70	1.726	100.0
#14	1.40	1.372	99.9
#16	1.18	1.193	97.0
#18	1.00	1.003	75.0
#20	0.850	0.870	38.8
#25	0.710	0.713	14.3
#30	0.600	0.597	7.0
#35	0.500	0.498	6.4
#40	0.425	0.416	6.2
#45	0.355	0.353	6.1
#50	0.300	0.288	5.9
#60	0.250	0.241	5.7
#70	0.212	0.212	5.5
#80	0.180	0.180	5.3
#100	0.150	0.150	5.1
#200	0.075	0.075	2.6
Effective Size, mm:			0.66
Uniformity Coefficient:			1.4

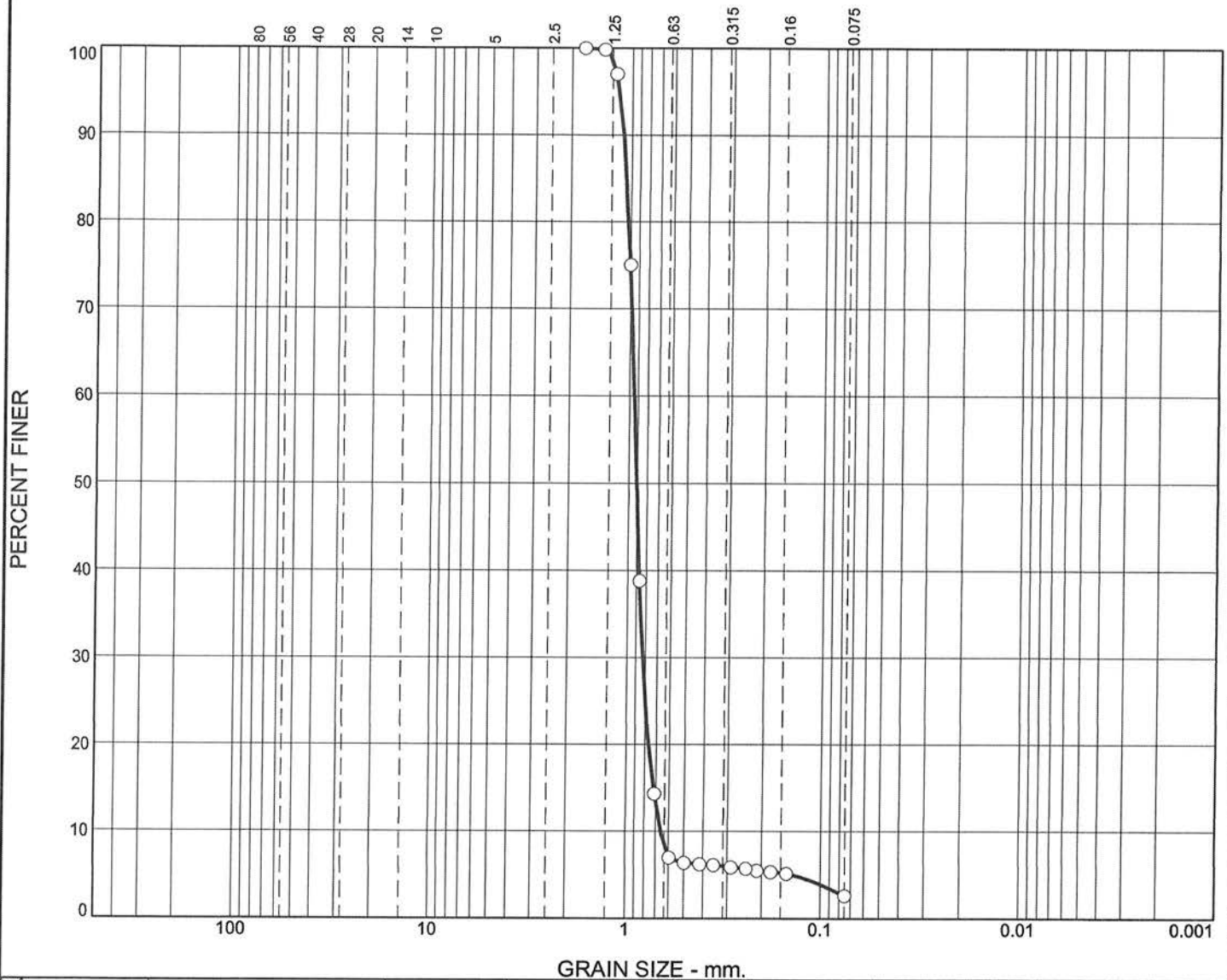
Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

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GRAIN SIZE DISTRIBUTION REPORT



	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
○	1.44		0.6582				0.9449	7.1

Material and Supplier

○ Rainfield Anderson 3W

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

○ **Location:** Date Received: 1/7/22

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

Tested By: RAS

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117091
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Anderson 4W

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#12	1.70	1.726	100.0
#14	1.40	1.372	99.8
#16	1.18	1.193	97.9
#18	1.00	1.003	77.8
#20	0.850	0.870	35.5
#25	0.710	0.713	13.7
#30	0.600	0.597	7.4
#35	0.500	0.498	7.0
#40	0.425	0.416	7.0
#45	0.355	0.353	6.9
#50	0.300	0.288	6.7
#60	0.250	0.241	6.5
#70	0.212	0.212	6.2
#80	0.180	0.180	6.0
#100	0.150	0.150	5.7
#200	0.075	0.075	3.3
Effective Size, mm:			0.65
Uniformity Coefficient:			1.5

Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,

BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

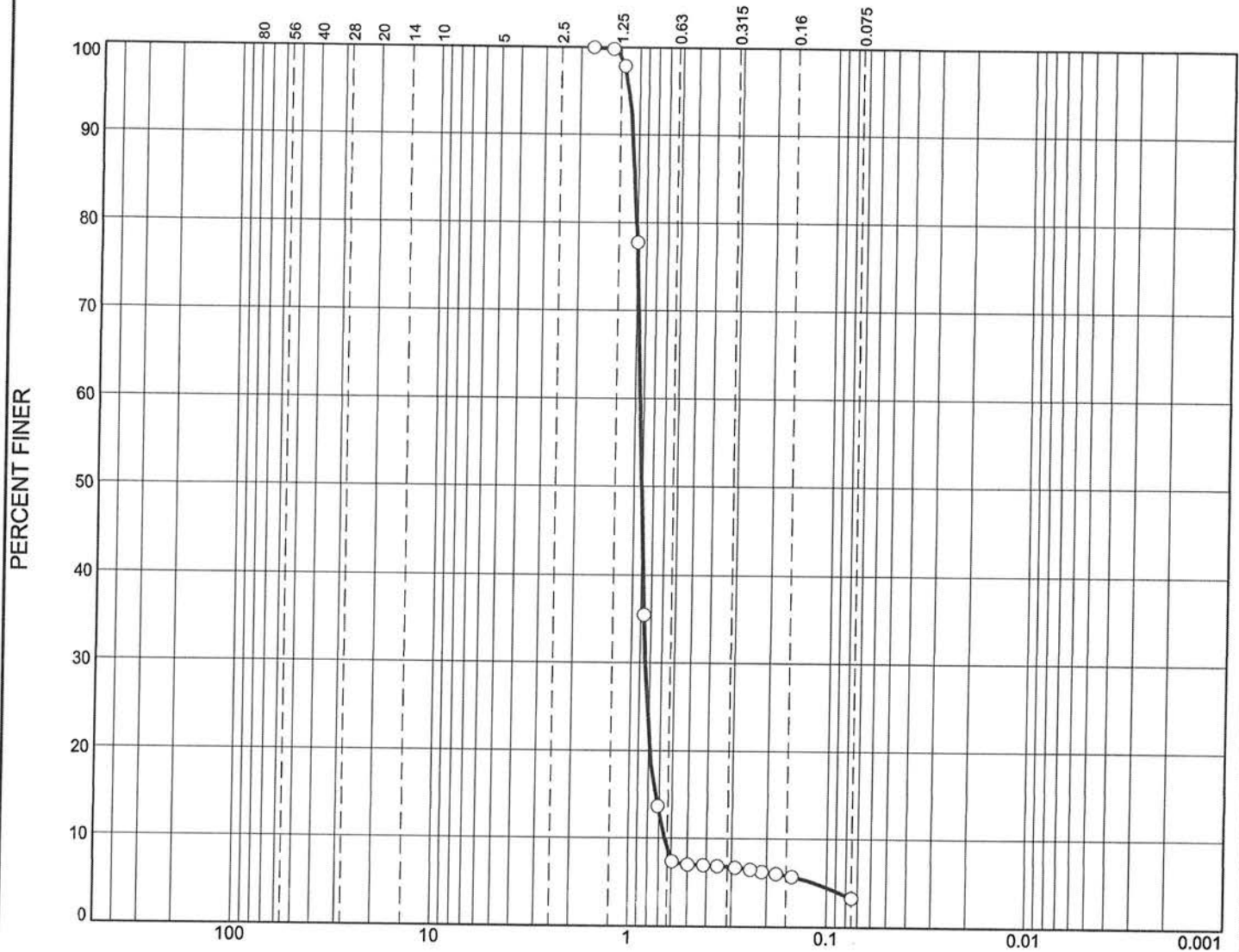
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GRAIN SIZE DISTRIBUTION REPORT



GRAIN SIZE - mm.

☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	1.45		0.6526				0.9440	7.5
☐								
☐								

Material and Supplier

☐ Rainfield Anderson 4W

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117092
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Swinford 1E

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#6	3.35	3.35	100.0
#7	2.80	2.80	99.9
#8	2.36	2.36	98.8
#10	2.00	2.008	91.0
#12	1.70	1.726	80.6
#14	1.40	1.372	62.1
#16	1.18	1.193	44.1
#18	1.00	1.003	37.3
#20	0.850	0.870	35.2
#25	0.710	0.713	30.6
#30	0.600	0.597	20.7
#35	0.500	0.498	11.7
#40	0.425	0.416	9.1
#45	0.355	0.353	7.9
#50	0.300	0.288	6.5
#60	0.250	0.241	5.4
#70	0.212	0.212	4.6
#80	0.180	0.180	3.8
#100	0.150	0.150	3.1
#200	0.075	0.075	1.4
Effective Size, mm:			0.46
Uniformity Coefficient:			2.9

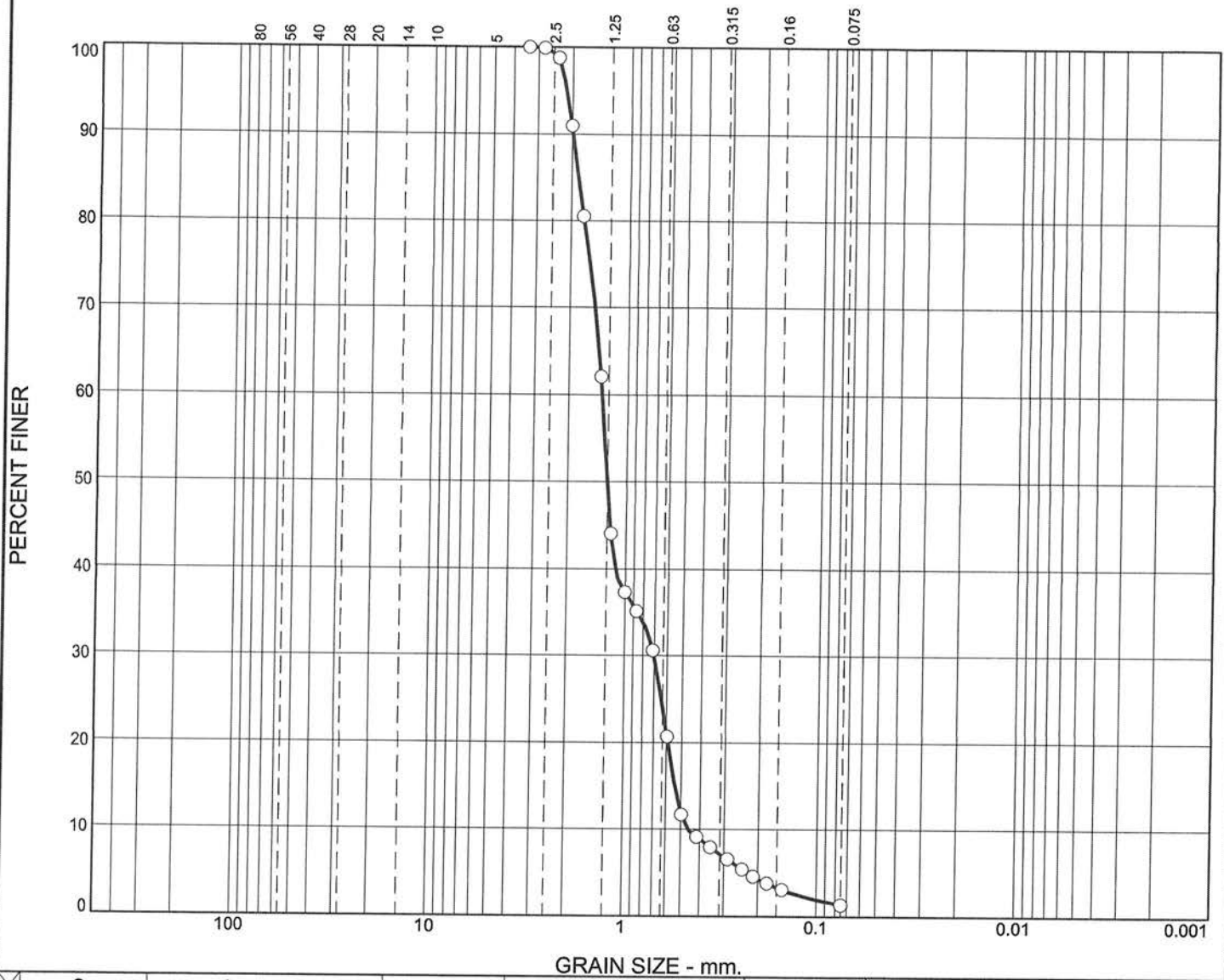
Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

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1-jlynch@national-water.com

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

GRAIN SIZE DISTRIBUTION REPORT

[illegible]

Material and Supplier

○ Rainfield Swinford 1E

Project No. 203874 **Client:** National Water Services, LLC

Project: Filter Media Analysis

○ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

Remarks:

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117093
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Swinford 2E

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#7	2.80	2.80	100.0
#8	2.36	2.36	98.4
#10	2.00	2.008	88.6
#12	1.70	1.726	76.9
#14	1.40	1.372	58.2
#16	1.18	1.193	47.7
#18	1.00	1.003	45.2
#20	0.850	0.870	44.6
#25	0.710	0.713	43.7
#30	0.600	0.597	32.2
#35	0.500	0.498	11.8
#40	0.425	0.416	7.1
#45	0.355	0.353	6.0
#50	0.300	0.288	5.2
#60	0.250	0.241	4.5
#70	0.212	0.212	4.0
#80	0.180	0.180	3.2
#100	0.150	0.150	2.4
#200	0.075	0.075	0.9
Effective Size, mm:			0.48
Uniformity Coefficient:			2.9

Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

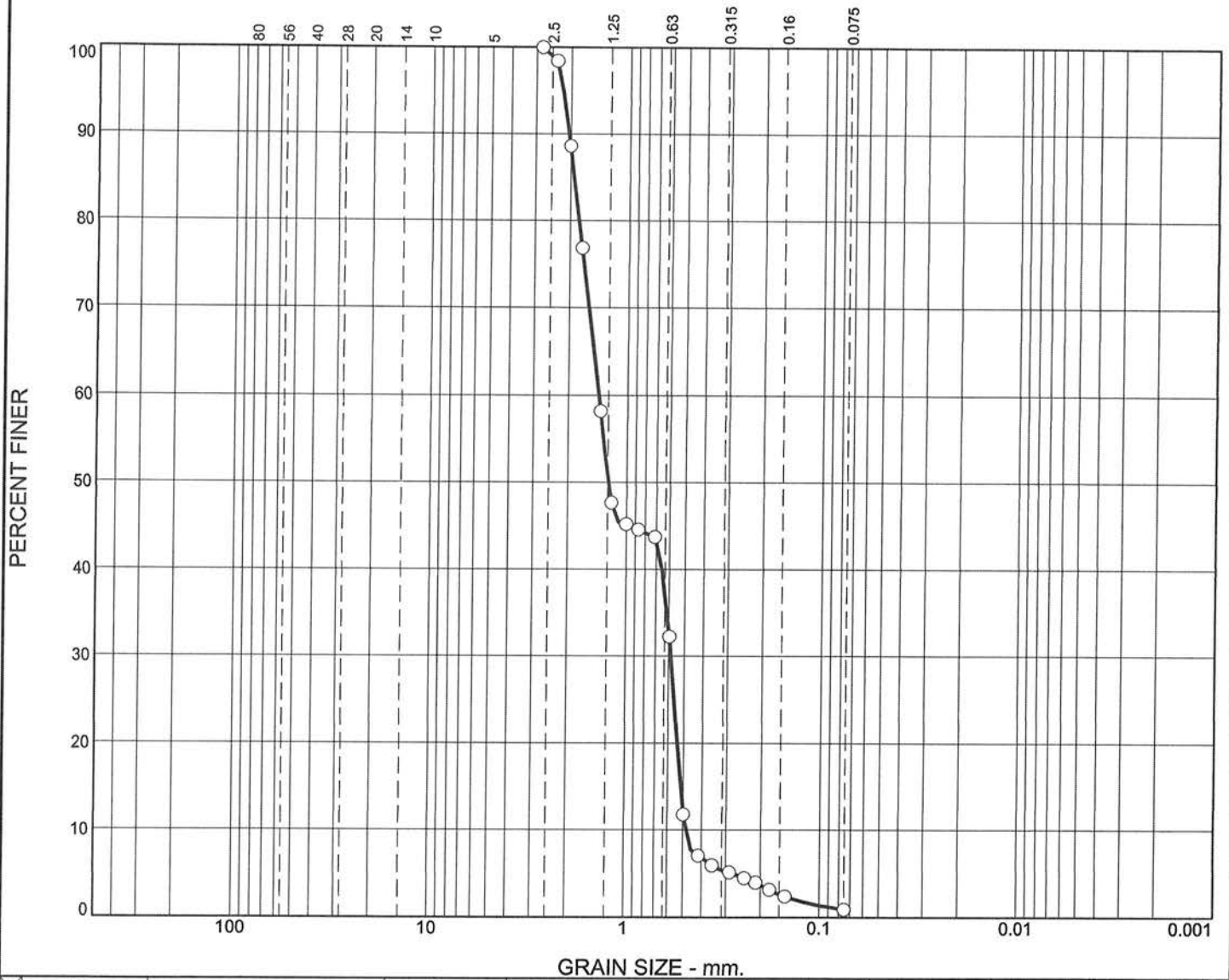
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GRAIN SIZE DISTRIBUTION REPORT



☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	2.89		0.4847				1.4008	32.8
☐								
☐								

Material and Supplier

☐ Rainfield Swinford 2E

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

Remarks:

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117094
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Swinford 3E

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#4	4.75	4.75	100.0
#5	4.00	4.00	99.9
#6	3.35	3.35	99.8
#7	2.80	2.80	99.1
#8	2.36	2.36	97.5
#10	2.00	2.008	94.0
#12	1.70	1.726	85.6
#14	1.40	1.372	61.4
#16	1.18	1.193	47.8
#18	1.00	1.003	44.6
#20	0.850	0.870	43.5
#25	0.710	0.713	40.0
#30	0.600	0.597	24.9
#35	0.500	0.498	10.6
#40	0.425	0.416	7.0
#45	0.355	0.353	5.9
#50	0.300	0.288	5.1
#60	0.250	0.241	4.3
#70	0.212	0.212	3.7
#80	0.180	0.180	2.8
#100	0.150	0.150	2.2
#200	0.075	0.075	0.7
Effective Size, mm:			0.49
Uniformity Coefficient:			2.8

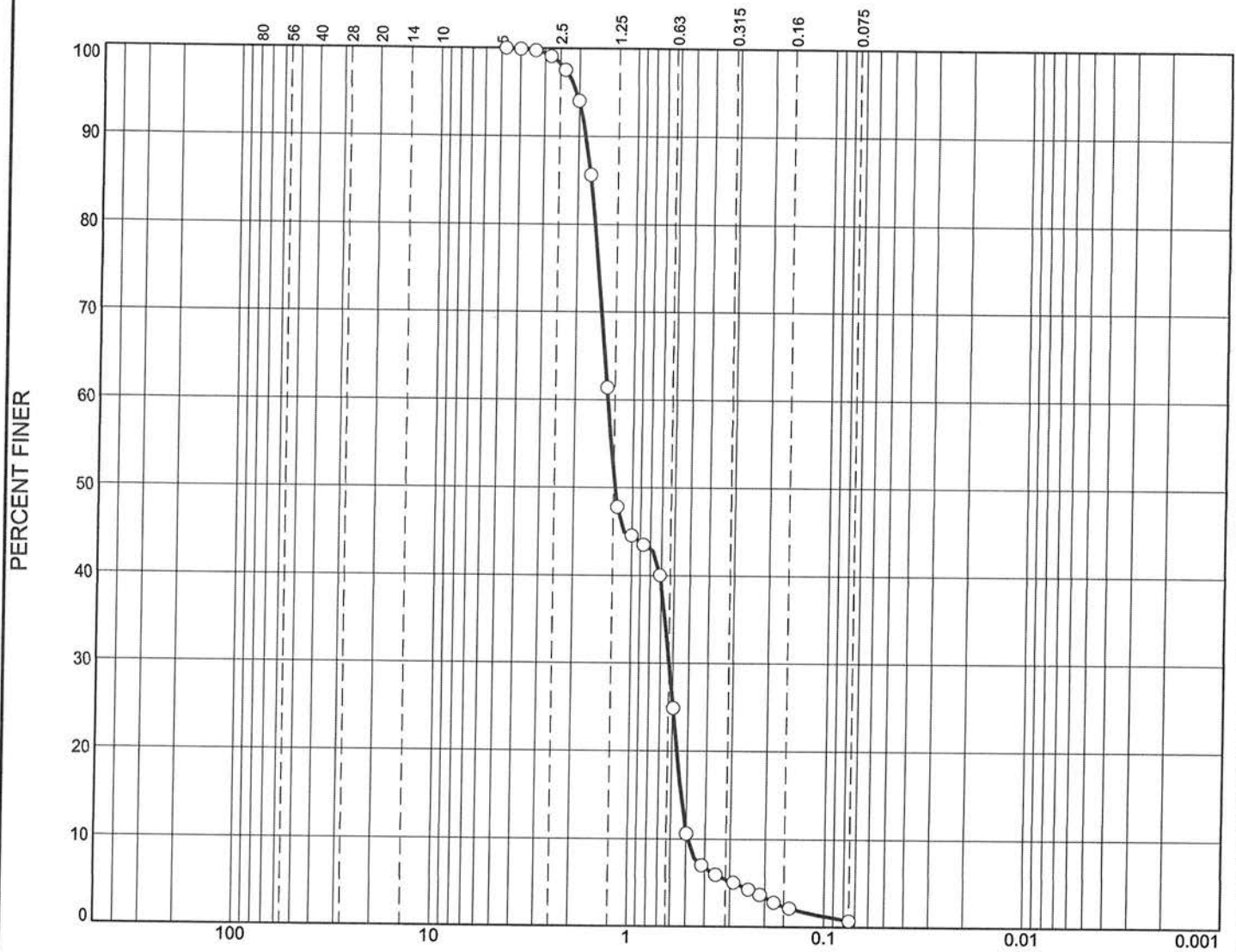
Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

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Respectfully submitted,
BOWSER-MORNER, INC.


Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

GRAIN SIZE DISTRIBUTION REPORT



GRAIN SIZE - mm.								
☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	2.76		0.4912				1.3556	25.4
☐								
☐								

Material and Supplier

☐ Rainfield Swinford 3E

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117095
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

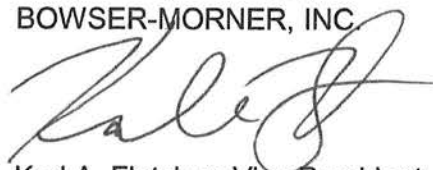
Sample ID: Rainfield Swinford 4E

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#5	4.00	4.00	100.0
#6	3.35	3.35	99.8
#7	2.80	2.80	99.7
#8	2.36	2.36	99.5
#10	2.00	2.008	98.5
#12	1.70	1.726	88.0
#14	1.40	1.372	52.9
#16	1.18	1.193	34.1
#18	1.00	1.003	31.0
#20	0.850	0.870	30.2
#25	0.710	0.713	29.3
#30	0.600	0.597	22.8
#35	0.500	0.498	12.0
#40	0.425	0.416	6.8
#45	0.355	0.353	5.5
#50	0.300	0.288	4.8
#60	0.250	0.241	3.9
#70	0.212	0.212	3.6
#80	0.180	0.180	2.7
#100	0.150	0.150	2.1
#200	0.075	0.075	0.6
Effective Size, mm:			0.48
Uniformity Coefficient:			3.0

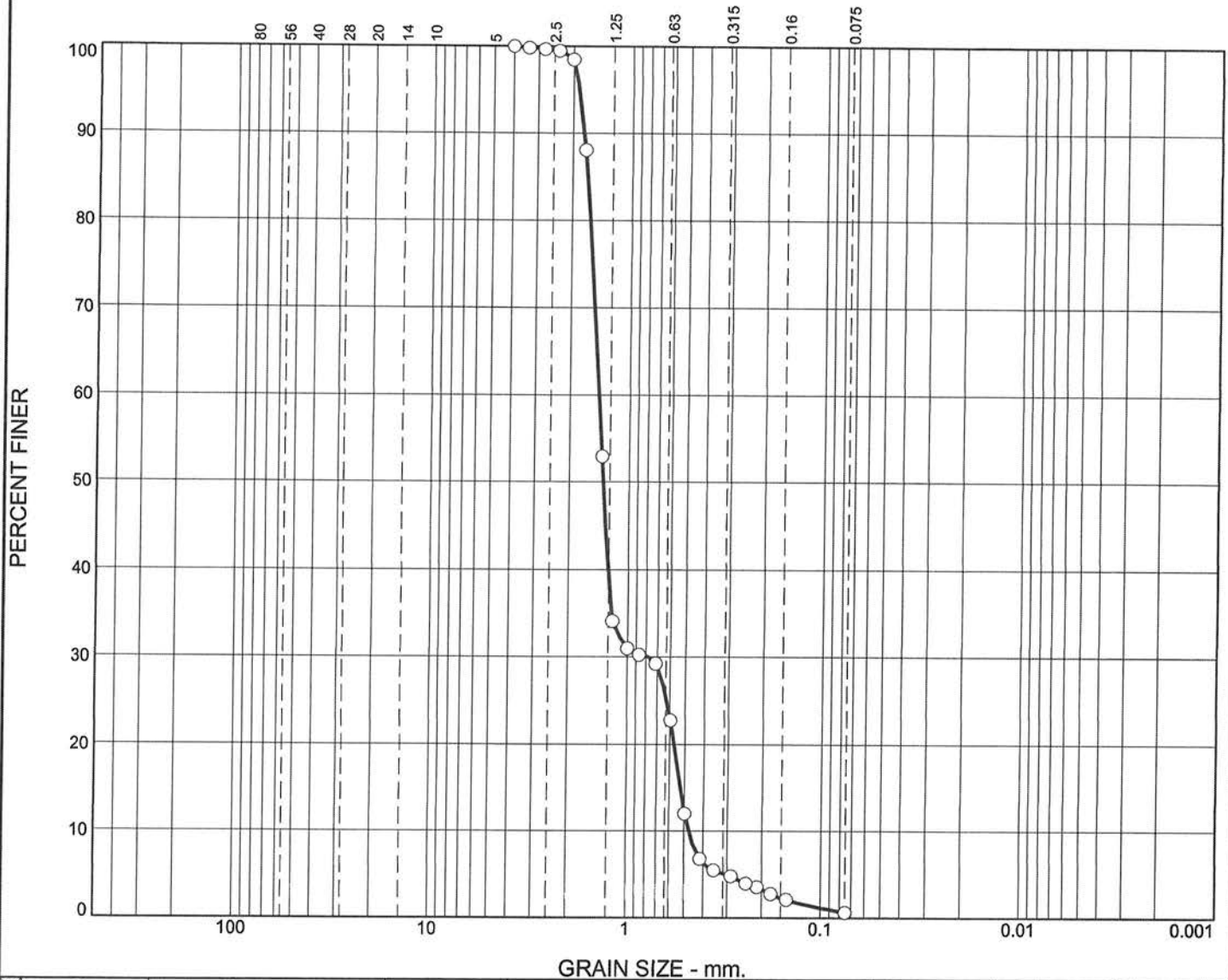
Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

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117095
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1-jlynch@national-water.com

Respectfully submitted,
BOWSER-MORNER, INC.


Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

GRAIN SIZE DISTRIBUTION REPORT



☒	C _u	C _u spec.	D ₁₀	D ₁₀ spec.	C _u	D ₁₀	D ₆₀	% - #30
○	3.01		0.4751				1.4310	23.1

Material and Supplier

○ Rainfield Swinford 4E

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

○ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

Remarks:

Tested By: RAS

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22

Job No.: 203874

Report No.: 117086

No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Southwest E1

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#12	1.70	1.726	100.0
#14	1.40	1.372	99.1
#16	1.18	1.193	97.3
#18	1.00	1.003	88.6
#20	0.850	0.870	54.7
#25	0.710	0.713	20.2
#30	0.600	0.597	3.6
#35	0.500	0.498	2.5
#40	0.425	0.416	2.3
#45	0.355	0.353	2.2
#50	0.300	0.288	2.2
#60	0.250	0.241	2.1
#70	0.212	0.212	2.0
#80	0.180	0.180	1.9
#100	0.150	0.150	1.5
#200	0.075	0.075	0.7
Effective Size, mm:			0.65
Uniformity Coefficient:			1.4

Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

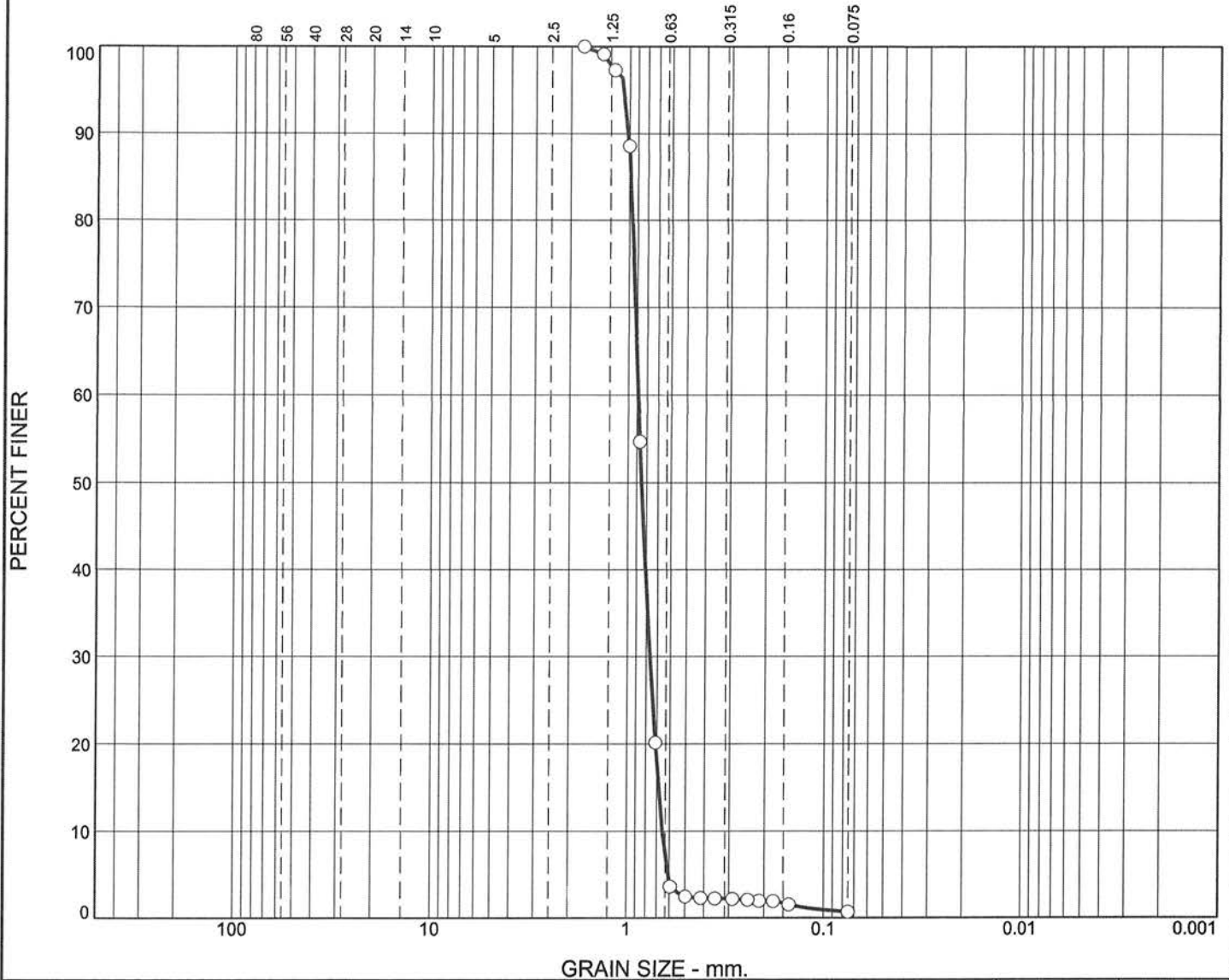
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1-jlynch@national-water.com

GRAIN SIZE DISTRIBUTION REPORT



☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	1.36		0.6521				0.8886	3.8
☐								
☐								

Material and Supplier

☐ Rainfield Southwest E1

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

Remarks:

Tested By: RAS

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117087
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Southwest W1

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#12	1.70	1.726	100.0
#14	1.40	1.372	99.8
#16	1.18	1.193	98.5
#18	1.00	1.003	89.8
#20	0.850	0.870	59.8
#25	0.710	0.713	23.8
#30	0.600	0.597	4.5
#35	0.500	0.498	3.1
#40	0.425	0.416	2.9
#45	0.355	0.353	2.9
#50	0.300	0.288	2.8
#60	0.250	0.241	2.7
#70	0.212	0.212	2.6
#80	0.180	0.180	2.6
#100	0.150	0.150	2.5
#200	0.075	0.075	1.7
Effective Size, mm:			0.64
Uniformity Coefficient:			1.4

Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

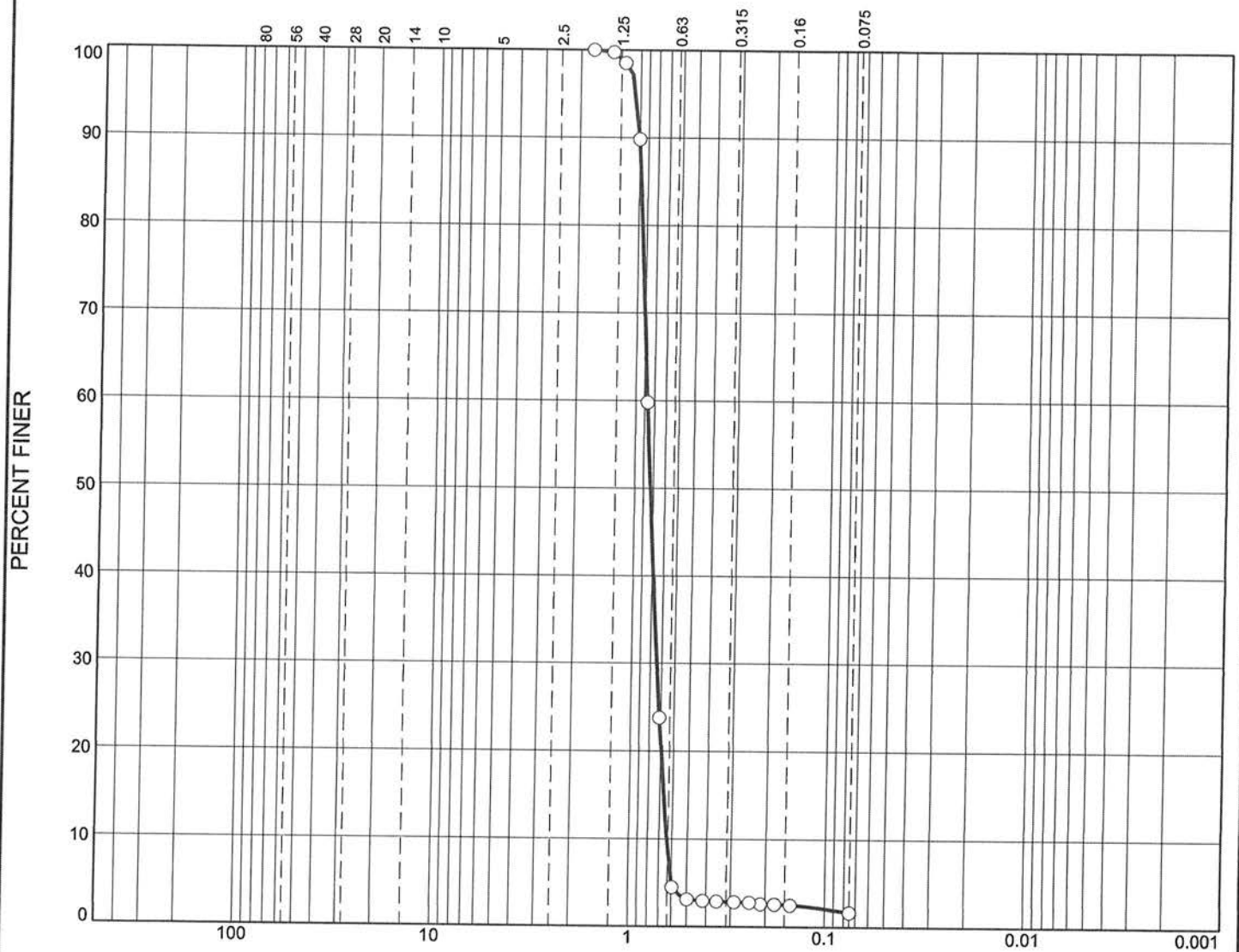
KAF/ras/dmj

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1-jlynch@national-water.com

GRAIN SIZE DISTRIBUTION REPORT



GRAIN SIZE - mm.

☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	1.36		0.6402				0.8708	4.8
☐								
☐								

Material and Supplier

☐ Rainfield Southwest W1

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

Tested By: RAS

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117088
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Anderson 1W

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#10	2.00	2.008	100.0
#12	1.70	1.726	99.9
#14	1.40	1.372	99.4
#16	1.18	1.193	97.6
#18	1.00	1.003	76.8
#20	0.850	0.870	35.9
#25	0.710	0.713	13.6
#30	0.600	0.597	5.2
#35	0.500	0.498	4.4
#40	0.425	0.416	4.2
#45	0.355	0.353	4.1
#50	0.300	0.288	4.0
#60	0.250	0.241	3.9
#70	0.212	0.212	3.8
#80	0.180	0.180	3.6
#100	0.150	0.150	3.4
#200	0.075	0.075	2.3
Effective Size, mm:			0.67
Uniformity Coefficient:			1.4

Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

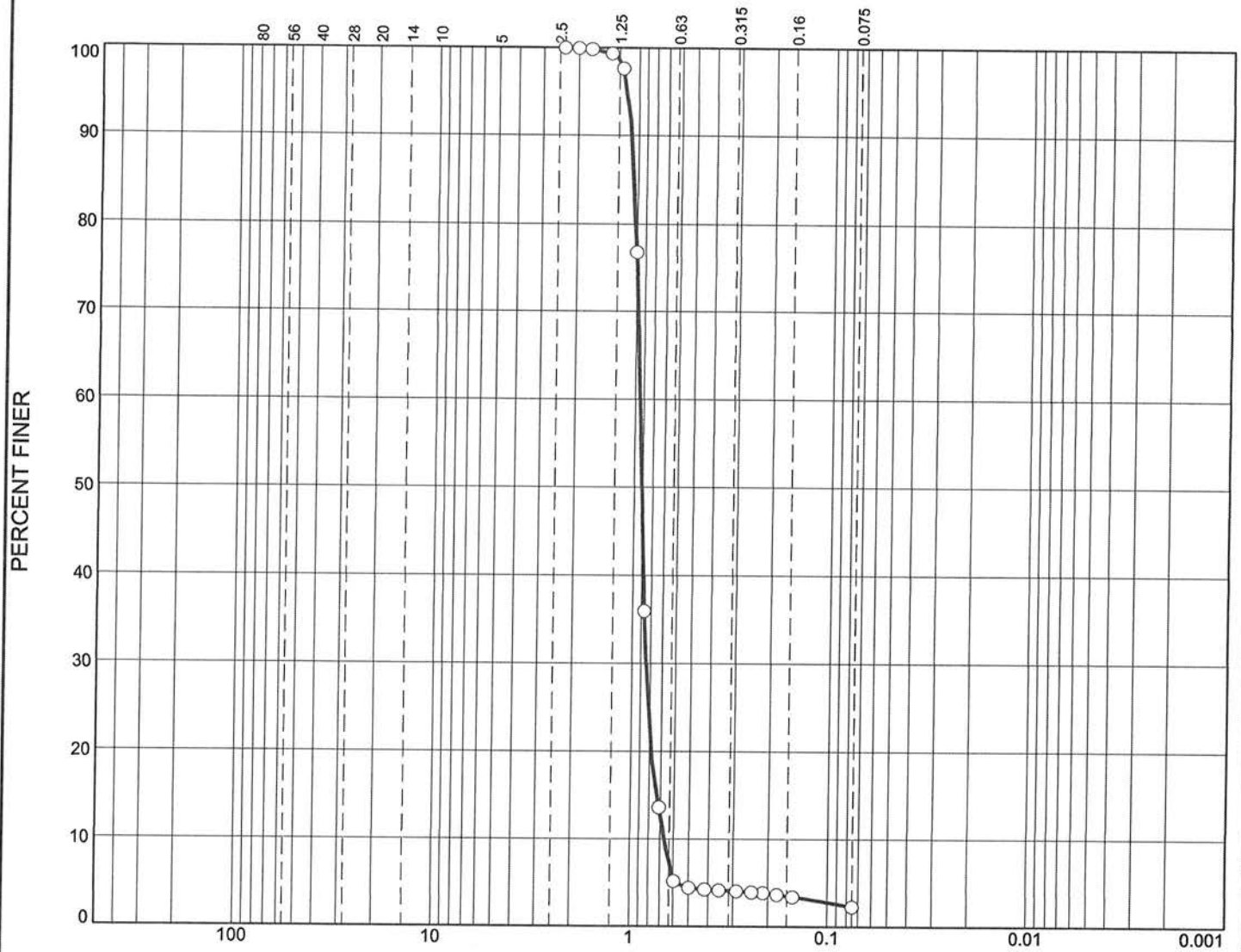
KAF/ras/drj

117088

1-File

1-jlynch@national-water.com

GRAIN SIZE DISTRIBUTION REPORT



GRAIN SIZE - mm.

☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	1.42		0.6678				0.9455	5.3
☐								
☐								

Material and Supplier

☐ Rainfield Anderson 1W

Project No. 203874 **Client:** National Water Services, LLC
Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

BOWSER-MORNER, INC.

Dayton, Ohio

Remarks:

Tested By: RAS

BOWSER-MORNER, INC.

Delivery Address: 4518 Taylorsville Rd • Dayton, Ohio 45424 Mailing Address: P.O. Box 51 • Dayton, Ohio 45401

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LABORATORY REPORT

Report To: National Water Services, LLC
Attn: Jason Lynch
524 North East Third St.
Paoli, IN 47454

Report Date: 02/07/22
Job No.: 203874
Report No.: 117089
No. of Pages: 2

Project/Plant: Filter Media Analysis

Test Method: AWWA B100-16

Sample ID: Rainfield Anderson 2W

USA Std.	Nominal, mm	Effective, mm	Percent Passing
#10	2.00	2.008	100.0
#12	1.70	1.726	99.7
#14	1.40	1.372	97.3
#16	1.18	1.193	92.2
#18	1.00	1.003	71.6
#20	0.850	0.870	32.5
#25	0.710	0.713	12.1
#30	0.600	0.597	6.0
#35	0.500	0.498	5.5
#40	0.425	0.416	5.3
#45	0.355	0.353	5.2
#50	0.300	0.288	5.1
#60	0.250	0.241	4.9
#70	0.212	0.212	4.7
#80	0.180	0.180	4.6
#100	0.150	0.150	4.3
#200	0.075	0.075	2.0
Effective Size, mm:			0.68
Uniformity Coefficient:			1.4

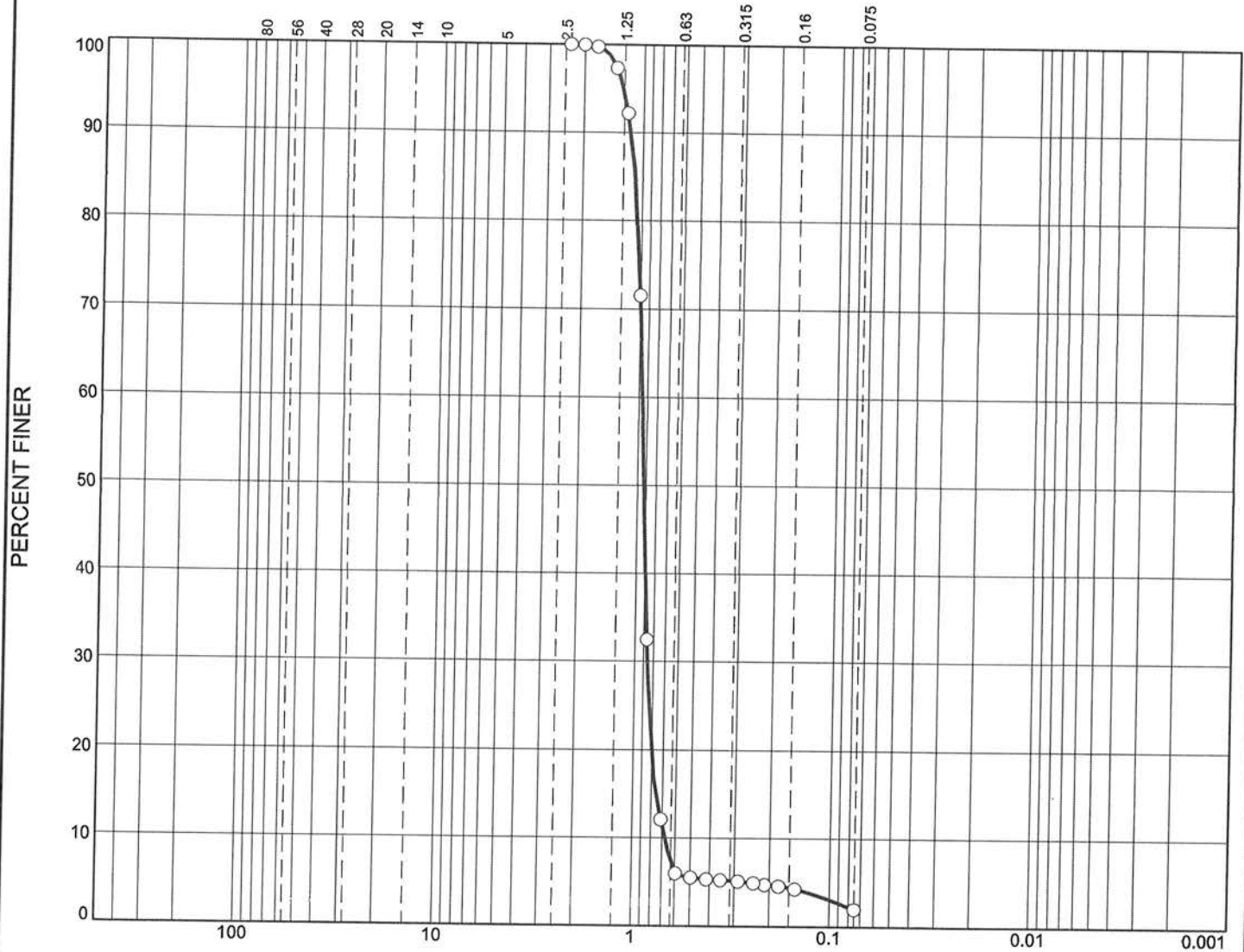
Should you have any questions or if we may be of further service, please contact me at 937-236-8805, extension 322.

KAF/ras/drj
117089
1-File
1-jlynch@national-water.com

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Vice President
Assistant Director, CMT &
Geotechnical Laboratories

GRAIN SIZE DISTRIBUTION REPORT



GRAIN SIZE - mm.								
☒	C_u	C_u spec.	D_{10}	D_{10} spec.	C_u	D_{10}	D_{60}	% - #30
☐	1.42		0.6782				0.9601	6.1
☐								
☐								

Material and Supplier

☐ Rainfield Anderson 2W

Project No. 203874 **Client:** National Water Services, LLC

Project: Filter Media Analysis

☐ **Location:** Date Received: 1/7/22

Remarks:

BOWSER-MORNER, INC.

Dayton, Ohio

Tested By: RAS

APPENDIX – D

Summary of Master Plan Update Water System
Improvements, 2004

**SUMMARY OF MASTER PLAN UPDATE
WATER SYSTEM IMPROVEMENTS
TOWN OF PLAINFIELD, INDIANA**

2004

This report is intended to summarize the updated findings of a study for the Town of Plainfield municipal water system. The information provided herein is intended as a summary of the 2004 update to the previously completed "Preliminary Engineering Report of Water System", January 1985 and "Master Plan For Water Distribution System For Delivery of Municipally Produced Water To Areas Outside Plainfield", April 1987, both prepared by Butler, Fairman & Seufert, Inc. The 2004 update addresses those areas of the water system that varied from the original studies previously noted and provides an opportunity to integrate the variances into a new planning document.

Recommendations for water system improvements are based upon the water system serving approximately 40,000 persons. Preliminary estimates suggest that such may occur near year 2025. At that time, the peak day water demand from retail water customers is estimated to be about 11.2 MGD based upon current usage patterns. Additional information regarding the anticipated future production requirements will be provided in later sections of this report.

EXISTING WATERWORKS SYSTEM

Currently, the waterworks consists of six source water wells, four water treatment facilities, two elevated and one ground storage tank, two pressure booster stations, and several hundred thousand feet of water main ranging in size from 4-inch diameter to 18-inch diameter. Growth of the system since the previous studies has been largely driven by need associated with development of land surrounding Plainfield. Implementation of water system improvements in coordination with development and transportation projects has been successful in terms of meeting customer needs and providing redundancy, especially within the distribution system. Perhaps the most interesting development is the Indianapolis Water Interconnect that occurred in 2002. Previous planning documents for the water system anticipated that Plainfield Water System would possibly purchase water as a result of the interconnect. In the end, it has turned out that the Plainfield Water

System has available water to provide wholesale delivery to Indianapolis Water rather than the opposite as previously anticipated.

Source of Water Supply and Water Treatment

Source water is pumped from two independent aquifers at several locations throughout the community. Sufficient development of source water supplies has occurred such that current well capacities are at least equal to the current maximum water treatment capacities of the specific treatment facilities being served. As the developed wells begin to age, some of the production capabilities may diminish in terms of the mechanical system pumping groundwater to the treatment facilities. The anticipated approach to such limitations is proper well maintenance and potentially abandonment of aging wells in conjunction with developing new wells.

Water treatment is provided at four locations throughout the distribution system. Currently, water treatment plants are located at Anderson Park, Swinford Park, Franklin Park, and immediately south of C.R. 750 S. between County Roads 600 E. and 650 E. (a.k.a. Southwest Water Treatment Facility). The rated capacities of each are 4.0 MGD at Anderson Park, 3.0 MGD at Swinford Park, 0.5 MGD at Franklin Park, and 2.0 MGD at the Southwest Water Treatment Facility. The result is a total rated treatment capacity 9.5 MGD which is sufficiently greater than recent peak day pumping requirements of approximately 5.5 MGD. The Swinford Park and Franklin Park facilities are older than the other facilities. Additional maintenance activities at these facilities will be required to keep each in proper operating condition.

Finished Water Storage

Finished water storage consists of two elevated water storage tanks and one ground storage tank. A 500,000 gallon elevated storage tank is located on the east side of Carr Road immediately south of the old railroad corridor. The 500,000 gallon tank is reported to have been erected in the 1950's and the exterior appears to be in good condition. There is only limited knowledge of the tanks interior condition and as such a detailed tank inspection is recommended.

Similarly, a 1,000,000 gallon elevated storage tank is located immediately east of State Road 267 approximately 1/2 mile north of Stafford Road in conjunction with a fire station.

The 1,000,000 gallon tank was reportedly constructed in 1979 and again the tank exterior appears to be in good condition with a need for a detailed inspection specifically related to the tank interior.

A 750,000 gallon ground storage tank was recently constructed in conjunction with the Southwest Water Treatment Facility. The ground storage tank was constructed on the same site as the water treatment facility and serves to supplement the peak day demands thus maintaining the elevated storage tanks at higher levels and providing improvements to the system in terms of pressure stability.

Water Distribution System

The distribution system has been in operation for many years and is constantly being upgraded and improved. As previously noted, water mains range in size from 4-inch diameter to 18-inch diameter. Expansion of the distribution system in recent years has largely been in conjunction with transportation and development projects to promote the timeliness and efficiency of such efforts. Looping of large diameter water mains to allow multiple flow paths, transmission of large volumes of water over long distances, and facilitate maintenance activities is needed in some areas. Distribution system improvements to provide increased pressure stability are also needed in some areas of the system. Currently, two water booster stations are in operation to assist with pressure stability concerns and provide for wholesale delivery of finished water at the Indianapolis Water Interconnect.

FUTURE WATER SYSTEM IMPROVEMENTS

Plans for growth of the water system are based upon the anticipated needs of the water system to serve 40,000 persons along with required considerations associated with terrain of the developed land area that would be encompassed by growth of the system. The actual timing for such development to occur is subject to a number of variables and consequently somewhat difficult to predict. For the purposes of the study, it is considered that development and expansion of the system to serve 40,000 persons will occur in about 20 years or near 2025.

The possibility of additional interconnection with the Indiana Boys School water system and the Liberty Water System appears to be reasonable. The numerous factors

associated with making such decisions on both sides need to be evaluated prior to proceeding with these efforts. In addition, portions of the planning area are already being provided water service from other suppliers. Due to territorial agreements, these areas are not being considered for water service as part of the water study.

Source of Water Supply and Water Treatment

Based upon projection of the current water demands and populations to the end of the planning period, it is estimated that source and treatment capacities will need to be approximately 12.2 MGD in order to meet the anticipated demand and allow for replenishment of lost storage that would result in the event of a major fire on a peak demand day during the hot summer months. In addition, wholesale supply of as much as 2.5 MGD of finished water is a realistic consideration. Therefore, planning for source and treatment needs requires consideration of the ability to produce 14.7 MGD of finished water.

The Anderson Water Treatment Facility and the Southwest Water Treatment Facility were each designed with an expandability element such that the treatment capacity of each plant can be doubled with some minor effort. As such, it is conceivable that the rated treatment capacity of the Plainfield Municipal Waterworks could be expanded from its current 9.5 MGD to 15.5 MGD in reasonably short order. An interesting element is that for long term considerations, the Franklin Park Treatment Facility is not required to meet peak day production requirements. Consideration of the value of the Franklin Park Water Treatment Facility in terms of redundancy of operation is a separate consideration. Review of aquifer performance testing should be completed prior to implementing expansion of the treatment facilities.

Finished Water Storage

Expansion of the finished water storage portion of the distribution system is required to meet the needs of the anticipated development. The intent of additional finished water storage is to provide for anticipated needs associated with growth as well as assist in reducing current problems in the existing system. That is, additional storage will be needed as peak day demands approach the available treatment capacity. Further, it appears possible to implement the additional storage in a way that benefits existing pressure fluctuation problems associated with terrain and demand in developing areas.

Water Distribution System

For the purpose of long range planning and correction of existing system problems, the need for large diameter water mains is the focus of the evaluation. As such, water mains smaller than 12-inch diameter are not considered as part of distribution system evaluation. Numerous 8-inch diameter water mains will be required to realize full development of the planning area. It is recommended that the smaller water mains be considered in reviewing proposed development plans.

Concerns related to the existing system are primarily north of U.S. Route 40 at both the northwest and northeast sections of the planning area, with the northwest section being a current problem. Actual terrain considerations as well as current and future development suggest that storage will be needed in these areas. Implementation of a new booster station similar to the current Carr Road booster station along with the storage and distribution improvements appears to be a reasonable approach.