January 30, 2013

Bethel, Ohio
Water System Evaluation Analysis and Recommendation Report
FINAL REPORT
12076

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Architects Engineers Planners

Introduction and Team:

The Village of Bethel was founded in 1798 as a proud Midwestern Ohio community in southeastern Clermont County, Ohio originally part of the Northwest Territory. The Village has a population of approximately 3,000 people in a little less than two square miles. In 1908, Bethel was home to the first movie theater in Ohio and today still has one of the only remaining drive-in theatres in the United States, StarLite Drive-In. History and community spirit run deep. The Grant Memorial Building located Main and Plane Streets is a historic building that honors Ulysses S. Grant, a US President born in nearby Point Pleasant, Ohio.

The Bethel team described below has been very supportive providing records and information for this system analysis study for the Bethel water system. We have been assisted with information from Michelle Price on billing and consumption data. Mitch Hatfield, Public Works Supervisor has provided field and operations data along with Brian Cheshire, field technician. Jerry Whitacre (Operator) has assisted with detailed water system information on records, water mains and related appurtenances.

Bethel has excellent communications with the community especially on water system matters with respect to water quality reporting, system outages and customer concerns in general.

Water System Summary:

The Village owns and operates a community public distribution water system for the Village residents as well as some township residents and businesses. The OEPA public water system number is OH1300116. The Bethel water system is considered a Class 1 Ohio water supply distribution and has a Class 1 operator licensed to operate water system. Bethel has no water treatment facilities in operation. Wholesale water is purchased entirely from Tate Monroe, a private water company. No Bethel pumping facilities exist. Tate Monroe delivers water supply

to the existing Water Tower on Water Street through a master meter. Bethel has two elevated water storage tanks, Water Street Tank at 100,000 gallons and SR 133 Tank at 250,000 gallons. The existing Water Street or Tower Tank has rehabilitation needs that could be significant and should be considered for replacement at a more western location to provide more direct peak service and emergency water supply to the West Plain Street, industrial and school areas.

As per the 2010 OEPA sanitary survey, the average day (AD) purchased water supply is around 228,000 gallons per day with a maximum day (MD) usage reported as 310,000 gallons per day. Maximum day usage is generally higher than this amount of 1.36 factor times average day. MD to AD typically runs between 1.6 to 1.8 times average day. This would make maximum day usage around 375,000 gallons per day; however, the current contract limit for purchase seems to be 320,000 gallons per day. The customers seem to not want to use peaking water during summer or high demand periods keeping peaking to minimum amounts. Population projections for the Village and general area is about 0.5% per year for the next 30 years.

- Bacteria sampling should possibly occur more often based on community size.
- The contingency and sample monitoring plan should to be updated and could easily be included as part of any OEPA CAP planning process for funding of projects.
- A water loading station exists and requires some modification to the discharge adaptor to provide an air gap protection for backflow and contamination potential.

Bethel does not supply any transient or non-transient seasonal water supply customers. One pressure zone or service area exists with pressures controlled by overflow of the two water tanks. No regulator or valve control stations exist to control and manage daily flow and pressure. No emergency connections exist of record to support adjacent community water systems. Tate Monroe may require restrictions due to its transmission capabilities.

Water Treatment Plant:

The Village does not operate a water treatment plant. The abandoned water treatment plant located on Macedonia Road includes buildings that still stand on property owned by the Village. All chemicals should be removed and site fencing secured. Surface water treatment requirements sources from East Fork area requires advanced treatment to remove contaminants and trihalomethanes in a more significant process. Point and non-point discharge to surface water supplies require advanced treatment like granular activated carbon or Ozone. This water plant had a rated treatment capacity of 720,000 gallons per day with

water usage at that time of 287,000 gallons per day. Plans to expand the transmission water supply through a series of 10 inch water mains was planned, but never constructed.

Wholesale Water Supply Purchased From Tate Monroe Water Association

About five years ago, a decision was made by the Village to eliminate and abandon the existing Bethel water treatment plant. As a surface water plant, more strict OEPA regulations made it more difficult to meet the surface water treatment regulations and requirements. With Harsha Lake nearby, Clermont County has invested millions of dollars to add granular activated carbon adsorption treatment to meet the tri-halomethanes and other contaminant requirements and standards of the OEPA.

The Tate Monroe Water Association a community groundwater system OH1301312 now provides wholesale water supply. The Tate Monroe general manager is Greg Stanley, 513-734-2236. The Tate Monroe Water Association serves approximately 32,000 people with 9,500 water services. Their current rated capacity is 4.0 million gallons per day with an average day usage of 1.8 million gallons per day.

Water supply from Tate Monroe is provided from an existing 12 inch transite (asbestos cement) water main along a Tower Alley between Plane and Water Streets. The contract purchase amount limit is 320,000 gallons per day. A four inch master meter provides water supply to maintain and operate the Tower Tank for the Bethel water system. A bypass line and valve exist that are in the closed position. No other wholesale water supply interconnections are used from Tate Monroe for water supply.

For system redundancy purposes, the AWWA and Ten State Standards recommend at least two sources of water supply for the Village. A second wholesale water supply connection should be investigated as to best location considering water demands and system requirements. Bethel should verify water measurements into its water system from Tate Monroe and require annual certification as to calibration of existing water meters to within a 2% accuracy requirements. Daily recording of water supply measurements should be captured through a SCADA system.

An emergency connection with Tate Monroe exists along Macedonia Road and Concord Streets. This emergency connection could be considered as a second source connection in the

future to meet system redundancy requirements; however, it is not located in the best hydraulic location for the Village.

Water Mains:

As for the water mains, at least 32 to 35 miles of water main of various sizes and materials exist including cast iron, PVC, transite (asbestos cement) and polyethylene. The Engineer reviewed available paper water distribution maps, development and project plans. Many of these paper records were dated from the 1950's up to a few years ago. Though some plans never moved forward to construction, most of the water system records seemed to exist per meetings with operations staff as generally shown per plan. Field inspection notes or as-built plans were not available in which to verify where assets were actually installed. The Engineer had several meetings with Bethel staff to determine location, size and type of pipe particularly along with many fire hydrants. It is anticipated that all valves and other related assets could easily be included within the ESRI ArcView and Arc Map environment. After the paper reviews, water main sizes, location and type of material were provided to the Engineer to input into a KYPIPE water model. As records are compared to what has been captured digitally, additional adjustments to the mapping data may still exist. Based on what was provided to date, the digital records now show the following sizes and footage:

Distribution System	
Size	**Footage**
1 inch	1,812 feet
2 inch	1,101 feet
3 inch	174 feet
4 inch	5,546 feet
6 inch	111,870 feet
8 inch	47,338 feet
10 inch	638 feet

Mapping Records:

A significant issue facing the water system is the need for updated digital water distribution mapping records. Some system wide records were kept back in the 1960's, but evidence shows that these records were not regularly maintained, except more recently with hand notes and system information. The water assets should be included in a digital water records file. All water mains locations, sizes and related attributes can be captured one time digitally and then maintained digitally by staff.

Fire Hydrants:

The Village has approximately 160 fire hydrants in service. At any one time, some fire hydrants may be out of service for repair, but are generally returned to service within a reasonable time. A seasonal flushing program should be established using fire hydrants from source of water towards end of water system. This flushing can be coordinated with fire department to minimize duplicative flushing operations. The Engineer recommends a directional flushing type program that has proven most effective per AWWA recommendations. We can work together to assist with this methodology and set up with staff.

Water Valves:

The existing water system has approximately 300 to 400 valves. Some records do exist on valve size, location and condition; however, it is difficult to say exactly how many valves exist and what condition they are currently in. As repairs have occurred or outages over the years valves have been repaired and replaced as noted on some paper records. This valve information should be captured into the digital water main maps and water model. Once digitally captured maintenance operations and repair records along with work orders can more easily be included for review and usage by operations and management staff. No existing preventative valve exercising operation and maintenance plan is available. Valves seem to be replaced at failure mode when needed for repair action or other distribution event.

A valve replacement program should be established that identifies primary valves to be replaced. Condition assessment and operations issues can be used to prioritize which valves should be replaced. Not all valves need to be replaced that are considered secondary, but the primary operation valves that affect significant portions of the water system, customers, safety and health should be a priority. The primary valves could be replaced under full line pressure in order to better control areas for shutdowns to replace additional valves in the shutdown areas. All valves selected should meet AWWA standards and meet pressure class requirements. Any water main replacement projects should always include replacing valves, fire hydrants and water services connected to the water main being replaced.

Water Storage and Pumping Facilities:

The primary and only wholesale location for water supply from Tate Monroe Water Association is at the existing water tower on Water Street. A weak water supply exists with small water mains running north from this location to the SR 133 tank, north of North Street. Bethel has no

pumping facilities and hence all water supply is provided through the one wholesale connection filling both existing tanks.

The Village could have a redundant water supply connection at the appropriate hydraulic location with the primary supply source from Tate Monroe at the Tower Tank. Other locations should be explored that are both advantageous to the Village as well as Tate Monroe. Having two redundant water supply locations each capable to provide the maximum day water demands is necessary. A second wholesale connection further west along the Central water main replacement corridor should be considered along South Ash Street.

The existing Tower Tank capacity of 100,000 gallons is generally marginal for peaking and fire demands that may be required without more water supply capacity from the SR 133 tank. The SR 133 Tank has a 250,000 gallon capacity and is somewhat isolated from high water demand requirements particularly along East and West Plane Street. A stronger water main connection needs to be constructed to allow water flow from the SR 133 tank to be able to support the Tower Tank in the event of an emergency or outage especially along West Plane Street towards the western corporate limits area where the Grant Vocational, Bethel Tate Middle School and other community businesses exist. Higher water demands in this area require the 12 inch water main replacement. A proposed Tower Tank replacement is recommended to match the existing overflow and capacity of the SR 133 tank and to be located generally south and west of the existing Tower Tank.

Water Billing Information:

The Village water billing records for 2011 indicate that there are 1,305 water accounts that the Village manages every day. There are 125 commercial accounts and 1,180 residential accounts. (It was reported that possibly as many as 1,500 meters exist currently)

	Water Services - Meter Sizes				
5/8 inch	3/4 inch	1 inch	1.5 inch	2 inch	3 inch
50	1180	35	28	8	4

Bethel Usage	Inside	Outside
8/2011 to 8/2012	MG	MG
January	5,145	1,808
February	4,158	1,467
March	3,957	1,439
April	4,557	1,853
May	4,555	1,521
June	4,649	1,834
July	4,995	2,082
August	3,624	1,247
September	4,556	1,601
October	***4,336***	1,491
November	4,717	1,656
December	3,868	1,285
Total	**53,117**	**19,284**
	73%	**27%**
Grand Total	**72,401**	**MG**

Water master meter reading through this time period averaged around 228,000 gallons. Total water billed usage was 198.4 MG which results in roughly an estimated water loss of 15%. Leakage is evidenced within the water system which is being addressed through daily operations for repair. Repair operations can only remedy water system infrastructure needs during the expected asset life for the water main or service branch. It is important to consider replacement needs for each water main asset prior to the expiration of the life asset value. Many of the asset values are reaching or exceeding fifty years in age and need to be replaced. A capital water main replacement program that considers the life asset value as well as the operations, community, health, budget and fire safety has been coordinated into one approach described later in this report.

Commercial water usage accounts for 16% of the total water usage, while residential water usage accounts for 84% of the total water usage. Most of the commercial usage exists along SR 125/East and West Plan Street which is about 75% of the total commercial water demand.

The Commercial area does not have sufficient fire water available required meeting the National Fire Protection Association (NFPA) standards. The Insurance Services offices have determined various needed fire flows and compared to actual flow tests at specific locations. The Ten State standards and AWWA sources along with NFPA recommend minimum fire flow amounts for

different types of development and potential fire hazard. Residential areas should have a minimum of 750 gpm at 20 psi and at least 500 gpm at 20 psi where homes are spaced more than 100 feet apart. The minimum fire flows along commercial routes like SR 125 (Plane Street) and SR 133 and 232 can vary from 1,500 to 3,500 gpm at 20 psi. Most of Plane Street has needed fire flows for at least 2,500 gpm at 20 psi. The water model was used to determine which mains could best be upgraded to provide the needed fire flows while considering routes to replace older aging infrastructure like 4 and 6 inch cast iron pipes with marginal capability to provide any long term domestic and fire water supply to meet these requirements. These locations in many cases were deficient in water available to fight fires and peaking water demands, especially near the schools and Grant Vocational areas and along Plane Street from Main Street to Kelli Drive. The capital plan at the end of this report addresses specific recommendations to improve water supply as a result of water modeling analysis.

Water Services, Billing, Water Loss and Usage:

The Bethel water system has approximately 1,300 water services with aging water meters. Many of these services have existing water meters that are older than 15 years. Water meters older than 15 to 20 years do under register water usage and can have losses of 30 to 40% of under registered water to customer. If Tate Monroe meters measure the water accurately as they state through annual calibration of the master meters, the Village is literally providing free water to the community without a regular meter replacement program. *A water loss analysis with a top down approach in accordance with AWWA M36 manual should be completed to verify all types of water losses both real and apparent losses.*

Recently, about 300 meters have been replaced with new meters by utility maintenance forces. These meters are measuring more accurate water flows and will improve the revenue stream for the water system. Water loss is shown as increasing from expected standards of 10% or less and should be reviewed.

Water Billing and Consumption:

Michelle Price maintains the meter books and billing data. Initial usage data provided from her office shows water usage or consumption at 72.4 million gallons from August 2011 to August 2012. This annual metered sales shows an average day usage of 198,400 gallons.

Water services are installed using polyethylene piping materials instead of copper service. Due the high cost of copper at ten times that of polyethylene, the Village has maintained quality water service branch materials. However, insuring proper embedment of plastic piping materials in tamped granular fill is a concern for the future increasing operational costs.

Water Rates:

Water rates for residential customers for first 2000 gallons are $18.20 inside the corporate limits. This is also the minimum charge per month. The next 1000 gallons is charged at a rate of $9.90. Water rates for residential customers for first 2000 gallons are $19.60 outside the corporate limits. This is also the minimum charge per month. The next 1000 gallons is charged at a rate of $10.10. Water rates overall in accordance with the AWWA annual survey of 2010 puts the water rates in the top 25% bracket for the Village when compared across the state. A water rate study coupled with a water loss analysis and continued meter replacements could determine areas of revenue enhancements.

Bethel Rules and Regulations:

The adopted rules and regulations under Ordinance No. 1592 are generally sufficient for water operations, control and management of the water system.

- All buildings or locations for water service including municipal operations should have metered water service for accountability of water supply even if no charge is rendered for service, including fire service lines with detector check meters minimally required to prevent theft and misuse of water supply.
- The applicant desiring water service needs to provide the water demand required based on AWWA standards and verified with flow tests in the field by the Village as to availability.
- A water availability process should be established to insure sufficient water supply at specific locations that meets expected demands at various required water system pressures. Water main replacements, upgrades and or loops could be required.
- A backflow survey should be required for any non-residential customer to insure compliance with OEPA regulations.
- Automated meter reading devices could be installed for digital capture of water usage meter readings with date and time to minimize meter reading errors and reducing adjusted bills.

- For new customers, a system fee could be determined and charged for connection to water system. This fee is separate from the tap in fee on the cost to install the water service branch from water main to property line.
- Any new water customer must execute a water user agreement in accordance with rules and regulations of the Village. The Engineer can provide a water user agreement for consideration by the Village.
- All temporary water service requests must be made by application with a flat fee charged based on estimated time of usage.

Findings and Recommendations:

Below are some recommendations and findings for review by the Village staff. BCI stands ready to follow up on any of these recommendations with further details and background. Many of these recommendations are discussed within the body of this report.

1. A priority recommendation is to replace existing water mains for a proposed 12 inch water main in West Plane Street from Main Street to Bethel Tate Middle School area. The existing water main is restricted from providing sufficient fire water to meet required fire flows as well as hourly peaking water demands. Some transite or asbestos cement pipe along with some cast iron pipe in locations is recommended for replacement as part of this general upgrade to improve water supply for domestic as well as fire flows.

   Recommendation: The existing water mains in West Plane Street should be replaced to increase capacity for maximum day demands and fire flow requirements.

2. No directional flushing program has been developed. No seasonal flushing has been utilized on a regular basis. The fire department flushes fire hydrants for freezing and operations purposes. The Village does flush dead end water mains for water turnover as well as water services due to repair activity or customer complaints.

   Recommendation: The Village should develop a flushing program that operates valves and flushes water system from source to system extremities. A flushing plan can be developed quickly now considering hydraulics from water analysis.

3. Valve maintenance program does not exist. Establishing primary valve operations for emergency situations and maintaining these valves is vital to safe and reliable water supply.

   Recommendation: The Village should identify primary and secondary valves. All primary valves should be operated on an annual basis, while secondary valves can be operated every 3 to 5 years. Transmission water supply for maximum day and fire flow scenarios must be considered between water tanks, sources of supply and customer needs in general. A planned schedule can be followed to reduce emergency costs and impacts on water customers. Many of the primary valves should be considered as part of a valve replacement project to improve operations and control of system and liability.

Breaks and Leaks:

The water system experiences about 4 to 6 leaks or breaks per year with many leaks reported on water mains, services and meters. Operations and maintenance records could not be found with little discoverable information on water main breaks, leaks, valve repairs, fire hydrants, etc.

Macedonia Road has had recent water main leakages. Currently, water leakage exists on some services along Rich Road. Operations staff has described a number of water service leaks and breaks on existing water services, meters, water mains of various types and sizes. The general sense from operations is an increasing rate of leaks and breaks within the water system. Providing data analysis and setting priority replacements based on engineering criteria is crucial to maintain the adequacy of the water system for the long term.

A water outage policy should be established that insures customers that water will be back in service within 8 hours. Notifications will be provided for scheduled water outages for repair activities, while emergency notifications will be done as quickly as the Village can respond.

Work Order Repair Report:

The water operations area could utilize a work order repair report that fully documents water main breaks and leaks (See attached). Existing condition assessment information could be included like type of break, location and duration of break or leak. These events can be linked

with GPS coordinates to be able to plot and review breaks and trend patterns within the BCI created ESRI ArcView record mapping.

Recommendation: The Village can work with BCI to develop an ESRI ArcView database and mapping system that contains all water system features and attributes. This GIS system could utilize ArcPad field devices for easy GPS mapping of water mains, services, fire hydrants, meters, etc. along with updates, operations and repairs completed in the field.

Implement WTP Usage For Peaking Using Available Groundwater:

The Village could explore options for a ground water source in the area of the treatment plant. The state well logs indicate some potential ground water sources that could be used to supply the water treatment plant. Water supply from ground water sources in general require less advanced treatment, typically iron removal and disinfectants with pH monitoring for stability.

SCADA and Monitoring Water System:

The Village maintains telemetry for Tower Tank and we believe the SR 133 Tank. However, telemetry at the SR 133 tank was not available for review at this time as to status and whether both tanks are utilized together for streamlined operations. Water turnover at the second tank is a concern with the water source supply from Tate Monroe supplying water at the Tower Tank location only.

Recommendation: A replacement SCADA system should be implemented to monitor flows and pressures at two water supply locations from Tate Monroe. The system should also monitor tank flows in and out as well as gradient changes throughout the day. This proposed SCADA system should use an off the shelf product such as Wonderware that is a windows based system for easy use from a laptop.

Water tower daily operations should be monitored from one location, preferably from the Operations facilities on Tower Alley. Both tanks should have control valves for operations for each tank. Daily usage and water turnover in the tank should be planned as part of an operations manual for these tanks. Also, the emergency connection on Macedonia Road and the primary wholesale water supply connection at Tower Alley should be included at the centralized monitoring location at the Operations facilities on Tower Alley. The future second wholesale water supply connection should be included as well.

Water Supply Operations - Tower Alley Tank

Water supply is received through a master meter with Tate Monroe at Tower Alley Tank. Water flows to the existing Tower Water Tank (100,000 gallon capacity) with an altitude control valve. Water flows in and out of this tank through Bethel's existing 8 inch cast iron water main to the west and a Bethel existing 8 inch asbestos water main to the east. The existing 8 inch valve on the east leg had broken stem and gates that were removed in 2010 which now leaves the valve as a non-operational open valve. These two water mains provide water supply for the entire Village service area. The existing tank has an operating range of 10 to 14 feet with an overflow elevation of 1009 feet. A new 8 inch valve was installed on the discharge side of the master meter that feeds the existing tank. This tank was repainted in October 2010.

Recommendation: The Tower Tank should be considered for replacement to improve system storage capability, operations, turnover and location to better serve the changing Village since the 1930's when this tank was first constructed. A 250,000 gallon elevated tank to match the SR 133 tank is desired in a south west location from the existing location.

Water Supply Operations - State Route 133 Tank

A second elevated water tank exists on State Route 133 that was constructed in 1968 after the Tower Alley Tank. This tank provides water supply for daily use as well as peaking and fire flow in the northern portion of the water system. The tank has a capacity of 250,000 gallons with altitude control valve and has an overflow of 1009 feet. The operating range is about 25 feet.

Though this tank exists in Tate Township, portions of the township have been served by the Village for a long time and continue to this day. Records were not available for any existing water contracts between the County, Tate Township or the Village about retail water service outside the Village limits.

Both water tanks are controlled by telemetry devices monitoring tank level in feet of elevation. The Village has purchased a Wach's machinery trailer to assist in operations, repair and maintenance. This piece of equipment does have GPS abilities for future use that can be used to locate each and every water main break for capture digitally time, location and break and include on the ESRI ArcView maps.

Water Distribution System Operations:

The water system is maintained by Public Works team lead by Mitch Hatfield. Jerry Whitacre is the water operator. Brian Cheshire has been on board for about a year and has focused on meter replacement program and operation and maintenance of water system.

Water system pressures range from 50 to 75 psi with maximum pressures and at some locations water pressure is just under 100 psi.

Many fire hydrants are out of service or missing. It is crucial that an assessment of fire hydrant locations and condition be completed in coordination with Insurance Service Offices and local fire authority. A proposed capital plan included with this report should address the deficiencies in fire flow requirements and many of the aging infrastructure high operations water mains.

Recommendation: A fire hydrant maintenance and replacement program should be established with yearly investments necessary to maintain all fire hydrants in good working order and with asset life limits determined develop a replacement strategy as required.

Water main breaks and leaks average about 2 to 4 per year and higher in some years. With the recent change in water supply from surface water to ground water, more consistent water temperatures have reduced the breakage of some water mains. Aging infrastructure and loss of asset life causes the department to increase water rates and debt financing to replace assets in a timely manner without incurring out of control operations expenses. With water main asset life expected to be a minimum of 50 years, water mains should be replaced at a 2% rate per year or approximately 4,000 feet per year.

Water services are more frequent causes for water system breaks and leaks. In one case on Rich Road, 2-4 breaks and leaks occurred in one year. Water services should be replaced along with a selected water main for replacement from water main to property line.

Many valves in the water system are in need of repair and replacements. When a water main break occurs, sometimes the valves do not hold and cause more valves to be involved in the water shutdown affecting more Village residents than what should be expected. A preventative valve maintenance program for primary valves would alleviate many unexpected valve failures.

Valves should be replaced like fire hydrants and services as part of a water main replacement project.

Capital Planning, Master Plan and Financing:

Bethel does not have a current distribution water system master plan of record. This evaluation study attempts to address master plan needs for water system over the next 10 to 20 years with hydraulic modeling, fire flow and system analysis in a brief and general manner. A master plan analyses the following types of data. Many of these tasks listed have been considered as part of this evaluation study in order to provide recommendations, findings and future steps to take.

- Population projections and potential growth in water system can be determined from area sources in Clermont County, OKI Regional Council and the Census Bureau.
- Track and block water demands can focus on specific areas of concern for needed water main upgrades.
- Employment data can be used to track water usage along with OKI traffic analysis zones. These types of water demand can be included in the water model to provide projections for water demand for a design period of typically 20 years.
- Land use, zoning records, planned street improvements and future potential developments should be input into water model for analysis.
- Water requirements and review of billing records as to daily and diurnal water demand patterns will be determined.
- Reviewing historic water trends and usage patterns will assist in predicting future water supply direction.
- Peaking demand factors that match the water projections will determine future water demand requirements.
- The Insurance Services Offices reports on available and needed fire flows are critical for sizing water mains.
- Hydraulic profiles test using actual flow testing on existing fire hydrants will be used to calibrate the water system model for verified accuracy and results.

The Village has upgraded many of the old four inch water mains over the past twenty years. A water main replacement project occurs on average about once in 10 years which is not enough to meet the rapidly declining asset life values. A coordinated master plan including Tate Monroe could identify areas that could be better served by Bethel directly. **At the recommended water main replacement rate, the Village needs to replace about 40,000**

feet every ten years. BCI recommends that an annual capital replacement program be established to manage the distribution assets primarily. The water supply and tanks should be included as well in the program to maintain the life asset values for these assets.

The first priority should be to reinvest back into the water system each year. A water main has an expected life of 20 to 100 years depending on the type of piping materials, construction methods and specifications used for installation. If you figure that the typical water system asset has a life of 50 years on average for area utilities, then 2% of the water mains and related appurtenances, valves, fire hydrants and services must be replaced each year.

The Bethel water system should be replacing about 4000 feet each year of water mains, fire hydrants and water services. **Currently, the best approach is to use debt financing at less than 2% interest rates typically through OEPA, OWDA, or OPWC. These infrastructure replacements usually get assistance with principal forgiveness or grants typically of 20 to 40% recently. BCI has developed a basic water model and provided a specific capital replacement plan that meets this goal and invests into the water system so as to maintain control of operations costs, meet replacement requirements and improve customer service.**

The capital replacement program budget for each year is expected to be $400.000. This level of investment secures expected reinvestment into the water system while maintaining asset life. In order to sustain the water system, additional revenues may be required to support and manage the necessary water main replacement program. The proposed capital replacement and improvement program that has been included as part of this study averages $323,400 in replacement costs annually over the next 10 years.

After significant review of water system assets, the following suggested water main replacement plan should be considered for the upcoming year. Providing redundancy at transmission level (8 inch water mains between the two tanks) and water supply for improved daily peak and fire flow is required. Fire flow capacities need to increase for ISO to improve fire ratings for the Village. The below capital replacement projects include fire hydrants, water services, engineering and construction related expenses.

Capital Replacement Program (Ten Years):

The water system in general is undersized to meet today's water transmission water supply and needed fire water supply to meet insurance services and fire department requirements as well as summer peaking demands in parts of the water system. The key initial projects are described below in general. The water model options map follows the project listings.

1. Plane Street needs to upgrade to a 12 inch water main size at the north and south arteries in Union, Ash and Main Streets which will significantly improve north south transmission while replacing the oldest cast iron water mains that have very little capacity and future asset life remaining.

2. A transmission water main should be installed to connect the two elevated water tanks. The routes for this north side connection along Main Street (SR 133) could be aligned to replace older 4 inch cast iron left in Ash Street and then back to Main Street to Plane Street. Providing this direct connection will improve flow capabilities between the tanks while improving the fire flow deficiencies along Main Street from Plane Street to Bone Alley.

3. A transmission water main should be installed along South Ash Street and Easter/South Street area to replace old cast iron while improving water supply in a larger region with a transmission water supply that not only betters these streets water supply but all the streets that are connected to this transmission water supply

4. Loops need to be constructed as shown in the capital improvement plan to strengthen water supply and fire flow. Providing redundant connections and minimizing the number of customers out of water service are chief goals for these water main loops as well. A review of these alignments infers reasonable access to acquiring easements.

5. Much of the old 4 inch water main has been replaced; however, the existing 6 and 8 inch cast iron have lost significant capacity capability and should be considered for replacement. Water main work orders and repairs indicate that the cast iron is pitted and has become restricted internally for conveying continued water supply.

6. A general move to eliminate transite pipe over time are recommended approaches that meet OEPA standards and requirements as well as strong system hydraulics for water supply, fire protection and water quality turnover in the water system.

7. The existing Tower Tank should be replaced with a new 250,000 gallon tank matching gradient overflow with the SR 133 tank. This proposed tank should be located further west and south for its existing location possibly utilizing a second wholesale connection with Tate Monroe as part of the Project A water main replacement project.

8. Other recommendations have been included within this report including a new SCADA system, valve and fire hydrant replacement program, GIS ESRI mapping of water system with field update capability and flushing programs, such as directional flushing per AWWA standards.

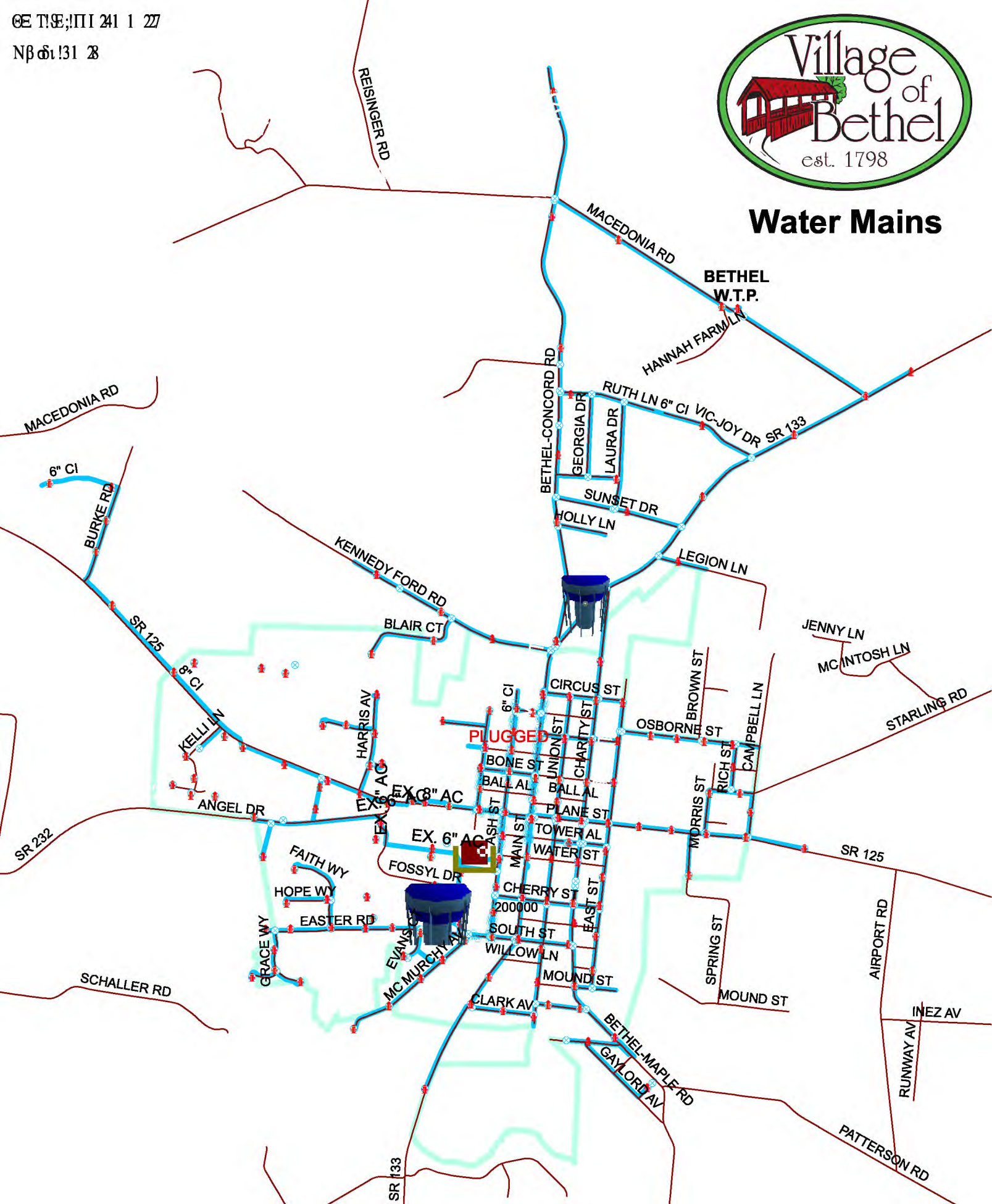
Bethel, Ohio Water System Capital Replacement Program

10-Jan-13

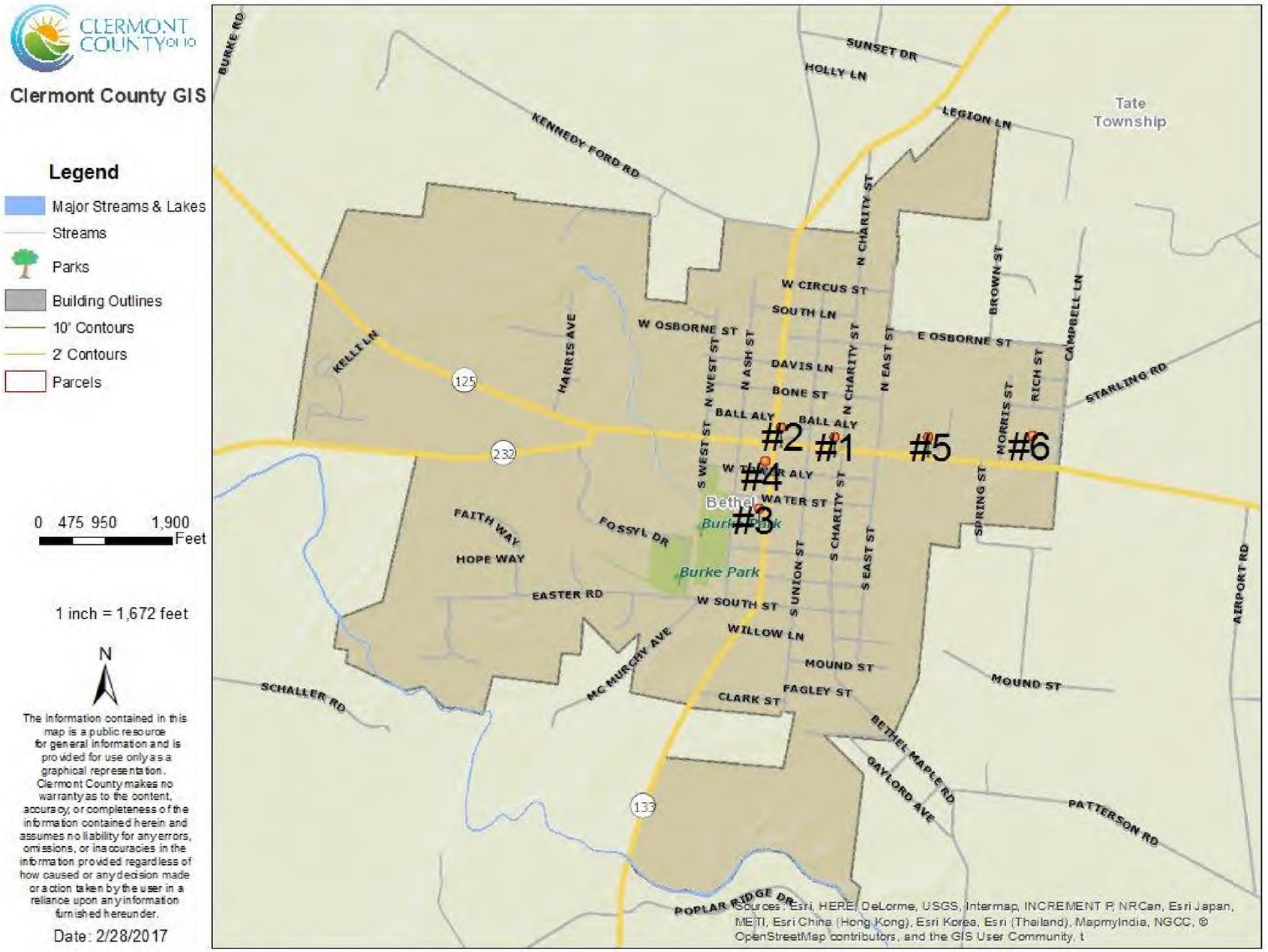
CIP Year	Name	Street	Limits	Size (inch)	Length (feet)	Line Cost	Project Cost
2014	**Project A**						
		S. Main Street	W. Tower to Plane Street	12	500	$ 62,500	
		W. Tower Alley	S. Main to S, Ash Streets	8	600	$ 66,000	
		S. Ash Street	W. South to Plane Street	8	2,600	$ 286,000	
		West Plain Street (SR 125)	Main Street to Water Street	12	1,200	$ 150,000	
							$ 564,500
2015	**Project B**						
		West Plain Street (SR 125)	Water Street to SR 232	12	2,000	$ 250,000	
		West Plain Street (SR 125)	SR 232 to Bethel Tate School	12	1,600	$ 200,000	
							$ 450,000
2016	**Project C**						
		N. Main Street	W. Circus to South Lane	8	450	$ 49,500	
		South Lane	N. Main to N. Ash Streets	8	500	$ 55,000	
		N. Ash Street	South to W. Bone Alley	8	1,200	$ 132,000	
		W. Bone Alley	N. Water to N. Main Streets	8	1,100	$ 121,000	
		N. Water Street	W. Plane to W. Bone Streets	8	800	$ 88,000	
		N. Main Street	W. Plane to W. Bone Streets	8	800	$ 88,000	
							$ 357,500
2017	**Project D**						
		W. Bone Alley	N. Main to North East Streets	8	1,600	$ 176,000	
		N. Charity Street	E. Plane to E. Bone Street	8	800	$ 88,000	
							$ 264,000
2017	**Project E**						
		W. Plane Street	Bethel Tate School to Kelli Lane	12	2,200	$ 275,000	
							$ 275,000
2018	**Project F**						
		Faith Way Loop	Faith Way to Spur off SR. 232	8	750	$ 82,500	
							$ 82,500
2018	**Project G**						
		SR 232 Loop	SR 232 to Kelli Lane	8	1,200	$ 132,000	
							$ 132,000
2018	**Project H**						
		E. Plane Street	N. Main to North East Streets	12	1,700	$ 212,500	
							$ 212,500
2019	**Project I**						
		E. Plane Street	North East to Morris Streets	8	1,800	$ 216,000	
							$ 216,000
2019	**Project J**						
		S, Union Street	E. Plane To E. South Streets	8	2,500	$ 300,000	
							$ 300,000
2020	**Project K**						
		W and E. South Street	S. Ash to S. Charity Streets	8	1,700	$ 204,000	
		Easter/W. South Streets	Evans to S. Ash Street	8	1,500	$ 180,000	
							$ 384,000
			Total Cost over 7 to 10 Years				**$3,238,000**

DRS/final

X:/2012 Projects/Bethel Water Evaluation 130130 drs 12076


Village of Bethel
est. 1798
Water Mains
BETHEL W.T.P.
REISINGER RD
MACEDONIA RD
HANNAH FARM LN
BETHEL-CONCORD RD
GEORGIA DR
LAURA DR
RUTH LN 6" CI
VIC-JOY DR
SR 133
SUNSET DR
HOLLY LN
LEGION LN
KENNEDY FORD RD
BLAIR CT
BURKE RD
6" CI
SR 125
KELLI LN
ANGEL DR
SR 232
HARRIS AV
EX. 6" AC
PLUGGED
CIRCUS ST
UNION ST
CHARITY ST
BROWN ST
OSBORNE ST
CAMPBELL LN
JENNY LN
MC INTOSH LN
STARLING RD
BONE ST
BALL AL
PLANE ST
TOWER AL
WATER ST
CHERRY ST
200000
SOUTH ST
WILLOW LN
MOUND ST
CLARK AV
MAIN ST
ASH ST
EAST ST
MORRIS ST
RICH ST
SPRING ST
AIRPORT RD
INEZ AV
RUNWAY AV
GAYLORD AV
BETHEL-MAPLE RD
PATTERSON RD
FOSSYL DR
FAITH WY
HOPE WY
EASTER RD
GRACE WY
EVANS CT
MC MURCHY AV
SCHALLER RD
SR 133

Village of Bethel Lead Survey Locations



#1	101 W Plane Street
#2	235 W Plane Street
#3	231 S Main Street
#4	137 S Main Street
#5	245 E Plane Street
#6	330 E Plane Street

This survey was conducted in February 2017 on the six oldest properties in the Village of Bethel. None were found to have lead service lines. No lead service lines are known to exist in the Village of Bethel.

Buildings in Ohio built prior to 1998 or that use plumbing material or solder manufactured before 1998 may have materials with greater than 8% lead and are at a higher risk of contributing lead to the drinking water than materials manufactured after 1998. In addition, buildings built and plumbing materials manufactured after 2014 were required to have less than 0.25% lead by weight and have the lowest risk for contributing lead to the drinking water. It should be noted however that, although prohibited, some use of leaded solder or leaded components may have occurred after the prohibitions became effective.

VERIFICATION FORM FOR COMMUNITY PUBLIC WATER SYSTEMS CLAIMING NO LEAD SERVICE LINES

The owner or operator of all community public water systems must identify and map areas of their distribution system that are known or are likely to contain lead service lines. Systems must submit a copy of the applicable map to the Ohio Department of Health and the Ohio Department of Job and Family Services. Systems must also submit a report to the director containing at least both of the following: (1) The applicable map with narrative, and (2) A list of sampling locations used to collect samples as required by Ohio Revised Code (ORC) Section 6109.121 and any rules adopted thereunder, including contact information for the owner and occupant of each sampling site.

Should a water system determine no lead service lines exist in their distribution system, they must provide information stating they reviewed, at the minimum, historical permit records and local ordinances, distribution maintenance records and information pertaining to installation dates or materials for all services lines. This information must be verified below.

I HEREBY CERTIFY THAT THE FOLLOWING METHOD(S) WERE USED TO DETERMINE NO LEAD SERVICE LINES EXIST IN THIS WATER SYSTEM'S DISTRIBUTION SYSTEM, AS REQUIRED BY ORC 6109.121(F):

LEAD SERVICE LINE VERIFICATION
This PWS states they have no lead service lines and has reviewed the following information (select one or more of the following): ☒ Historical permit records and/or local ordinances ☒ Distribution maintenance records (i.e. meter replacement, waterline break repairs) ☒ Information pertaining to installation dates for all service lines (i.e. after 1986 when lead services lines were banned) ☐ Service line material of all service lines is known (i.e. all service lines are known to be PVC)

Brian G Cheshire 2-22-2017
Signature of Responsible Person Date

Brian G. Cheshire Water Superintendent
Printed Name and Title of Responsible Person

PWS NAME: Village of Bethel
PWS ID: OH 1300116
COUNTY: Clermont

For Ohio EPA use only:

Date Verification Rec'd: _____