Village of Westphalia

Drinking Water State Revolving Fund Project Plan

WATER SYSTEM IMPROVEMENTS

DWSRF No. 7617-01

PREPARED FOR:

CLINTON COUNTY, MICHIGAN

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

DATE: APRIL 2021
PROJECT NO.: 848580

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EXECUTIVE SUMMARY

The purpose of the Village of Westphalia (Village) Drinking Water State Revolving Fund (DWSRF) Project Plan is to fulfill the project planning requirements under the State's Safe Drinking Water Act 399 and to provide the basis for ranking of the Village's proposed waterworks improvements under a Project Priority List for a low interest Drinking Water Revolving Fund Loan.

The DWSRF program assists municipalities in financing water utility improvements projects over a 20 or 30-year term at favorable interest rates typically between 1.875 - 2.25%. As such, projects reflect the long-term needs of the community.

The Scope of the Project Plan includes a summary of the existing water quality and reliability issues within the Village's service area, projection of the population served within the next 20 years, identifying principal alternatives to meet the future water needs of the service area, and to evaluate the environmental impacts in both long and short term on a selected alternative.

The Project Plan also presents projected user costs for financing the selected alternative and will summarize the public participation and public comments solicited by the Village on the selected alternative. The availability of the Project Plan for public review will be advertised in the Lansing State Journal, on the Village's website, and at the Village Office 30 days prior to the Public Hearing. A summary of public participation and public comments solicited by the Village regarding the Project Plan and Selected Alternative will be included in Appendix D.

The format of the report follows the project planning guidelines for DWSRF Projects revised in May of 2016, issued by the Michigan Department of Environment, Great Lakes, & Energy (EGLE).

I. PROJECT BACKGROUND

A. Study Area Characteristics

1. Delineation of Study Area

The study and services area includes all of the Village of Westphalia, located in Clinton County, T6N, R4W, Sections 4, 5, 8, & 9. A map of the study area is shown in Figure 1.

Westphalia was founded in 1836 by Roman Catholic settlers from Westphalia, Germany. The Village has close proximity to Lansing, East Lansing, & Grand Rapids, attracting families to the area.

The Village maintains a relatively flat topography within its borders, with a significant portion of the land designated for agricultural and residential purposes. The Kloeckner & and Fuller Creek, a tributary of the Grand River, branches into two sections just north of the Village, with both sides of the creek traveling N/S on either side of the Village. These water features are shown in Figure 1. The general groundwater quality and quantity is good throughout the service area – since Wells 1 and 2 were drilled in 1952, the Village has had minimal issues with delivering water to its customers.

2. Land Use in Study Area

The existing land use in the Village of Westphalia is a mixture of mainly residential & agricultural zoning, with a commercial district in town and a car wash serving as the only industrial user in the Village limits. A zoning map of the Village is currently being updated. Predicted land use in the area is expected to change in some capacity, as a few farmers have sold their land to be developed into neighborhoods. These new neighborhoods will be hooked up to Village water supply, so considerations of their water demands have been taken into account for the coming 20 years.

3. Population Data

The Villages' population increased from 876 to 923 persons from the 2000 to the 2010 census, a 0.54% increase per year, bucking the downward trend of the State during the same time period. Due to this statistic and plans for new development, Table 1 below shows population projections based on data from the Tri County Regional Planning Agency, Census data, and Census Bureau predictions. Moderate, sustainable growth is anticipated for this Village as there is interest in people moving to the Village and interest in developing new housing, as mentioned above regarding farmer's selling their land for housing developments.

Table 1. Population Data

Year	Population	Actual/Estimate	Source	Growth Rate/Year
2000	876	Actual	U.S. Census	-
2010	923	Actual	U.S. Census	0.51%
2019	989	Estimate	2019 Census American Community Survey 5-Year Estimate	0.79%
2045	948	Estimate*	Tri-County Regional Planning Commission	-0.16%
2045	1170	Estimate	Past average growth rates of around 0.65% increase per year	0.65%

**At the time Tri-County estimated this number, they did not have the 2019 estimate from the U.S. Census Bureau. The Commission recognizes this number is lower than anticipated. As such, a 2045 estimate using the historical average growth rate of 0.65% was used to determine 2045 population estimates.*

4. Existing Facilities

i. Source Facilities

The Village sources its water from two wells located off Willow Street and Church Street next to their water tower and Village office. The Village owns Well No 1. and Well No. 2, both of which are in good condition, as well as the structures in which they are housed. Annual inspection and servicing occur by Peerless Midwest to ensure the wells are in good working order. Most recently, Well No. 1 was cleaned and the submersible pump was replaced. Please refer to Table 2 below for key data regarding these Type 1 municipal wells.

Table 2. Well Summary

Well No.	Year Drilled	Diameter	Depth	Capacity	Total Dynamic Head
1	1952	6 Inch	355 Feet	170 GPM	328 Feet
2	1952	10 Inch	411 Feet	249 GPM	225 Feet

The Village of Westphalia has an existing Wellhead Protection Plan in place from 2011.

There is a 30 horsepower gas motor with a manual run driveshaft available at the well houses. As stated in the 2014 Water Reliability Study, installation of a permanent standby generator is recommended but has not been completed yet.

ii. Water Treatment

The Village of Westphalia does not utilize any treatment to their water before distribution into the water mains & services. The Village tests for Lead and Copper on a triennial basis. Lead & Copper levels continue to meet EGLE's requirements.

iii. Storage Facilities

The Village's existing 150,000 gallon water tower is located east of Willow Street behind the Public Works garage and well houses. The tower was constructed in 1987 and has an overflow elevation of 898 feet. The next tank inspection is scheduled for this Spring. Past inspections have yielded results such as routine maintenance.

The base elevation of the tank is 760 feet and is supplied water by the two wells and corresponding pumps which are located 150 feet from the base of the tank. The Village maintains a flat elevation through all areas within its borders; elevations range from 750 feet to 765 feet.

iv. Service Lines; Water Meters

The Village of Westphalia is confident that no lead service lines exist in their system due to the installation of the system in the 50's and 60's. The use of lead service lines was phased out of construction prior to the installation of the Village's water utility.

Westphalia's Preliminary Distribution System Materials Inventory (DSMI) stated that all 425 service lines were not made of Lead or Galvanized previously connected to Lead (GPCL). The Village is working toward identifying all 425 services to determine whether they are made of plastic or copper. These results will be published in their final Distribution System Materials Inventory (DSMI) report by 2025.

The Village's water meters are in good condition. Any defective meters were replaced in 2008.

v. Distribution System

Westphalia's water distribution system is composed of 43,624 linear feet of pipe, ranging from 2 to 12 inches in diameter. The majority of the distribution system is made of 4, 6, and 8-inch asbestos concrete and ductile iron water main. Please refer to the water main inventory below:

Table 3. Existing Water Main Inventory

Water Main Size (Inches)	Length (feet)	Percentage of Total (%)
Less than 2	528	1.2
4	7785	17.8
6	26,329	60.4
8	8,948	20.5
12	34	0.1
Total	43,624	100.0%

vi. Methods of Residual Handling & Disposal

There are no existing residuals handling and disposal requirements for the Village's water supply system.

vii. Design Capacity; Future Demands

Westphalia anticipates modest growth in the coming years due to new residential developments coming to town. These developments correspond to increases in water usage. Table 4 shows Westphalia's water existing and projected water demand, which are reflective of the increases in water demand based on projected population growth in the Village.

Table 4. Existing & Projected Water Demand

Year	Average Day Demand (gallons)	Source
2007	72,000	MDEQ/EGLE Sanitary Survey
2008	70,000	MDEQ/EGLE Sanitary Survey
2009	69,000	MDEQ/EGLE Sanitary Survey
2010	66,000	MDEQ/EGLE Sanitary Survey
2011	65,000	MDEQ/EGLE Sanitary Survey
2012	68,000	MDEQ/EGLE Sanitary Survey
2013	68,000	MDEQ/EGLE Sanitary Survey
2014	63,000	MDEQ/EGLE Sanitary Survey
2015	59,000	MDEQ/EGLE Sanitary Survey
2016	62,000	MDEQ/EGLE Sanitary Survey
2020	69,332	2020 Pumpage Report

There are no expected demand increases from non-residential users such as commercial and industrial developments.

viii. Operations & Maintenance

The Village's year-end pumping report data from 2020 is shown below in Table 5, which shows key data regarding water pumped in the Village.

Table 5. 2020 Year-End Pump Report	
Total Yearly Pumpage (gallons)	25,306,200
Average Daily Pumpage/Usage	69,332
Max. Daily Pumpage (7/3/2020)	144,300
Min. Daily Pumpage (3/17/2020)	36,800
Water Loss (%, compares pumped water vs. billed water)	8.23% water loss

The Village of Westphalia's water system is classified as S-4. As such, the Village employs two operators with S-4 licenses. The Village's two operators adequately handle the day to day operations of the water system. There have been no water main breaks since the last update in the 2014 WRS, with the exception of a main break on Westphalia Street in 2021.

viiii. Climate Resiliency

As the country and world deal with the aftereffects of global warming and climate change, it is important to view potential effects through a water utility lense. At this time, the Village does not anticipate needing to respond to any changes resulting from climate change.

B. Summary of Project Need

1. Compliance with Drinking Water Standards

The service area for the DWSRF Project Plan includes the entire Village limits of Westphalia as shown in Figure 1. The service area was developed in a 2014 Water System Reliability Study completed by Fleis & VandenBrink Engineering, Inc. A copy of the 2014 study is included in Appendix A.

The Village of Westphalia's water supply system currently consists of two wells. These wells are designated as Wells No. 1 and No. 2 and are shown in Figure 3. Wells 1 and 2 are located in the central/northeast portion of the Village near the base of their water tower. The system has a total well capacity of approximately 419 gallons per minute (gpm).

Based on past source supply sampling/monitoring, there has been no known acute or nonacute violations of the Maximum Contaminant Levels (MCL) at any of the Village's Wells. The Village has never been cited with any court or enforcement order such as a Notice of Violation, Consent Agreement, or EGLE or Department order to correct deficiencies for compliance with Michigan's Safe Drinking Water Act. There have never been any waterborne disease outbreaks reported for the Village's municipal Water Supply System.

2. Orders / Enforcement Actions

No existing EGLE orders or enforcement actions exist beyond the recommendations included within the 2017 EGLE Sanitary Survey, which is included in Appendix B.

3. Drinking Water Quality Problems

The Village's primary sources for water supply are Well's No. 1 and 2. No treatment is applied to the water before it enters the distribution system. The Village regularly tests the quality of its wells and water supply network per EGLE requirements. Testing is done monthly for bacteria, yearly for partial chemical, and every three years for metals analysis. The Village of Westphalia continuously meets and/or exceeds all State and Federal drinking water standards.

4. Projected Needs for the Next 20 Years

The 2014 Water Reliability Study (WRS) identified all water system improvements that should be made in the coming 20 years (2014 - 2034). Although funding is not being sought for all of these improvements, it was important to assess all needs and determine the most important improvements to be made. All recommended improvements are stated in the WRS in Appendix A.

A cost-effectiveness analysis on the selected improvements included in this project plan will be discussed further in the project plan report.

II. ANALYSIS OF ALTERNATIVES

Alternatives to accomplish needed improvements to the Village's water system, alternative solutions were developed and evaluated based on their ability to meet the scope of the project while remaining within financial, regulatory, and technical constraints. Project objectives include:

- Ensure reliable water distribution to customers, include adequate water quality, flows, fire flows, and pressures.
- Rehabilitate/repair high priority areas of existing water infrastructure that are beyond their useful life.
- Provide infrastructure capable of providing consistent compliance with regulatory and permit requirements.
- Minimize financial burden to the water system users.
- Minimize environmental impact during construction of the improvements project.

The following alternatives were evaluated:

a. Alternative A – No Action
b. Alternative B – Optimum Performance of Existing Facilities
c. Alternative C – Regional Water Utility
d. Alternative D – System Replacements

The alternatives are described in detail in the following subsections. Each alternative was initially screened based on effectiveness, constructability, reliability, and financial requirements. Feasible alternatives were then subjected to a comprehensive evaluation with attention to detailed economic, technical, environmental, and public concerns.

A. Identification of Potential Alternatives

1. Alternative A - No Action

Under the no action alternative, the Village would continue use of the existing water system in its current condition. The no action alternative assumes continued use of approximately 11,670 feet of 4 and 6 -inch asbestos concrete water main in need of replacement. The system would continue to age, causing increased water loss, increased frequency of watermain and service breaks, and continue the status quo of having inadequate water main diameters to deliver fire flow.

The no action alternative continues to use 4-inch diameter water main in Westphalia's system, which goes against the minimum diameter of 6 inches as recommend by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. Their guidance, typically referred to as "Ten-State Standards" in the industry, states that water main must be 6 inches in diameter at a minimum in order to deliver needed fire flow and customer flow.

Much of the 4 and 6-inch water main in the proposed scope of work is made of asbestos concrete, a material no longer allowed for new construction but still acceptable if already in the ground. This material has a wide useful life range of 50 to 70 years. With much of the water main installed in 1952 (69 years old), this water main is nearly past its recommended useful life. By taking Alternative A – no action, this water main will continue to be in the ground, undersized, the wrong material, and past its useful life.

Based on the analysis presented above, this alternative does not accomplish the objectives of the project and will not be further evaluated as a principal alternative.

2. Alternative B - Optimum Performance of Existing Facilities

This option looks at the feasibility of keeping the existing water main in the ground and optimizing the infrastructure to the best of the Village's ability. However, there is not much to be done to optimize an undersized, old, asbestos concrete pipe that is subject to breaks. Even if minor repairs were done as part of the "optimum performance" plan, this would only create more problems. Repair of sections of asbestos concrete pipe is a special process that is much more time and labor intensive than repair of a ductile iron or PVC pipe. This option of constantly performing minor repairs while keeping asbestos concrete pipe in the ground does not accomplish the objectives and will not be further evaluated as a principal alternative.

3. Alternative C – Regional Water System

Due to the relatively isolated location of the Village of Westphalia from other municipal water systems, any regional consolidation of waterworks facilities does not appear to be a feasible and cost effective alternative for further evaluation. Even if the Village joined another municipality for a regional system, the current issue of undersized and old water mains would not be addressed. This option will not be further evaluated as a principal alternative.

4. Alternative D – System Replacements

Under this alternative, the water main on the following streets would be replaced with 8-inch water main, and the water services would be replaced to the right-of-way:

- Pine Street, Church Street, West Main Street, East Main Street, Maple Street, School Street, Chestnut Street, Heyer Street, Westphalia Street, Willow Street, and Walnut Street

Please refer to Figure 3 for a map showing the existing water system overlayed with the proposed improvements.

These existing pipes are undersized and are past their useful life. Replacing the main in these locations accomplishes the objectives of the project and will be further evaluated as a principal alternative. These areas were identified for replacement in the 2014 Water Reliability Study, which is attached in Appendix A. The replacement water main size of 8-inches was selected in the Water Reliability Study, and the sizing was based on the minimum size needed to meet peak water system demands over the next 20 years.

B. Analysis of Principal Alternatives

Principal alternatives to be explored include variations of implementing Alternative D – System Replacements. Because replacement of water main was selected as the best decision for the Village, an analysis of construction methods and pipe materials were examined as Principal Alternatives.

A big decision for any Village looking to replace water main is what material to choose. The two most common pipe materials used in the mid-Michigan area are Ductile Iron and PVC. Both offer long, useful lives, structural stability under roads, and high C-Factors to cut down on friction loss through the system. Some Villages also use HDPE pipe, although it as not as common. Westphalia has no HDPE in their system currently, so they will not be evaluating its use as a Principal Alternative.

Installation of water main also offers alternatives, such bore and jacking, directional drilling, or using an open trench to lay new pipe. Utilizing bore and jack methods or directional drilling eliminates the need for a 15-foot wide trench to be dug to lay pipe. However, these methods still tend to be more expensive as the equipment used for the drilling is expensive and the process is only utilized on very long stretches of water main with few disturbances. In the case of the Village, using directional drilling or boring would be too risky given all the other utilities in the ground. Breaking sanitary lines, fiber optic, or storm sewers proves to be costly and can disturb residents.

The Principal Alternatives section will evaluate the use of PVC pipe versus Ductile Iron pipe to implement Alternative D – system improvements. The decision between these two materials is very common for communities – the price, durability, and maintenance could be argued either way. The construction method to be utilized will be open trenches, as this is the most cost effective and common method for laying new pipe.

1. Monetary Evaluation

The monetary evaluation includes a present worth analysis. This analysis does not identify the source of funds but examines costs over the 20-year planning period. The present worth is the sum which, if invested now at a given interest rate, would provide exactly the same funds required paying all present and future costs. The total present worth is the sum of the initial capital cost, plus the present worth of OM&R costs, minus the present worth of the salvage value at the end of the 20-year planning period. The discount rate used in computing the present worth cost was established by EGLE at 0.2% for FY2021 SRF Projects.

No salvage value was calculated for water main pipes in this analysis, as they do not have any value left at the end of their useful life. The cost of labor, equipment and materials is not escalated over the 20-year life. The interest charged during construction (capitalized interest) was not included in the cost-effective analysis.

Due to the current similarities in PVC and Ductile Iron water main, a cost comparison of these two materials was not performed. However, a present worth analysis was performed between Alternatives A & D. This shows the financial present worth of not doing the project versus completing the project, as shown below in Table 6:

Table 6. Present Worth Analysis: Alternative A & D		
Item	**Alternative A**	**Alternative D**
2022 Project Cost	$0	$1,701,000
Annual Operations, Maintenance, and Repair (O, M, & R) Costs	$83,500	$83,500
Present Worth of Annual O, M & R Costs at 20 years with 0.5% Discount rate	$1,585,400	$1,585,400
Total Present Worth:	**$1,585,400**	**$3,286,400**
Salvage Value at 20 Years	$0	$0
Present Worth of Salvage Value	$0	$0
Net Present Worth	**$1,585,400**	**$3,286,400**

Construction Delivery Method

Water main construction projects typically utilize a Design-Bid-Build (DBB) project delivery method, and the Village's project is no exception. In the DBB method, an engineer works closely with the Village and prepares the project bidding documents including the construction drawings and specifications.

General contractors submit bids based on the plans and specifications, and the lowest, responsible bidder is awarded the project. The general contractor pricing includes their subcontractors, or trade contractors, to perform specialized work such as asphalt, concrete work, pavement markings, crane work, etc. Typically, the engineering firm that developed the design provides construction observation and construction administration services during the construction phase. In this alternative there are three parties – the Owner, the engineer, and the general contractor.

The following advantages are offered by the DBB method:

- Well understood and accepted.
- Independent oversight of Builder.
- Open to Owner involvement during design.

The following disadvantages are offered by the DBB method:

- Pricing is not known until the design process is complete.
- Contractor selected based on low bid not on value, knowledge, and experience brought to the team.

Although there are disadvantages to this delivery method, Fleis & VandenBrink and the Village are confident this project delivery method is the best fit for the scope of work."

2. Environmental Evaluation

An environmental evaluation of the Principal Alternatives was performed and summarized below. A number of environmental issues were considered when narrowing down the best alternative for the Village of Westphalia.

Climate

Climatological data for the area is based on information from the National Weather Service Forecast Office. 2020 Annual Data obtained from the nearby Grand Rapids airport shows the following climate data for the surrounding area, likely inclusive of Westphalia:

- Mean temperature of 50.1° F
- Average minimum temperature of 41.2°F
- Average maximum temperature of 59.1°F
- Daily average rainfall of 0.1 inches
- 37.7 inches of total snowfall in 2020, with an average depth of 1 inch

These climate conditions, specifically the winter conditions and design frost levels, would have equal design and construction impacts on all the principal alternatives and equally affect the length of construction seasons for all alternatives.

When analyzing PVC versus Ductile Iron pipe, both pipes are placed below the frostline for this area and are rated for Michigan's contrasting temperatures. There are no climatic concerns that would differentiate the two selections.

Air Quality

Air quality impacts due to construction dust and emissions in the area from construction equipment would be temporary and similar for the principal alternatives.

Wetlands

Wetlands were analyzed based on maps from the EGLE Wetlands Map Viewer and the USFWS National Wetlands Inventory website. There are no wetlands near the proposed project, and it is not anticipated that this project will have any long-term impacts on area wetlands. As such, neither of the alternatives would adversely affect wetlands.

Floodplains

The proposed improvements are not located within the FEMA 100-year floodplain. As such, there are minimal concerns for floodplain interference, regardless of the alternative selected.

Special Designation Rivers (Trout, Natural, Wild & Scenic)

The Wild and Scenic Rivers Act, as amended by the Michigan Scenic Rivers Act of 1991, prohibits federal assistance to a project which will have a direct and adverse effect on the values for which a river segment listed in the National Wild and Scenic Rivers System or designated for study on the National Rivers Inventory was established.

Rivers located within the Village of Westphalia are not listed on the National Wild and Scenic Rivers System website, administered by the National Park System, or on the Michigan Natural Rivers System found on the Michigan Department of Natural Resources website. As such, neither alternative will adversely impact river segments from this system.

Major Surface Waters

As mentioned in the Project Background, the only waters within the Village are the Kloeckner & Fuller Creek and the Thorne & Wieber Drain. Both of these features are tributaries of the Grand River. Because these two creeks run through the Village and are near the proposed sites of improvements, special care will be taken to ensure no construction activities impact the water bodies. Proper soil erosion and sedimentation control (SESC) measures will be in place, especially since a Clinton County SESC permit will be required for this project. Although the risk of impacting these water bodies is not zero, the impacts will be significantly lessened by following the SESC permit and proper construction activities. There are no differing impacts between the two principal alternatives when analyzing major surface waters.

Agricultural Resources

The Village of Westphalia boasts many farms in its borders, with these plots of land being highly productive. However, because the proposed improvements are set to be built in existing road rights-of-ways, there are

no anticipated impacts to prime agricultural farmland. Proper sedimentation and erosion control measures will be in place to prevent sediment from ever reaching these farms. Adequate detours will also be in place to ensure farmers can travel to and from their land when need be.

The matrix below shows the impacts of both alternative 4a and 4b for each of the environmental features.

Table 7. Environmental Evaluation for Principal Alternative

Environmental Feature	Alternative 4a (PVC)	Alternative 4b (Ductile Iron)
Air Quality	T	T
Wetlands	NSI	NSI
Floodplains	NSI	NSI
Special Designation Rivers	N/A	N/A
Major Surface Waters	NSI	NSI
Agricultural Resources	NSI	NSI

Explanation of Abbreviations:

NSI: No Significant Impact
L: Low, But Measurable Impact
SI: Significant Impact
T: Temporary Impact
B: Beneficial
NA: Not Applicable

3. Mitigation

As shown in Table 6 above, there are minimal impacts to the environment, regardless of which alternative is selected. One of the most important mitigation techniques to protect surrounding water bodies, agricultural resources, wetlands, and floodplains will be the SESC permit. By working with the Clinton County Drain Commissioner, an SESC permit will be obtained for this project and the resident project representative (RPR) will be responsible for inspecting the control measures throughout the project. Clear communication to the contractor will be imperative to make sure measures are corrected if need be.

No mitigation costs are to be included in the cost effectiveness comparison, since an SESC permit fee must be paid regardless.

4. Implementability & Public Participation

The Project Plan will be made available to the Public during the public comment period from May 7 to June 7, 2021. At that time, the public will be able to comment on principal alternatives and affects that the construction of the project will have on them and the community. This input from residents is valuable in the planning process.

The implementability of the project depends on many factors, including the added financial burden to the Village, availability of space in the right-of-way to lay new pipe, and new operation and maintenance challenges.

Financial impacts will be further discussed in the Selected Alternative section below. Construction concerns related to having adequate space to lay pipe will be a challenge but not impossible to meet. The Village's two licensed water operators are fully equipped to operate and maintain these new improvements. In fact, the project will help decrease annual O&M activities given new, reliable infrastructure will be in the ground.

5. Technical Considerations

Design of water main adheres to the "Recommended Standards for Waterworks" as published by the Great Lakes & Upper Mississippi Board of State Sanitary Engineers. The two alternatives were analyzed against these guidelines and both pipe options meet all standards recommended by the board.

6. Residuals

This section is not applicable to the Village of Westphalia, as only distribution improvements are being pursued.

7. Contamination

There are no known areas of contamination in the Village. Examples of contamination could be old underground storage tanks; however, Village staff have no knowledge of any risks at this time.

Once the design phase of the project begins, Fleis & VandenBrink will perform an environmental assessment of the study area. This assessment will use existing data from EGLE regarding past recorded contamination. Should any contamination be found, special care when installing PVC would have to be considered, should that be the selected material choice. Contaminated soils can corrode PVC pipe. Special fabric wrap and gaskets must be used. Additionally, extra costs for testing and hauling away material could factor into the project cost as well. These reasons make it attractive to consider Ductile Iron as the material choice just in case contaminated soils are discovered during the design phase.

8. New/Increased Water Withdrawals

This section is not applicable to the Village of Westphalia, as only distribution improvements are being pursued.

III. SELECTED ALTERNATIVE

The Principal Alternatives analyzed above looked at utilizing PVC or Ductile Iron water main for the proposed improvements. The Village of Westphalia has decided to go with Ductile Iron pipe. This alternative was chosen for the following reasons:

- Better suited against any possible contaminants in soil (PVC has a possibility of corrosion)
- The Village has already been upgrading their system to Ductile Iron, so keeping the system as one material is advantageous
    - Allows for the same parts to be kept on the shelf, familiarity with maintenance, etc.
- The price difference between the two is negligible due to shortages of PVC manufacturing

A. Design Parameters

The proposed water main and associated appurtenances will be designed according to "Ten State Standards" and EGLE-recommended practices. Ten State Standards suggest that water mains should be at least 6 inches in diameter, but the vast majority of municipalities install 8-inch water main. This size is appropriate for Westphalia given their water tower capacity, population served, and pressures needed to fight fires. Per the 2014 WRS in Appendix A, there were still areas of the Village not meeting residential fire flow – upgrading to a larger size pipe will increase fire flow capacity. Furthermore, by upsizing pipe to 8 inches and installing brand new pipe, the C-factor will be increased, thereby reducing head loss from old, non-smooth pipes. By selecting Ductile Iron as the pipe material, the Village is doing away with

Asbestos Concrete pipe. Although this pipe is allowed to stay in the ground, it is not permitted as a new pipe material due to safety concerns related to asbestos.

B. Maps

A map of the proposed improvements is shown in Figure 3. This map details the existing water system, including pipes, valves, hydrants, pumps, and water tower. Overlayed on this map are the proposed water main improvements for the Village. Each water main segment includes its proposed length and size. A summary of proposed water main segments are listed below:

Table 8. Proposed Water Main Improvements by Street

Street	Proposed Linear Feet of 8-Inch Water Main
1. Pine St - Westphalia to Willow	500
2. Church St - Feneis to Walnut	500
3. W Main St - Heyer to west end	1980
4. E Main St - Westphalia to Walnut	2450
5. Maple St - Westphalia to west end	990
6. School St - Main to north end	*(Abandon only; no new water main proposed)*
7. Chestnut St - Elm to Pine	590
8. Heyer St - Maple to Oak	960
9. Westphalia St - Main to south end	2750
10. Willow St - Elm to Pine	620
11. Walnut St - Main to Church	330
Total	**11,670**

C. Schedule for Design & Construction

Table presents the proposed project schedule, which follows the DWSRF FY2021 Q3 milestone schedule, assuming that funds will be available in FY2021. Dates are subject to change pending the final DWSRF milestone schedule.

Table 9. Proposed Schedule for Design and Construction

Anticipated Date	Activity
July 2021	Submit Final SRF Project Plan to EGLE
December 2021	Submit Preliminary Plans & Specifications
February 2022	Submit Final Plans & Specifications
March 2022	Bidding
April 2022	MFA Closing
June 2022	Begin Construction
October 2022	Complete Construction
April 2023	Final Reconstruction, Record Drawings

D. Cost Estimate

The costs below are associated with design, construction, administrative, financial, and all other project-related activities.

Table 10. Selected Alternative Cost Summary	
	Alternative 4b
Estimated Construction Costs	$1,344,500
Construction Contingencies (10%)	$134,450
Design & Construction Engineering (10%)	$221,800
Total Project Cost	$1,701,000

E. User Costs

The Village funds their water utility budget through user fees billed to their customers. The following table breaks down the water utility operations & maintenance budget for fiscal year 2020-2021:

Table 11. Water Utility Operations & Maintenance Budget , Projected for 2020-2021 Fiscal Year	
Projected Income	
Charges for Services	$85000
Charges for Services – Hook-Up	$3000
Charges for Services – Hydrant 47@300	$14100
Interest & Dividends	$1000
Miscellaneous Revenue	$1000
Total	**$104,100**
Projected Expenses	
Administrative - Salary	$8000
Administrative - Supplies	$1500
Administrative - Audit	-
Administrative Assessment	$12000
Contributions to Other Funds	$5000
Well Head Protection Grant	$500
Maintenance - Wages	$15000
Maintenance - Supplies	$8000
Maintenance - Contractual Services	$15000
Maintenance - Utilities	$8000
Maintenance - Rental	$3500
Maintenance - Miscellaneous	$5000
Customer Service - Supplies	$1000
Customer Service - Miscellaneous	$1000
Total	**$83,500**
Net difference	**+$20,600**

EGLE has provided the following interest rates for the State Revolving Fund projects:

- 20 year loan at 1.875%
- 30 year loan at 2.125%

The estimated annual debt service for Selected Alternative D is $1,701,000 without considering any Principal Forgiveness through the Governor's Clean Water Plan. Using a basic amortization schedule, this translates to a $77,260.00 annual payment, given the Village's interest in a 30 year term loan at an interest rate of 2.125%. This payment will likely lead to rate increases for Westphalia water customers. The following show current water customers and typical bills:

- Westphalia water customers: 425 total
  - 395 residential customers
  - 35 business customers

- Water Billing Rates:
  - $20.50 Ready to Serve (base rate) plus $1.87 per 1,000 gallons
  - Average residential bill (assuming 3,500 gallon monthly usage): $27.04

If the Village were to use their extra $20,600 in funds each year from water revenues to offset the $77,260.00 payment, the additional money needed would be $56,660. Dividing this figure among the 425 customers equates to an increase of $133 annually per customer. However, this simple calculation does not take into account resident equivalent units. The exact increase in a customer's water bill should be determined by a Municipal Financial Advisor to ensure that the utility is properly funded in the coming years. The decision of whether to raise Ready to Serve Fees, Commodity fees, or a combination of both should be carefully examined by a financial professional.

F. Disadvantaged Community

Part 53 of the NREPA, provides for several benefits to municipalities who meet the state's criteria for disadvantaged community status. Those benefits include additional priority points and extended loan terms. EGLE has determined that this project does not qualify for Disadvantaged Community Status.

E. Ability to Implement Selected Alternative

The ability for the Village of Westphalia to implement the selected alternative depends on the success of the Village's application to the EGLE to fund the project. As discussed previously, the Village will be able to make principal and interest payments on the loan through the increased billing rates to customers. Because the Village does not currently have any water debt, they are better equipped to handle this upcoming debt payment. The Village intends to utilize consultants to assist with project coordination, construction management and bidding.

IV. Evaluation of Environmental Impacts

The potential environmental impacts of the Selected Alternative are evaluated in this section of the project plan. The analyses may show direct, indirect, beneficial, and/or detrimental impacts because of certain project activities.

A. Water Quality

The Village of Westphalia has the Kloeckner and Fuller Creek running through its southwest area and the Thorne & Wieber Drain running through the northeast quadrant of the Village. It is possible that construction activities could result in sediment, debris, etc. to enter these water bodies.

It is not anticipated that the project plan will have any effect on groundwater quality/quantity, given the proposed water main will be placed around five feet deep, and the water table is significantly lower.

It is anticipated that drinking water quality will increase as a result of this project. By upgrading the pipes, the chance of water main breaks and subsequent contamination will decrease.

B. Land/Water Interface

1. Wetlands

A review of the mapping available from the US Fish and Wildlife and the EGLE wetland inventory map indicated that the project does not impact any state or federally identified wetlands.

2. Floodplains

The flood insurance rate map for the Village indicates that 100-year floodplain boundary is near a section of water main set to be replaced. The 100-year floodplain from the Kloeckner and Fuller Creek in the southwest area of the Village travels just south of West Main Street, which is set to have new water main installed. The floodplain does not overlap Main Street and is 100 feet south of the roadway. During design, a topographic survey will be required to properly assess this issue and see if any additional permits are necessary.

3. Rivers/Streams

The Wild and Scenic Rivers Act as amended by the Michigan Scenic Rivers Act of 1991, prohibits federal assistance to a project which will have a direct and adverse effect on the values for which a river segment listed in the National Wild and Scenic Rivers System or designated for study on the National Rivers Inventory was established. No river in or near the Village of Westphalia and the project scope is listed on the National Wild and Scenic Rivers System website, administered by the National Park System, or on the Michigan Natural Rivers System found on the Michigan Department of Environmental Quality website. The selected alternative will have no impact on natural, wild, or scenic rivers.

4. Coastal Zones

The Village of Westphalia is not located near any coastal zones; as such, no analysis on impacts of coastal zones was completed.

C. Agricultural Land

The Farmland and Open Space Preservation Act, Part 361 of the Natural Resources and Environmental Protection Act, enables a farm owner to maintain land in an agricultural use and ensures the land is not developed in a non-agricultural use. There are no plans to convert farmland to other uses within this project scope.

D. Social/Economic Impact

There will be no permanent dislocation of people/businesses during and after the construction.

E. Construction/Operational Impact

Areas that will be impacted by construction include the roads in which the water mains of interest are located. Trenches will have to dug at approximately 15 feet wide in order to lay new pipe at 5 feet of depth. Natural and man-made features at the project sites include but are not limited to: roadways, concrete curb & gutter, sidewalks, driveways, culverts/ditches, storm/sanitary sewer, etc. A topographic survey will be completed as part of the design and a full drawing of features will be determined at that time.

No hazardous or contaminated material exposure is anticipated for this project. All work will be done in roadways, where the materials underneath the road are known materials suitable for supporting the road and utilities.

F. Indirect Impacts

Indirect impacts are those caused by the proposed project but removed in time and/or distance. Indirect impacts are often secondary in nature and are generally caused by residential and/or commercial development made possible by the project.

The proposed project for the Village includes replacing water main that currently exists within the same road right-of-way. No new water main is being placed where water main is not currently placed. However, with the replacement of 4 and 6-inch asbestos pipe to 8-inch ductile iron, it may attract developers to the area since the Village has demonstrated their investment in their infrastructure.

However, a new development planned in Westphalia was planned long before talks of water main replacement were even occurring. It would be a stretch to correlate and provide causation that water main replacements helped spur development since plans are already in the works. As stated in the executive summary, Westphalia's proximity to Grand Rapids, Portland, and Lansing makes it an attractive Village for many.

Should new developments occur after this project is complete, adverse air or water quality impacts are not impacted. Developers must adhere to strict designs for utility placement, construction of homes, etc.

There are no adverse aesthetic impacts anticipated. Proper restoration of construction sites is mandatory by the contractor in order to receive final payment. The proposed project will also not result in any changes in anticipated land use since the improvements are happening in established road rights-of-ways.

V. MITIGATION

As part of this Project Plan, discussion of potential environmental impacts and mitigation tools is a necessary step. Both Direct and Indirect impacts are a possibility if care is not taken during the planning, construction, and restoration process. The following environmental features and possible results stemming from the project were discussed in the previous section and must be evaluated for mitigation potential.

"Structural" and "Non-Structural" measures to mitigate adverse impacts were analyzed. The structural measures involve the specific design and construction of the improvements while the non-structural measures involve regulatory, institutional, governmental, or private plans, policies or regulations of the County, Village, and/or State regulatory agencies here possible, care was taken to reduce the impact as much as possible to make it negligible.

1. Water Quality

In the Environmental Evaluation, it was identified that the two water bodies in Westphalia could be at risk of having sediment from construction enter the water body. However, an SESC permit will be obtained through Clinton County. This permit will ensure that during construction, proper erosion and sedimentation control procedures will be followed in order to prevent sediment, debris, and pollution from entering any these creeks/drains.

2. Wetlands

Because this proposed project will not be near any wetlands, no impacts were identified. As such, no mitigation activities were necessary for surrounding wetlands.

3. Floodplains

The FEMA 100-year floodplain is near the proposed water main on Main Street. To mitigate any construction impacts on this area, an SESC permit will be obtained similar to protecting water quality as explained above.

4. Rivers/Streams

Since there are no Scenic Rivers or Streams near this project, no proposed mitigation activities for adverse impacts were necessary.

5. Coastal Zones

There are no coastal zones near the proposed improvements, so no proposed mitigation activities for adverse impacts were necessary.

6. Agricultural Land

Although this project will not directly lead to agricultural land being converted to residential use, this is always a possibility in a community such as Westphalia. The most effective way of mitigating unrestricted growth in any community (such as farmland conversion) is proactive creation of zoning districts and effective enforcement of that zoning. By keeping an updated zoning map and having open discussions with farmers and the community, the Village can ensure everyone is on the same page regarding future growth.

7. Social/Economic Impact

To help minimize disruptions to residents, business owners, and patrons, detours will be utilized to ensure access to all businesses and homes. Contractors are required to plan for homeowners coming and going to/from their residences. Temporary access drives will be utilized to keep the daily activities of all Village residents going to the greatest extent possible. These measures will help mitigate adverse impacts in the social and economic lense.

8. Construction/Operational Impact

Adverse impacts from construction activities explained above can be kept to a minimum if a contractor can carefully plan out their construction schedule. The traffic patterns of the job will be left in part up to the selected contractor for the job. This contractor will have to coordinate with the Village Dept. of Public Works Supervisor to have the traffic plan approved. Large water main jobs are typically done street by street, with contractors only digging a trench when they will be working on that street. This allows for the construction to be staggered in both location and timing during the construction process. Once they are done laying new pipe on a street, they will backfill and compact the area to make it suitable for vehicles to

drive on. If it is a more traveled roadway, such as Main Street, the contractor may even schedule paving for that section to complete that entire street.

With any construction site, dust and loud noises will be part of the everyday scene. Dust control will be mitigated by spraying the construction access roads if it's too dry, and noises will be kept to a realistic minimum. Construction activities will only be allowed during the hours approved by the Township and would be subject to all local noise control ordinances. Construction workers and site visitors may be required to wear earplugs to minimize the effects of long-term noise during the construction operations.

VI. Public Participation

A. Public Meeting

A Public Hearing for the DWSRF Project Plan will be held June 7, 2021 to discuss the need for the project, principal alternatives, environmental impacts, description of the Recommended Alternative, associated cost estimates & subsequent user charges, and schedule of the proposed project. A copy of the public notice, transcript of the Public Hearing, the presentation and Resolution of the Village Council will be included in Appendix D.

B. Formal Public Hearing and/or Recording

A formal public hearing on project alternatives and user costs will be held on Monday, June 7, 2021 at 7:00 pm at the Westphalia Village office.

C. Public Hearing Advertisement

The public hearing will be advertised in the Lansing State Journal. A copy of the public hearing notice will be included in Appendix D.

A copy of the Draft Project Plan has been made available to the public for a 30-day period at the Westphalia Village office and by email request as stated in the public hearing notice.

D. Public Hearing Transcript or Recording

A verbatim transcript of the public hearing, recorded by a certified court reporter, will also be included in Appendix D.

E. Public Hearing Contents

The following items will be discussed at the public hearing:

- Project background.
- A description of the water utility needs and problem areas.
- A description of the principal alternatives considered.
- A breakdown of capital costs and OM&R costs for the principal alternative.
- Proposed method of financing.
- Recommended Alternative and its environmental impacts.
- Proposed monthly user costs for the implementation of the Recommended Alternative for the average residential customer.

F. Comments Received and Answered

Written comments from the public before, during or subsequent to the Public Hearing will be recorded and included as part of this project plan. A Question and Answer portion of the presentation during the Public Hearing will also take place.

G. Adoption of the Project Plan

The official period for receiving comments will end at the close of the formal public hearing on Monday, June 7, 2021. After the close of the public comment period, comments will be evaluated and a decision will be made by the Village of Westphalia Council. A copy of relevant decisions the Council will make will be included in Appendix D.

VILLAGE OF WESTPHALIA
DWSRF PROJECT PLAN

Index of Figures

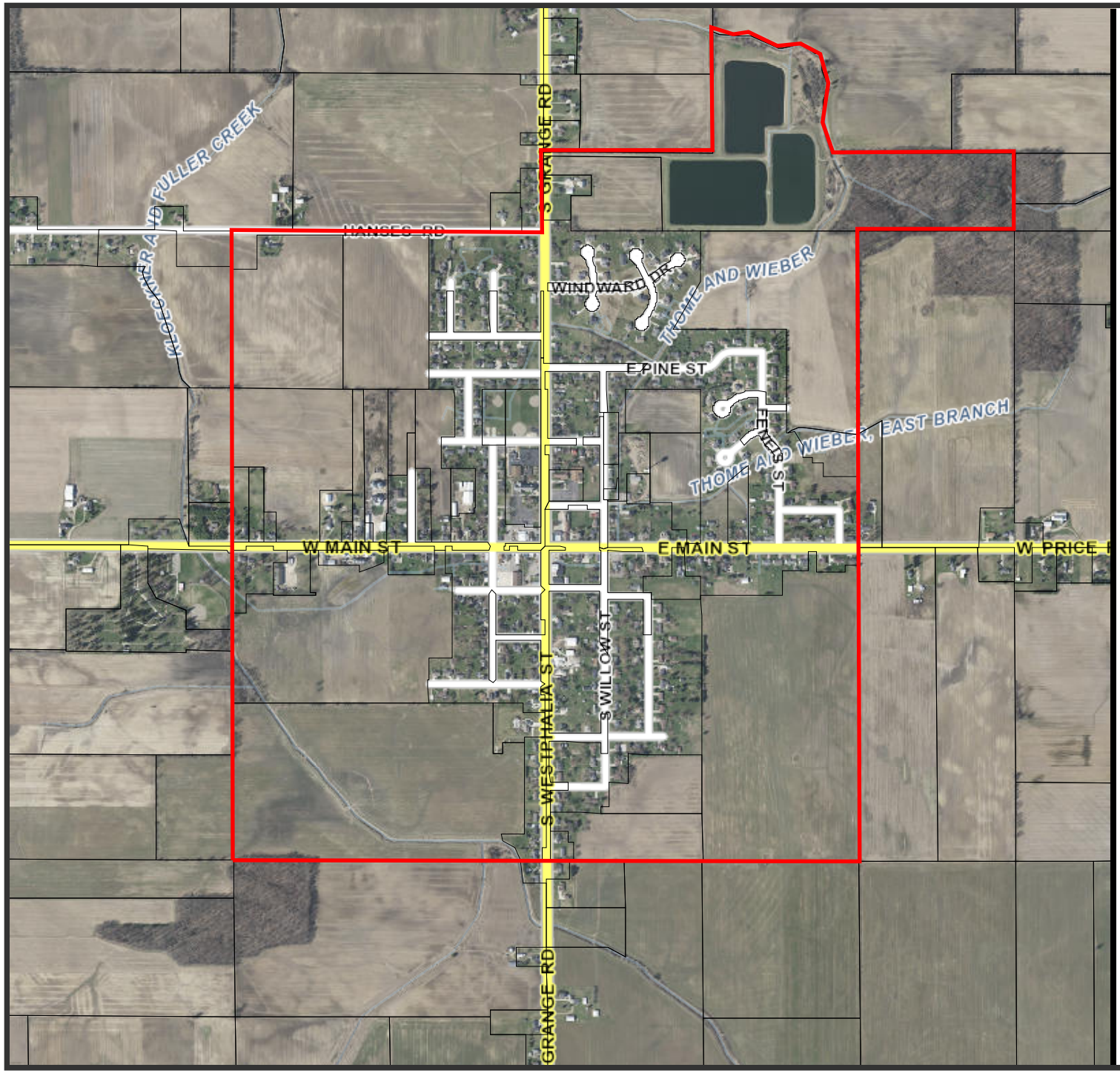


Figure 1: Study Area

Village of Westphalia

Map Publication:
04/14/2021 10:27 AM

0.4km
0.2mi

powered by FetchGIS

Legend:
Study Area & Village Limits

Disclaimer: This map does not represent a survey or legal document and is provided on an "as is" basis. Clinton County expresses no warranty for the information displayed on this map document.

NORTH

1" = 500'

150,000 gal
ELEVATED TANK

WELL #1: 170 gpm @ 328' TDH

WELL #2: 249 gpm @ 225' TDH

VILLAGE OF WESTPHALIA

LEGEND

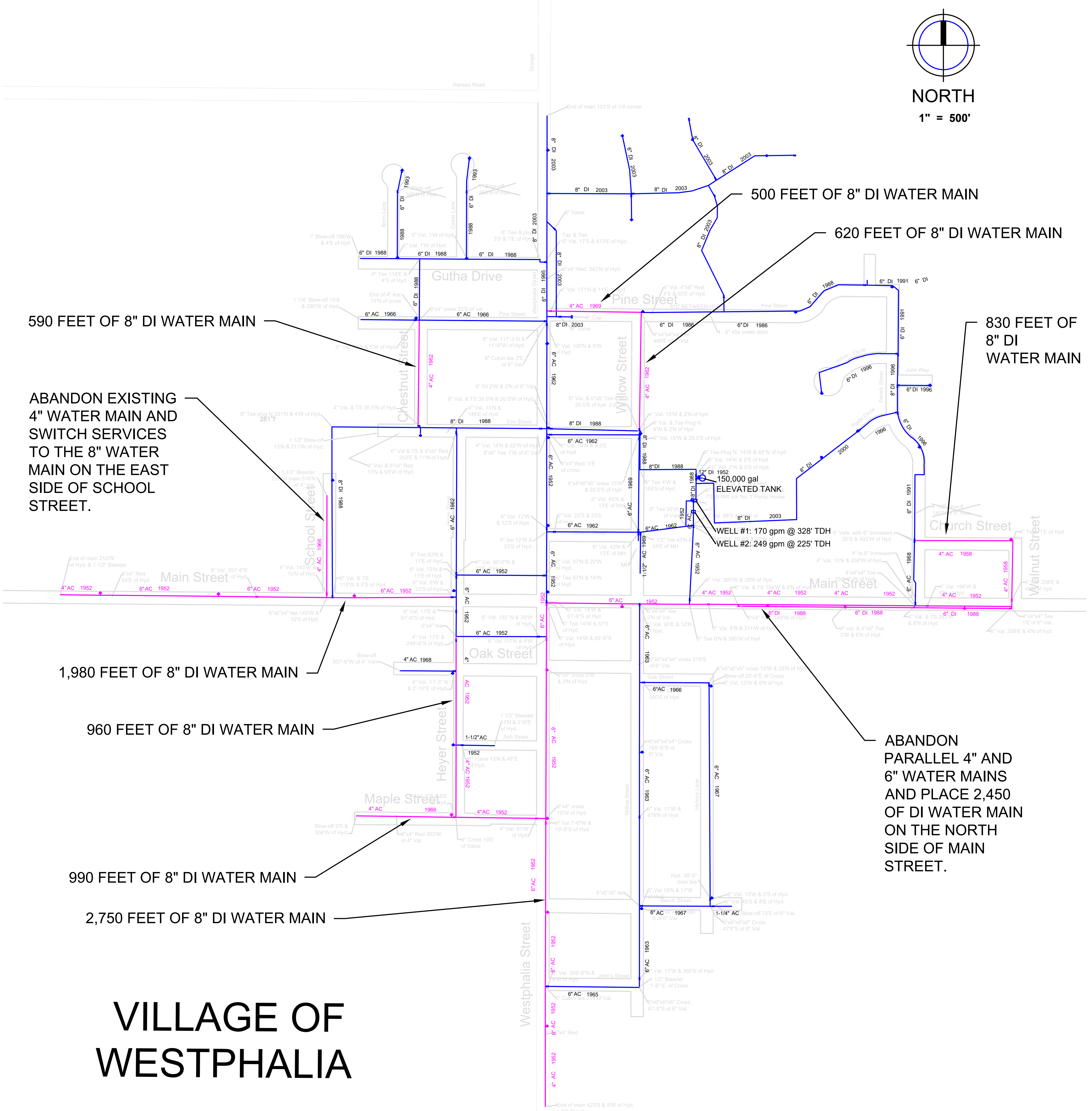
- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN
EXISTING WATER SYSTEM

FIGURE 2

/ PROJECT NO. 848580

F&V



VILLAGE OF WESTPHALIA

LEGEND

12"	EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
⌖	EXISTING HYDRANT
⋈	EXISTING VALVE
	PROPOSED WATER MAIN IMPROVEMENTS

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN
EXISTING & PROPOSED WATER SYSTEM

FIGURE 3

/ PROJECT NO. 848580

VILLAGE OF WESTPHALIA
DWSRF PROJECT PLAN

Appendices

Appendix A	–	2014 Westphalia Water Reliability Study
Appendix B	–	2017 Westphalia Sanitary Survey
Appendix C	–	2019 Westphalia Water Quality Report
Appendix D	–	Public Participation Materials ***(currently blank)***

VILLAGE OF WESTPHALIA

CLINTON COUNTY, MI

WATER SYSTEM RELIABILITY STUDY

Date July 2014
Project No. 817430

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

TABLE OF CONTENTS

TABLES:

FIGURES:

I. EXECUTIVE SUMMARY

This report is an evaluation of the Village of Westphalia's water system facilities, capacities and needs through the year 2033. In addition, it provides a master plan for water system improvements to be implemented as feasible.

The system was evaluated in three categories: water supply, water distribution and water storage. In general, the system was found to meet the current daily demands but has some distribution and storage deficiencies.

A. WATER SUPPLY & TREATMENT

Water supply is currently met with two wells that have capacities great enough to meet current demands. The wells are located close together, and the wells meet the state drinking water requirements. Recommended improvements for the water supply include intrusion alarms for the well houses which run approximately $500 total and a standby generator sufficient to run both pumps at a cost of $40,000. The MDEQ recommends that communities plan to increase supply when maximum day demand reaches 80% of firm capacity. The projected maximum day demand of 117 gpm for 2033 is approximately 69% of firm capacity. Planning for a new well is still recommended within the next twenty years since both wells are currently located in the same well field. A new well will cost approximately $350,000 - $500,000 depending on location and well house parameters.

B. WATER STORAGE

The 150,000 gallon elevated water storage tank was last inspected by Nelson Tank Engineering & Consulting, Inc. in March of 2009. The inspection recommendations were completed in June of 2009 and the next inspection is due in 2014.

Security fencing around the tower is recommended by the MDEQ in the 2013 Water System Sanitary Survey for additional protection of the water supply. Fencing in an area of approximately 40 feet by 50 feet is estimated at $12,000.

C. WATER DISTRIBUTION

The water distribution system is comprised of watermains ranging in size from 4-inch to 12-inch. Approximately 20% of the distribution system is made up of watermains smaller than 6-inch. The presence of these smaller mains limits the amount of available fire flow. Since watermain smaller than 6-inch is no longer permitted by the MDEQ, replacement of a majority of the 4-inch and smaller watermain should be budgeted.

D. RECOMMENDED IMPROVEMENTS

A number of water distribution improvements are recommended with a total estimated cost of $1,063,000. The distribution projects are listed in order of priority. However, implementation of these projects should coincide with the Village's street improvements plan or master plan.

Each recommended improvement has an estimated cost associated with it. These costs are rough estimates to be used for budgeting purposes. The estimated total cost of all recommended improvements for the water system is $1,116,000.

II. BACKGROUND AND PURPOSE

The Village of Westphalia is located near the western side of Clinton County. Wesphalia has a type 1 (public) water supply and distribution system with two water production wells and one elevated storage tank.

The purpose of this report is to provide the Village with a comprehensive analysis of their water system in order to comply with MDEQ and Act 399. The report evaluates the existing water supply, treatment, storage and distribution, and provides recommendations for improvements to serve the existing and future needs of the Village. This report is intended to be the master plan for guiding the community on the overall future water system capital improvement needs to meet future daily water and fire flow demands.

The study and service area includes the Village of Westphalia. The Village of Westphalia water system was constructed in 1952, and the last water reliability study for the system was completed in 2009.

III. EXISTING WATER SYSTEM

A. WATER SUPPLY

1. Wells

The Village of Westphalia's water supply system currently consists of two wells. These wells are designated as Wells No. 1 and 2 and are shown on Figure 1. Both wells are located off of Willow Street near the DPW building on the eastern side of the Village.

The capacity and total dynamic head (TDH) information was obtained from the April 2013 Annual Well and Pump Servicing & Testing by Peerless Midwest and updated based on additional operating information verified by Peerless. The firm well capacity of the wells (Well No. 2 out of service) is 170 gpm.

TABLE 1
WELL SUMMARY

Well No.	Year Drilled	Diameter	Depth	Capacity	TDH
1	1952	6 inch	355 feet	170 gpm	328 feet
2	1952	10 inch	411 feet	249 gpm	225 feet

Table 2 shows the amount of water that was pumped from each supply source in 2012.

TABLE 2
2012 WELL PRODUCTION LEVELS

Month	Well #1 (gallons)	Well #2 (gallons)	Total (gallons)
January	19,100	1,645,000	1,664,100
February	2,900	1,591,500	1,594,400
March	17,100	1,613,400	1,630,500
April	2,400	1,617,600	1,620,000
May	325,800	2,078,300	2,404,100
June	799,600	2,065,400	2,865,000
July	1,051,700	2,151,400	3,203,100
August	72,500	2,356,500	2,429,000
September	18,600	1,975,600	1,994,200
October	5,200	1,727,400	1,732,600
November	157,300	1,743,600	1,900,900
December	2,500	1,820,300	1,822,800
Totals	**2,474,700**	**22,386,000**	**24,860,700**

2. Well House

The well houses are located off of Willow Street on the eastern side of Town. The well houses are vinyl and in good condition. Intrusion alarms are recommended for the security of the well houses at a cost of $250 per well house.

3. Water Treatment & Quality

The Village does not disinfect the well water, but emergency treatment would be obtained

through Elhorn Engineering.

Westphalia regularly tests the water quality of its wells and throughout the system per MDEQ requirements. There is testing done monthly for bacteria, yearly for partial chemical and every 3 years for metals analysis. The most recent testing conducted report that the contaminant levels were generally well below the state requirements. The metals testing performed in 2013 indicate that the water met the State drinking water standards.

The Village tests for lead and copper on an triennial basis. Lead/copper levels met the MDEQ action levels in the most recent testing. The Village is in compliance, with the next round of testing due in the fall of 2014.

4. Wellhead Protection

The Village has an approved wellhead protection plan from January 2011.

5. Auxiliary Power

The Village has a small generator, manual run, for tower auxiliary power. The wells have a 30 hp gas motor with a manul run driveshaft. A generator to run both pump houses is recommended. The permanent standby generator will cost approximately $40,000 installed.

6. Emergency Response Plan

The 2010 Village Emergency Response Plan addresses the Village plans for water shortages.

B. DISTRIBUTION SYSTEM

1. Pipe Condition

The existing water distribution system was primarily constructed in 1950's and 1960's, as shown on Figure 1, and is entirely within the Village limits. The system includes watermain ranging from 4 to 12 inches in diameter for primary distribution mains. The majority of the Village's distribution system is made up of 4-inch, 6-inch and 8-inch asbestos concrete and ductile iron watermain. Approximately 20% of the watermain are still smaller than 6-inch.

An inventory of the distribution system showing watermain sizes and the approximate lengths of each size are shown in Table 3.

TABLE 3
WATER MAIN INVENTORY

Watermain Size (inches)	Length (feet)	Percentage of Total (%)
Less than 2	528	1.2%
4	8,405	18.9%
6	26,529	59.7%
8	8,948	20.1%
12	34	0.1%
Total	**44,444**	**100.0%**

1. Low Flow Areas

   As shown in Table 3, a portion of the existing system is composed of 4-inch waterlines. Figure 1 shows that there are a few areas fed by dead-end water mains.

2. Watermain Breaks

   The Village has not had any watermain breaks in approximately the last 10 years and has not had complaints of low water pressure.

C. WATER STORAGE

1. Specifications

   The Village has one existing tank located east of Willow Street behind the DPW and well houses. This elevated spherical tank has an overflow elevation of approximately 898 feet. The storage capacity of tank is 150,000 gallons.

2. Tank Maintenance

   The tank was constructed in 1987 and was last inspected by Nelson Tank Engineering & Consulting, Inc. in March of 2009. The exterior was repainted in 2001 and power washed in 2008. The 2009 Nelson inspection recommended repainting the wet interior, grout repair and repainting of the dry interior, installation of a mud valve, and installation of a screen over the overflow pipe. The exterior was in good condition. In June of 2009, painting of the wet and dry interior of the tank along with installation of a mud valve was completed. The next inspection is due in 2014.

   Security fencing around the tower is recommended by the MDEQ in the 2013 Water System Sanitary Survey for additional protection of the water supply. Fencing in an area of approximately 40 feet by 50 feet is estimated at $12,000.

D. CONTROLS

1. Telemetry

   The wells are located next to the tower so the tower, wells, and controls are hardwired together.

E. SYSTEM OPERATIONS

1. Operators

   The Village of Westphalia's water system is classified as S-4. The Village has two operators with S-4 licenses. MDEQ recommends that public water systems have a minimum of two certified people on staff to operate the system, so the Village should maintain their current staffing levels.

2. Meters

   The water system operator performs meter reading on a quarterly basis. The meters throughout the Village were replaced in 2008 with any defective meters changed out as needed. The system currently serves 384 customers.

3. Maintenance

   The Village operates each system valve bi-annually and flushes the hydrants three times per year.

4. Parts

   The Village maintains spare parts for the system including all service and meter parts,and clamps of various sizes for the pipes within the system. Other parts are purchased from local suppliers.

IV. WATER USE AND FIRE PROTECTION

A. WATER USE

1. Customers

The Village of Westphalia water system currently serves 384 customers, consisting of roughly 12% commercial/institutional and 88% residential. Past water usage data is presented in Table 4 below. Peak hour demands are estimated based on a peaking factor of 5 times the average day demand.

TABLE 4
WATER USAGE

Year	Total Water Pumped (gal)	Average Day Demand (gpd)	Maximum Day Demand* (gpd)	Average Day Demand (gpm)	Maximum Day Demand* (gpm)	Maximum Day Peaking Factor	Peak Hour Demand (gpm)
2008	25,094,000	68,751	129,000	47.7	89.6	1.9	238.5
2009	25,262,000	69,211	127,000	48.1	88.2	1.8	240.5
2010	24,133,800	66,120	123,000	45.9	85.4	1.9	229.5
2011	23,752,400	65,075	124,200	45.2	86.3	1.9	226.0
2012	24,860,700	68,112	120,000	47.3	83.3	1.8	236.5

* Includes high usage days caused by water main breaks, tower outages, etc.

2. Historical Water Loss

Water losses were between 6.6% and 9.9% from 2011 to 2012 as calculated by dividing the unbilled water by annual pumpage. These losses are below the 10-15% target level that is typical of similar systems. The target range of 10% to 15% accounts for acceptable system leakage and routine hydrant flushing.

TABLE 5
WATER LOSS CALCULATIONS*

Year	Total Water Pumped (gal)	Total Water Billed (gal)	Total Unbilled Water (gal)	Unbilled Percentage
2011	23,752,400	22,176,028	1,576,372	6.64%
2012	24,860,700	22,399,035	2,461,665	9.90%

* Information based on monthly operating reports and Village billing records

3. Large Water Users

Table 6 shows the average monthly use for the system's largest water users. Using this data, the average daily use and average demand were derived. These water users represent approximately 6% of the Village's daily water use.

TABLE 6
LARGEST WATER USERS

Customer	Average Quarterly Use (gal)	Average Daily Use (gal)	Average Demand (gpm)
Car Wash	135,727	1,487	1.03
Charlie's Bar	107,091	1,174	0.81
School	62,364	683	0.47
Stan Bauer	58,364	640	0.44
Planned Scapes	29,273	321	0.22

As Table 6 shows, the Village has a small number of locations that have higher water demands than residential use. Therefore, the system demand for water can be related to population served. The customer type distribution and water usage data is listed below in Table 7 for planning purposes.

TABLE 7
CUSTOMER PLANNING DATA

Customer Type	Number of Connections	Approximate REUs	2012 Water Usage (Gallons)
Government	3	1	26,000
Schools	1	4	252,000
Church/Hall/Apt.	12	3	185,000
Industrial	0	0	0
Commercial	30	34	2,019,000
Residential	338	338	19,917,035
Totals	**384**	**380**	**22,399,035**

B. POPULATION PROJECTIONS

The projected 20-year water demand for the Village was estimated using the past and estimated current population numbers obtained from the U.S. Census Bureau. The population of Westphalia increased at an average rate of 0.54% annually between 2000 and 2010.

Due to continued moderate growth and limited plans for new development, a population growth rate of 0.6% was used to project the future population from the 2010 U.S. Census Bureau numbers, resulting in the population trends shown below. Table 8 below shows the past, estimated and projected populations for the Village.

TABLE 8
POPULATION PROJECTIONS

Year	Population
2000	876
2010	923
2013	940 Est
2018	967 Est
2023	995 Est
2033	1050 Est

C. PROJECTED WATER DEMANDS

The projected water demands for the 20-year study period were calculated using projected population and the current average usage per capita. Table 9 shows the current per capita water usage. Estimated populations are from the U.S. Census Bureau and report projections.

TABLE 9
PER CAPITA WATER USAGE

Year	Average Day Demand (gpd)	Estimated Population	Average Day Demand (gpcd)
2008	68,751	914	75.2
2009	69,211	918	75.4
2010	66,120	923	71.6
2011	65,075	925	70.4
2012	68,112	927	73.5

The amount of water used on a per capita basis has ranged from 70.4 gpd to 75.4 gpd over the last five years. This study assumes the water usage will increase proportionally as population increases. A value of 80 gpcd will be used for analysis. Since 2008, the maximum peaking factor (maximum day demand divided by average day demand) has been around 1.9 including flushing days and other high demand days. Based on this, a maximum day peaking factor of 2.0 is used in this report to estimate future maximum day demands. Table 10 shows the projected water demands.

TABLE 10
PROJECTED WATER DEMANDS

	2018 (Estimate)	2023 (Estimate)	2033 (Estimate)
Population	967	995	1,050
Average Usage (gpcd)	80	80	80
Average Day Demand (gallons)	77,360	79,600	84,000
Average Day Demands (gpm)	53.7	55.3	58.3
Peaking Factor	2.0	2.0	2.0
Maximum Day Demand (gallons)	154,720	159,200	168,000
Maximum Day Demand (gpm)	107	111	117
Peak Hour Peaking Factor	5	5	5
Peak Hour Demand (gpm)	269	277	292

D. FIRE PROTECTION

1. ISO Rating System

The Insurance Services Office (ISO) establishes suggested fire flow protection standards based on various factors including building construction type, area, height, type of development and density. These factors and others such as fire fighting capabilities, when combined, result in an ISO rating of between 1 and 10, 1 being the best and 10 being the worst. This rating is used by insurance companies to determine appropriate insurance rates for its customers that live within the water supply system. The Village of Wesphalia currently has an ISO rating of 6. The current rating is based on an evaluation received in August 2005.

2. Recommended Fire Flows

The ISO establishes suggested fire flows at various locations throughout a community during a survey. It is not always cost-effective for a community to build a water system that meets all of the suggested ISO fire flows. In such a situation, the community can choose to adopt target fire flow values. Table 11 below presents the suggested ISO fire flows and recommended target fire flow values. These recommended target fire flows were obtained from tabular values presented in the *"Fire Protection Handbook'*, and the AWWA's Manual of Water Supply Practices –*"Distribution System Requirements for Fire Protection"*. It will be necessary for the Village to decide as to whether these recommended target fire flows provide the desired level of protection.

TABLE 11
ISO SUGGESTED AND RECOMMENDED TARGET FIRE FLOW VALUES AND DURATIONS

Classification	ISO Suggested Fire Flows at 20 psi	Recommended Target Fire Flows at 20 psi	Duration (hrs)
Residential	1,000-1,500	1,000	2
Commercial	2,000-2,500	2,000	2
Industrial	3,000	3,000	3
Institutional	3,500	3,500	3

3. Hydrant Flow Tests

Fleis & VandenBrink Engineering and Village staff performed fire hydrant flow tests at select locations throughout the system (See Figure 2) on March 31, 2014 in order to obtain information used in calibration of the WaterCAD hydraulic computer model. Table 12 provides the results of the fire hydrant tests. The available fire flow amount at the minimum residual pressure of 20 psi was calculated using the following formula:

$$\text{AVAILABLE FIRE FLOW at 20 psi} = \frac{\text{Hydrant Flow} * (\text{Static Pressure} - 20)^{0.54}}{(\text{Static Pressure} - \text{Residual Pressure})^{0.54}}$$

TABLE 12
AVAILABLE FIRE FLOW at 20 PSI FOR SELECT LOCATIONS

Test #	Location	Hydrant Flow (gpm)	Static Pressure Reading (psi)	Residual Pressure Reading (psi)	Calculated Flow at 20 psi (gpm)
1	Walnut Street at Church Street	830	62	38	1,123
2	Main Street, West of School Street	790	61	38	1,079
3	Westphalia Street, South of John's Street	880	60	40	1,279
4	Hickory Lane at Beech Street	960	63	48	1,695
5*	Westphalia Street at Main Street	1,095	61	56	3,411
6	Westphalia Street, North of Pine Street	1,130	65	55	2,546

*The pressure drop at this location was less than 10 psi, therefore this test was not used for calibration purposes.

The results of the fire hydrant flow tests indicate that the Village's system provides adequate static pressures, and the available fire flow is usually within the recommended range. Figure 3 shows the static pressures for the Village's water system while Figure 4 shows the residual pressures.

V. EVALUATION OF SYSTEM CAPACITY

A. HYDRAULIC MODEL ANALYSIS

1. Model Description

In order to evaluate the water distribution system, a computer model was developed to simulate the existing system. The software used was WaterCAD version 8.0 developed by Bentley. The water main sizes, configuration, friction factors, well pump curves, topographic information, flow demands and storage tank data were input into the model to simulate the existing and proposed water distribution systems. Water main friction factors were estimated based on values required to achieve model calibration to within ±10% of the calculated available fire flow at 20 psi residual for the test locations. Table 13 presents the comparison of the calculated available fire flow at 20 psi to the values obtained in the calibrated WaterCAD model for the test locations listed.

TABLE 13
COMPARISON OF CALCULATED FIRE FLOWS FROM FIELD MEASUREMENTS TO WATERCAD FIRE FLOWS

Test #	Location	Available Fire Flow at 20 psi (calculated) (gpm)	Available Fire Flow at 20 psi (WaterCAD) (gpm)	Difference Between Calculated & WaterCAD (%)
1	Walnut Street at Church Street	1,123	1,033	8.0%
2	Main Street, West of School Street	1,079	1,004	7.0%
3	Westphalia Street, South of John's Street	1,279	1,242	2.9%
4	Hickory Lane at Beech Street	1,695	1,541	9.1%
5	Westphalia Street at Main Street	3,411	3,641	-6.8%
6	Westphalia Street, North of Pine Street	2,546	2,372	6.8%

2. Test Results

As the results of Table 13 show, the difference between the calculated available fire flow at 20 psi from hydrant testing and that predicted by the calibrated WaterCAD model is within a +/- 10% tolerance. Therefore, the model is an accurate approximation of the system.

3. Fire Flow Results

Fire flows were simulated throughout the existing system. The simulations were completed under existing firm capacity conditions. The elevated tank water levels were set at average operating depth. MDEQ recommends a minimum of 20 psi residual pressure in the system at all times. This is to ensure the positive water pressure remains in the distribution system for customer use and to ensure safe water quality. All available fire flows reported are with a 20 psi residual pressure. Table 14 below presents available fire flow at 20 psi under max day conditions for the existing water distribution system. These values were obtained by running the WaterCAD model under firm capacity conditions and target fire flow demands.

Figure 5 shows the existing available fire flow, expressed as contours, throughout the Village for the 2012 maximum day demand. Figures 5.1 and 5.2 show the existing system under future 2018 and 2033 demands.

TABLE 14
COMPARISON OF TARGET FIRE FLOWS TO WATERCAD FIRE FLOWS

Test #	Location	Recommended Target Fire Flow at 20 psi (gpm)	Available Fire Flow at 20 psi (WaterCAD) (gpm)	Difference between Target & Available (%)
1	Walnut Street at Church Street	1,000	1,033	3%
2	Main Street, West of School Street	2,000	1,004	-50%
3	Westphalia Street, South of John's Street	1,000	1,242	24%
4	Hickory Lane at Beech Street	1,000	1,541	54%
5	Westphalia Street at Main Street	2,000	3,641	82%
6	Westphalia Street, North of Pine Street	1,000	2,372	137%

The available fire flows shown in Table 14 vary from the values shown in Table 13 for multiple reasons. In Table 13, the wells were turned off for calibration, and in Table 14, Well No. 1 was operating to model firm capacity conditions. Also, Table 14 shows the flows during the maximum day demands, while the calibration model portrays minimal flow conditions.

In all of of the test locations except Test 2, the recommended target fire flow can be met at 20 psi residual pressure.

B. WATER SUPPLY

The MDEQ recommends that the firm capacity of a community's water supply be greater than its maximum day demand. Currently, the firm capacity of the Village's water supply is 170 gpm and the 2012 maximum day demand was 83 gpm. Therefore, the existing firm capacity is sufficient for the current demands of the system. The MDEQ recommends that communities plan to increase supply when maximum day demand reaches 80% of firm capacity. The projected maximum day demand of 117 gpm for 2033 is approximately 69% of firm capacity. Although the maximum day demand has not reached 80% of the firm capacity, the Village should start the process of locating a new well site for future use. Locating and installing a new well will run between $350,000 and $500,000 depending on well location and well house parameters.

C. WATER STORAGE

The recommended target fire flow for commercial areas is 2,000 gpm for two hours. To provide the required volume of water to combat a fire of this duration, 240,000 gallons of water would be used (2,000 gpm times 120 minutes). Table 15 compares the volume of available water using

current firm well capacity and the existing storage volume for each of the classifications of recommended target fire flows and fire flow durations for the existing maximum day demand.

TABLE 15
REQUIRED STORAGE CAPACITY FOR FIRE FIGHTING
(EXISTING MAXIMUM DAY DEMAND)

Classification	Desired Fire Flow at 20 psi (gpm)	Duration (hr)	Existing Maximum Day Demand (gpm)	Total Flow Required (system outflow) (gpm)	Well Flow (system inflow) (gpm)	Net (system outflow) (gpm)	Total Storage Required (gal)	Existing Storage (gal)	Addt'l Storage Required (gal)
Residential	1,000	2	83	1,083	170	913	109,560	150,000	0
Commercial	2,000	2	83	2,083	170	1,913	229,560	150,000	79,560
Industrial	3,000	3	83	3,083	170	2,913	524,340	150,000	374,340
Institutional	3,500	3	83	3,583	170	3,413	614,340	150,000	464,340

As the data in Table 15 shows, the Village does not have sufficient storage to meet the target fire flow requirements for fires classified at and above the commercial level. A commercial fire could be met for a little over 75 minutes.

Although these tables show that the existing storage is low in terms of meeting fire flow requirements, the storage capacity of the tank exceeds existing and future maximum day demands of the system.

While storage tanks are sized to provide for fire flows, they also need to be sized to prevent freezing. The current tank can turn over the stored water in approximately two days of normal demands. Meanwhile a 250,000 gallon tank, that is needed to meet commercial demands, would take over 3.5 days to turn over. Considering the low daily water demands, no additional storage is recommended at this time.

Table 16 shows the estimated storage needed for the future maximum day demand. The estimated change in storage needed over the next twenty years is minimal.

TABLE 16
REQUIRED STORAGE CAPACITY FOR FIRE FIGHTING
(2033 PROJECTED MAXIMUM DAY DEMAND)

Classification	Desired Fire Flow at 20 psi (gpm)	Duration (hr)	Maximum Day Demand (gpm)	Total Flow Required (system outflow) (gpm)	Firm Well Flow (system inflow) (gpm)	Net (system outflow) (gpm)	Total Storage Required (gal)	Existing Storage (gal)	Addt'l Storage Required (gal)
Residential	1,000	2	117	1,117	170	947	113,640	150,000	0
Commercial	2,000	2	117	2,117	170	1,947	233,640	150,000	83,640
Industrial	3,000	3	117	3,117	170	2,947	530,460	150,000	380,460
Institutional	3,500	3	117	3,617	170	3,447	620,460	150,000	470,460

VI. RECOMMENDED IMPROVEMENTS

Figure 6 shows the recommended improvements. Figure 7 shows the residual pressure contours under the future 2018 maximum day demand after completion of the recommended improvements, and Figure 8 shows available future 2018 fire flows as contour lines. Figures 7.1 and 8.1 show the residual pressures and fire flows under the 2033 maximum day demand with the recommended improvements.

Table 17 provides a comparison of the future available 2033 fire flows to the recommended target fire flows after completion of the recommended improvements.

TABLE 17
COMPARISON OF AVAILABLE FIRE FLOW TO TARGET FIRE FLOWS
AFTER COMPLETION OF RECOMMENDED IMPROVEMENTS

Test #	Location	Recommended Target Fire Flow at 20 psi (gpm)	2033 Available Fire Flow at 20 psi (WaterCAD) (gpm)	Difference between Target & Available (%)
1	Walnut Street at Church Street	1,000	1,653	65%
2	Main Street, West of School Street	2,000	1.906	-5%
3	Westphalia Street, South of John's Street	1,000	1,324	32%
4	Hickory Lane at Beech Street	1,000	1,585	59%
5	Westphalia Street at Main Street	2,000	3,760	88%
6	Westphalia Street, North of Pine Street	1,000	3,076	208%

As seen in Table 17, the recommended improvements increase the available fire flow in each location to meet or exceed the target flows in all but one location. Test #5 flows are very close to the target flow and no further improvements are recommended at this time.

Recommended Improvements – Estimated Cost

Distribution system improvements are recommended to improve available fire flows and overall system reliability. These improvements should be considered and implemented by Village officials as deemed necessary and as funding allows. Distribution improvements are shown in Figure 6. The Village should plan on replacing 4-inch or smaller water mains as road improvements are conducted in the Village. These small lines should be replaced with minimum 8-inch lines.

Estimated costs are included with the recommended improvements. They are meant to be rough estimates for budgeting purposes only. They include appurtenances such as valves, hydrants, fittings, water services, restoration, engineering and contingencies. A unit price of $110 per foot was used for 8-inch water main and $120 per foot for 12-inch water main. It is assumed that the water mains could be placed outside of the paved roadway. The costs are estimated to increase by anywhere from $25 per foot to $60 per foot if water main must be constructed within the paved roadway, depending on the amount and type of road construction.

Recommended Improvements

General:

1. Permanent standby generator for well pumps. $40,000
2. Intrusion alarms for well houses. $500
3. Water tower fencing (40 feet x 50 feet). $12,000

Cost of General Improvements: ***$53,000***

Short Term (0-5 years):

1. Replace 2,080 feet of 4-inch and 6-inch watermain on Main Street from Heyer Street west to the dead end. $229,000
2. Replace 950 feet of 4-inch watermain with 8-inch watermain on Heyer Street from the 6-inch watermain on Heyer Street north of Oak Street to Maple Street. $105,000
3. Replace 520 feet of 4-inch watermain with 8-inch watermain on Church Street from Feneis Street to Walnut Street. $57,000

Cost of Short Term Recommended Improvements: $391,000

Long Term (5-20 years):

4. Replace remaining 6,110 feet of 4-inch watermain in the system with 8-inch watermain. $672,000

Cost of Long Term Recommended Improvements: $672,000

TOTAL COST OF RECOMMENDED IMPROVEMENTS: $1,116,000

VII. FUNDING SOURCES

Five possible sources of funding have been identified for the Village of Westphalia to complete the recommended improvement projects. A brief description of each follows:

Drinking Water Revolving Fund

This is a preferred alternative. It is a low interest loan program sponsored by the Michigan Department of Environmental Quality. The current interest rate is 2.5 percent, and some communities may be eligible for principle forgiveness under the Green Project Reserve funding if the project reduces system energy use or provides water conservation.

The program is competitive and projects are scored on a point system that ranks them on a priority list. Not all projects submitted are funded so it is important to maximize points on the application. Requirements include a fairly extensive project plan, but most expenses, including the project plan, are eligible activities that can be rolled into the loan. In order for a community to be competitive, they should have a completed wellhead protection program. Applications are submitted by May 1st of every year.

USDA - Rural Utilities Service Grants or Loans (formerly FHA)

Rural Utility Service offers grants and loans for water improvements to communities with a low to moderate average household income. Since the Village's median average household income is not in the low to moderate range, it may be difficult to obtain grant dollars for a project. There are two types of loans available from RUS: direct loans and guaranteed loans.

Direct loans are only issued if the Village is unable to obtain funding from other sources at reasonable rates. The current interest rate is approximately 3.25 percent.

Guaranteed loans are made and serviced by lenders such as banks and savings and loan associations. Guarantees will not exceed 80 percent on any loss of interest and principal on the loan.

Special Assessment Bonds

Special assessments levied under PA 188 of 1954 are one of the most common ways to finance infrastructure improvements. The Village may levy special assessments against properties that receive special benefits from a public improvement. Property owners have petition rights that must be satisfied before the special assessment can go forward. The current bond rate is approximately 5.0 percent.

Special assessments typically can be repaid in installments with interest. The bonds may not exceed the amount of the special assessment roll, and may be secured secondarily by a pledge of the Village's full faith and credit.

Revenue Bonds

Revenue bonds are authorized by PA 94 of 1933. They authorize the Village to borrow money and issue bonds. They are paid from user fees generated by the operation of the improvements.

Revenue bonds are subject to the right of referendum. Petitions for a public vote can be filed by registered Village voters during a 45-day referendum period. Voter approval is not required if the referendum period expires without petitions being filed. The current bond rate is approximately 5.0 percent.

Contract Bonds

Contract bonds are authorized by several state laws. They authorize the Village to enter into an agreement with the County or a public authority in order to have the County or authority issue bonds on behalf of the Village.

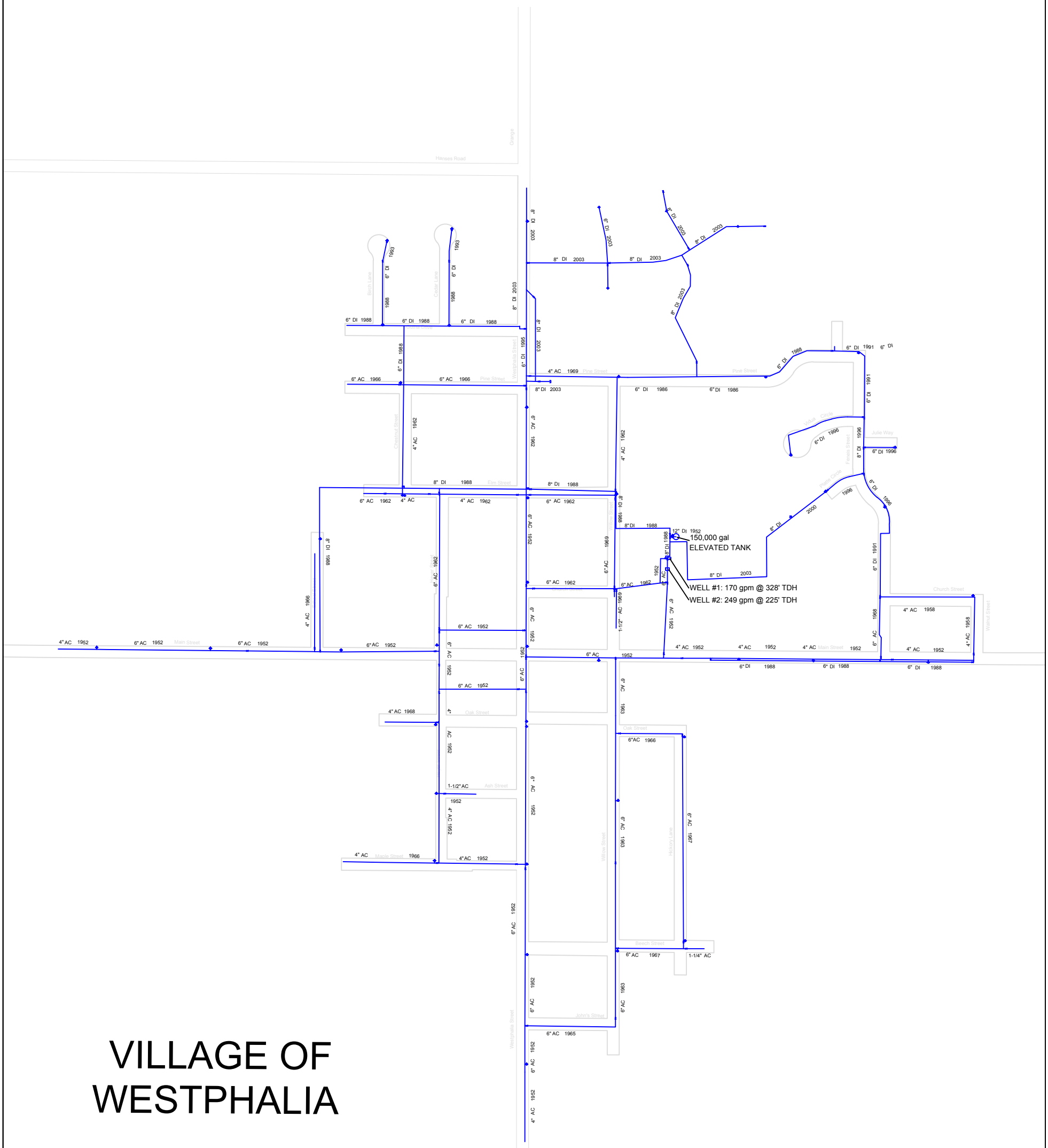
The Village may want to consider a contract bond as the County may be able to borrow at a more favorable rate than the Village if they are willing to pledge its taxing power as secondary security for repayment of the bonds. Also contract bonds may be paid back by a number of sources including: specials assessments, connection fees, and user fees. The current bond rate is approximately 5.0 percent.

Economic Development Administration (EDA) and Michigan Economic Development Commission (MEDC)

EDA and MEDC fund infrastructure improvements when a business or industry is interested in locating in a community that will need to provide infrastructure improvements to support the incoming industry.

As an example, if an industry wanted to locate in the Village where there is not currently watermain, or the watermain is undersized to serve the business, these organizations could assist in funding the improvements. Also, water supply and/or storage improvements could be funded with grant dollars if the improvements are necessary to support the new business.

817430_Figure 1 / colleenw 060314



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- 12" EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE

FLEIS & VANDENBRINK ENGINEERING, INC.

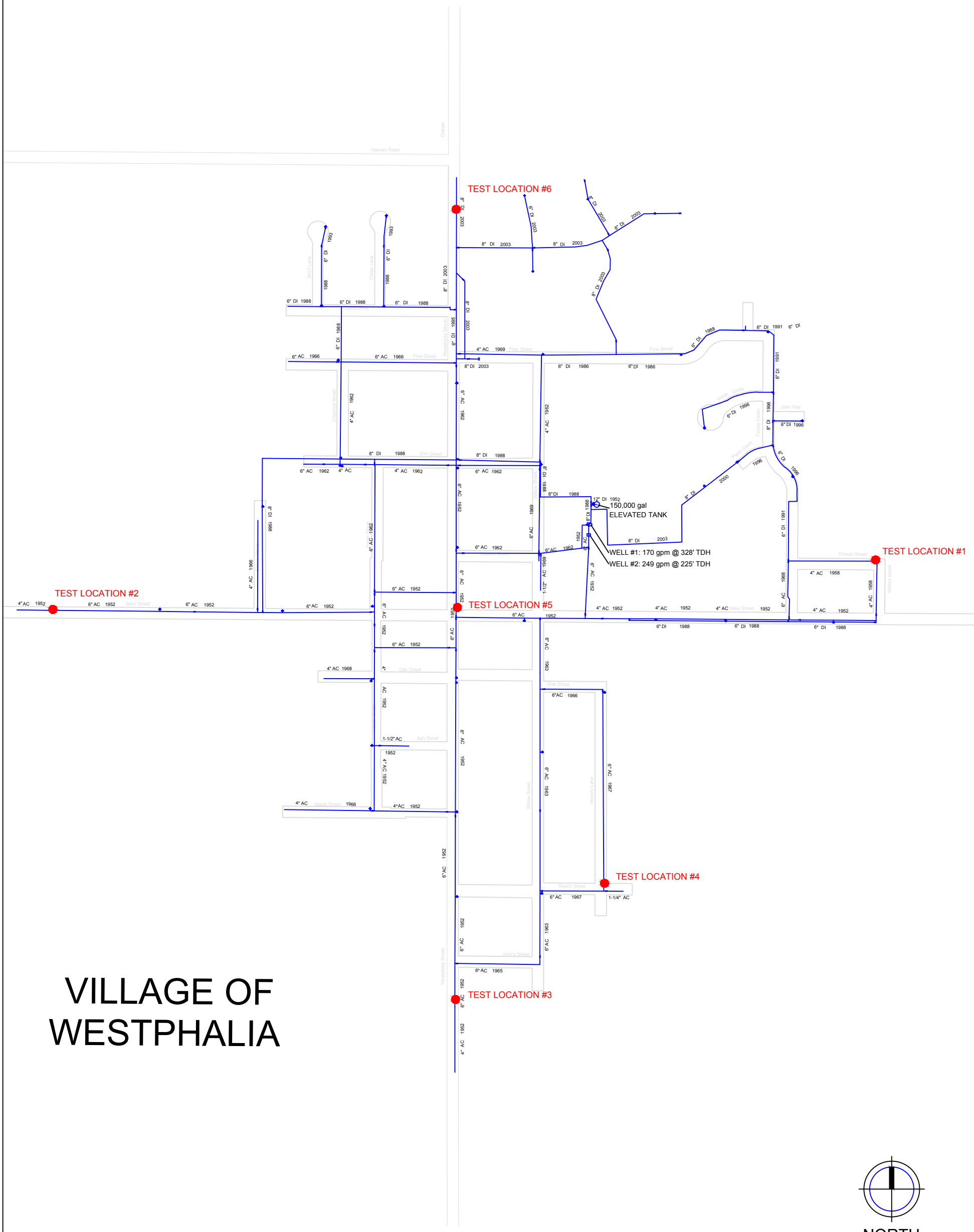
VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING WATER SYSTEM
FIGURE 1

2014 817430

817430_Figure 2 / colleenw 060314

VILLAGE OF WESTPHALIA



LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE

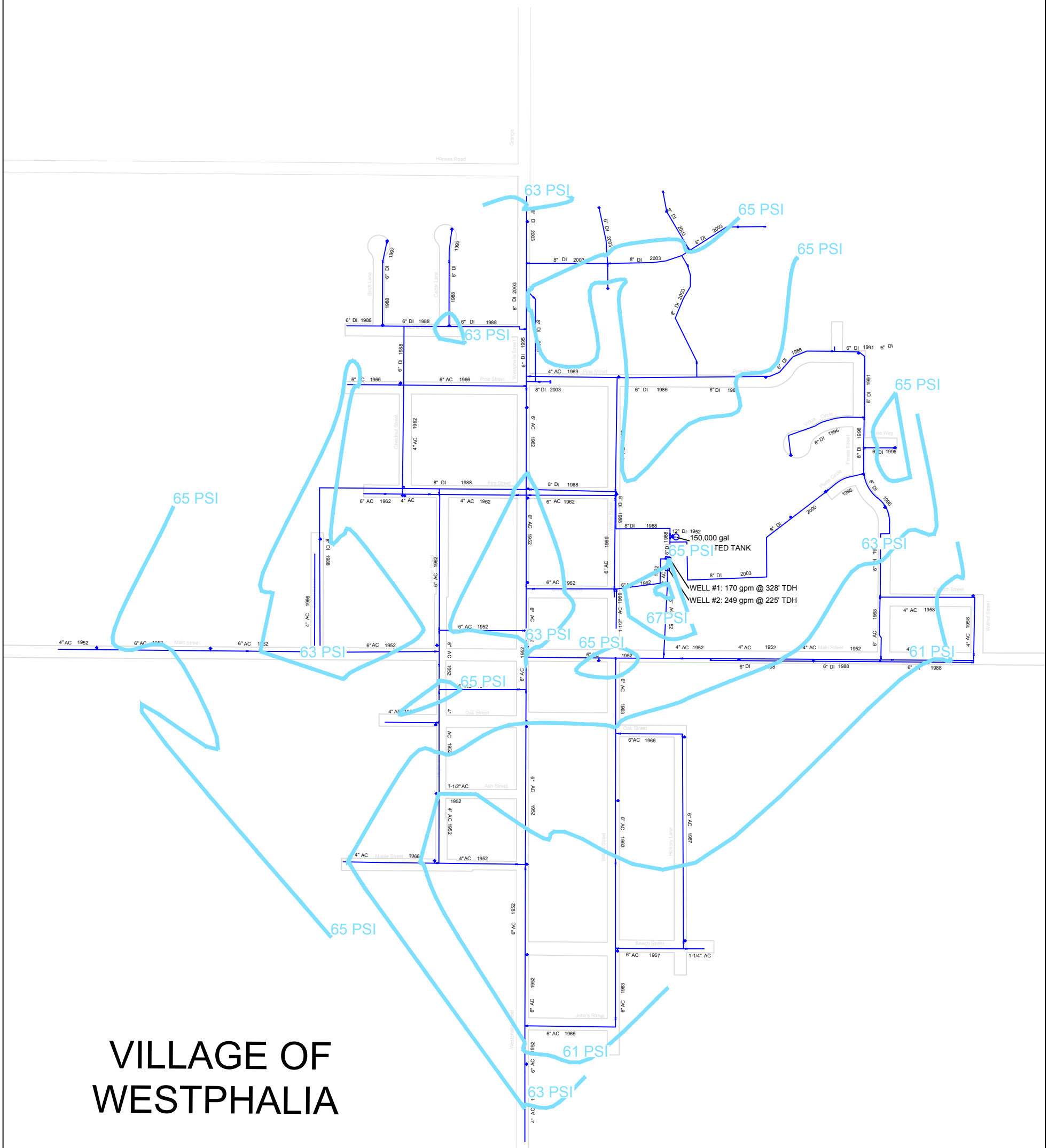
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

HYDRANT FLOW TEST LOCATIONS
FIGURE 2

2014 817430

817430_Figure 3 / colleenw 060314



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- PRESSURE CONTOURS

FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING STATIC PRESSURE

FIGURE 3

2014 817430

817430_Figure 4 / colleenw 060314

VILLAGE OF WESTPHALIA

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- PRESSURE CONTOURS

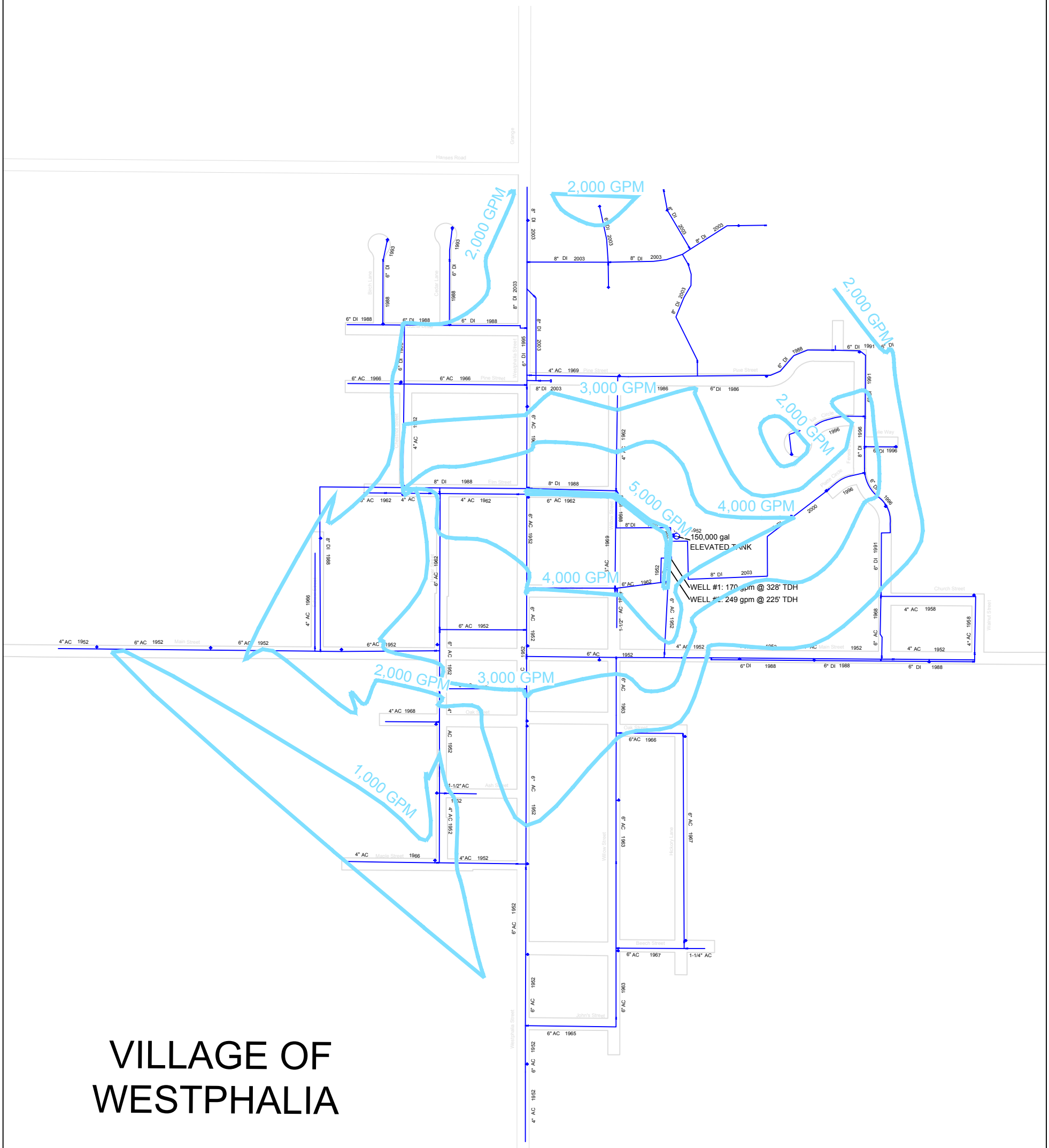
NORTH

FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING RESIDUAL PRESSURE
FIGURE 4
2014 817430

817430_Figure 5 / colleenw 060314



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- FIRE FLOW CONTOURS

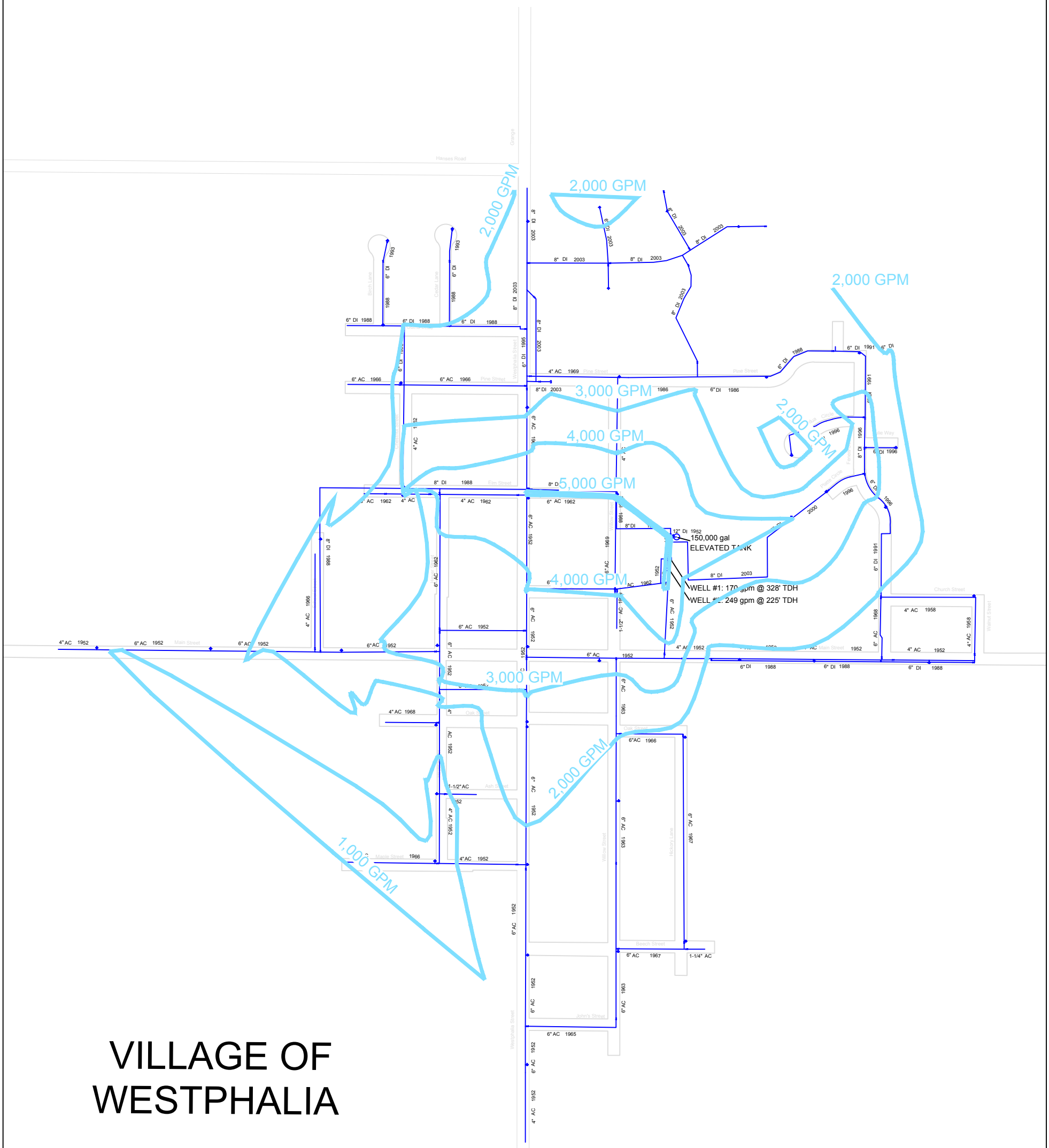
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING MAX DAY
FIRE FLOWS
FIGURE 5

2014 817430

817430_Figure 5.1 / colleenw 060314



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- FIRE FLOW CONTOURS

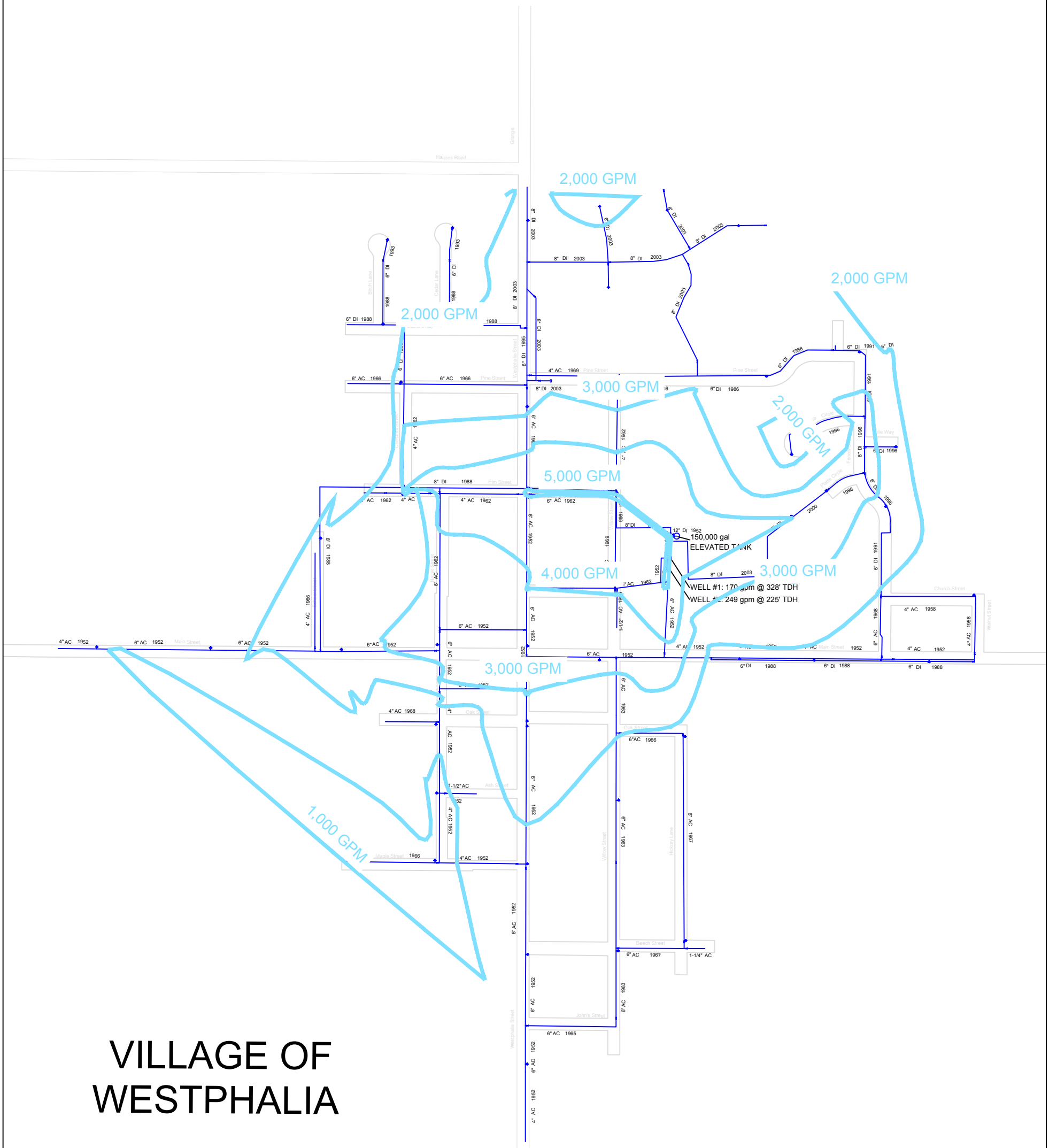
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING 2018 MAX DAY FIRE FLOWS
FIGURE 5.1

2014 817430

817430_Figure 5.2 / colleenw 060314



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- FIRE FLOW CONTOURS

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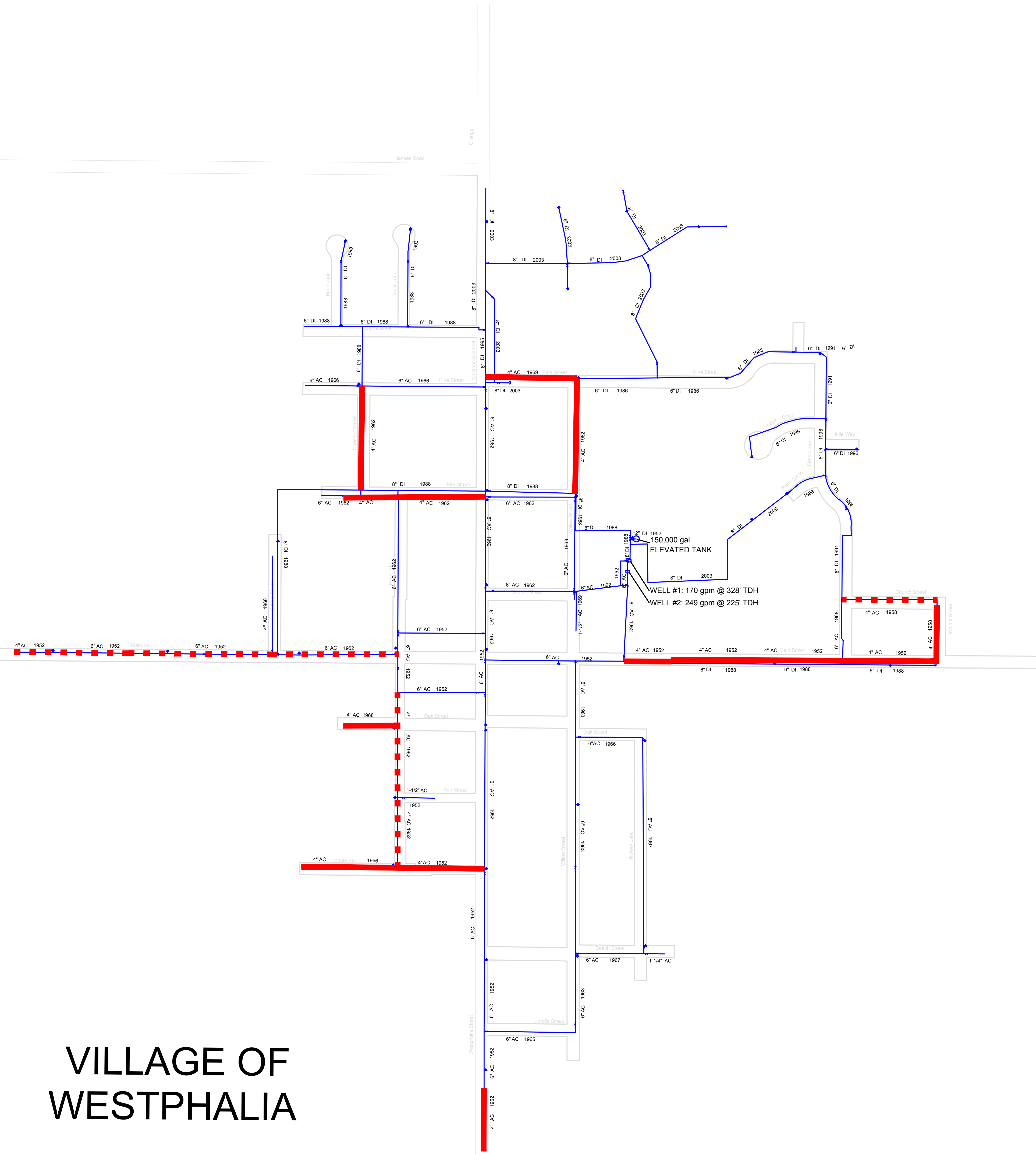
VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

EXISTING 2033 MAX DAY FIRE FLOWS
FIGURE 5.2

2014 817430

817430_Figure 6 / colleenw 060414



LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- SHORT TERM IMPROVEMENTS
- LONG TERM IMPROVEMENTS

FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

RECOMMENDED IMPROVEMENTS

FIGURE 6

2014 817430

817430_Figure 7 / karim 042914

VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- PRESSURE CONTOURS

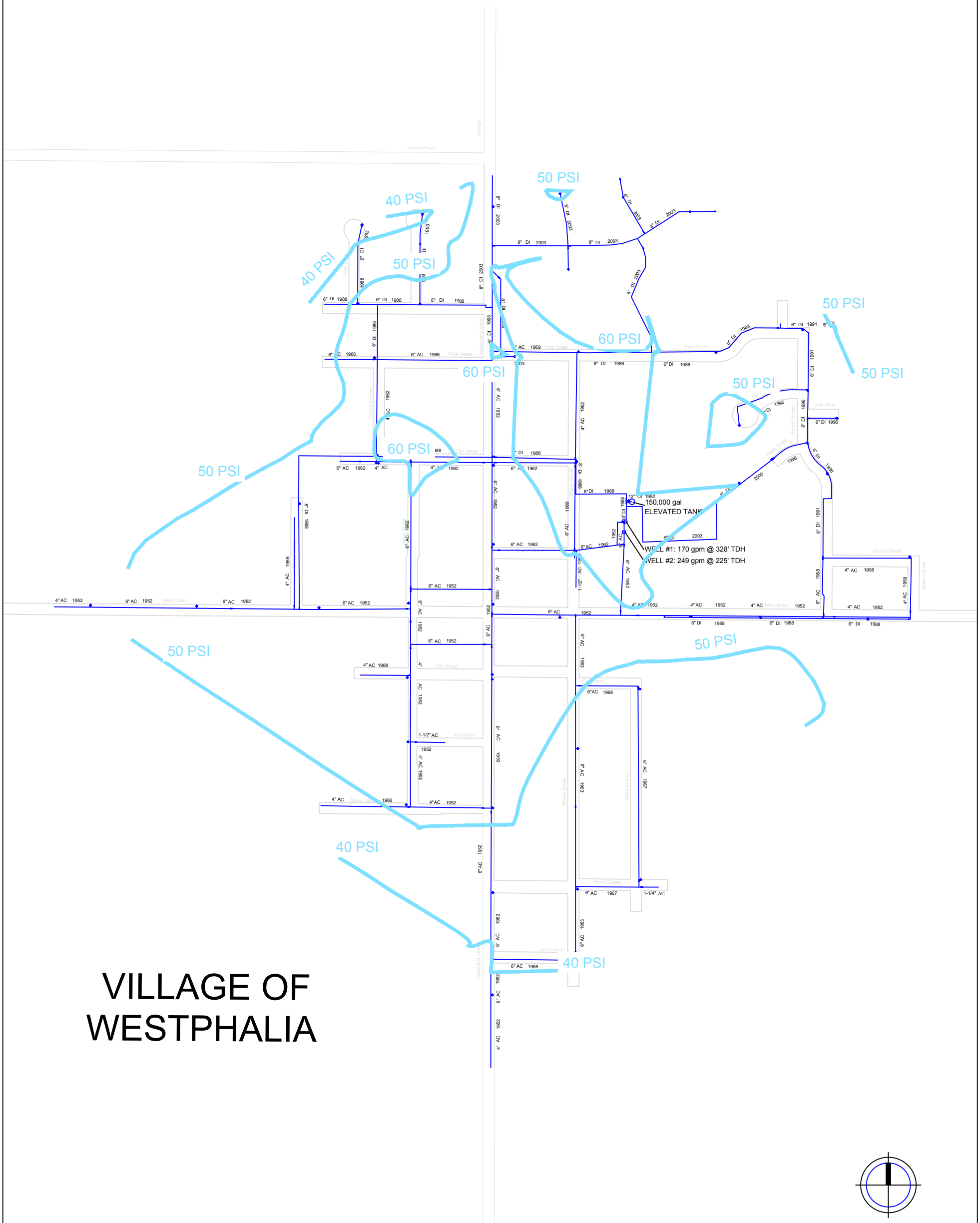
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

2018 MAX DAY
RESIDUAL PRESSURES
FIGURE 7

2014 817430

817430_Figure 7.1 / colleenw 060414



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- PRESSURE CONTOURS

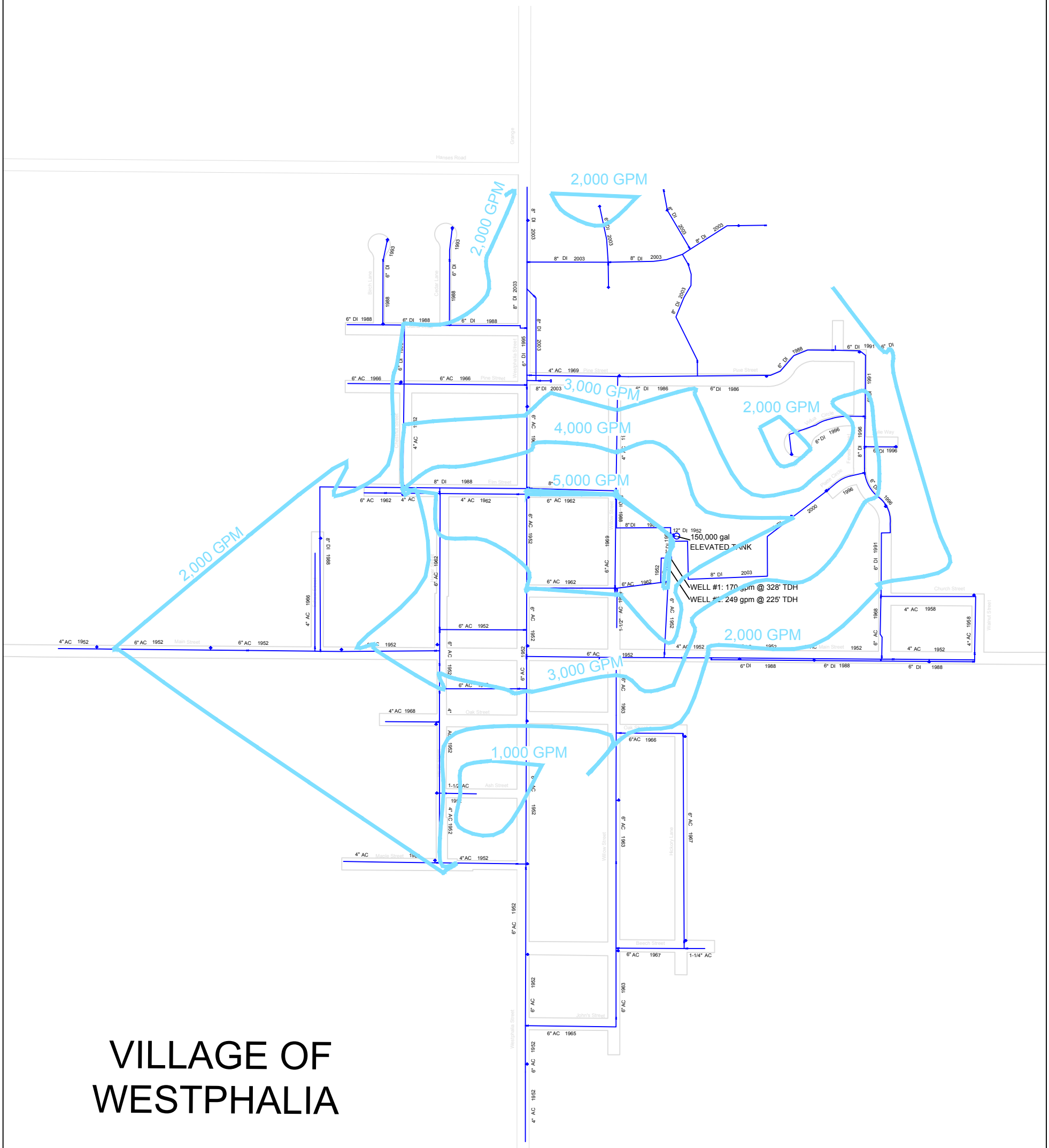
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

2033 MAX DAY
RESIDUAL PRESSURES
FIGURE 7.1

2014 817430

817430_Figure 8 / karim 042914



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- FIRE FLOW CONTOURS

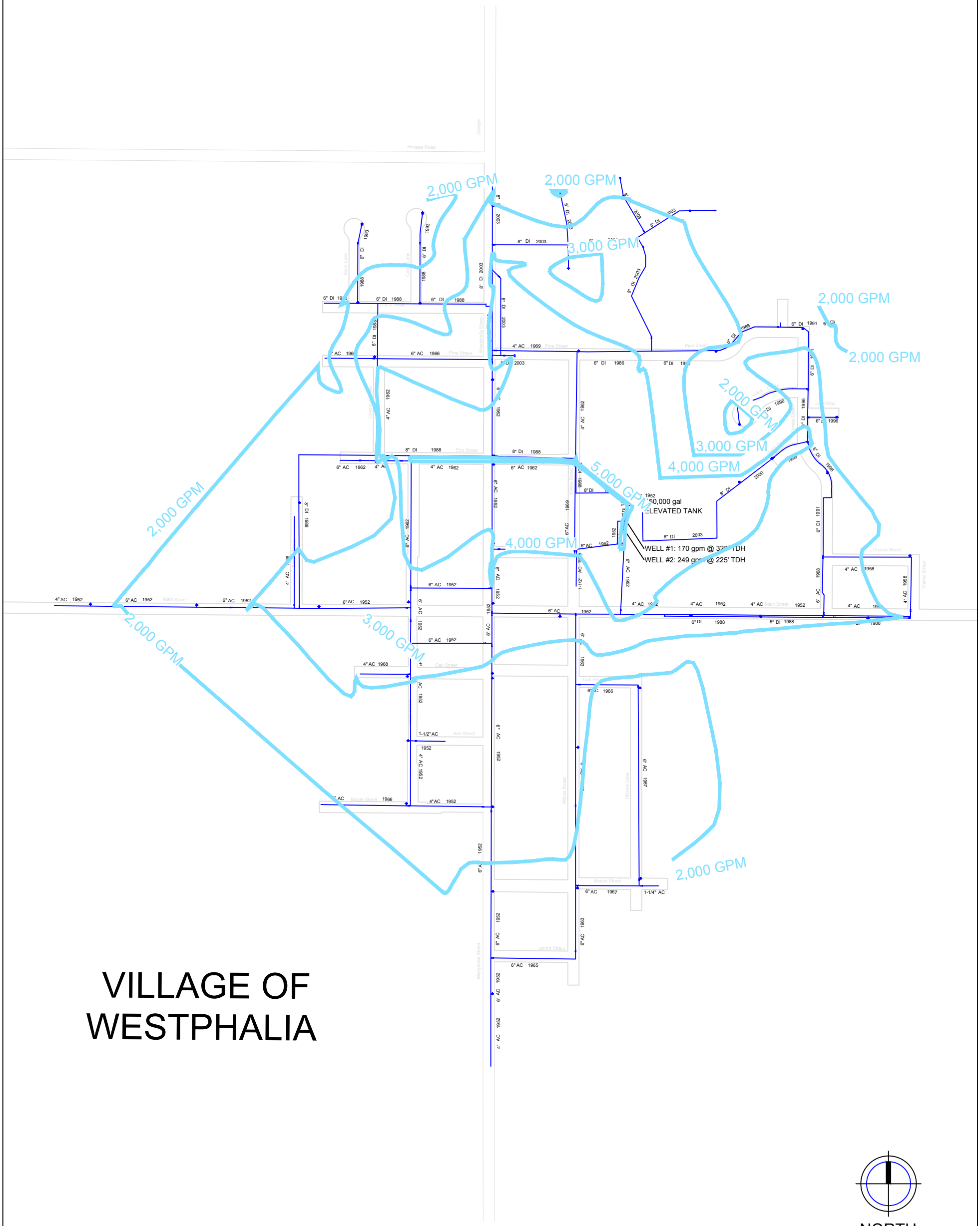
FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

2018 MAX DAY
FIRE FLOWS
FIGURE 8

2014 817430

817430_Figure 8.1 / colleenw 060414



VILLAGE OF WESTPHALIA

NORTH

LEGEND

- EXISTING WATERMAIN WITH SIZE, MATERIAL, & INSTALLATION YEAR
- EXISTING HYDRANT
- EXISTING VALVE
- FIRE FLOW CONTOURS

FLEIS & VANDENBRINK ENGINEERING, INC.

VILLAGE OF WESTPHALIA
CLINTON COUNTY, MICHIGAN

2033 MAX DAY
FIRE FLOWS
FIGURE 8.1

2014 817430

Office of Drinking Water and Municipal Assistance

Lansing District Office

Water System Sanitary Survey

Village of Westphalia Water System

WSSN 07050

May 2017

DEQ

CONSTITUTION HALL • 525 WEST ALLEGAN STREET • P.O. BOX 30242 • LANSING, MICHIGAN 48909-7742

www.michigan.gov/deq

Sanitary Survey of Community Water Supply - Review Summary

Water Supply: Village of Westphalia
County: Clinton
Evaluator: Mark Joseph

WSSN: 7050
District: Lansing
Date:

Category	Comment	N/A	NotEv	NoD/R	Rec	Def	SigDef
Source							
Construction & Maintenance							
Standby Power							
Isolation							
Source Water Protection							
Capacity							
Treatment							
Disinfection							
Fluoride							
Phosphate Addition							
Softening							
Iron/Manganese Removal							
Arsenic Removal							
Pretreatment							
Filtration (gravity or membranes)							
C*T							
Other							
Distribution System							
Interconnections w/ Other WS							
Hydrants & Valves							
Service Lines & Metering							
General Plan							
Cross Connections							
Construction & Maintenance							
Capacity							
Finished Water Storage							
Construction & Maintenance							
Controls							
Capacity							
Pumps (All Pumping Facilities)							
Construction & Maintenance							
Controls							
Capacity							
Monitoring & Reporting							
Bacteriological Monitoring							
Chemical Monitoring							
MOR or Annual Pumpage Report							
Consumer Confidence Report							
Analytical Capabilities							
System Management & Operations							
Owner Responsibility							
Capacity Development							
Reliability Study							
Operations Oversight							
Permits							
Operator Compliance							
Operator Certification							
Technical Knowledge & Training							
Security							
Emergency Response Plan							
Site Security (Fences, Alarms...)							
Financial							
Rates							
Budget & Capital Imp. Plan							
Other							

N/A - Not Applicable
NotEv - Not Evaluated
NoD/R - No Deficiencies/Recommendations Made
Rec - Recommendations Made
Def - Deficiencies Identified
SigDef - Significant Deficiencies Identified

WATER SYSTEM SANITARY SURVEY

GENERAL

Basic Information

WSSN:	07050	Supply:	Village of Westphalia	County:	Clinton
Date:	5/31/2017	Reviewed by:	Mark Joseph	District	Lansing
Update:	4/17/2017				

Primary Contact:	James Bierstetel	Copy To:	Dean Kohagen
SDWIS Role:	Operator-in-Charge	SDWIS Role:	Administrative Contact
Title:	Supervisor, Dept. Public Works	Title:	Village President
Telephone:	989-587-6906	Telephone	989-587-4434
Cell Phone:	989-640-0994	Cell Phone:	
Pager:		Pager:	
Fax:		Fax:	
e-mail:		e-mail:	
Address:	200 North Willow	Address:	200 North Willow
	P.O. Box 8		P.O. Box 8
	Westphalia, Michigan 48894		Westphalia, Michigan 48894

Population:	870	Year:	2010	Basis:	Census

Operator Certification

Distribution Classification:	S-4	Certification	Op. #	Exp. Date
Operator in Charge:	Jim Bierstetel	S-4	1566	7/15/2018
Backup Operator:	Steve Miller	S-4	16648	1/15/2019
Other Operators:				

Treatment Capacity:	NA	MGD			
Treatment Classification:	NA		Certification	Op. #	Exp. Date
Operator in Charge:					
Backup Operator:					
Other Operators:					

Do the operators receive adequate technical training? Yes

If not, what and why?

Comments:

Both operators hold drinking water certifications that meet the classification of this community water supply.

Ownership

Ownership:	Village	(City, Village, Township, County, Authority, Association)
Consent Agreement:	NA	
Escrow Account:	NA	
Annual Fee:	Paid	(Paid, Unpaid, Exempt, Etc.)

Comments:

SOURCE

Well Construction and Maintenance				
BASIC DATA				
Well Name/Number	1	2		
Wellogic ID	19000002026	19000002025		
SDWIS Facility ID (Site Code)	WL001	WL002		
Well Log Available?	Yes	No		
Constructed Date	1952	1952		
Well Status	Active	Active		
Well Status Date	1953	1953		
Treatment at Well	No	No		
SDWIS Entry Point ID (Site Code)	CH001	CH001		
Treatment at Entry Point	No	No		
GPS Coordinates Latitude	Available	Available		
Longitude				
Operator Visit Frequency				
Comments:				
Discuss well information. Some inconsistencies.				
WELL CONSTRUCTION				
Grout Type	None	None		
Rock or Drift	Rock	Rock		
Casing 12" Above Grade	Yes	Yes		
Total Depth	355	411-462		
Casing Depth	156	Unknown		
Casing Diameter	6	10		
Gravel Pack Dimensions	NA	NA		
Gravel Pack Material	NA	NA		
Screen Length	NA	NA		
Screen Diameter	NA	NA		
Screen Slot Size	NA	NA		
Comments:				
~~The exact depth of the well is unknown but is believed to be anywhere from 411 to 462 feet deep. The village should have depth of well #2 verified when the well is inspected.~~				
WELL PUMP INFORMATION				
Pump Type	Submersible	Vertical Turbine		
HP	15	20		
Permit Capacity (GPM)				
Permit TDH				
Current Capacity (GPM)	125	252		
Current TDH	328	217		
Basis for Current Capacity	Efficiency Test	Efficiency Test		
Pump Setting	168	150		
Static Water Level	26	28		
Pumping Water Level (24 hr)	87	78		
Pumping Water Level (100 day)				
Last Cleaning	2006	2006		
Last Pulled for Inspection	2006	2006		
Last Efficiency Test	2011	2011		
Phase/Surge/Lightning Protection				
Comments:				
1. The village replaced both pumps in 2006.				
2. Efficiency tests are completed on each well each year. The Department of Environmental Quality (DEQ) appreciates copies of the efficiency tests that have been provided for our records.				

SOURCE

Well Construction and Maintenance				
Well Number	1	2	-	-
WELL APPURTENANCES				
Well Seal	Yes, Cap	Yes, Cap		
Pump to Waste Piping	Yes	Yes		
Screened?	Yes	Yes		
Air/Vac Relief	NA	Yes		
Screened?	NA	Yes		
Casing Vent	Yes	Yes		
Screened?	Yes	Yes		
Check Valve (VT or Sub)	Yes	Yes		
Meter	Yes	Yes		
Raw Sample Tap	Yes	Yes		
Chemical Injection Tap	Yes	Yes		
Plant Tap	Yes	Yes		
Appropriate Chemical Feed Outlet	Yes	Yes		
Water Level Device	Yes	Yes		
Pressure Gauge	Yes	Yes		
Pressure Relief Valve	No	No		
Comments:				
WELL CONTROLS				
Run Timer	No	No		
H-O-A Switch	Yes	Yes		
Alternating Relay	No	No		
Operating Pressure, psi	55-65	55-65		
Control Signal Type	Pressure	Pressure		
Control System Adequate?	Yes	Yes		
Comments:				
WELLHOUSE INFORMATION				
Heater / Dehumidifier	Yes/No	Yes/No		
Floor Drain	Yes	Yes		
Doors open out	No	No		
Adequate Security Measures?	Yes	Yes		
Comments:				
1. Each well house received new siding and roofs in 2009.				
2. Recommend intrusion alarms for each well house.				

Standby Power				
WELL AUXILIARY POWER				
Well Number	1	2	-	-
Power Type		Mechanical		
Power Rating (kWh or KVA)				
Fuel Type		Gasoline		
Capacity (gpm)		260		
Horse Power (HP)				
Starting Frequency		Once/month		
Load Testing Frequency		Once/month		
Basis for Auxiliary Power Waiver				
Comments:				
Permanent standby power?				

SOURCE

Isolation				
Well Number	1	2	-	-
Approved Isolation Radius	100	100		
Available Isolation Radius	100	100		
Type of Isolation Control	Owned	Owned		
GW flows from/direction	South to North			
Basis for GW Flow	MGWMT			
Important Potential Source	None	None		
Distance and Direction				
Important Major Source	Above Ground Storage Tank			
Distance and Direction	100, West	100, West		
Detects	None	None		
Sensitivity	Low	Low		
Susceptibility	Moderately Low	Moderately Low		

Comments:

1. MGWMT - Michigan Groundwater Mapping Tool
2. The sensitivity represents the degree of natural protection afforded by the materials overlying the waterbearing formation. Susceptibility identifies the relative potential of contamination for public water supply sources.
3. The village maintains an above ground gasoline storage tank for fueling their equipment. Secondary containment has been provided for the gasoline tank.

Wellhead Protection/Source Water Protection Program		
Is the Source Water Assessment available? (Y/N)	4/22/2004	
Date of last update		
Is there an approved Wellhead Protection Program? (Y/N)	Yes	
Date of DEQ approval	9/2/2011	
Have any of the following been initiated? (Y/N)		
Wellhead Protection/Source Water Protection Team	Yes	
Delineation/Tritium Designation	Yes	
Contaminant Source Inventory	Yes	
Management Strategies for Contaminant Sources/Land Use	Yes	
Contingency Plan addressing wellhead area	Yes	
Plan for phasing new wells into WHPP	Yes	
Public Participation		
What is status of wellhead delineation/tritium designation?	Ongoing	(ongoing, or date of DEQ action)
Have Source Water Protection efforts been initiated? (Y/N)		(if yes, briefly describe)

Comments:

1. Tritium sample collected in August 2011 and results were less than 1. The aquifer would be considered "not vunerable" to contamination.
2. The village's Wellhead Protection Program (WHPP) was approved in 2011. The implementation of a WHPP will benefit the village in protecting their source of drinking water. A WHPP minimizes the potential for contamination by identifying and protecting the area that contributes water to municipal water supply wells and avoids costly groundwater clean-ups.

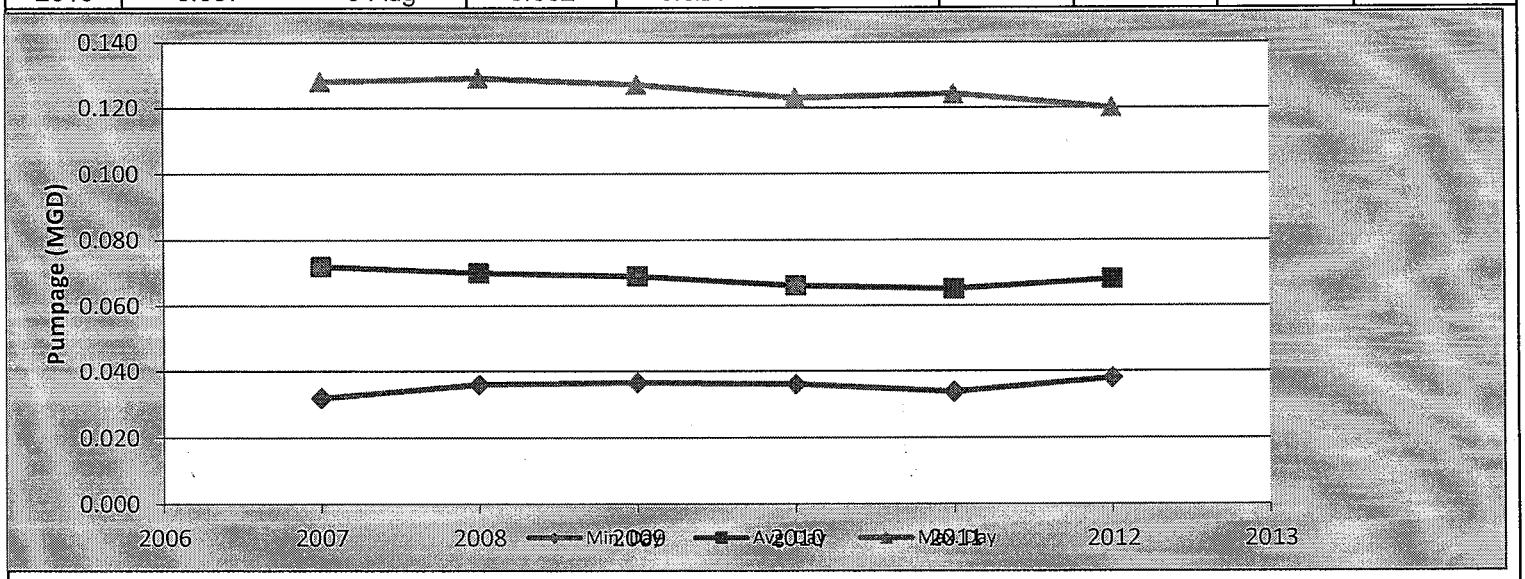
DEQ Conclusions/Recommendations:

A WHPP is required to be updated every 6 years or as changes occur within the WHPP. The WHPP expires in 2017. Grant application for WHPP are due June 15, 2017. Questions regarding your WHPP should be directed to Jason Berndt, Source Water Protection Unit at 989-705-3420.

SOURCE

Capacity

Year	Pumpage (MGD)					Max/Avg	Population History	G/C/D	% unacct.H_2O
	Max. Day	Date	Avg. Day	Min. Day	Date				
2007	0.128	15-Jun	0.072	0.032	28-Dec	1.78	925	77.8	7.92%
2008	0.129	27-Jul	0.070	0.036	5-Dec	1.84	925	75.7	3.99%
2009	0.127	6-Aug	0.069	0.037	22-Dec	1.84	925	74.6	4.21%
2010	0.123	17-Aug	0.066	0.036	3-May	1.86	923	71.6	4.18%
2011	0.124	21-Jul	0.065	0.034	28-May	1.91	926	70.3	4.00%
2012	0.120	26-Jul	0.068	0.038	14-Jan	1.76	927	73.5	5.00%
2013	0.110	27-Jul	0.068	0.036		1.63	938	72.0	10.00%
2014	0.097	1-Apr	0.063	0.033	28-Apr	1.55	944	66.3	4.70%
2015	0.087	22-Jul	0.059	0.031	6-Jan	1.46	937	63.4	8.50%
2016	0.097	8-Aug	0.062	0.024	7-Jan	1.56			7.62%



Five Year Max. Day	0.120			
Ten year Max. Day	0.129			
Five Year Avg. Day	0.064			
Max Day for capacity requirements:	0.120			
Baseline Capacity	415	gpm	0.598	mgd
Total Well Capacity	377	gpm	0.543	mgd
Firm Well Capacity	125	gpm	0.180	mgd
Firm Well Capacity/Max. Day	150%	(>100% adequate)		
Total Aux. Power Well Capacity	260	gpm	0.375	mgd
Aux. Power Well Capacity/Avg. Day	585%			

Comments:

1. Water usage for community water supplies are routinely evaluated by the DEQ to determine the reliability of the system. Typically, firm well capacity is re-evaluated by the DEQ on an annual basis or when occupancy or water usage increases. Increases in water usage above the firm well capacity will require a community water supply to provide additional well capacity to meet their demands. The firm capacity for this CWS is based on meeting maximum day demand with the largest well out of service. A review of the annual pumpage since 2007 indicates sufficient firm well capacity to meet the maximum day demand of this water system.
2. Lost water is lost revenue for a municipality. An acceptable target range for lost water is 10-15%. Less than 10% should be the goal for a municipality. Different elements contribute to lost water. These elements include: leaks, meter errors, non-metered sources, fire fighting, flushing, and other reasons. The village provides lost water estimates with their annual pumpage report.
3. Excessive water usage above the norm, such as, flushing, watermain break, or taking a storage tank out of service should be documented but not reported for maximum day pumpage on the monthly operation report (MOR) or annual pumpage report. The CWS should document excess water usage.

STORAGE

Construction, Controls & Maintenance	
Location	Near DPW Building
SDWIS Facility ID (Site Code)	ST001
Volume	0.015
Type	Single Pedestal
Material	Steel
O.F. Elevation	30
Date Constructed	1987
Date Inspected	2009
Date Painted Inside	2009
Paint System	Epoxy
NSF Std 61 Compliant (Y/N)	Yes
Date Painted Outside	1998
Cathodic Protection	No
Tank Isolation Valve	Yes
Tank Drain (Hydrant)	Yes
Altitude Valve	No
Mud Valve	Yes
High Alarm	29
Low Alarm	16
Alarms Received By	Autodialer
Total Head Range (Feet)	30
Normal High Water Level	28
Normal Low Water level	23
Normal/Average Pressure	55-65
Data Recording System	None
Control Signal Type	Dedicated
Auxiliary Power for Controls?	No
Control System Adequate?	Yes
Vents Screened	Yes
Overflow Screened	Yes
Access Hatches Locked	Yes
Expansion Collar Lubricated	No
Mixing System	No
Overflow Splash Pad	No
Adequate Security?	Yes
Operator Visit Frequency	Once per month

Comments:
1. The exterior to the tank was power washed in 2008.
2. The overflow discharges to a storm water catchbasin.
3. Lights are used to illuminate the tank at night.

Capacity	
Usable Storage, MG	0.15
Total Usable Storage, MG	0.15
Total Usable Storage/Max Day	116%
Total Usable Storage/Avg. Day	234%

Comments:

DISTRIBUTION

Interconnections with Other Supplies

Is water purchased from other supplies?	No
If yes, list WSSN number (s):	
No. of Emergency Connections:	No

Location	Main Size	Capacity	Metered?	Status (Regular/Emergency)	WSSN c Connectic

Are valves exercised annually? 3 yrs

Flushed? seasonal

Comments:

Distribution Piping

Mains by Material	
Cast Iron	N/A
Ductile Iron	38.5%
PVC	1.5%
Asbestos-Cement	60.0%
HDPE	N/A
Galvanized	N/A
Concrete	N/A

Mains by Size	
1.5"	1.2%
4"	18.9%
6"	59.7%
8"	20.1%
10"	
12"	0.1%
16"	

Mains by Age			
1988	to 2003	years	
1988	to 2003	years	
	to 1979	years	
	to 1952	years	
	to	years	
	to	years	
	to	years	

Estimated percent of piping with coal tar lining 0 %

Comments:

The village has approximately 8.5 milest of water main in their distribution system. Material is estimated based on DEQ records The village needs to develop a water main inventory list by size, material, and age. Asbestos-cement pipe for 4 and 6 inch wate main is 62 years old.

DISTRIBUTION

Operational Concerns & Maintenance

Are there areas where water main breaks are frequent? No

If yes, identify locations: _____

Comments:
A record is required to be maintained when a water main break occurs. These records should include the location, repair type, depth, and size, material, age, and condition of the water main. Maintaining a record of water main breaks can help the village priortize future improvements to the distribution system.

Are there areas where aesthetic water quality complaints are frequent? No

If yes, identify locations: _____

Comments:
The village receives infrequent red water complaints.

Do you receive complaints alleging illness due to the water? No

If yes, identify locations: _____

Comments:

Are there areas where customers complain of low pressure? No

If yes, identify locations: _____

Comments:
Some service line issues created low pressure for a few customers.

What is the procedure to respond to and track these complaints? None

Comments:

Distribution System Capacity

Are there areas where peak flows (including fire flow) cannot be maintained? No

If yes, identify locations: _____

Comments:

Last ISO report date? 10/17/2005 Rating 6

Proposed distribution system improvements:

Location:	Estimated Completion Date
Main St from Heyer St to dead end	
Heyer St from Oak St to Maple St	
Church St from Feneis St to Walnut St	
Replace remaining 4-inch water main	

Comments:
1. The amount of fire flow a municipality wishes to provide is a matter of choice. The village has identified their minimum flow requirements for fire protection for residential areas at 1,000 gpm for 2 hours.
2. Proposed distribution improvements from 2014 Reliability Study. CIP?

DISTRIBUTION

Hydrants			
Number of Hydrants	46		
Number Without Auxiliary Shut-Off Valves	0		
Number that are Self-Draining	46		
Number of Inoperable Hydrants	0		
Frequency of Hydrant inspection:	3 times/year		
Inspection Staff:	DPW		
Are there areas where additional hydrants are needed?	No		
If yes, list locations:			
Hydrant location system	Yes	Accurate?	Yes
Are hydrants color coded for capacity?	No		
Has this information been provided to the fire department?			
Frequency and seasons of hydrant flushing	3 times	per year	Spring/summer/fall
Purpose of flushing	Aesthetics, operation and maintenance		
Is the public notified prior to flushing?	Yes		
Does flushing follow a specific format?	Yes		
Is the volume of water used during flushing estimated?	No		
Do hydrants receive maintenance painting?	As needed		
Is a record maintained of hydrant activities?	No		

Hydrant records should include: Hydrant number, location of the hydrant, type of hydrant, size of barrel, size of bottom valve, size of lead, direction of turn, operable or inoperable, auxiliary valve type and size, weep holes plugged or unplugged, condition of hydrant (caps, chains, valve operation, operating nut, leakage & etc.), color coded capacity, flow data (gpm & psi) flushing dates, inspection dates.

Comments:

1. General Plan is used as a record for hydrant locations.
2. The operators flush the water distribution system beginning near the center of the village out to the distal points of the distribution system.
3. The village should monitor the volume of water flushed to account for excess water used.

Valves			
Number of Valves	115		
Number of inoperable valves	0		
Are there areas where additional valves are needed?	No		
If yes, list locations:			
Valve location system	Yes	Accurate?	Yes
Valve Turning Frequencies	Primary:	Once per year	
	Others:	Every 3 years	
Records Maintained?	Yes		

Valve records should include: valve number, location of valve (with witness points), type of valve, size of valve, normal operating status (open or closed), condition of valve (operable or inoperable), direction of turn, number of turns, and dates of operation.

Comments:

1. General plan and card file are used for valve location and recordkeeping.
2. Some valves are exercised when the distribution system is flushed. All valves are exercised every 3 years.

DISTRIBUTION

Customer Service Information

Number of service connections	339
Number of metered service connections	338

Percentage of service line materials:	
Copper	98%
PVC/PE/PB	1%
Galvanized	1%
Lead	

Ownership of Service (CWS/Customer)	
From Corp Stop to Curb Stop	CWS
From Curb Stop to Property Line	CWS
From Property Line to Meter	Customer
Meter	CWS

CUSTOMER METERS

Types of meters Used	Piston Type
Number of Meters with Remote Reading Devices	Touchpad
Residential Meter Sizes	5/8"
Industrial/Commercial Meter Sizes	up to 4"
Meter Testing/Maintenance Program	No
Average Age of Meter in System	4
Criteria for Changeout	Malfunction
Number or Percent Changeout per Year	
Master Meter Locations	Well Houses
Calibration of Master Meters	
Meter Reading Staff/Contract:	DPW Staff

Percent of Usage by Customer Type	
% Residential	95%
% Commercial	5%
% Industrial	
% Other	

Large Users - % of Use	
Car wash	

Comments:
1. Sensus piston type meters are used by the village for metering water usage.
2. All meters were changed about 10 years ago.

System Growth/Water Main Replacement

Year	# of Construction Permits Issued	Permitted Amount of WM Feet	Water Main Extension	Water Main Replacement
2007	0			
2008	0			
2009	0			
2010	0			
2011	0			
2012	0			
2013	0			
2014	0			
2015	0			
2016	0			

Comments:

DISTRIBUTION

Water Rates		
What is your current rate schedule?	$ 1.87	/1,000gals/quarter
Are current rates adequate to support O&M and CIPS?		
When was last time rates were adjusted?	2012	
Has a water rate study been performed? When?	Yes, 2012	
Connection Fee?	$500	
Is there a meter charge or ready to serve charge?	$19	
Is a copy of the water rate schedule and ordinance available?	Yes	

Comments:
A water rate study was completed by USDA Rural Water in 2012.

Repair Parts Inventory	
Extra Mains (Sections for Each Size in Service)	No
Repair Clamps (2 or more for each size)	Most
Tees, Crosses & Elbows	No
Hydrants	No
Valves	No
Services (Corp & Curb Stops, Clamps and Lines)	Yes
Other	Meters

Comments:
The village secures parts from local vendors when needed.

Safety Programs	
Confined Space Entry Program	Yes
Trench Safety Program	Yes

Comments:
The operators attend safety programs.

PROGRAM COMPLIANCE

Cross Connection Programs

Ordinance No.	1.1-1979	Date:	1979		
Approved Program (Y/N)?		Date:	1979		
Staff Assigned to Program, (No., Dept and/or who)			DPW Staff		
Is Annual Cross Connection report required (Y/N)?			Yes		
Was previous year's annual report received (Y/N)?			Yes	Date:	2/27/2017
Was previous year's annual report acceptable (Y/N)?			Yes		
Inspection Status:	Good				
Assembly Testing Frequency		High Hazard:	1/year	Low Hazard:	3/year
Assembly Testing Performance	Good				
Recordkeeping:	Good				

Private Well Isolation/Abandonment Procedure:

Comments:

Annual Pumpage Reports

Is Annual Pumpage Report required (Y/N)?	Yes		
Was previous year's annual report received (Y/N)?	Yes	Date:	2/17/2017

Comments:

Monthly Operator Reports

Are Monthly Operation Reports required (Y/N)?	No		
Were all previous year's reports received (Y/N)?		Timely?	
Are previous year's reports acceptable (Y/N)?			

If no, describe problems:

Comments:

Consumer Confidence Reports

Is the annual CCR required? (Y/N)	Yes		
Was the previous year's report received? (Y/N)	Yes	Date:	6/22/2016
Was the previous year's acceptable? (Y/N)			
Was the previous year's certification form received? (Y/N)	Yes	Date:	6/29/2016

Comments:

Emergency Reponse Plan

Date of ERP	10/13/2010	Acceptable?	Yes
Filed where?			

Comments:

DEQ contact information updated May 31, 2017.

PROGRAM COMPLIANCE

General Plan

Date of Most Recent Plan:	7/28/2014	
Filed Where?		Acceptable?
	General Layout	Yes
	Facility locations & capacities	Yes/Yes
	Water Main Inventory	Yes
	Identification of Service Areas	Yes
	Hydraulic Analysis	Yes
	Capital Improvement Plan	No

Comments:
1. The villages General Plan identifies water main by size, material, and age.
2. The 2014 Water Reliability Study provides 5-year and 20-year recommended improvements.

DEQ Recommendations/Conclusions:
1. Consider creating a table listing water main by size, material and age.
2. A capital improvement plan (CIP) was required by January 1, 2016. No record of CIP being submitted identifying 5-year and 20-year needs.

Reliability Study

Date of Most Recent Study:	7/28/2014	
Filed Where?		Acceptable?
Contents:	5 & 20 Year Demand Projections	Yes
	Source Production Totals (Monthly)	Yes
	Customer Supply Usage (Annual)	NA
	Res/Comm/Ind Usage (Annual)	Yes
	Water Shortage Response Plan	No
	Recommended Improvements	Yes
	Next Due:	2019

Comments:

Permits

Applies for and obtains permits prior to construction (Y/N):	Yes	
Reviews plans prior to submittal to DEQ (Y/N):		
Standard specifications on file at CWS (Y/N):		
If applicable, adheres to contract with supplier regarding plan submittal (Y/N):	NA	Date:
Follows master plan for any construction (Y/N):		
Develops as-built plans (Y/N):		
Updates general plans (Y/N):		

Comments:

MONITORING

Bacteriological			
Date of Approved Site Sampling Plan :	5/18/2016		
Number of samples required each month	1	Basis:	Population
Certified Lab Used:	City of Ionia		
MCL, Monitoring or Reporting Violation(s) in past 3 years? (Y/N)	No	Date:	
Number & Type of Violations			
Public Notice Issued according to regulations? (Y/N)		Date:	
Comments:			

Chemical			
Date of Monitoring Schedule:	2/14/2017		
Were nitrate, nitrite and fluoride (or partial chemical) samples collected? (Y/N)	Yes		
If nitrate detect, what is concentration (mg/L)?	Not Detected	Date:	2/24/2017
If nitrite detect, what is concentration (mg/L)?	Not Detected	Date:	2/24/2017
Fluoride (naturally occurring), mg/L	0.51	Date:	2/24/2017
Detects for metals > 50% of MCL? (Y/N)	No		
Metals (list)		Date:	
		Date:	
Detects for VOCs (Y/N)	No	Date:	3/22/2016
Detects for SOCs (Y/N)	No	Date:	3/10/2015
Date of Approved Disinfection Byproduct Monitoring Plan:			
Comments:			

Lead and Copper Monitoring			
No. of Samples Required:	10		
Frequency (Semi Annual/Annual/Triennial)	Triennial		
Exceedance of lead or copper action level (Y/N)	No		
If yes, was public education issued? (Y/N)		Date:	
Next Monitoring Period:	2017		
Corrosion Control Program Status, if applicable			
Lead service line replacement status, if applicable			
Comments:			

Radiological Monitoring			
Gross Alpha, piC/L	4.7	Date:	11/26/2013
Combined Radium (226+228), piC/L	1.78	Date:	3/8/2012
Beta, Uranium		Date:	
Radon		Date:	
Tritium		Date:	
Detects for Rads > 50% of MCL? (Y/N)	No		
If yes, list		Date:	
		Date:	
Comments:			

2019 Water Quality Report for Westphalia Village

This report covers the drinking water quality for The Village of Westphalia, for the calendar year 2019. This information is a snapshot of the quality of the water that we provided to you in 2019. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards.

Your water comes from 2 groundwater wells located 204 N. Willow. The depths of our wells are 355 feet and 411 feet in bedrock. Our water comes from the Saginaw formation watershed. The State performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately low. "Significant sources of contamination include abandoned wells, underground fuel storage tanks, and surface contamination.

The Village Water Department is now involved in a Well Head Protection Program. One part of this program is looking for abandoned wells (A private well that a home owner had that is not being used. If a homeowner has one or thinks they have one please contact the Water Department, **this is your responsibility by state law**). Abandoned wells are one way that contaminants may enter the ground water which in turn may contaminate village wells. The village will assist you in proper closure. The village urges all of its citizens to recognize the water quality basics of source protection, conservation and personnal involvement, and to recognize the value, importance, and fragility of our water source.

- **Contaminants and their presence in water:** Drinking Water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the **EPA's Safe Drinking Water Hotline (800-426-4791)**.
- **Vulnerability of sub-populations:** Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).
- **Sources of Drinking Water:** The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. Our water comes from wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.
- Contaminants that may be present in source water include:
  - **Microbial contaminants**, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
  - **Inorganic contaminants**, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
  - **Pesticides and herbicides**, which may come from a variety of sources such as agriculture and residential uses.
  - **Radioactive contaminants**, which are naturally occurring.
  - **Organic chemical contaminants**, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration regulations establish limits for contaminants in bottled water which provide the same protection for public health.

Lead in Drinking Water – If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Village of Westphalia is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Water Quality Data

The table below lists all the drinking water contaminants that we detected during the 2019 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 – December 31, 2019. The State allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. All of the data is representative of the water quality, but some are more than one year old.

Terms and abbreviations used below:

- Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
- N/A: Not applicable ND: not detectable at testing limit ppb: parts per billion or micrograms per liter ppm: parts per million or milligrams per liter.
- Picocuries per liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.
- Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Regulated Contaminant	MCL	MCLG	Our Water	Sample Date (If not in '02)	Violation Yes / No	Typical Source of Contaminant
Fluoride	4	4	0.49 ppm	2019	NO	Erosion of natural deposits. Discharge from fertilizer and aluminum factories.
Gross Alpha	15	15	3.5pCi/L	2019	NO	Erosion of natural deposits.
Barium	2	2	0.11ppm	2018	NO	Discharge of drilling waste, metal refineries; erosion of natural deposits.
Total Coliform Bacteria	0	0		2017	NO	Naturally present in the environment
Unregulated Contaminant *						
Sodium (ppm)	Not regulated		12 ppm	2019	NO	Erosion of natural deposits
Contaminant Subject to AL	**Action Level**		**90% of Samples ≤ This Level**		**Number of Samples Above AL**	
Lead (ppb)	15 ppb		1.0	2017	0	Corrosion of household plumbing systems; Erosion of natural deposits
Copper (ppm)	1.3		0.1	2017	0	Corrosion of household plumbing systems; Erosion of natural deposits Leaching from wood preservatives

* Unregulated contaminants are those for which EPA has not established drinking water standards. The purpose of unregulated contaminant monitoring is to assist EPA in determining the occurrence of unregulated contaminants in drinking water and whether future regulation is warranted.

Is our water system meeting other rules that govern our operations? Yes, we met all the monitoring and reporting requirements for 2019. The State and EPA require us to test our water on a regular basis to ensure its safety.

We are committed to providing you safe, reliable, and healthy water. We are pleased to provide you with this information to keep you fully informed about your water. We will be updating this report annually, and will also keep you informed of any problems that may occur throughout the year, as they happen.

We invite public participation in decisions that affect drinking water quality, please contact DPW during regular office hours.

For more information about your water, or the contents of this report, contact ___Steve Miller_____ at _____587-6906_____. For more information about safe drinking water, visit the U.S. Environmental Protection Agency at www.epa.gov/safewater/.