Project Plan

City of Kalamazoo FY 2020
Drinking Water Project Plan

Prepared for
City of Kalamazoo

April 2019
2180551
Contents

1 Richland Township Water Mains ........................................................................................................ 7
  1.1 Project Background .................................................................................................................. 7
      1.1.1 Delineation of Study Area .......................................................................................... 7
      1.1.2 Land Use ................................................................................................................. 7
      1.1.3 Population Projections .............................................................................................. 7
      1.1.4 Water Demand and Existing Facilities ....................................................................... 7
      1.1.5 Summary of Project Need .......................................................................................... 8
  1.2 Analysis of Alternatives .......................................................................................................... 8
      1.2.1 Routing Options ......................................................................................................... 8
      1.2.2 Method of Construction ............................................................................................ 9
      1.2.3 Pipe Material .............................................................................................................. 9
      1.2.4 Water Services ......................................................................................................... 10
      1.2.5 No Action ................................................................................................................. 11
      1.2.6 Optimum Performance of Existing Facilities ............................................................ 11
      1.2.7 Regional Alternatives ............................................................................................... 11
  1.3 Principal Alternatives ........................................................................................................... 11
  1.4 Selected Alternative ............................................................................................................. 11
      1.4.1 Design Parameters .................................................................................................... 11
      1.4.2 Maps ........................................................................................................................ 12
      1.4.3 Schedule ................................................................................................................... 12
      1.4.4 Cost Estimates .......................................................................................................... 12
      1.4.5 Users Costs ............................................................................................................. 12
      1.4.6 Disadvantaged Community ...................................................................................... 13
      1.4.7 Ability to Implement the Selected Alternatives .......................................................... 13
  1.5 Environmental Evaluation .................................................................................................... 14
      1.5.1 Historical/Archaeological/Tribal Resources ................................................................. 14
      1.5.2 Water Quality ............................................................................................................ 14
      1.5.3 Land/Water Interface ................................................................................................. 14
      1.5.4 Endangered Species ................................................................................................. 14
      1.5.5 Agricultural Land ..................................................................................................... 15
      1.5.6 Social/Economic Impact ............................................................................................ 15
1.5.7 Construction/Operational Impact ................................................................. 15
1.5.8 Indirect Impacts ............................................................................................ 16
1.6 Mitigation Measures ......................................................................................... 17
  1.6.1 Short Term Construction Related Mitigation .............................................. 17
  1.6.2 Traffic Disruption ....................................................................................... 17
  1.6.3 Dust and Noise ........................................................................................... 18
  1.6.4 Soil Erosion ............................................................................................... 18
  1.6.5 Water Service Disruption .................................................................. 18
  1.6.6 Potential Loss of Wildlife / Habitat ......................................................... 18
  1.6.7 Mitigation of Indirect Impacts ................................................................. 18
1.7 Public Participation .......................................................................................... 19
  1.7.1 Formal Public Hearing ........................................................................... 19
  1.7.2 Adoption of Project Plan ......................................................................... 20
2 Cooper Township Water Mains ......................................................................... 21
  2.1 Project Background ..................................................................................... 21
    2.1.1 Delineation of Study Area .................................................................... 21
    2.1.2 Land Use ............................................................................................... 21
    2.1.3 Population Projections ......................................................................... 21
    2.1.4 Water Demand and Existing Facilities ................................................. 22
    2.1.5 Summary of Project Need .................................................................... 22
  2.2 Analysis of Alternatives ............................................................................... 23
    2.2.1 Routing Options .................................................................................... 23
    2.2.2 Method of Construction ....................................................................... 23
    2.2.3 Pipe Material ......................................................................................... 24
    2.2.4 Water Services ....................................................................................... 25
    2.2.5 No Action ............................................................................................. 25
    2.2.6 Optimum Performance of Existing Facilities ..................................... 25
    2.2.7 Regional Alternatives .......................................................................... 25
  2.3 Principal Alternatives ................................................................................... 26
  2.4 Selected Alternative .................................................................................... 26
    2.4.1 Design Parameters ................................................................................. 26
    2.4.2 Maps ....................................................................................................... 26
    2.4.3 Schedule ................................................................................................. 26
    2.4.4 Cost Estimates ...................................................................................... 27
2.4.5 Users Costs ............................................................................................................... 27
2.4.6 Disadvantaged Community ...................................................................................... 27
2.4.7 Ability to Implement the Selected Alternatives ....................................................... 28

2.5 Environmental Evaluation .......................................................................................... 28
   2.5.1 Historical/Archaeological/Tribal Resources .......................................................... 28
   2.5.2 Water Quality ........................................................................................................... 28
   2.5.3 Land/Water Interface ............................................................................................. 29
   2.5.4 Endangered Species ................................................................................................. 29
   2.5.5 Agricultural Land ...................................................................................................... 29
   2.5.6 Social/Economic Impact ........................................................................................... 29
   2.5.7 Construction/Operational Impact ........................................................................... 30
   2.5.8 Indirect Impacts ....................................................................................................... 30

2.6 Mitigation Measures ................................................................................................... 32
   2.6.1 Short Term Construction Related Mitigation ......................................................... 32
   2.6.2 Traffic Disruption ..................................................................................................... 32
   2.6.3 Dust and Noise ......................................................................................................... 32
   2.6.4 Soil Erosion ............................................................................................................... 32
   2.6.5 Water Service Disruption ......................................................................................... 32
   2.6.6 Potential Loss of Wildlife / Habitat .......................................................................... 32
   2.6.7 Mitigation of Indirect Impacts ................................................................................. 33

2.7 Public Participation ..................................................................................................... 33
   2.7.1 Formal Public Hearing .......................................................................................... 33
   2.7.2 Adoption of Project Plan ........................................................................................ 33

3 City of Parchment – Glendale Water Main Replacement .............................................. 35
   3.1 Project Background ................................................................................................... 35
      3.1.1 Delineation of Study Area ..................................................................................... 35
      3.1.2 Land Use ............................................................................................................... 35
      3.1.3 Population Projections ........................................................................................ 35
      3.1.4 Water Demand and Existing Facilities ................................................................. 35
      3.1.5 Summary of Project Need .................................................................................... 36

   3.2 Analysis of Alternatives .......................................................................................... 36
      3.2.1 Routing Options .................................................................................................... 36
      3.2.2 Method of Construction ....................................................................................... 36
      3.2.3 Pipe Material ......................................................................................................... 37
3.2.4 Water Services ................................................................. 38
3.2.5 No Action .............................................................................. 38
3.2.6 Optimum Performance of Existing Facilities ......................... 38
3.2.7 Regional Alternatives ............................................................. 38
3.3 Principal Alternatives ................................................................. 39
3.4 Selected Alternative ................................................................. 39
  3.4.1 Design Parameters .................................................................. 39
  3.4.2 Maps ................................................................................ 39
  3.4.3 Schedule ........................................................................... 39
  3.4.4 Cost Estimates ...................................................................... 40
  3.4.5 Users Costs ........................................................................ 40
  3.4.6 Disadvantaged Community .................................................... 40
  3.4.7 Ability to Implement the Selected Alternatives ....................... 41
3.5 Environmental Evaluation ......................................................... 41
  3.5.1 Historical/Archaeological/Tribal Resources .............................. 41
  3.5.2 Water Quality ...................................................................... 41
  3.5.3 Land/Water Interface ............................................................ 42
  3.5.4 Endangered Species ............................................................. 42
  3.5.5 Agricultural Land ................................................................. 42
  3.5.6 Social/Economic Impact ......................................................... 42
  3.5.7 Construction/Operational Impact ........................................... 42
  3.5.8 Indirect Impacts ................................................................... 43
3.6 Mitigation Measures ................................................................. 44
  3.6.1 Short Term Construction Related Mitigation ......................... 44
  3.6.2 Traffic Disruption ................................................................. 45
  3.6.3 Dust and Noise ................................................................... 45
  3.6.4 Soil Erosion ......................................................................... 45
  3.6.5 Water Service Disruption ....................................................... 45
  3.6.6 Potential Loss of Wildlife / Habitat ....................................... 45
  3.6.7 Mitigation of Indirect Impacts ................................................ 46
3.7 Public Participation ................................................................. 46
  3.7.1 Formal Public Hearing .......................................................... 46
  3.7.2 Adoption of Project Plan ......................................................... 46
4 City of Kalamazoo – Lead Water Service Replacement ............... 48

Prein&Newhof
4.1 Project Background ........................................................................................................ 48
  4.1.1 Delineation of Study Area .................................................................................. 48
  4.1.2 Land Use ............................................................................................................ 48
  4.1.3 Population Projections ...................................................................................... 48
  4.1.4 Water Demand and Existing Facilities .............................................................. 48
  4.1.5 Summary of Project Need .................................................................................. 48

4.2 Analysis of Alternatives ............................................................................................ 49
  4.2.1 Routing Options ............................................................................................... 49
  4.2.2 Method of Construction ................................................................................... 49
  4.2.3 Pipe Material for Water Services ..................................................................... 50
  4.2.4 No Action ........................................................................................................ 50
  4.2.5 Optimum Performance of Existing Facilities .................................................. 50
  4.2.6 Regional Alternatives ....................................................................................... 50

4.3 Principal Alternatives .............................................................................................. 50

4.4 Selected Alternative ............................................................................................... 51
  4.4.1 Design Parameters ........................................................................................... 51
  4.4.2 Maps ................................................................................................................ 51
  4.4.3 Schedule .......................................................................................................... 51
  4.4.4 Cost Estimates ................................................................................................. 51
  4.4.5 Users Costs ...................................................................................................... 52
  4.4.6 Disadvantaged Community ............................................................................. 52
  4.4.7 Ability to Implement the Selected Alternatives .............................................. 52

4.5 Environmental Evaluation ....................................................................................... 53
  4.5.1 Historical/Archaeological/Tribal Resources .................................................... 53
  4.5.2 Water Quality .................................................................................................. 53
  4.5.3 Land/Water Interface ...................................................................................... 53
  4.5.4 Endangered Species ....................................................................................... 53
  4.5.5 Agricultural Land ............................................................................................ 54
  4.5.6 Social/Economic Impact .................................................................................. 54
  4.5.7 Construction/Operational Impact .................................................................... 54
  4.5.8 Indirect Impacts ............................................................................................... 55

4.6 Mitigation Measures ............................................................................................... 56
  4.6.1 Short Term Construction Related Mitigation ................................................ 56
  4.6.2 Traffic Disruption ........................................................................................... 56
4.6.3 Dust and Noise .............................................................................................................................56
4.6.4 Soil Erosion ..................................................................................................................................57
4.6.5 Water Service Disruption ..............................................................................................................57
4.6.6 Potential Loss of Wildlife / Habitat ..............................................................................................57
4.6.7 Mitigation of Indirect Impacts .......................................................................................................57
4.7 Public Participation ..........................................................................................................................58
  4.7.1 Formal Public Hearing ................................................................................................................58
  4.7.2 Adoption of Project Plan .............................................................................................................58

Figures
Figure 1 PFOA & PFAS Sampling Results in Richland Township
Figure 2 Map of Proposed Project Areas
Figure 3 Richland Township Zoning/Land Use Map
Figure 4 Project Area and Proposed Water Mains in Richland Township
Figure 5 Project Area and Proposed Water Mains in Cooper Township
Figure 6 Cooper Township Zoning/Land Use Map
Figure 7 PFAS Sampling Results in Cooper Township
Figure 8 PFAS Sampling Results in Cooper Township and City of Parchment
Figure 9 Project Area and Proposed Water Main in City of Parchment
Figure 10 City of Parchment Zoning/Land Use Map
Figure 11 Project Area and Proposed Water Service Replacement in City of Kalamazoo
Figure 12 City of Kalamazoo Zoning/Land Use Map

Appendices
Appendix A Richland Water Extension Modeling Summary
Appendix B Project Costs
Appendix C Annual Cost Summary
Appendix D SHPO and Tribal Communications
Appendix E Public Hearing Communications
Appendix F Public Hearing Sign-in Sheets
Appendix G Project Plan Resolution
Appendix H Parchment/Cooper Modeling Summary
1 Richland Township Water Mains

1.1 Project Background

An investigation into PFAS in Richland Township started in April of 2018, when an effluent sample associated with the groundwater pumping system at the former Production Plated Plastics facility on East D Avenue (Figure 1) indicated PFAS levels higher than the lifetime advisory of 70 ppt. Residential well sampling commenced immediately with an initial sampling set of 29 wells. Those residents with wells returning results over the 70 ppt advisory limit were provided bottled water immediately. Since then, the investigation area has expanded. The PFAS investigation is being led by a coalition of the Kalamazoo County Health and Community Services Department, the Michigan Department of Health and Human Services, and the Michigan Department of Environmental Quality. Richland Township and Kalamazoo County maintain their websites with weekly updates of the investigation. MDEQ representative Nathan Whitmyer is the primary point of contact for the investigative effort/findings.

1.1.1 Delineation of Study Area

The project area lies southwest of Gull Lake in Kalamazoo County and is illustrated in Figure 2. The investigation area illustrated in Figure 1 is approximately bounded on the west by North 34th Street, on the south by Greer Drive, on the east by a line coincident with North 36th Street, and on the north by East C Avenue.

1.1.2 Land Use

The current zoning map is shown in Figure 3. The area affected is primarily residential with Commercial Zoning along the M-89 corridor. The Township does not have any other proposed uses for Master Planning purposes.

1.1.3 Population Projections

Per the 2016 City of Kalamazoo Water Reliability Study (WRS), the current population to be served by the FY 2020 DWRF water mains is 89 people. The WRS 10 year projection was 92 people and the 20 year projection was 95 people.

1.1.4 Water Demand and Existing Facilities

The City of Kalamazoo provides all the public water for the southwest area of Richland Township. A comprehensive review of the existing City of Kalamazoo water system is
contained in the 2016 City of Kalamazoo Water Reliability Study. Various water main extensions in this area of Richland Township were modeled to ensure adequate supply for the entire area. A summary of findings based on the modeling results is included in Appendix A.

1.1.5 Summary of Project Need

1.1.5.1 Standards Compliance and Reliability

There is currently no potable municipal water supply in the area of Richland Township affected by the PFAS contamination. The City of Kalamazoo water system is currently in compliance with all drinking water standards and has the capacity to serve the affected area in Richland Township.

1.1.5.2 Orders of Enforcement Action

There are currently no orders of enforcement in place for the City of Kalamazoo water system.

1.1.5.3 Drinking Water Quality Problems

The proposed project is required to provide potable water to that area of Richland Township currently known to be affected by PFAS contamination above advisory levels as shown in Figure 1. There are 36 residential water wells currently identified as impacted by the PFAS contamination. The PFAS investigation is being led by a coalition of the Kalamazoo County Health and Community Services Department, the Michigan Department of Health and Human Services, and the Michigan Department of Environmental Quality. MDEQ representative Nathan Whitmyer is the primary point of contact for the ongoing investigative effort/findings.

1.1.5.4 Projected Needs for the Next 20 Years

Various water main extensions in this area of Richland Township were modeled to ensure adequate supply for the entire area. A summary of findings is included in Appendix A.

1.2 Analysis of Alternatives

1.2.1 Routing Options

Routing options evaluated were based on the results of the PFAS testing results provided by the MDEQ. Water main extensions, as shown in Figure 4, were chosen which
provided potable water to properties which either currently are affected or may be
affected by the PFAS. System hydraulics and needed looping for system reliability were
also reviewed.

1.2.2 Method of Construction

1.2.2.1 Open Cut

Traditional open cut methods of excavation are used extensively in the West Michigan
area for installation of most underground public utilities. The traffic volumes on many
of the roads are not excessive enough to warrant the generally more expensive
trenchless technologies currently used today. Open cut construction allows the greatest
control of water main depth and alignment. Open cut will be the preferred method of
construction for all the proposed water mains.

1.2.2.2 Directional Drill

Directional drilling is the process of using a small, steer-able steel pipe that is guided
under the soil to create a pilot hole. The pipe is guided by above-grade monitoring
equipment that tracks the depth and location. Once the guided head reaches its location,
the host pipe is attached and pulled back through the pilot hole. Although directional
drilling is not the preferred method for the primary water mains, it is the preferred
method for the proposed water service lines. Small diameter service lines can be
accurately and economically installed via directional drilling.

1.2.3 Pipe Material

Polyvinyl chloride (PVC), Polyethylene (PE), and Ductile Iron (DI) are the three pipe
materials most commonly used for construction of new water main less than 16-inches in
diameter.

1.2.3.1 Polyvinyl Chloride (PVC) Pipe / Polyethylene Pipe

PVC pipe and PE pipe are manufactured from petroleum derivatives, chlorine gas, and
vinyl chloride. PVC pipe and polyethylene pipe are sensitive to impacts like ultraviolet
light exposure and temperature. According to UNIBELL – the nationally recognized
authority on PVC pipe and PE pipe – the impact resistance of PVC pipe and PE pipe is
reduced by approximately 20 percent when exposed to ultraviolet light for extended periods of time.

As flexible pipe, PVC and PE are sensitive to the type of materials used for bedding in the trench. The strength of flexible pipe largely comes from the soil supporting the pipe from the centerline of the pipe and below. This requires close attention to proper compaction of the granular backfill. Without proper compaction, flexible pipe can deflect under the static load of the soil column to the point of bursting. Since PVC pipe and PE pipe are sensitive to installation compared to DI, the cost associated with installation can be higher than ductile iron.

Fittings connecting the PVC pipe materials for pressure application occasionally have separated over time, which can cause breaks and sewage flooding.

PVC and PE are more difficult to locate because current locating technologies rely on magnetic properties of the pipe material. Locating PVC pipe and PE pipe materials requires installation of a tracing wire. It is possible that this wire can be cut or corrode over time, which may make locating the pipe more difficult.

1.2.3.2  Ductile Iron Pipe (DI)

The cost of installing DI may be slightly less than PVC since DI is less dependent on the surrounding soils for its strength. The materials for manufacturing DI are more environmentally friendly than PVC and PE since it is made from recycled steel.

In select situations, there are numerous advantages to using DI over PVC and PE. Therefore, DI pipe will be considered in the water main applications.

1.2.4  Water Services

Current City of Kalamazoo Building Code adopts the use of the Michigan Building Code and Michigan Residential Code. These codes allow for the use of multiple water service materials on the private property side of water services. Because the City of Kalamazoo is responsible for water services from the water main up to, and including, the water meter, all water services installed will be Type K copper as is required of services in the City of Kalamazoo water system.
1.2.5 No Action
Taking no action to provide public potable water to the areas of Richland Township affected by the PFAS contamination would force all properties to utilize bottled water in perpetuity. Property values could be significantly affected and the long term health of the residents may be detrimentally affected.

1.2.6 Optimum Performance of Existing Facilities
The existing potable water supply in the proposed project area is through private wells. Some improvement in the water quality of the private well water can be obtained by installing carbon filters on each individual well supply. However this has been proven by projects throughout the State of Michigan to not be a reliable, long-term solution to PFAS contamination.

1.2.7 Regional Alternatives
The current project proposed to create a regional solution by extending the existing City of Kalamazoo water system farther into Richland Township to provide potable municipal water to the areas of Richland Township affected by the PFAS contamination. The City of Kalamazoo and Richland Township already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.

1.3 Principal Alternatives
Because there is no realistic alternative to providing potable water to the population affected by the PFAS contamination other than extending the City of Kalamazoo public water system, the principal alternative is the selected alternative.

1.4 Selected Alternative

1.4.1 Design Parameters
A comprehensive review of the existing City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. Various water main extensions in this area of Richland Township were modeled to ensure adequate supply for the entire area. A summary of findings in included in Appendix A. The modeling of current and future demand requirements generated the desired water main sizing proposed for the project.
1.4.2 Maps

Figure 1 illustrates the area currently known to be impacted by PFAS contamination. A map of the proposed water main extensions are provided in Figure 4. Water mains will be extended into PFAS impacted areas to provide potable, municipal water for the residents and local businesses.

1.4.3 Schedule

Project Schedule:

The table below is a schedule for the proposed water distribution system improvement project. It would be funded under the second quarter of fiscal year 2020.

### DWRF Project (2nd Quarter 2020) Proposed Project Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hold Public Hearing</td>
<td>April 11, 2019</td>
</tr>
<tr>
<td>Submit Final Project Plan to MDEQ</td>
<td>April 30, 2019</td>
</tr>
<tr>
<td>Receive Approval of Project Plan</td>
<td>August 2019</td>
</tr>
<tr>
<td>User Charge System Approved</td>
<td>November 2019</td>
</tr>
<tr>
<td>Plans and Specifications Approved</td>
<td>December 2019</td>
</tr>
<tr>
<td>Receive Construction Permit</td>
<td>January 2020</td>
</tr>
<tr>
<td>Receive Construction Bids</td>
<td>February 2020</td>
</tr>
<tr>
<td>DWRF Loan Awarded</td>
<td>March 2020</td>
</tr>
<tr>
<td>Begin Construction</td>
<td>April 2020</td>
</tr>
<tr>
<td>Construction Completed</td>
<td>November 2020</td>
</tr>
</tbody>
</table>

1.4.4 Cost Estimates

Appendix B contains cost estimates for the proposed water system improvements. The project costs include construction costs and approximately 25% for construction contingencies, legal, administrative, and project engineering costs.

1.4.5 Users Costs

The project cost funding analysis is provided in Appendix C. The City of Kalamazoo is planning on funding the FY2020 projects with an estimated $22,698,000 DWRF loan at a 3.0% interest rate for a 20 year period. The expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $1,525,662 per year.
The City typically bases its cost allocations on a Residential Equivalent Unit (REU). One REU is the designation given to a single family residential household which has an average water use of approximately 250 gallons per day and a water meter size of 5/8-inches. For businesses or industries with larger meters, the number of Residential Equivalent units is calculated based on the meter size serving that entity. The larger the meter, the larger the number of equivalent units assigned to that meter. The assigned REU is directly proportional to the larger meter’s capacity as compared to the capacity of a residential meter.

The residents to be served by the Richland Township water main extensions are currently on private wells and do not receive a user charge from the water system.

**1.4.6 Disadvantaged Community**

In order to qualify as a disadvantaged community under the DWRF program, the applicant must demonstrate that the median annual household income (MAHI) of the service area does not exceed 120 percent of the updated statewide MAHI for Michigan along with meeting one of several other eligibility criteria.

The City of Kalamazoo is currently working with MDEQ staff on a final determination of Disadvantaged Status.

**1.4.7 Ability to Implement the Selected Alternatives**

All proposed water system improvements will be designed and constructed in accordance with 10 States Standards, guidelines of the American Water Works Association, requirements of the Michigan Department of Environmental Quality (permitting agency), and City of Kalamazoo Standards.

The City of Kalamazoo and Richland Township already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.

Implementation of the proposed project is based on the assumption that the project will be financed by a low-interest loan from the DWRF program. City of Kalamazoo has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation and maintenance of the proposed facilities.
1.5 Environmental Evaluation

Pursuant to MDEQ guidelines, correspondence with cultural and environmental agencies indicating the location and scope of the proposed work activities is underway.

1.5.1 Historical/Archaeological/Tribal Resources

The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. The Michigan State Historic Preservation Office (SHPO) was contacted to determine if in fact any historic sites could be impacted.

In addition, the Tribal Historic Preservation Officers (THPO) were contacted to determine if any tribal historic sites or regional plans could be impacted by the proposed projects. All current correspondence is included in Appendix D.

1.5.2 Water Quality

The proposed project will eliminate the withdraw of PFAS contaminated groundwater through the local private wells and will provide the local residents with potable municipal drinking water which meets all current public drinking water standards.

1.5.3 Land/Water Interface

The proposed projects will not have any effect on local wetlands, floodplains, or surface water bodies with the exception that it will eliminate the input of well water containing PFAS into the local on-site septic systems. This will reduce the amount of PFAS being released into the upper regions of the local aquifer.

1.5.4 Endangered Species

The proposed projects are located within existing road right-of-way and will not impact habitats or species within the project areas with the exception of two bat species. Habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered. These bats typically roost under bark or in crevices in trees.
1.5.5 Agricultural Land
All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

1.5.6 Social/Economic Impact
The proposed projects will have a massively positive impact on the economics of the project area. Residents with water wells affected by high levels of PFAS have been recommended to not utilize the well water for drinking or food preparation/canning. Additionally, there is a precaution against using the water for vegetable/fruit gardening as the implications due to plant uptake of PFAS impacted water is currently unknown. Given the multiple un-defined impacts of PFAS on humans and other organisms, there is an atmosphere of fear which reduced the current quality of life in the area and is potentially affecting property values. The proposed installation of water mains and connection to a reliable, safe potable water supply will significantly reduce or eliminate the current social and economic impacts of the PFAS contamination.

1.5.7 Construction/Operational Impact

1.5.7.1 Natural and Man-made Features
The proposed water main installation will be entirely within the existing road right-of-ways. Some removal/replacement of both natural and man-made features may be necessary for the installation of the proposed water main. The existing ROW is a previously disturbed space and measures will be taken during design and construction to minimize construction impacts.

1.5.7.2 Contamination
We have reviewed the environmental database maintained by the MDEQ and there no know environmental hazards, land use restrictions, or other contamination which will affect the construction of the proposed project.
1.5.8 Indirect Impacts

1.5.8.1 Climate

Normal climatological information for the City of Kalamazoo was obtained from U.S. Climate Data.

<table>
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<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
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<td>10.2</td>
<td>5.2</td>
</tr>
</tbody>
</table>

1.5.8.2 Air Quality

All of the projects are either rehabilitating or replacing existing water infrastructure. Therefore the projects will not negatively impact the air quality in the affected areas.

1.5.8.3 Wetlands

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent wetlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

1.5.8.4 Coastal Zones

None of the project areas is within a coastal zone.
1.5.8.5  **Floodplains**

FEMA floodplain maps were reviewed and none of the project areas is within a designated floodplain.

1.5.8.6  **Inland Lakes and Streams**

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent lakes. Replacement of lead service lines will be through private properties and not affect any adjacent lakes or streams.

1.5.8.7  **Natural or Wild and Scenic Rivers**

We reviewed the State of Michigan Department of Natural Resources data and found that no designated wild, scenic or natural rivers or tributaries exist within the study area.

1.5.8.8  **Other impacts**

Once construction is completed, there should be no permanent, detrimental impacts to the community.

1.6  **Mitigation Measures**

1.6.1  **Short Term Construction Related Mitigation**

Standard procedures used in the construction industry will be included in the construction contract documents to mitigate construction activities.

1.6.2  **Traffic Disruption**

The proposed projects are located in road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.
1.6.3 Dust and Noise

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.

1.6.4 Soil Erosion

Soil erosion and sedimentation control measures such as straw bales, sedimentation basins, and silt fence, will be part of the construction activities to prevent soil release and protect streams and wetlands.

1.6.5 Water Service Disruption

During construction of new water services and connection to home water systems, drinking water will be provided to the residents and connection to the municipal system made as quickly as possible.

1.6.6 Potential Loss of Wildlife / Habitat

Given the potential for tree removal within the road right-of-way, tree removal can be limited to the time periods between October 1 and March 31, in order to protect young bats that are not able to fly. Survey of the trees will be performed by a qualified biologist in order to determine whether the trees are potential habitats for the bats and the necessary protection measures will be established. If tree cutting is performed outside of this season, surveys of the trees will be performed in order to determine whether they are roost trees for the endangered Indiana bat or the threatened Northern long-eared bat.

1.6.7 Mitigation of Indirect Impacts

There are no major projected changes in the land use of the study area that would significantly impact potable water flows beyond the average daily flow projections and maximum daily flow projections provided in Appendix A. A copy of the zoning and land use map for the affected area of the Township are included in Figure 3. None of the proposed projects are located in areas where significant growth or land use changes are projected to occur.
All of the community’s ordinances can be found on their website. General rules are the same as DEQ permits require, such as storm water containment, and soil erosion and sedimentation control.

1.7 Public Participation

As noted in the Project Need section, the proposed project work is in response to discovered PFAS contamination. The PFAS investigation is being led by a coalition of the Kalamazoo County Health and Community Services Department, the Michigan Department of Health and Human Services, and the Michigan Department of Environmental Quality. Richland Township and Kalamazoo County maintain their websites with weekly updates of the investigation. MDEQ representative Nathan Whitmyer is the primary point of contact for the investigative effort/findings. Kalamazoo County HCS also maintains a Facebook page to disseminate information and receive public input. There have been multiple public meetings since the PFAS was discovered in the spring of 2018. The scope of the proposed project is based on the current testing data available and the public input received to date.

1.7.1 Formal Public Hearing

A notice of public hearing was published in the local newspaper, the Kalamazoo Gazette, on Tuesday, March 12, 2019, thirty days prior to the public hearing. A copy of the notice and an affidavit of publication are provided in Appendix E. The plan was posted on the city’s website. A copy of the posting is provided in Appendix E. The city received no comments or questions during the public comment period.

The public hearing describing the draft project plan was held at 6 PM on Thursday, April 11, 2019 at Gracespring Bible Church, 8643 Gull Rd, Richland, MI 49083. A presentation was given by the City of Kalamazoo during which a description of the DWRF program and general comments on the Project Plan were presented. It was noted that the Project Plan discussed cost estimates for projects and potential impacts. All comments/questions were immediately addressed during the hearing and none required modification of the project plan.

A sign-in sheet of the meeting are provided in Appendix F and digital file of the video/audio recording included in the plan submittal.
1.7.2 Adoption of Project Plan

On Monday, April 15, 2019, the City of Kalamazoo passed a resolution adopting the Project Plan. A copy of the signed resolution is provided in Appendix G.
2 Cooper Township Water Mains

2.1 Project Background
On July 26, 2018, the City of Parchment discovered unacceptable levels of PFAS in its drinking water well supply. At that time, the City of Parchment provided drinking water from ground water wells to portions of both the City of Parchment and Cooper Township. The current total service population is approximately 3,100 residential units and several businesses. When the PFAS issue was discovered, the three communities of Cooper Township, the City of Parchment, and the City of Kalamazoo immediately began coordinated efforts to shut down the Parchment wells and provide drinking water through emergency interconnections with the City of Kalamazoo water system. City of Kalamazoo was notified at approximately 6:30 pm on July 26, 2018. Temporary water connections were completed and the City of Kalamazoo was flushing the Parchment water system by 12:32 AM on July 27, 2018. Three permanent connections were designed, permitted, constructed, and put into permanent service within 21 days, one connection week each. Flushing and testing of the Parchment system continued after the permanent connections were made and the “Do not drink” order was lifted on August 27, 2018.

The City of Kalamazoo is currently providing retail water service to both the City of Parchment and Cooper Township.

2.1.1 Delineation of Study Area
The project area for Cooper Township is illustrated in Figure 5. The area lies north of G Avenue which is the southern boundary of Cooper Township and extends both east and west of the Riverview Drive corridor. There are approximately 494 homes/businesses within the project area. All of these currently obtain their drinking water from private water wells.

2.1.2 Land Use
The current zoning map is shown in Figure 6. The area affected is primarily residential with some Commercial Zoning along the Riverview Drive corridor. The Township does not have any other proposed uses for Master Planning purposes.

2.1.3 Population Projections
Based on actual structure counts of 494 structures in the project area, the current population to be served by the FY 2020 DWRF water mains is 1,235 people. Given the existence of an
additional 52 parcels which could develop, the 10 year projection is 1,300 people and the 20 year projection is 1,365 people.

2.1.4 Water Demand and Existing Facilities

The City of Kalamazoo provides all the public water for both the City of Parchment and Cooper Township. Because the City of Parchment previously provided water to Cooper Township, a comprehensive review of the existing Parchment/Cooper water system is contained in the 2011 City of Parchment Water Reliability Study. A comprehensive review of the City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. Now that all the water systems are connected, various water main extensions in this area of Cooper Township were modeled to ensure adequate supply for the entire area. A summary of findings based on the modeling results is included in Appendix H.

2.1.5 Summary of Project Need

2.1.5.1 Standards Compliance and Reliability

There is currently no potable municipal water supply in the area of Cooper Township affected by the PFAS contamination. The City of Kalamazoo water system is currently in compliance with all drinking water standards and has the capacity to serve the affected area in Cooper Township.

2.1.5.2 Orders of Enforcement Action

There are currently no orders of enforcement in place for the City of Kalamazoo water system.

2.1.5.3 Drinking Water Quality Problems

The proposed project is required to provide potable water to that area of Cooper Township currently known to be affected by PFAS contamination above advisory levels as shown in Figure 7. The PFAS investigation is being led by a coalition of the Kalamazoo County Health and Community Services Department, the Michigan Department of Health and Human Services, and the Michigan Department of Environmental Quality. MDEQ representative Nathan Whitmyer is the primary point of contact for the ongoing investigative effort/findings.
2.1.5.4 Projected Needs for the Next 20 Years

Various water main extensions in this area of Cooper Township were modeled to ensure adequate supply for the entire area. A summary of findings in included in Appendix H.

2.2 Analysis of Alternatives

2.2.1 Routing Options

Routing options evaluated were based on the results of the PFAS testing results provided by the MDEQ. Water main extensions, as shown in Figure 5, were chosen which provided potable water to properties which either currently are affected or may be affected by the PFAS. System hydraulics and needed looping for system reliability were also reviewed.

2.2.2 Method of Construction

2.2.2.1 Open Cut

Traditional open cut methods of excavation are used extensively in the West Michigan area for installation of most underground public utilities. The traffic volumes on many of the roads are not excessive enough to warrant the generally more expensive trenchless technologies currently used today. Open cut construction allows the greatest control of water main depth and alignment. Open cut will be the preferred method of construction for all the proposed water mains.

2.2.2.2 Directional Drill

Directional drilling is the process of using a small, steer-able steel pipe that is guided under the soil to create a pilot hole. The pipe is guided by above-grade monitoring equipment that tracks the depth and location. Once the guided head reaches its location, the host pipe is attached and pulled back through the pilot hole. Although directional drilling is not the preferred method for the primary water mains, it is the preferred method for the proposed water service lines. Small diameter service lines can be accurately and economically installed via directional drilling.
2.2.3  **Pipe Material**

Polyvinyl chloride (PVC), Polyethylene (PE), and Ductile Iron (DI) are the three pipe materials most commonly used for construction of new water main less than 16-inches in diameter.

2.2.3.1  **Polyvinyl Chloride (PVC) Pipe / Polyethylene Pipe**

PVC pipe and PE pipe are manufactured from petroleum derivatives, chlorine gas, and vinyl chloride. PVC pipe and polyethylene pipe are sensitive to impacts like ultraviolet light exposure and temperature. According to UNIBELL – the nationally recognized authority on PVC pipe and PE pipe – the impact resistance of PVC pipe and PE pipe is reduced by approximately 20 percent when exposed to ultraviolet light for extended periods of time.

As flexible pipe, PVC and PE are sensitive to the type of materials used for bedding in the trench. The strength of flexible pipe largely comes from the soil supporting the pipe from the centerline of the pipe and below. This requires close attention to proper compaction of the granular backfill. Without proper compaction, flexible pipe can deflect under the static load of the soil column to the point of bursting. Since PVC pipe and PE pipe are sensitive to installation compared to DI, the cost associated with installation can be higher than ductile iron.

Fittings connecting the PVC pipe materials for pressure application occasionally have separated over time, which can cause breaks and sewage flooding.

PVC and PE are more difficult to locate because current locating technologies rely on magnetic properties of the pipe material. Locating PVC pipe and PE pipe materials requires installation of a tracing wire. It is possible that this wire can be cut or corrode over time, which may make locating the pipe more difficult.

2.2.3.2  **Ductile Iron Pipe (DI)**

The cost of installing DI may be slightly less than PVC since DI is less dependent on the surrounding soils for its strength. The materials for manufacturing DI are more environmentally friendly than PVC and PE since it is made from recycled steel.
In select situations, there are numerous advantages to using DI over PVC and PE. Therefore, DI pipe will be considered in the water main applications.

2.2.4 Water Services

Current City of Kalamazoo Building Code adopts the use of the Michigan Building Code and Michigan Residential Code. These codes allow for the use of multiple water service materials on the private property side of water services. Because the City of Kalamazoo is responsible for water services from the water main up to, and including, the water meter, all water services installed will be Type K copper as is required of services in the City of Kalamazoo water system.

2.2.5 No Action

Taking no action to provide public potable water to the areas of Cooper Township affected by the PFAS contamination would force all properties to utilize bottled water in perpetuity. Property values could be significantly affected and the long term health of the residents may be detrimentally affected.

2.2.6 Optimum Performance of Existing Facilities

The existing potable water supply in the proposed project area is through private wells. Some improvement in the water quality of the private well water can be obtained by installing carbon filters on each individual well supply. However this has been proven by projects throughout the State of Michigan to not be a reliable, long-term solution to PFAS contamination.

2.2.7 Regional Alternatives

The current project proposed to create a regional solution by extending the existing City of Kalamazoo water system farther into Cooper Township to provide potable municipal water to the areas of Cooper Township affected by the PFAS contamination. The City of Kalamazoo and Cooper Township already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.
2.3 Principal Alternatives

Because there is no realistic alternative to providing potable water to the population affected by the PFAS contamination other than extending the City of Kalamazoo public water system, the principal alternative is the selected alternative.

2.4 Selected Alternative

2.4.1 Design Parameters

A comprehensive review of the existing City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. Various water main extensions in this area of Cooper Township were modeled to ensure adequate supply for the entire area. A summary of findings is included in Appendix H. The modeling of current and future demand requirements generated the desired water main sizing proposed for the project.

2.4.2 Maps

A map of the proposed water main extensions are provided in Figure 5. Water mains will be extended into PFAS impacted areas to provide potable, municipal water for the residents and local businesses.

2.4.3 Schedule

Project Schedule:

The table below is a schedule for the proposed water distribution system improvement project. It would be funded under the second quarter of fiscal year 2020.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hold Public Hearing</td>
<td>April 9, 2019</td>
</tr>
<tr>
<td>Submit Final Project Plan to MDEQ</td>
<td>April 30, 2019</td>
</tr>
<tr>
<td>Receive Approval of Project Plan</td>
<td>August 2019</td>
</tr>
<tr>
<td>User Charge System Approved</td>
<td>November 2019</td>
</tr>
<tr>
<td>Plans and Specifications Approved</td>
<td>December 2019</td>
</tr>
<tr>
<td>Receive Construction Permit</td>
<td>January 2020</td>
</tr>
<tr>
<td>Receive Construction Bids</td>
<td>February 2020</td>
</tr>
<tr>
<td>DWRF Loan Awarded</td>
<td>March 2020</td>
</tr>
<tr>
<td>Begin Construction</td>
<td>April 2020</td>
</tr>
<tr>
<td>Construction Completed</td>
<td>November 2020</td>
</tr>
</tbody>
</table>
2.4.4 Cost Estimates

Appendix B contains cost estimates for the proposed water system improvements. The project costs include construction costs and approximately 25% for construction contingencies, legal, administrative, and project engineering costs.

2.4.5 Users Costs

The project cost funding analysis is provided in Appendix C. The City of Kalamazoo is planning on funding the FY2020 projects with an estimated $22,698,000 DWRF loan at a 3.0% interest rate for a 20 year period. The expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $1,525,662 per year.

The City typically bases its cost allocations on a Residential Equivalent Unit (REU). One REU is the designation given to a single family residential household which has an average water use of approximately 250 gallons per day and a water meter size of 5/8-inches. For businesses or industries with larger meters, the number of Residential Equivalent units is calculated based on the meter size serving that entity. The larger the meter, the larger the number of equivalent units assigned to that meter. The assigned REU is directly proportional to the larger meter’s capacity as compared to the capacity of a residential meter.

The residents to be served by the Cooper Township water main extensions are currently on private wells and do not receive a user charge from the water system.

2.4.6 Disadvantaged Community

In order to qualify as a disadvantaged community under the DWRF program, the applicant must demonstrate that the median annual household income (MAHI) of the service area does not exceed 120 percent of the updated statewide MAHI for Michigan along with meeting one of several other eligibility criteria.

The City of Kalamazoo is currently working with MDEQ staff on a final determination of Disadvantaged Status.
2.4.7 Ability to Implement the Selected Alternatives

All proposed water system improvements will be designed and constructed in accordance with 10 States Standards, guidelines of the American Water Works Association, requirements of the Michigan Department of Environmental Quality (permitting agency), and City of Kalamazoo Standards.

The City of Kalamazoo and Cooper Township already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.

Implementation of the proposed project is based on the assumption that the project will be financed by a low-interest loan from the DWRF program. City of Kalamazoo has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation and maintenance of the proposed facilities.

2.5 Environmental Evaluation

Pursuant to MDEQ guidelines, correspondence with cultural and environmental agencies indicating the location and scope of the proposed work activities is underway.

2.5.1 Historical/Archaeological/Tribal Resources

The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. The Michigan State Historic Preservation Office (SHPO) was contacted to determine if in fact any historic sites could be impacted.

In addition, the Tribal Historic Preservation Officers (THPO) were contacted to determine if any tribal historic sites or regional plans could be impacted by the proposed projects. All correspondence is included in Appendix D.

2.5.2 Water Quality

The proposed project will eliminate the withdraw of PFAS contaminated groundwater through the local private wells and will provide the local residents with potable municipal drinking water which meets all current public drinking water standards.
2.5.3  Land/Water Interface

The proposed projects will not have any effect on local wetlands, floodplains, or surface water bodies with the exception that it will eliminate the input of well water containing PFAS into the local on-site septic systems. This will reduce the amount of PFAS being released into the upper regions of the local aquifer.

2.5.4  Endangered Species

The proposed projects are located within existing road right-of-way and will not impact habitats or species within the project areas with the exception of two bat species. Habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered. These bats typically roost under bark or in crevices in trees.

2.5.5  Agricultural Land

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

2.5.6  Social/Economic Impact

The proposed projects will have a massively positive impact on the economics of the project area. Residents with water wells affected by high levels of PFAS have been recommended not to utilize the well water for drinking or food preparation/canning. Additionally, there is a precaution against using the water for vegetable/fruit gardening as the implications due to plant uptake of PFAS impacted water is currently unknown. Given the multiple un-defined impacts of PFAS on humans and other organisms, there is an atmosphere of fear which reduced the current quality of life in the area and is potentially affecting property values. The proposed installation of water mains and connection to a reliable, safe potable water supply will significantly reduce or eliminate the current social and economic impacts of the PFAS contamination.
2.5.7 Construction/Operational Impact

2.5.7.1 Natural and Man-made Features

The proposed water main installation will be entirely within the existing road right-of-ways. Some removal/replacement of both natural and man-made features may be necessary for the installation of the proposed water main. The existing ROW is a previously disturbed space and measures will be taken during design and construction to minimize construction impacts.

2.5.7.2 Contamination

We have reviewed the environmental database maintained by the MDEQ and there no know environmental hazards, land use restrictions, or other contamination which will affect the construction of the proposed project.

2.5.8 Indirect Impacts

2.5.8.1 Climate

Normal climatological information for the City of Kalamazoo was obtained from U.S. Climate Data.

<table>
<thead>
<tr>
<th>Averages</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Temperature</td>
<td>58</td>
<td>81</td>
<td>60</td>
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</tr>
<tr>
<td>Low Temperature</td>
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<td>60</td>
<td>42</td>
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</tr>
<tr>
<td>Mean Temperature</td>
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<td>51</td>
<td>27</td>
</tr>
<tr>
<td>Precipitation (inches)</td>
<td>9.17</td>
<td>11.14</td>
<td>10.2</td>
<td>5.2</td>
</tr>
</tbody>
</table>
2.5.8.2 Air Quality

All of the projects are either rehabilitating or replacing existing water infrastructure. Therefore the projects will not negatively impact the air quality in the affected areas.

2.5.8.3 Wetlands

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent wetlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

2.5.8.4 Coastal Zones

None of the project areas is within a coastal zone.

2.5.8.5 Floodplains

FEMA floodplain maps were reviewed and none of the project areas is within a designated floodplain.

2.5.8.6 Inland Lakes and Streams

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent lakes. Replacement of lead service lines will be through private properties and not affect any adjacent lakes or streams.

2.5.8.7 Natural or Wild and Scenic Rivers

We reviewed the State of Michigan Department of Natural Resources data and found that no designated wild, scenic or natural rivers or tributaries exist within the study area.

2.5.8.8 Other impacts

Once construction is completed, there should be no permanent, detrimental impacts to the community.
2.6 Mitigation Measures

2.6.1 Short Term Construction Related Mitigation

Standard procedures used in the construction industry will be included in the construction contract documents to mitigate construction activities.

2.6.2 Traffic Disruption

The proposed projects are located in road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.

2.6.3 Dust and Noise

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.

2.6.4 Soil Erosion

Soil erosion and sedimentation control measures such as straw bales, sedimentation basins, and silt fence, will be part of the construction activities to prevent soil release and protect streams and wetlands.

2.6.5 Water Service Disruption

During construction of new water services and connection to home water systems, drinking water will be provided to the residents and connection to the municipal system made as quickly as possible.

2.6.6 Potential Loss of Wildlife / Habitat

Given the potential for tree removal within the road right-of-way, tree removal can be limited to the time periods between October 1 and March 31, in order to protect young bats that are not able to fly. Survey of the trees will be performed by a qualified biologist in order to determine whether the trees are potential habitats for the bats and the necessary protection...
measures will be established. If tree cutting is performed outside of this season, surveys of the trees will be performed in order to determine whether they are roost trees for the endangered Indiana bat or the threatened Northern long-eared bat.

2.6.7 Mitigation of Indirect Impacts

There are no major projected changes in the land use of the study area that would significantly impact potable water flows beyond the average daily flow projections and maximum daily flow projections provided in Appendix H. The zoning and land use map for the Township is illustrated in Figure 6. None of the proposed projects are located in areas where significant growth or land use changes are projected to occur.

All of the community’s ordinances can be found on their website. General rules are the same as DEQ permits require, such as storm water containment, and soil erosion and sedimentation control.

2.7 Public Participation

As noted in the Project Need section, the proposed project work is in response to discovered PFAS contamination. The PFAS investigation is being led by a coalition of the Kalamazoo County Health and Community Services Department, the Michigan Department of Health and Human Services, and the Michigan Department of Environmental Quality. Cooper Township and Kalamazoo County maintain their websites with weekly updates of the investigation. MDEQ representative Nathan Whitmyer is the primary point of contact for the investigative effort/findings. Kalamazoo County HCS also maintains a Facebook page to disseminate information and receive public input. There have been multiple public meetings since the PFAS was discovered in the spring of 2018. The scope of the proposed project is based on the current testing data available and the public input received to date.

2.7.1 Formal Public Hearing

A notice of public hearing was published in the local newspaper, the Kalamazoo Gazette, on Tuesday, March 12, 2019, thirty days prior to the public hearing. A copy of the notice and an affidavit of publication are provided in Appendix E. The plan was posted on the City’s website. The city received no comments or questions during the public comment period.
The public hearing describing the draft project plan was held at 6 PM on Tuesday, April 9, 2019 at St. Mary’s Church, 939 Charlotte Avenue, Kalamazoo, MI 49048. A presentation was given by the City of Kalamazoo during which a description of the DWRF program and general comments on the Project Plan were presented. It was noted that the Project Plan discussed cost estimates for projects and potential impacts. All comments/questions were immediately addressed during the hearing and none required modification of the project plan.

A sign-in sheet of the meeting are provided in Appendix F and digital file of the video/audio recording included in the plan submittal.

2.7.2 Adoption of Project Plan

On Monday, April 15, 2019, the City of Kalamazoo passed a resolution adopting the Project Plan. A copy of the signed resolution is provided in Appendix G.
3 City of Parchment – Glendale Water Main Replacement

3.1 Project Background

After the City of Kalamazoo took over ownership of the City of Parchment water system in the fall of 2018, the City began investigation of lead services and lead testing in the City of Parchment. Water samples from the water main in Glendale Avenue indicated the presence of lead in the main water line. Samples from water mains in the surrounding area did not indicate the presence of lead so the lead appears to be isolated to the water main in Glendale Avenue.

3.1.1 Delineation of Study Area

The extent of the project area is illustrated in Figure 9. The area bounded on the west by Riverview Drive and on the east by Orient Avenue (City of Parchment east boundary line). All existing water main and water services will be replaced in the project area.

3.1.2 Land Use

The current zoning map is shown in Figure 10. The area affected is all residential. The City does not have any other proposed uses for Master Planning purposes.

3.1.3 Population Projections

The area is fully developed and has a current population of approximately 155 people. The 10 and 20 year population projections match the existing population.

3.1.4 Water Demand and Existing Facilities

The City of Kalamazoo provides all the public water for both the City of Parchment and Cooper Township. Because the City of Parchment previously provided water to Cooper Township, a comprehensive review of the existing Parchment/Cooper water system is contained in the 2011 City of Parchment Water Reliability Study. A comprehensive review of the City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. Now that all the water systems are connected, the system interconnection was modeled to ensure adequate supply for the entire area. A summary of findings based on the modeling results is included in Appendix H.
3.1.5 Summary of Project Need

3.1.5.1 Standards Compliance and Reliability
The City of Kalamazoo water system is currently in compliance with all drinking water standards and has the capacity to serve the affected area in City of Parchment.

3.1.5.2 Orders of Enforcement Action
There are currently no orders of enforcement in place for the City of Kalamazoo water system.

3.1.5.3 Drinking Water Quality Problems
The proposed project is required to provide potable water, free of lead, to the Glendale Avenue residents. There are 62 residential homes impacted by the lead in this area.

3.1.5.4 Projected Needs for the Next 20 Years
The area is currently fully developed and land use is not expected to change. A comprehensive review of the current and future needs can be found in the 2011 City of Parchment Water Reliability Study and the 2016 City of Kalamazoo Water Reliability Study.

3.2 Analysis of Alternatives

3.2.1 Routing Options
The proposed project will replace an existing water main so the existing Glendale Avenue right-of-way corridor will be utilized. No alternative routes are available.

3.2.2 Method of Construction

3.2.2.1 Open Cut
Traditional open cut methods of excavation are used extensively in the West Michigan area for installation of most underground public utilities. The traffic volumes on many of the roads are not excessive enough to warrant the generally more expensive trenchless technologies currently used today. Open cut construction allows the greatest control of water main depth and alignment. Open cut will be the preferred method of construction for all the proposed water mains.
3.2.2.2 Directional Drill

Directional drilling is the process of using a small, steer-able steel pipe that is guided under the soil to create a pilot hole. The pipe is guided by above-grade monitoring equipment that tracks the depth and location. Once the guided head reaches its location, the host pipe is attached and pulled back through the pilot hole. Although directional drilling is not the preferred method for the primary water mains, it is the preferred method for the proposed water service lines. Small diameter service lines can be accurately and economically installed via directional drilling.

3.2.3 Pipe Material

Polyvinyl chloride (PVC), Polyethylene (PE), and Ductile Iron (DI) are the three pipe materials most commonly used for construction of new water main less than 16-inches in diameter.

3.2.3.1 Polyvinyl Chloride (PVC) Pipe / Polyethylene Pipe

PVC pipe and PE pipe are manufactured from petroleum derivatives, chlorine gas, and vinyl chloride. PVC pipe and polyethylene pipe are sensitive to impacts like ultraviolet light exposure and temperature. According to UNIBELL – the nationally recognized authority on PVC pipe and PE pipe – the impact resistance of PVC pipe and PE pipe is reduced by approximately 20 percent when exposed to ultraviolet light for extended periods of time.

As flexible pipe, PVC and PE are sensitive to the type of materials used for bedding in the trench. The strength of flexible pipe largely comes from the soil supporting the pipe from the centerline of the pipe and below. This requires close attention to proper compaction of the granular backfill. Without proper compaction, flexible pipe can deflect under the static load of the soil column to the point of bursting. Since PVC pipe and PE pipe are sensitive to installation compared to DI, the cost associated with installation can be higher than ductile iron.

Fittings connecting the PVC pipe materials for pressure application occasionally have separated over time, which can cause breaks and sewage flooding.
PVC and PE are more difficult to locate because current locating technologies rely on magnetic properties of the pipe material. Locating PVC pipe and PE pipe materials requires installation of a tracing wire. It is possible that this wire can be cut or corrode over time, which may make locating the pipe more difficult.

3.2.3.2 Ductile Iron Pipe (DI)

The cost of installing DI may be slightly less than PVC since DI is less dependent on the surrounding soils for its strength. The materials for manufacturing DI are more environmentally friendly than PVC and PE since it is made from recycled steel.

In select situations, there are numerous advantages to using DI over PVC and PE. Therefore, DI pipe will be considered in the water main applications.

3.2.4 Water Services

Current City of Kalamazoo Building Code adopts the use of the Michigan Building Code and Michigan Residential Code. These codes allow for the use of multiple water service materials on the private property side of water services. Because the City of Kalamazoo is responsible for water services from the water main up to, and including, the water meter, all water services installed will be Type K copper as is required of services in the City of Kalamazoo water system.

3.2.5 No Action

Taking no action to provide public potable water to this area of the City of Parchment would force all properties to utilize bottled water in perpetuity. Property values could be significantly affected and the long term health of the residents may be detrimentally affected.

3.2.6 Optimum Performance of Existing Facilities

Some improvement in the water quality can be obtained by installing carbon filters on each individual water services. However this has been proven by projects throughout the State of Michigan to not be a reliable, long-term solution to lead contamination.

3.2.7 Regional Alternatives

The current project proposed to create a regional solution by continuing to have the existing City of Kalamazoo water system provide potable municipal water to the City of Parchment.
The City of Kalamazoo and the City of Parchment already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.

### 3.3 Principal Alternatives

Because there is no realistic alternative to providing potable water to the population affected by the lead contamination other than replacing the public water main, the principal alternative is the selected alternative.

### 3.4 Selected Alternative

#### 3.4.1 Design Parameters

The City of Kalamazoo provides all the public water for both the City of Parchment and Cooper Township. Because the City of Parchment previously provided water to Cooper Township, a comprehensive review of the existing Parchment/Cooper water system is contained in the 2011 City of Parchment Water Reliability Study. A comprehensive review of the City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. Now that all the water systems are connected, the system interconnection was modeled to ensure adequate supply for the entire area. A summary of findings based on the modeling results is included in Appendix H. The modeling of current and future demand requirements generated the desired water main sizing proposed for the project.

#### 3.4.2 Maps

A map of the proposed water main replacement is provided in Figure 9. This water main will provide potable, municipal water for the residents.

#### 3.4.3 Schedule

**Project Schedule:**

The table below is a schedule for the proposed water distribution system improvement project. It would be funded under the second quarter of fiscal year 2020.

<table>
<thead>
<tr>
<th>DWRF Project (2nd Quarter 2020) Proposed Project Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Milestone</strong></td>
</tr>
<tr>
<td>Hold Public Hearing</td>
</tr>
<tr>
<td>Submit Final Project Plan to MDEQ</td>
</tr>
<tr>
<td><strong>Receive Approval of Project Plan</strong></td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>User Charge System Approved</strong></td>
</tr>
<tr>
<td><strong>Plans and Specifications Approved</strong></td>
</tr>
<tr>
<td><strong>Receive Construction Permit</strong></td>
</tr>
<tr>
<td><strong>Receive Construction Bids</strong></td>
</tr>
<tr>
<td><strong>DWRF Loan Awarded</strong></td>
</tr>
<tr>
<td><strong>Begin Construction</strong></td>
</tr>
<tr>
<td><strong>Construction Completed</strong></td>
</tr>
</tbody>
</table>

### 3.4.4 Cost Estimates

Appendix B contains cost estimates for the proposed water system improvements. The project costs include construction costs and approximately 25% for construction contingencies, legal, administrative, and project engineering costs.

### 3.4.5 Users Costs

The project cost funding analysis is provided in Appendix C. The City of Kalamazoo is planning on funding the FY2020 projects with an estimated $22,698,000 DWRF loan at a 3.0% interest rate for a 20 year period. The expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $1,525,662 per year.

The City typically bases its cost allocations on a Residential Equivalent Unit (REU). One REU is the designation given to a single family residential household which has an average water use of approximately 250 gallons per day and a water meter size of 5/8-inches. For businesses or industries with larger meters, the number of Residential Equivalent units is calculated based on the meter size serving that entity. The larger the meter, the larger the number of equivalent units assigned to that meter. The assigned REU is directly proportional to the larger meter’s capacity as compared to the capacity of a residential meter.

### 3.4.6 Disadvantaged Community

In order to qualify as a disadvantaged community under the DWRF program, the applicant must demonstrate that the median annual household income (MAHI) of the service area does not exceed 120 percent of the updated statewide MAHI for Michigan along with meeting one of several other eligibility criteria.
The City of Kalamazoo is currently working with MDEQ staff on a final determination of Disadvantaged Status.

**3.4.7 Ability to Implement the Selected Alternatives**

All proposed water system improvements will be designed and constructed in accordance with 10 States Standards, guidelines of the American Water Works Association, requirements of the Michigan Department of Environmental Quality (permitting agency), and City of Kalamazoo Standards.

The City of Kalamazoo and the City of Parchment already have water service agreements in-place so no additional agreements or municipal authoritative actions are required.

Implementation of the proposed project is based on the assumption that the project will be financed by a low-interest loan from the DWRF program. City of Kalamazoo has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation and maintenance of the proposed facilities.

**3.5 Environmental Evaluation**

Pursuant to MDEQ guidelines, correspondence with cultural and environmental agencies indicating the location and scope of the proposed work activities is underway.

**3.5.1 Historical/Archaeological/Tribal Resources**

The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. The Michigan State Historic Preservation Office (SHPO) was contacted to determine if in fact any historic sites could be impacted.

In addition, the Tribal Historic Preservation Officers (THPO) were contacted to determine if any tribal historic sites or regional plans could be impacted by the proposed projects. All correspondence is included in Appendix D.

**3.5.2 Water Quality**

The proposed project will eliminate the potential source of lead and will provide the local residents with potable municipal drinking water which meets all current public drinking water standards.
3.5.3 Land/Water Interface

The proposed projects will not have any effect on local wetlands, floodplains, or surface water.

3.5.4 Endangered Species

The proposed projects are located within existing road right-of-way and will not impact habitats or species within the project areas with the exception of two bat species. Habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered. These bats typically roost under bark or in crevices in trees.

3.5.5 Agricultural Land

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

3.5.6 Social/Economic Impact

The proposed projects will have a massively positive impact on the economics of the project area. Residents with water wells affected by high levels of lead have been recommended to not utilize the well water for drinking or food preparation/canning. Given the multiple impacts of lead on humans and other organisms, there is an atmosphere of fear which reduced the current quality of life in the area and is potentially affecting property values. The proposed installation of water mains and connection to a reliable, safe potable water supply will significantly reduce or eliminate the current social and economic impacts of the lead contamination.

3.5.7 Construction/Operational Impact

3.5.7.1 Natural and Man-made Features

The proposed water main installation will be entirely within the existing road right-of-ways. Some removal/replacement of both natural and man-made features may be necessary for the installation of the proposed water main. The existing ROW is a
previously disturbed space and measures will be taken during design and construction to minimize construction impacts.

3.5.7.2 Contamination
We have reviewed the environmental database maintained by the MDEQ and there no know environmental hazards, land use restrictions, or other contamination which will affect the construction of the proposed project.

3.5.8 Indirect Impacts

3.5.8.1 Climate
Normal climatological information for the City of Kalamazoo was obtained from U.S. Climate Data.

<table>
<thead>
<tr>
<th></th>
<th>Averages</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
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<tr>
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<tr>
<td>Mean Temperature</td>
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</tr>
<tr>
<td>Precipitation (inches)</td>
<td></td>
<td>9.17</td>
<td>11.14</td>
<td>10.2</td>
<td>5.2</td>
</tr>
</tbody>
</table>

3.5.8.2 Air Quality
All of the projects are either rehabilitating or replacing existing water infrastructure. Therefore the projects will not negatively impact the air quality in the affected areas.

3.5.8.3 Wetlands
All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent wetlands. Replacement of lead service lines will be with
trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

3.5.8.4 Coastal Zones

None of the project areas is within a coastal zone.

3.5.8.5 Floodplains

FEMA floodplain maps were reviewed and none of the project areas is within a designated floodplain.

3.5.8.6 Inland Lakes and Streams

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent lakes. Replacement of lead service lines will be through private properties and not affect any adjacent lakes or streams.

3.5.8.7 Natural or Wild and Scenic Rivers

We reviewed the State of Michigan Department of Natural Resources data and found that no designated wild, scenic or natural rivers or tributaries exist within the study area.

3.5.8.8 Other impacts

Once construction is completed, there should be no permanent, detrimental impacts to the community.

3.6 Mitigation Measures

3.6.1 Short Term Construction Related Mitigation

Standard procedures used in the construction industry will be included in the construction contract documents to mitigate construction activities.
3.6.2 Traffic Disruption

The proposed projects are located in road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.

3.6.3 Dust and Noise

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.

3.6.4 Soil Erosion

Soil erosion and sedimentation control measures such as straw bales, sedimentation basins, and silt fence, will be part of the construction activities to prevent soil release and protect streams and wetlands.

3.6.5 Water Service Disruption

During construction of new water services and connection to home water systems, drinking water will be provided to the residents and connection to the municipal system made as quickly as possible.

3.6.6 Potential Loss of Wildlife / Habitat

Given the potential for tree removal within the road right-of-way, tree removal can be limited to the time periods between October 1 and March 31, in order to protect young bats that are not able to fly. Survey of the trees will be performed by a qualified biologist in order to determine whether the trees are potential habitats for the bats and the necessary protection measures will be established. If tree cutting is performed outside of this season, surveys of the trees will be performed in order to determine whether they are roost trees for the endangered Indiana bat or the threatened Northern long-eared bat.
3.6.7 Mitigation of Indirect Impacts

There are no major projected changes in the land use of the study area that would significantly impact potable water flows beyond the average daily flow projections and maximum daily flow projections provided in Appendix H. The zoning and land use map for the City is illustrated in Figure 10. None of the proposed area has space where significant growth or land use changes are projected to occur.

All of the community’s ordinances can be found on their website. General rules are the same as DEQ permits require, such as storm water containment, and soil erosion and sedimentation control.

3.7 Public Participation

As noted in the Project Need section, the proposed project work is in response to discovered lead contamination. The scope of the proposed project is based on the current testing data available and the public input received to date.

3.7.1 Formal Public Hearing

A notice of public hearing was published in the local newspaper, the Kalamazoo Gazette, on Tuesday, March 12, 2019, thirty days prior to the public hearing. A copy of the notice and an affidavit of publication are provided in Appendix E. The plan was posted on the city’s website. The city received no comments or questions during the public comment period.

The public hearing describing the draft project plan was held at 6 PM on Tuesday, April 9, 2019 at St. Mary’s Church, 939 Charlotte Avenue, Kalamazoo, MI 49048. A presentation was given by the City of Kalamazoo during which a description of the DWRF program and general comments on the Project Plan were presented. It was noted that the Project Plan discussed cost estimates for projects and potential impacts. All comments/questions were immediately addressed during the hearing and none required modification of the project plan.

A sign-in sheet of the meeting are provided in Appendix F and digital file of the video/audio recording included in the plan submittal.
3.7.2 Adoption of Project Plan

On Monday, April 15, 2019, the City of Kalamazoo passed a resolution adopting the Project Plan. A copy of the signed resolution is provided in Appendix G.
4 City of Kalamazoo – Lead Water Service Replacement

4.1 Project Background

The City has been in the process of identifying and replacing all lead or potential lead services in the City of Kalamazoo water system. In the past three years, they have replaced over 800 lead services. As part of the overall effort, the City has identified the existence (or potential existence) of approximately 1,343 lead services in the neighborhood south of Gull Road and east of the Kalamazoo River. Pursuant with current State of Michigan requirements, the City has implemented a program to replace all the lead lines in their water system.

4.1.1 Delineation of Study Area

The extent of the project area is illustrated in Figure 11. The area bounded on the west by the Kalamazoo River and on the north by Gull Road. All existing water services, suspected to potentially contain lead, will be replaced in the project area.

4.1.2 Land Use

The current zoning map is shown in Figure 12. The area affected is all residential. The City does not have any other proposed uses for Master Planning purposes.

4.1.3 Population Projections

The area is nearly fully developed and has a current population of approximately 5,172 people. The 10-year population projection is 5,324 and the 20-year population projection is 5,476.

4.1.4 Water Demand and Existing Facilities

A comprehensive review of the City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. That study concluded that the system has adequate supply for both current and future demands.

4.1.5 Summary of Project Need

4.1.5.1 Standards Compliance and Reliability

The City of Kalamazoo water system is currently in compliance with all drinking water standards and has the capacity to serve the affected area.
4.1.5.2 **Orders of Enforcement Action**

There are currently no orders of enforcement in place for the City of Kalamazoo wastewater system.

4.1.5.3 **Drinking Water Quality Problems**

The proposed project is required to provide potable water, free of lead, to the City of Kalamazoo residents in the affected area. There are 2,069 residential homes impacted by lead services in this area.

4.1.5.4 **Projected Needs for the Next 20 Years**

The area is currently nearly fully developed and land use is not expected to change. A comprehensive review of the current and future needs can be found in the 2016 City of Kalamazoo Water Reliability Study.

4.2 **Analysis of Alternatives**

4.2.1 **Routing Options**

The proposed project will replace an existing water services so no alternative routes are available.

4.2.2 **Method of Construction**

4.2.2.1 **Open Cut**

Traditional open cut methods of excavation are used extensively in the West Michigan area for installation of most underground public utilities. Open cut construction allows the greatest control of water main depth and alignment.

4.2.2.2 **Directional Drill**

Directional drilling is the process of using a small, steerable steel pipe that is guided under the soil to create a pilot hole. The pipe is guided by above-grade monitoring equipment that tracks the depth and location. Once the guided head reaches its location, the host pipe is attached and pulled back through the pilot hole. Although directional drilling is not the preferred method for the primary water mains, it is the preferred
method for the proposed water service lines. Small diameter service lines can be accurately and economically installed via directional drilling.

4.2.3 Pipe Material for Water Services

Current City of Kalamazoo Building Code adopts the use of the Michigan Building Code and Michigan Residential Code. These codes allow for the use of multiple water service materials on the private property side of water services. Because the City of Kalamazoo is responsible for water services from the water main up to, and including, the water meter, all water services installed will be Type K copper as is required of services in the City of Kalamazoo water system.

4.2.4 No Action

Taking no action to provide public potable water to this area of the City of Kalamazoo would force all properties to utilize bottled water in perpetuity. Property values could be significantly affected and the long term health of the residents may be detrimentally affected.

4.2.5 Optimum Performance of Existing Facilities

Some improvement in the water quality can be obtained by installing carbon filters on each individual water services. However this has been proven by projects throughout the State of Michigan to not be a reliable, long-term solution to lead contamination.

4.2.6 Regional Alternatives

The City of Kalamazoo is the regional water provider and will continue to be in the future. No other regional alternatives exist.

4.3 Principal Alternatives

Because there is no realistic alternative to providing potable water to the population affected by the lead contamination other than replacing the water services, the principal alternative is the selected alternative.
4.4 Selected Alternative

4.4.1 Design Parameters

A comprehensive review of the City of Kalamazoo water system is contained in the 2016 City of Kalamazoo Water Reliability Study. The reliability study confirmed the City’s ability to provide potable water at the desired pressures and flow rates to the project area.

4.4.2 Maps

A map of the proposed water service replacements is provided in Figure 11. These services will provide potable, municipal water for the residents.

4.4.3 Schedule

Project Schedule:

The table below is a schedule for the proposed water distribution system improvement project. It would be funded under the second quarter of fiscal year 2020.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hold Public Hearing</td>
<td>April 11, 2019</td>
</tr>
<tr>
<td>Submit Final Project Plan to MDEQ</td>
<td>April 30, 2019</td>
</tr>
<tr>
<td>Receive Approval of Project Plan</td>
<td>August 2019</td>
</tr>
<tr>
<td>User Charge System Approved</td>
<td>November 2019</td>
</tr>
<tr>
<td>Plans and Specifications Approved</td>
<td>December 2019</td>
</tr>
<tr>
<td>Receive Construction Permit</td>
<td>January 2020</td>
</tr>
<tr>
<td>Receive Construction Bids</td>
<td>February 2020</td>
</tr>
<tr>
<td>DWRF Loan Awarded</td>
<td>March 2020</td>
</tr>
<tr>
<td>Begin Construction</td>
<td>April 2020</td>
</tr>
<tr>
<td>Construction Completed</td>
<td>November 2020</td>
</tr>
</tbody>
</table>

4.4.4 Cost Estimates

Appendix B contains cost estimates for the proposed water system improvements. The project costs include construction costs and approximately 25% for construction contingencies, legal, administrative, and project engineering costs.
4.4.5 Users Costs

The project cost funding analysis is provided in Appendix C. The City of Kalamazoo is planning on funding the FY2020 projects with an estimated $22,698,000 DWRF loan at a 3.0% interest rate for a 20 year period. The expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $1,525,662 per year.

The City typically bases its cost allocations on a Residential Equivalent Unit (REU). One REU is the designation given to a single family residential household which has an average water use of approximately 250 gallons per day and a water meter size of 5/8-inches. For businesses or industries with larger meters, the number of Residential Equivalent units is calculated based on the meter size serving that entity. The larger the meter, the larger the number of equivalent units assigned to that meter. The assigned REU is directly proportional to the larger meter’s capacity as compared to the capacity of a residential meter.

The increase due to the proposed water system improvements translates to an annual cost of about $476.87 per REU or $39.74 per month to the affected residents in the City of Kalamazoo.

4.4.6 Disadvantaged Community

In order to qualify as a disadvantaged community under the DWRF program, the applicant must demonstrate that the median annual household income (MAHI) of the service area does not exceed 120 percent of the updated statewide MAHI for Michigan along with meeting one of several other eligibility criteria.

The City of Kalamazoo is currently working with MDEQ staff on a final determination of Disadvantaged Status.

4.4.7 Ability to Implement the Selected Alternatives

All proposed water system improvements will be designed and constructed in accordance with 10 States Standards, guidelines of the American Water Works Association, requirements of the Michigan Department of Environmental Quality (permitting agency), and City of Kalamazoo Standards.

The City of Kalamazoo already provides water to this area so no additional agreements or municipal authoritative actions are required.
Implementation of the proposed project is based on the assumption that the project will be financed by a low-interest loan from the DWRF program. City of Kalamazoo has the necessary legal, institutional, financial, and managerial resources available to ensure the construction, operation and maintenance of the proposed facilities.

4.5 Environmental Evaluation

Pursuant to MDEQ guidelines, correspondence with cultural and environmental agencies indicating the location and scope of the proposed work activities is underway.

4.5.1 Historical/Archaeological/Tribal Resources

The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. The Michigan State Historic Preservation Office (SHPO) was contacted to determine if in fact any historic sites could be impacted.

In addition, the Tribal Historic Preservation Officers (THPO) were contacted to determine if any tribal historic sites or regional plans could be impacted by the proposed projects. All correspondence is included in Appendix D.

4.5.2 Water Quality

The proposed project will eliminate the potential source of lead and will provide the local residents with potable municipal drinking water which meets all current public drinking water standards.

4.5.3 Land/Water Interface

The proposed projects will not have any effect on local wetlands, floodplains, or surface water.

4.5.4 Endangered Species

The proposed projects are located within existing road right-of-way and will not impact habitats or species within the project areas with the exception of two bat species. Habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered. These bats typically roost under bark or in crevices in trees.
4.5.5 Agricultural Land

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands. Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

4.5.6 Social/Economic Impact

The proposed projects will have a massively positive impact on the economics of the project area. Residents with water wells affected by high levels of lead have been recommended to not utilize the well water for drinking or food preparation/canning. Given the multiple impacts of lead on humans and other organisms, there is an atmosphere of fear which reduced the current quality of life in the area and is potentially affecting property values. The proposed installation of water mains and connection to a reliable, safe potable water supply will significantly reduce or eliminate the current social and economic impacts of the lead contamination.

4.5.7 Construction/Operational Impact

4.5.7.1 Natural and Man-made Features

The proposed water service installations will either follow the path of the existing service or be directly adjacent to the existing service. The service paths are previously disturbed space and measures will be taken during design and construction to minimize construction impacts.

4.5.7.2 Contamination

We have reviewed the environmental database maintained by the MDEQ and there no know environmental hazards, land use restrictions, or other contamination which will affect the construction of the proposed project.
4.5.8  Indirect Impacts

4.5.8.1  Climate

Normal climatological information for the City of Kalamazoo was obtained from U.S. Climate Data.

<table>
<thead>
<tr>
<th>Averages</th>
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</table>

4.5.8.2  Air Quality

All of the projects are either rehabilitating or replacing existing water infrastructure. Therefore the projects will not negatively impact the air quality in the affected areas.

4.5.8.3  Wetlands

Replacement of lead service lines will be with trenchless installation methods and so will not affect any surface features between the road right-of-way and homes.

4.5.8.4  Coastal Zones

None of the project areas is within a coastal zone.

4.5.8.5  Floodplains

FEMA floodplain maps were reviewed and none of the project areas is within a designated floodplain.
4.5.8.6  **Inland Lakes and Streams**

Replacement of lead service lines will be in public right-of-way and through private properties which will not affect any adjacent lakes or streams.

4.5.8.7  **Natural or Wild and Scenic Rivers**

We reviewed the State of Michigan Department of Natural Resources data and found that no designated wild, scenic or natural rivers or tributaries exist within the study area.

4.5.8.8  **Other impacts**

Once construction is completed, there should be no permanent, detrimental impacts to the community.

4.6  **Mitigation Measures**

4.6.1  **Short Term Construction Related Mitigation**

Standard procedures used in the construction industry will be included in the construction contract documents to mitigate construction activities.

4.6.2  **Traffic Disruption**

The proposed projects are located in road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.

4.6.3  **Dust and Noise**

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.
4.6.4 Soil Erosion

Soil erosion and sedimentation control measures such as straw bales, sedimentation basins, and silt fence, will be part of the construction activities to prevent soil release and protect streams and wetlands.

4.6.5 Water Service Disruption

During construction of new water services and connection to home water systems, drinking water will be provided to the residents and connection to the municipal system made as quickly as possible.

4.6.6 Potential Loss of Wildlife / Habitat

Given the potential for tree removal within the road right-of-way, tree removal can be limited to the time periods between October 1 and March 31, in order to protect young bats that are not able to fly. Survey of the trees will be performed by a qualified biologist in order to determine whether the trees are potential habitats for the bats and the necessary protection measures will be established. If tree cutting is performed outside of this season, surveys of the trees will be performed in order to determine whether they are roost trees for the endangered Indiana bat or the threatened Northern long-eared bat.

4.6.7 Mitigation of Indirect Impacts

There are no major projected changes in the land use of the study area that would significantly impact potable water flows beyond the average daily flow projections and maximum daily flow projections provided in the City of Kalamazoo Water Reliability Study. The zoning and land use map for the City is illustrated in Figure 12. None of the proposed area has space where significant growth or land use changes are projected to occur.

All of the community’s ordinances can be found on their website. General rules are the same as DEQ permits require, such as storm water containment, and soil erosion and sedimentation control.
4.7 Public Participation

As noted in the Project Need section, the proposed project work is in response to discovered lead contamination. The scope of the proposed project is based on the current testing data available and the public input received to date.

4.7.1 Formal Public Hearing

A notice of public hearing was published in the local newspaper, the Kalamazoo Gazette, on Tuesday, March 12, 2019, thirty days prior to the public hearing. A copy of the notice and an affidavit of publication are provided in Appendix E. The plan was posted on the city’s website. The city received no comments or questions during the public comment period.

The public hearing describing the draft project plan was held at 6 PM on Tuesday, April 9, 2019 at St. Mary’s Church, 939 Charlotte Avenue, Kalamazoo, MI 49048. A presentation was given by the City of Kalamazoo during which a description of the DWRF program and general comments on the Project Plan were presented. It was noted that the Project Plan discussed cost estimates for projects and potential impacts. All comments/questions were immediately addressed during the hearing and none required modification of the project plan.

A sign-in sheet of the meeting are provided in Appendix F and digital file of the video/audio recording included in the plan submittal.

4.7.2 Adoption of Project Plan

On Monday, April 15, 2019, the City of Kalamazoo passed a resolution adopting the Project Plan. A copy of the signed resolution is provided in Appendix G.
Figures

Figure 1   PFOA & PFAS Sampling Results in Richland Township
Figure 2   Map of Proposed Project Areas
Figure 3   Richland Township Zoning/Land Use Map
Figure 4   Project Area and Proposed Water Mains in Richland Township
Figure 5   Project Area and Proposed Water Mains in Cooper Township
Figure 6   Cooper Township Zoning/Land Use Map
Figure 7   PFAS Sampling Results in Cooper Township
Figure 8   PFAS Sampling Results in Cooper Township and City of Parchment
Figure 9   Project Area and Proposed Water Main in City of Parchment
Figure 10  City of Parchment Zoning/Land Use Map
Figure 11  Project Area and Proposed Water Service Replacement in City of Kalamazoo
Figure 12  City of Kalamazoo Zoning/Land Use Map
Figure 1

PFOA + PFOS Concentration (ppt)

- >1,000 Residential Well Sample
- >70 - 1,000 Existing Monitoring Well Sample
- >10 - 70
- >0 - 10
- Non-Detect

Legend:
- Proposed Monitoring Well Location (20)
- Proposed Surface Water Sample
- Proposed Irrigation Well Sample
- Production Plated Plastics
- 100 Foot Buffer Zone

Drawn: JS Date: 10/9/2019
Approved: JS Date: 10/9/2019
Project #: 020022402

RICHLAND, MI
Cooper Township Watermain
494 Existing Structures
546 Existing Parcels
Figure 6

Legend:
- Proposed 8" (28,320')
- Proposed 12" (13,581')
- Affected Area

- A Agricultural District
- R-1 Rural Residential District
- R-2 Residence District, Single Family
- R-3 Residence District, Single & Two Family
- R-4 Residence District, Medium Density, Multi-Family
- R-5 Residence District, High Density, Multi-Family
- R-6 Mobile Home Park District
- R-D Recreation District
- CBD Commercial Business District
- C-1 Commercial District, Local
- C-2 Commercial District, General
- I-1 Industrial District, General
- I-2 Industrial District, Manufacturing & Service
- I-3 Industrial District, Heavy

City of Kalamazoo
Cooper Township
Kalamazoo County, MI
Cooper Township Zoning Map
of Affected Area
Prein&Newhol
2380551
Residential Well Sampling
Total PFAS (ppt)
Non-Det (54)
>0 - 10 (43)
>10 - 70 (86)
>70 (39)

Municipal Supply Well
Parchment Treatment Plant
1 Mile Buffer Area
Former Allegan Water Treatment Plant
Former Parchment Paper Mill
Closed Landfill

Figure 7
Figure 8

Legend

- Study Area
- Proposed Phase II Monitoring Well
- Proposed Phase II Surface Water Sample
- Phase I Surface Water Sample
- Phase I Monitoring Well
- Surface Water

Sample Locations with PFOA plus PFOS Results
- Non-Detect
- >1-70 ng/L
- >70 ng/L

Notes
1. Nomenclature definitions for MW 1801A, B or C
   "MW" = monitoring well
   "1801" = year of installation
   "01" = location number
   "A" = shallowest well at location
   "B" = intermediate well at location (between shallow and deep)
   "C" = deepest well at location
2. PFOA = Perfluorooctanoic Acid, PFOS = Perfluorooctane Sulfonate
3. PFOA and PFOS results obtained by the Michigan Department of Environmental Quality (MDEQ) July to August 2016.
4. 70 nanograms per liter (ng/L) for PFOA plus PFOS is the MDEQ Drinking Water Criteria per Part 201, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and the Part 201 Administrative Rules. Table 1(June 25, 2018).
Figure 9

Parchment Glendale Watermain
62 Existing Structures
62 Existing Parcels

LEGEND

Elevated Storage Tank
Existing Watermain
Proposed Main Replacement
Affected Area

City of Kalamazoo
City of Parchment
Kalamazoo County, MI

Parchment Glendale Affected Area
Kalamazoo Lead Services
2,069 Existing Structures
2,372 Existing Parcels
1,341 Lead Services

Figure 11

City of Kalamazoo
Kalamazoo County, MI

Kalamazoo Affected Area

Legend
- Lead Service Replacement
- Elevated Storage Tank
- Production Well
- Existing City of Kalamazoo Watermain