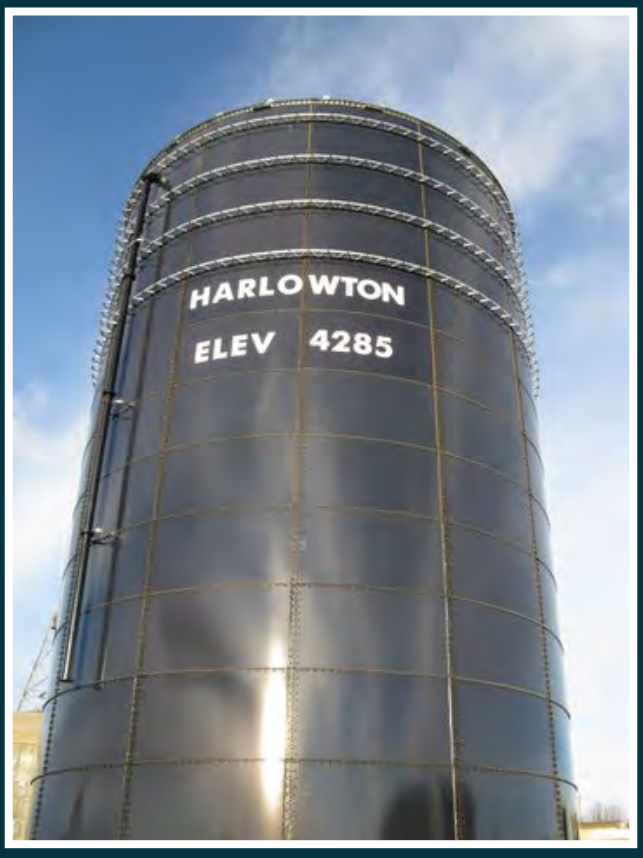
CITY OF HARLOWTON

2020 Preliminary Engineering Report

Water System Improvements



June 2020

Prepared by:

GreatWest engineering®

CITY OF HARLOWTON

Preliminary Engineering Report
Water System Improvements

June 2020

Prepared for:
City of Harlowton

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GreatWest engineering®

Table of Contents

1.0 EXECUTIVE SUMMARY 1

1.1 Introduction and Background 1

1.2 Problem Definition 2

1.3 Alternatives Considered 2

1.4 Preferred Alternative 3

1.5 Project Costs and Budget 4

2.0 PROJECT PLANNING 5

2.1 Location 5

2.2 Environmental Resources Present 5

2.2.1 Land Resources 7

2.2.2 Biological Resources 8

2.2.3 Water Resources 9

2.2.4 Floodplains 10

2.2.5 Wetlands 10

2.2.6 Cultural Resources 10

2.2.7 Socio-economic and Environmental Justice Issues 11

2.3 Population Trends 11

2.4 Community Engagement 12

3.0 EXISTING FACILITIES 13

3.1 Location Map 13

3.2 History 13

3.3 Condition of Existing Facilities 15

3.3.1 Supply 16

3.3.2 Treatment 27

3.3.3 Storage 28

3.3.4 Pumping Stations 29

3.3.5 Distribution System 30

3.4 Operational and Management Practices and Capabilities 34

3.5 Financial Status of any Existing Facilities 35

3.6 Water/Energy/Waste Audits 36

4.0 NEED FOR PROJECT 37

4.1 Health, Sanitation and Security 37

4.2 Aging Infrastructure 48
4.3 Reasonable Growth 49
5.0 ALTERNATIVES CONSIDERED 51
5.1 Alternative Screening 51
5.2 Supply Alternatives 51
5.3 Treatment Alternatives 51
5.4 Storage Alternatives 51
5.5 Pumping Station Alternatives 51
5.6 Distribution System Alternatives 52
5.6.1 Alternative D-1: Phase 5 - Replace 7,900 LF of undersized and failing cast iron pipe 53
5.6.2 Alternative D-2: Phase 6 - Replace 7,200 LF of undersized and failing cast iron and asbestos cement pipe 59
6.0 SELECTION OF AN ALTERNATIVE 65
6.1 Life Cycle Cost Analysis 65
6.2 Recommended Improvement Program 66
7.0 PROPOSED PROJECT 67
7.1 Preliminary Project Design 67
7.1.1 Water Supply 67
7.1.2 Treatment 67
7.1.3 Storage 67
7.1.4 Pumping Stations 67
7.1.5 Distribution System 67
7.2 Project Schedule 68
7.3 Permit Requirements 68
7.4 Sustainability Considerations 68
7.5 Cost Estimates 70
7.6 Annual Operating Budget 72
7.6.1 Income 72
7.6.2 Annual O&M Costs 72
7.6.3 Debt Repayments 73
7.6.4 Reserves 74
8.0 CONCLUSIONS AND RECOMMENDATIONS 75
8.1 Funding 75

8.1.1 Funding Sources 75
8.1.2 Funding Strategy 79
8.2 Implementation 82
9.0 REFERENCES 84

List of Figures

Figure 2-1 - Topographic Map and Planning Area 6
Figure 2-2 - Summary Report of Species in the Harlowton 24K Quad 8
Figure 3-1 - Existing Water Distribution System 14
Figure 3-2 - Photo of Deteriorated Cast Iron Water Main 31
Figure 3-3 - Ian Reed Public Works Director receives MRWS Manager of the Year Award 35
Figure 4-1 - Benzene Groundwater Concentration 38
Figure 4-2 - Shallow Groundwater Flow 39
Figure 4-3 - Deep Groundwater Flow 40
Figure 5-1 - Alternative D-1. Phase 5 - 7,900 feet of Water Distribution Improvements 54
Figure 5-2 - Alternative D-2. Phase 6 - 7,200 feet of Water Distribution Improvements 60

List of Tables

Table 2-1 - Population Trends 12
Table 3-1 - Total Source Water Average Monthly Flows 17
Table 3-2 - Metered Water Usage 18
Table 3-3 - Projected Water System Demands 19
Table 3-4 - Water Use Comparison 20
Table 3-5 - Summary of Existing Well Capacity 21
Table 3-6 - EPA Secondary Drinking Water Standards 22
Table 3-7 - Thompson Well Petroleum Sample Results 26
Table 3-8 - Storage Requirements 29
Table 3-9 - Pipe Inventory 30
Table 3-10 - Water System Energy Consumption 34
Table 3-11 - Summary of Expenses and Income 36

Table 4-1 - Stage 1 DBPR – Regulated Contaminants/Disinfectants.....45
Table 4-2 - Stage 2 DBPR – Regulated Contaminants.....46
Table 5-1 - Cost Estimate Alternative D-1 Phase 5 58
Table 5-2 - Cost Estimate Alternative D-2 Phase 6 64
Table 6-1 - Life Cycle Cost Analysis.....66
Table 6-2 - Recommended Improvement Program 66
Table 7-1 - Cost Estimate Alternative D-1 Phase 5 71
Table 7-2 - Water System Annual Operating Budget.....72
Table 8-1 - Funding Scenarios for Harlowton 80
Table 8-2 - Detailed Project Budget 82
Table 8-3 - Project Implementation Schedule.....83

List of Appendices

Appendix A	Environmental Checklist and Agency Correspondence
Appendix B	MTNHP Land Cover/Land Resources
Appendix C	NRCS Soil Report
Appendix D	Harlowton Source Water Delineation and Assessment Report
Appendix E	NHP Species of Concern
Appendix F	DEQ Sanitary Survey
Appendix G	FIRM Flood Insurance Rate Map
Appendix H	Wetlands and Riparian Mapping
Appendix I	2015 ACS Census Data and Target Rate Information
Appendix J	DEQ PWS Compliance and Sampling Records, Water Quality Analyses
Appendix K	DEQ LUST Petroleum Contamination Reports
Appendix L	Water Rights Summary
Appendix M	Harlowton Fire Department Letter
Appendix N	Three-Year Well Pump Records
Appendix O	Distribution System Model
Appendix P	Three-Year Detailed Income and Expense Reports

Appendix Q	EPA Chapter 2 Cross-Connection Control Manual
Appendix R	Water Rate Schedule
Appendix S	Metered Water Usage
Appendix T	Public Outreach and Community Engagement
Appendix U	Resolutions

1.0 EXECUTIVE SUMMARY

1.1 Introduction and Background

Located in central Montana, the City of Harlowton is the county seat of Wheatland County. The original water distribution system for the City was constructed in the 1930's of cast iron pipe. Subsequent repairs and replacements have resulted in a variety of pipe types and sizes. A significant portion of the pipe remaining in the system is cast iron and asbestos cement. A 2008 Water System PER evaluated the water storage, distribution, supply, and treatment infrastructure at the time. In 2011, using State, local and Federal funding, the City completed Phase 1 water system upgrades by constructing a new 590,000-gallon storage tank, booster station and about 2,000 lineal feet of new 12-inch PVC main. In 2013, approximately 5,500 feet of water main was replaced with 6-inch and 10-inch PVC under Phase 2 of the water project. The City's Pritchard Well was rehabilitated to improve water quality and well longevity by installing a liner casing to exclude corrosion by-products that are encrusted onto the cast iron casing. The 2014 Water System PER described a phased approach to replace approximately 25,000 feet of deteriorated cast iron pipe. The City was successful in obtaining funding for the Phase 3 project which replaced approximately 9,000 lineal feet of pipe. Construction on this project concluded in the Spring of 2017. In 2018, the City obtained funding for Phase 4 water system improvements which will replace approximately 7,500 feet of pipe. Construction of the Phase 4 improvements will be completed in the Summer of 2020.

After the construction of the new water storage tank, the resulting improved static pressures caused the cast iron distribution pipe to break with notable frequency. According to the City's Public Works Director, beginning in the late fall of 2011, City crews were called out on breaks so often that during some periods they had insufficient time to adequately record the breaks. However, accurate records do exist for 87 breaks since October 2011, including 25 in the last four years.

The DEQ Mager Leaking Underground Storage Tank (LUST) Trust Fund Site is currently active in Harlowton. Reports fully characterizing the areal extent and magnitude of hydrocarbon-contaminated groundwater beneath this site (comprising eight or nine potential sources) have recently been prepared by DEQ and others. Monitoring well data presented in DEQ reports indicate that the thickness of free product (leaded gasoline) floating on top of groundwater may range from 5 ft to 9 ft.

The City still has about 8,500 lineal feet of old, deteriorated and undersized cast iron pipe and over 13,000 lineal feet of aging asbestos cement water mains.

1.2 Problem Definition

The PER provides a thorough description of Harlowton's water system infrastructure and a detailed analysis of the performance and condition of the existing water system. The system deficiencies identified in this report are as follows:

- Approximately 8,500 lineal feet of the existing water distribution system is comprised of deteriorated cast iron water mains that are roughly 80 years old and have outlived their useful life.
- The old pipe is subject to electrolysis which corrodes and forms holes in the pipe that provide contaminant-entry points to the public drinking water system.
- The cast iron pipe does not withstand current available and required static pressures, resulting in catastrophic failure and main breakage at the rate of over 30 breaks per year in the last two years.
- Main breakage results in an imminent public health and safety problem when low or zero static pressures allow for the inflow, backflow, and infiltration of potential contaminants, such as petroleum hydrocarbons derived from the Mager LUST Trust Fund Site.
- Unaccounted for water exceeds 50%, indicative of well pumping far in excess of usage and billing for revenue because of high system leakage. This negatively affects water conservation efforts.

1.3 Alternatives Considered

Discussion throughout this report has clearly established the need for distribution system improvements. Leakage in the distribution system has been excessive over past years, with leakage estimates exceeding 50% of water pumped. The high frequency of pipe break repairs has been extremely burdensome to the Public Works Department staff, oftentimes diverting their time and attention from other important operational and maintenance duties.

Leaking, breaking, tuberculated, undersized cast iron and asbestos cement pipe and associated reduced static pressures are a source for potential contamination from backflow, inflow, and backsiphonage from high groundwater, overburden, and direct cross-connections within the

distribution network. Undersized lines and leaking lines limit flows, which could be extremely critical in emergency fire situations. To bring the system into full MDEQ compliance, provide necessary fireflows for safety concerns, and to protect public health and safety from potential contaminants, all cast iron, asbestos cement and undersized pipe must be replaced as soon as possible. The evaluation and summary of the recommended improvements will be discussed further and the alternatives evaluation will be completed with the goal of meeting the following criteria:

- Replace cast iron mains installed in the 1930's
- Replace failing asbestos cement water mains
- Use the least permeable available pipe materials within and contiguous to contaminant zones
- Provide a distribution system capable of providing adequate fire protection
- Replace all substandard water mains in the system, including those that do not meet the minimum six-inch diameter size required by MDEQ for fire flow

The alternatives considered for water distribution include:

- No Action
- Alt. D-1: Phase 5 Distribution System Improvements - Replace 7,900 LF of undersized and failing cast iron pipe
- Alt. D-2: Phase 6 Distribution System Improvements - Replace 7,200 LF of undersized and failing cast iron and asbestos cement pipe

1.4 Preferred Alternative

Through previous analysis, the City has determined that a phased approach is the most cost-effective and efficient method of addressing the distribution system deficiencies. Based upon the alternative evaluation, public comment, funding strategy and feedback from the City, the proposed project is Alt. D-1 Phase 5 Distribution System Improvements. The pipe replacement will include 7,200 lineal feet of 6-inch PVC pipe and 700 lineal feet of ductile iron pipe contiguous to the DEQ-defined Mager LUST Trust Fund Site. Replacement is needed to increase fire flow to the area and eliminate potential leaks. Old cast iron pipe in Harlowton's water distribution system is a significant contributor to 50% unaccounted for water in recent years.

1.5 Project Costs and Budget

The total estimated cost for the selected Phase 5 Distribution System Alternative is $1,914,000. These costs are detailed in Table 5-1. Various funding sources for the improvements are considered in Chapter 8 and include a variety of grant and low interest loan sources available to the City of Harlowton.

The City's preferred funding package for the Alt. D-1 Phase 5 proposed project includes Funding Scenario #1 (Table 8-1):

- $625,000 TSEP Grant
- $125,000 DNRC-RRGL Grant
- $450,000 CDBG Grant
- $357,000 SRF Loan Forgiveness
- $357,000 SRF Loan

Table 8-1 presents the various funding scenarios considered, including the proposed funding strategy. Table 8-2 is a Detailed Project Budget based upon the proposed funding strategy.

The City understands the significant infrastructure improvements needed in their water system. With this understanding, the City has taken a steady and moderate approach to increasing water rates to help put the community in a position to complete all of the necessary improvements and to provide long-term stability for the water system.

Assuming the overall funding strategy is successful for Phase 5, the project will increase user rates by about $3.38/month/Equivalent Dwelling Unit (EDU). The current average monthly water user rate is $41.80. The user cost per month including the proposed project is $45.18. The current average monthly sewer user rate for the City is $33.90, making a combined user rate, with the proposed project of $79.08. This amount compared to the City's target rate as established by the Montana Department of Commerce ($57.14) shows that the City exceeds the target rate by 138%. The City is capable of providing the necessary funds for the City to repay the new debt service and meeting coverage requirements while adequately operating and maintaining the system.

2.0 PROJECT PLANNING

The planning and service area for this PER is shown in Figure 2-1. It generally consists of the incorporated boundary of the City of Harlowton.

2.1 Location

The City of Harlowton is located in central Montana at the convergence of Highway 12 and Highway 191. Harlowton is also the county seat of Wheatland County. It is bordered on the South by the Musselshell River and is located about 100 miles northwest of Billings. More specifically the City is located at:

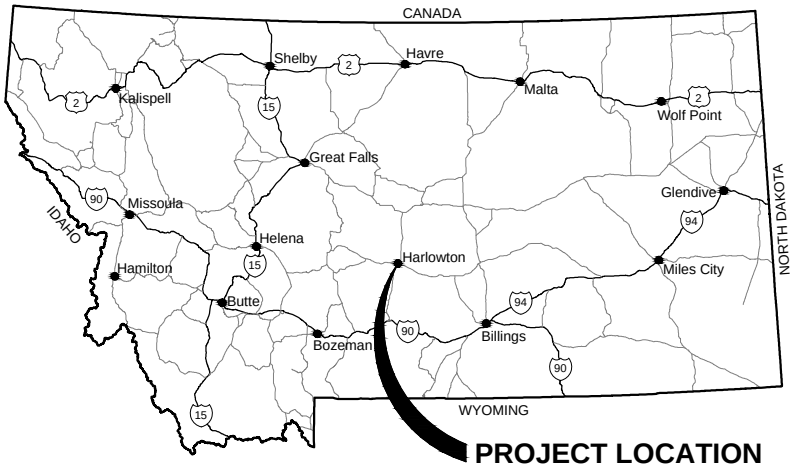
Township/Range/Section:	Township 8N Range 15E Sections 21 and 22
Latitude/Longitude:	46.44°N / 109.83° W
Elevation:	4,200 ft.

2.2 Environmental Resources Present

As with any major construction project, the potential effect of the project on the surrounding environment must be considered and provisions made to mitigate any negative effects. The Uniform Environmental Checklist as required by the Uniform Application summarizes the environmental review process. A completed Environmental Checklist may be found in Appendix A along with the Treasure State Endowment Program Environmental Assessment (EA). In summarizing the environmental information, the EA states that,

- All impacts of the proposed actions have been accurately identified,
- All impacts will be mitigated below the level of significance, and
- No significant impact is likely to occur.

Quantification and characterization of potential impacts to environmental, human, and historic resources, includes sending letters to pertinent local, state, and federal agencies for their review and comment on any potential environmental effects as a result of the proposed improvements. The letters and responses are included in Appendix A.



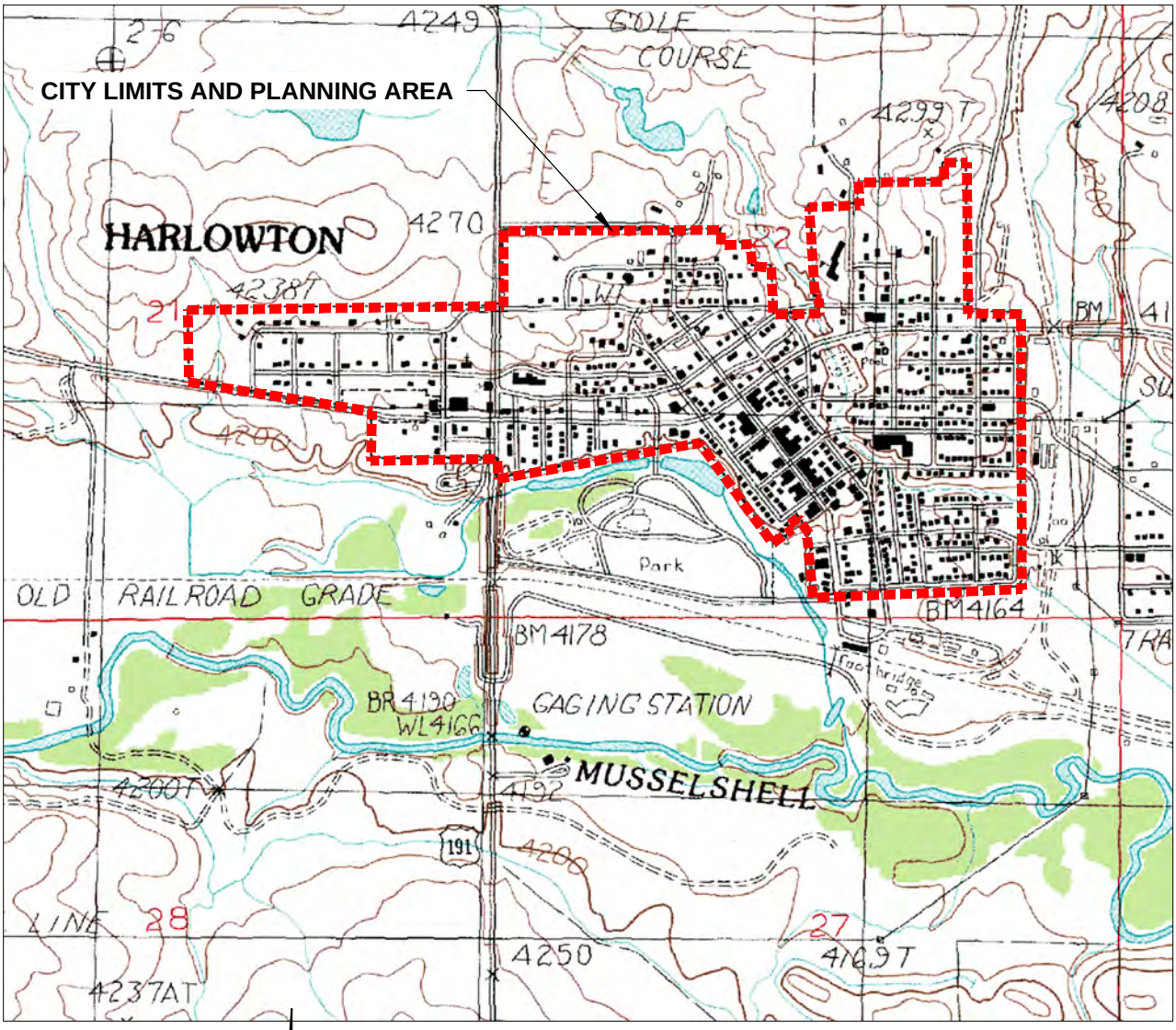


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Figure 2-1
TOPOGRAPHIC MAP AND PLANNING AREA

CITY OF HARLOWTON
WATER SYSTEM IMPROVEMENTS

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2.2.1 Land Resources

Land use information obtained from the Montana Natural Heritage Program (map shown in Appendix B) shows that land resources surrounding the City of Harlowton consist primarily of grasslands and secondarily of introduced vegetation. Land use is principally livestock production. There is no prime farmland or forestland in the immediate vicinity of Harlowton.

Within the City limits land use is residential/commercial, with gas and gas storage shown on the landcover map.

The NRCS Custom Soil Report (Appendix C) for Harlowton shows that the primary soil type within the proposed project area is the Niart-Rothiemay loam. This soil overlies an alluvial fan derived from limestone and sandstone. The soils are gently sloping at 0 to 4 percent and are classified as well-drained with a moderate to high water capacity. NRCS reports maximum calcium carbonate content at 55 to 60 percent.

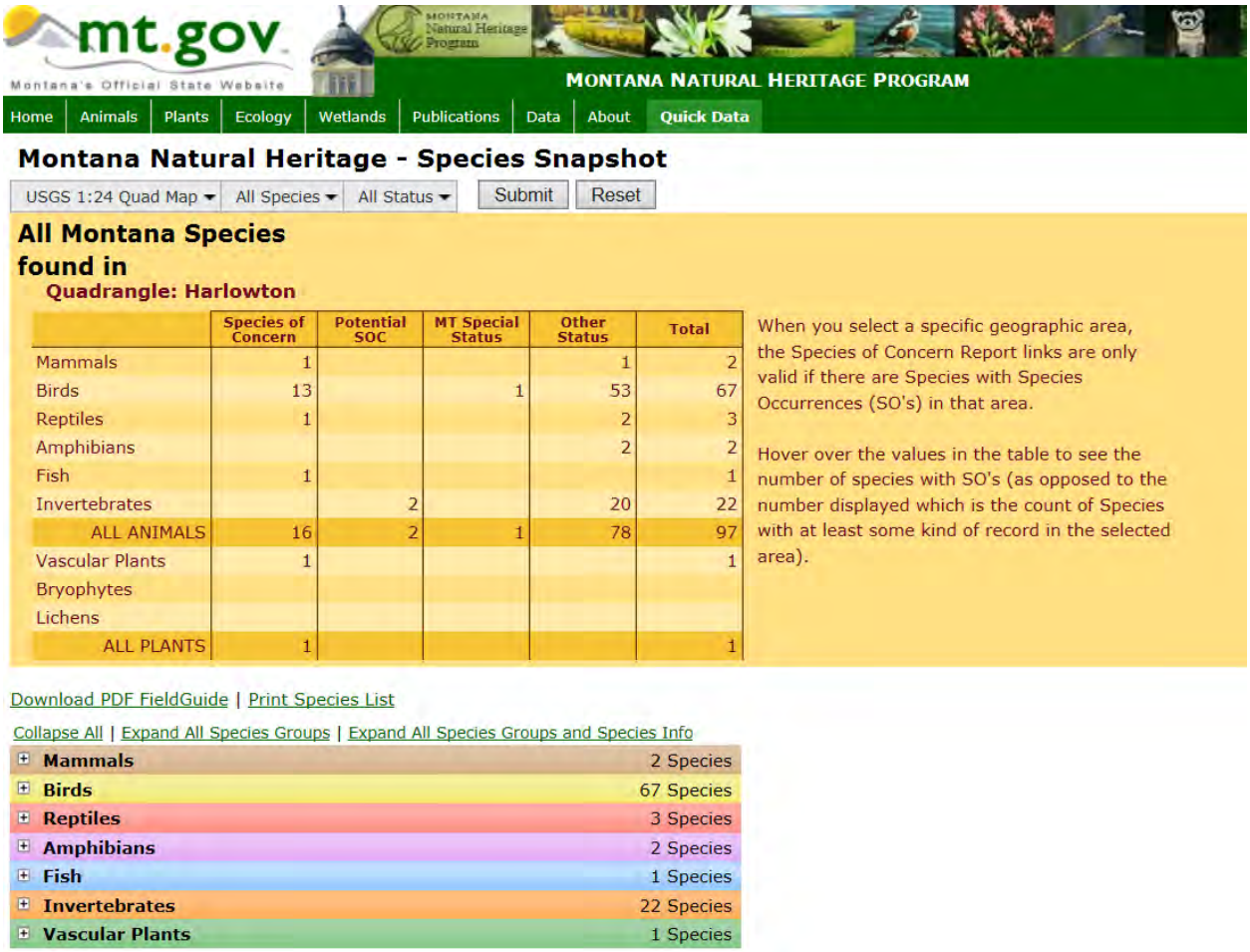
The topography of the area within the City limits gently slopes down in elevation toward the southeast of town. Elevations range from approximately 4,170 feet in the southeast area of town to approximately 4,280 feet at the northern boundary of the city limits. Elevations, in general, are gently sloping with the highest elevations in the north or northwest and the lowest elevations in the south or southeast.

The geology of the Harlowton area as described by Wilde and Porter (Geologic Map of the Harlowton 30'x60' Quadrangle, 2001, Montana Bureau of Mines and Geology OFR 434) and by DEQ in the Harlowton Source Water Delineation and Assessment Report (Appendix D) is summarized here. The Shawmut Anticline, lying south of town across the Musselshell River dominates this part of the quadrangle by rising several hundred feet above the river. This anticline forms a hydrologic divide between the Musselshell River and the Yellowstone River Basins. Harlowton is located in the un-glaciated Missouri Plateau of the Great Plains Physiographic Province. Geology underlying the City consists of Cretaceous age Judith River Formation overlain by Quaternary age alluvial terrace deposits.

2.2.2 Biological Resources

Biological resources, including both plant and animal species of concern have been evaluated through the Montana Natural Heritage Program (NHP) as summarized in Figure 2-2. A detailed listing of all species names is found in Appendix A.

Figure 2-2 - Summary Report of Species in the Harlowton 24K Quad



	Species of Concern	Potential SOC	MT Special Status	Other Status	Total
Mammals	1			1	2
Birds	13		1	53	67
Reptiles	1			2	3
Amphibians				2	2
Fish	1				1
Invertebrates		2		20	22
ALL ANIMALS	16	2	1	78	97
Vascular Plants	1				1
Bryophytes					
Lichens					
ALL PLANTS	1				1

USFWS lists the following species as threatened, endangered and candidate species in Wheatland County as a whole:

- Black-footed Ferret
- Canada Lynx
- Whitebark Pine

USFWS does not anticipate adverse effects to threatened, endangered, or candidate species to result from implementation of the proposed project.

The proposed project is not mapped in an Executive Order (EO) Area for Sage Grouse Habitat and since the proposed project will take place in an urban setting, it is not anticipated that negative impacts will occur to sage grouse, vegetation, wildlife, or habitat. Water main replacements will occur in previously disturbed areas along established easements, below streets and alleys and is not expected to affect any species of concern.

2.2.3 Water Resources

The Musselshell River is the primary water body in the area and runs just south of Harlowton, generally preventing significant community growth to the south. Other small creeks, including Jawbone Creek and Antelope Creek run north and south through the eastern half of town.

The City limits as shown on Figure 2-1 show that the City has reasonable areas for growth available to the north and east. Since the City is not anticipating major growth in the near future, the planning area for the purpose of this report will be limited to the City limits as presented in Figure 2-1.

The City obtains all of its source water using groundwater from three wells located throughout the City. All wells are completed in deep bedrock aquifers. Groundwater contamination attributable to the DEQ Mager LUST TRUST Fund site has been reported by DEQ. The site was discovered in the late 1990's and is currently being characterized and remediated.

The Thompson Well is currently the City's largest producing well with a capacity of about 375 gpm. With a total depth of 414 feet, the Thompson Well is the city's most shallow well. It appears to be completed in the Cretaceous age Claggett Shale with an open bottom. The Claggett Shale is a brown, fissile shale that contains numerous lenticular fine-grained sandstone beds. It should be noted that the Thompson Well flows artesian during some months. The South Well also flows at surface under pressure (artesian flow). Thompson Well samples indicate that it has been affected by the hydrocarbon plume; benzene and 1,2,-DCA have been detected at very low concentrations. This would suggest the existence of a certain degree of hydraulic connectivity between the shallow flow system and the deeper flow system, possibly through casing leakage.

Even though the South Well is the City's smallest producing well, it can still provide about 280 gpm. At a total depth of 921 feet, the South Well is completed in the Cretaceous age Eagle Formation with perforations from 208-210 feet, 638 – 646 feet, and from 800 – 860 feet. The Eagle Formation is a light gray to tan, fine- to medium-grained sandstone that often forms low cliffs and ridges.

The Pritchard Well total depth is 1,402 feet and is also completed in the Eagle Formation with perforations from 503-645 feet and from 825 – 858 feet. The Pritchard Well is undergoing rehabilitation as of the time of this writing to address the problem of casing corrosion, heavy encrustation, and subsequent production of particulates. The current projected sustained yield of the Pritchard well is 275 gpm.

The Source Water Assessment Report (Appendix D) and the Sanitary Survey (Appendix F) provide more detailed information on the groundwater supply for Harlowton. More information on the wells and water quality is presented in Chapter 3.3.1.

2.2.4 Floodplains

The Flood Insurance Rate Map found in Appendix G shows the location of 100- and 500-year floodplains as of September 16, 1981. Portions of the planning area lie within the designated floodplains and permitting will be required for any improvements occurring within the designated floodplains.

2.2.5 Wetlands

Wetlands mapping for the Harlowton area has been completed but has not yet been published on the MTNHP Wetland and Riparian Mapping Center's data page. The author obtained a copy of the map from the Ecologist who performed the mapping at the Montana Natural Heritage Program in Helena, MT. The map, found in Appendix H, shows that there are no wetlands within the proposed project area.

2.2.6 Cultural Resources

Cultural resources include historic and prehistoric archaeological sites, historic architecture, engineering features and structures, and resources of significance to Native Americans. The Montana State Historic Preservation Office (SHPO) was contacted to determine whether there are significant historical and cultural resources within the project area, The response from

SHPO dated March 26, 2020 is included in Appendix A and explains that there are several previously recorded sites within the area, but that based on previous disturbance ground disturbance within roadways, SHPO feels that there is a low likelihood that cultural properties will be impacted. SHPO therefore feels that a recommendation for a cultural resources inventory is unwarranted at this time.

2.2.7 Socio-economic and Environmental Justice Issues

The 2015 American Communities Survey shows that the current Low and Moderate Income percentage is 51.74% (Appendix I). This report also shows that the poverty rate in Harlowton is 16.4%. The community qualifies for Community Development Block Grant (CDBG), a low-income grant program that requires low and moderate incomes (LMI) levels of at least 51% to be eligible for their program grant money. The City of Harlowton intends to pursue a CDBG grant in 2020 to fund the next phase of water system improvements.

The proposed improvements will affect the entire community equally. The improvements will be beneficial to human health and will not adversely affect the environment. There will be no disproportionate effects as a result of the proposed improvements.

2.3 Population Trends

Population analyses provide the basis for all planning efforts and play a large role in planning decisions. Projections of future population are used in planning and engineering design to properly size facilities. Historic and projected populations for Wheatland County and for the City of Harlowton are shown in Table 2-1. The current population for the City is 899 based on the 2015 American Communities Survey. Supporting census data are included in Appendix I. Historically, Wheatland County experienced a decline in population from the 1960 census until the 2000 census when the population equilibrated and showed a slight increase at 0.6%. County population decline continued, however into the 2010 census period. City population declination patterns follow that of the County, but with somewhat more dramatic fluctuations demonstrated. A population increase of 1% per year is assumed for the 20-year planning period (year 2040) to allow for modest growth in the community. Growth could accompany incremental improvements in drinking water quality, especially with the eventual connection to the CMRWA system supply. This correlates to a design year population of 1,097, or an additional 198 residents over the 2015 census population. This growth is anticipated to occur throughout the City. No areas of concentrated growth are identified.

Table 2-1 - Population Trends

Historic (1), Current (2) , and Projected (3) Population Trends 1960 - 2040				
	Wheatland County		City of Harlowton	
Year	Population	Growth During Period	Population	Growth During Period
1960	3,026		1,734	
1970	2,529	-16.4%	1,375	-20.7%
1980	2,359	-6.7%	1,181	-14.1%
1990	2,246	-4.8%	1,049	-11.2%
2000	2,259	0.6%	1,062	1.2%
2010	2,168	-4.0%	997	-6.1%
2020	2,115	-2.4%	899	-9.8%
2040(3)	2,538		1,097	

Notes:

(1) Source: U.S. Bureau of the Census, Decennial Censuses of Population (title varies per Census), 1890-2010

(2) 2015 American Communities Survey

(3) 20-year design population assumes 1% per year growth rate

2.4 Community Engagement

Water system needs have been discussed with the public numerous times over the past 10 years, with three phases of water system improvements previously completed and a fourth phase currently in construction. The City has a Facebook page that is utilized for reaching out to the public to inform them of important issues, meetings, and forums for public input.

Due to the restrictions of COVID-19 on public meetings, the City was unable to effectively meet with the public to discuss this PER and proposed improvements prior to the publication of the document. The City of Harlowton will continue to work with Great West Engineering on a plan for in-person public meetings as restrictions allow. The City of Harlowton is confident that public meetings will occur prior to August 1, 2020.

3.0 EXISTING FACILITIES

This chapter describes the various components of the Harlowton water system, discusses their condition, and analyzes facility capacity, functionality, and deficiencies.

3.1 Location Map

Figure 3-1 is a map showing the location and schematic layout of the existing water system.

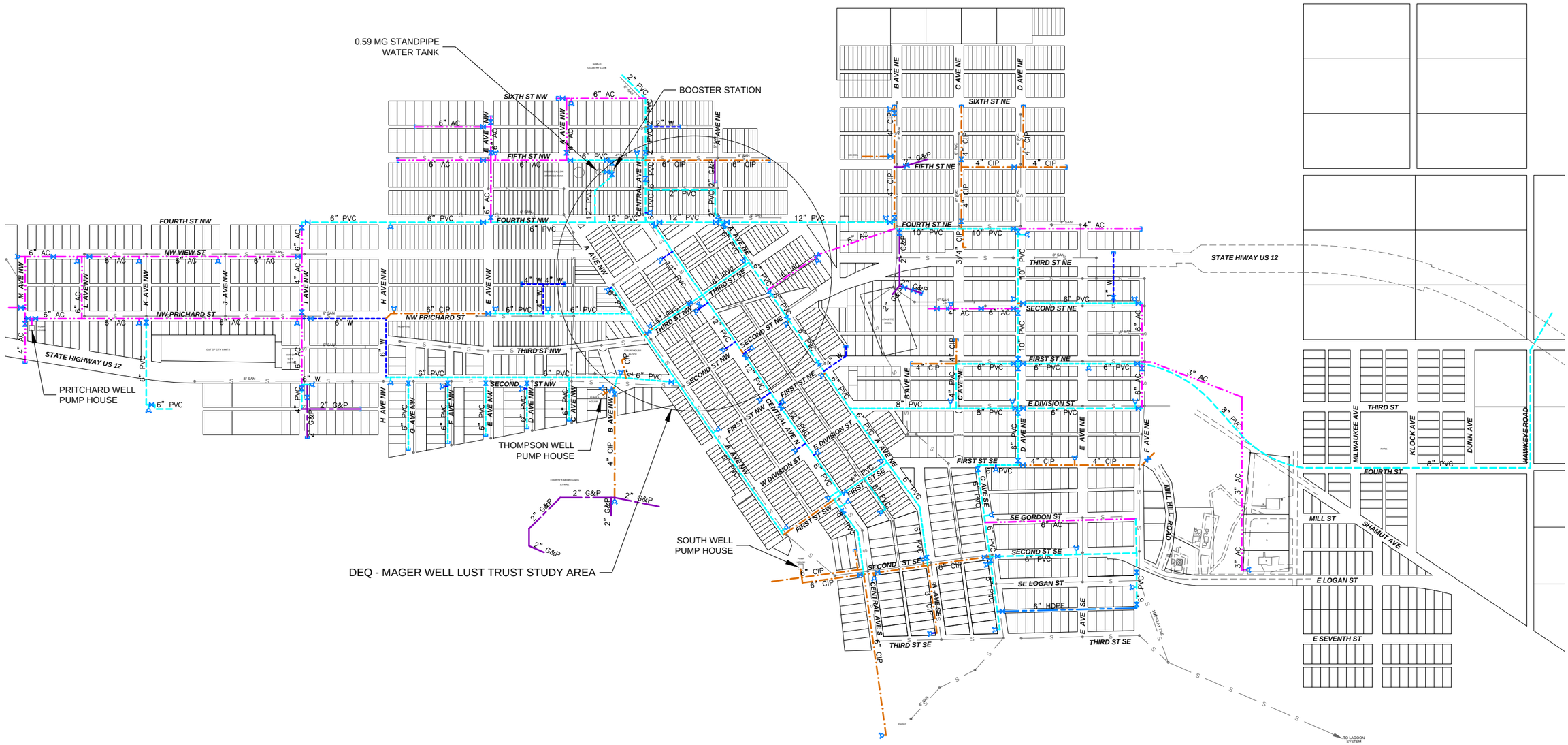
The water system consists of the following:

- Supply:
    - Pritchard Well with wellhouse
    - Thompson Well with wellhouse
    - South Well with wellhouse
- Storage
    - 590,000 gallon stand pipe water storage tank
- Treatment
    - Chlorine injection
    - Orthophosphate addition
- Distribution
    - Booster Station
    - For Pipe inventory see Table 3-7.

3.2 History

The Thompson well was installed to a total depth of 414 feet in 1941. The Pritchard Well was completed in 1961 to a total depth of 1,402 feet, and the South Well was drilled in 1975 to a total depth of 921 feet.

A well rehabilitation project was recently completed to address particulate/sediment production associated with corrosion by-products in the Pritchard Well. This project was completed in 2015.



LEGEND

- UNKNOWN TYPE WATER LINE
- PVC WATER LINE
- HDPE WATER LINE
- CAST IRON WATER LINE
- ASBESTOS CEMENT WATER LINE
- GALVANIZED AND PLASTIC WATER LINE
- GATE VALVE
- FIRE HYDRANT

0 300 600
SCALE IN FEET

NORTH

Figure 3-1
Existing Water Distribution System Improvements

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The new 590,000 gallon standpipe water storage tank was constructed in 2011 to replace the aging (1940's) concrete tank which has been subsequently de-commissioned.

City personnel have noted that most of the system includes leaded-joint pipe services. In 2001 the City had one Action Level Exceedance (0.18 mg/L) for lead. There have been no other lead violations to date. In 2006 an Administrative Order was issued with the subsequent requirement that the City complete a Corrosion Control Treatment Study/Plan. Corrosion inhibitors were subsequently added to the treatment protocol. The City is currently adding orthophosphate to each well as a passivation agent to protect the distribution and service lines from the corrosive reactions that occur when they are in long-term contact with untreated source water. Gaseous chlorine is also injected at each wellhead.

The existing distribution system was installed in the 1930's using cast iron pipe. In the ensuing 80 years the City has completed various projects that have replaced short segments of cast iron with an assortment of pipe types and sizes including asbestos cement, galvanized pipe, plastic, and PVC. Table 3-7 presents a current inventory of pipe materials and sizes. Corrosion inhibition came too late to save the cast iron pipe from the degradatory effects of the source water quality such that now it is quite fragile and breaks with notable frequency. Out of concern for public health and excessive O&M costs, the City has been instituting pipe replacement projects, using its own resources for labor and materials in addition to resources of funding agencies. About 2,000 ft. of transmission main was replaced with 12" PVC in 2011 in concert with the tank replacement project (Phase 1). An additional 3,800 feet of 10" and 6" PVC main replacements were completed in 2012 under the Phase 2 project. In 2016 under the Phase 3 project, 9,000 feet of pipe was replaced. Also, as part of the Phase 3 project, 460 water meters were replaced, and a new well chlorination structure was added at the Thompson Well. Approximately 7,500 feet of pipe is being replaced under the Phase 4 project during the summer of 2020.

3.3 Condition of Existing Facilities

Harlowton is a member community of the Musselshell Judith Rural Water System, a proposed water system of the Central Montana Regional Water Authority (CMRWA). The CMRWA is seeking Congressional authority and funding to construct and operate a regional water system. The City of Harlowton would be one of the first members to connect to the new water source after construction. The first pipeline segment from the wellfield near Garneil down to Harlowton

has been designed and approved by DEQ. The Authority is waiting on funding approval to begin construction of this segment.

The City has made significant progress in addressing deficiencies in the water system by taking a prioritized, phased approach to water system improvements as illustrated above. But even after notable improvements to the City's supply, storage, and distribution system, important deficiencies within the distribution system remain as a result of corrosion, aging, increased static pressures, and the presence of a petroleum hydrocarbon plume. The known characterized areal extent of this plume to date encompasses roughly 10-20% of the subsurface within the City limits, contaminating the shallow groundwater and potentially contaminating the soil. Data found in available reports suggest that the full extent of the plume has not yet been defined. Please see Chapter 9.0 for a list of report citations on the Mager LUST Trust Fund Site.

None of the wells are supplemented with an emergency generator. In the event of a power failure the City is dependent on the water in the storage tank. The wells are spread throughout town, only a City-wide power failure would result in a complete loss of water supply.

3.3.1 Supply

Until construction of the CMRWA, the City is wholly reliant on its three wells as described above and below.

Water Demand

Harlowton's source water is metered in pump houses located near each well. Meter readings are added together to obtain a total amount of water produced. Additionally, water meters are installed on each service and individual and commercial water usage is recorded monthly. The following sections will discuss the methodology and assumptions used in determining the existing and projected water demands for the community.

Historical Water Demands

The calculation of average daily demand is dependent on the specific community and the information available for the community. The following water demands are based on data for 2017 through 2019. Table 3-1 represents a summary of the historical average monthly source water flows. Table 3-2 summarizes the historical metered usage within the City of Harlowton.

Table 3-1 - Total Source Water Average Monthly Flows

Total Source Water Average Monthly Water Flows						
Month	2017 (gal)	2018 (gal)	2019 (gal)	Average per month (gal)	Average Per Day (gal)	Average Per Capita Use (gpcd)[1]
January	5,967,500	5,019,986	6,897,221	5,961,569	192,309	214
February	5,269,212	5,664,102	7,373,435	6,102,250	217,937	242
March	5,890,577	6,156,023	8,881,515	6,976,038	225,033	250
April	7,032,990	6,202,467	7,733,380	6,989,612	232,987	259
May	9,669,209	6,599,330	7,435,082	7,901,207	254,878	284
June	14,241,231	7,168,943	9,106,595	10,172,256	339,075	377
July	12,484,642	12,102,161	9,534,350	11,373,718	366,894	408
August	10,954,096	11,892,697	10,323,627	11,056,807	356,671	397
September	6,557,692	7,633,643	7,545,983	7,245,773	241,526	269
October	3,618,317	6,273,111	6,222,667	5,371,365	179,046	199
November	4,557,900	6,106,921	6,192,826	5,619,216	187,307	208
December	4,204,357	6,746,438	6,153,905	5,701,567	183,922	205
Total	90,447,723	87,565,822	93,400,586	90,471,377	247,867	276

Notes:
[1] Based on existing service population of 899.

Table 3-2 - Metered Water Usage

Metered Water Usage						
Month	2017 (gal)	2018 (gal)	2019 (gal)	Average per month (gal)	Average Per Day (gal)	Average Per Capita Use (gpcd)[1]
January	2,059,545	2,017,098	2,296,110	2,124,251	68,524	76
February	1,878,902	1,830,860	2,456,950	2,055,571	73,413	82
March	1,981,097	1,882,347	1,683,760	1,849,068	59,647	66
April	1,909,315	1,996,580	2,236,390	2,047,428	68,248	76
May	3,046,526	2,605,794	2,210,490	2,620,937	84,546	94
June	5,973,127	2,504,435	3,244,130	3,907,231	130,241	145
July	7,502,541	6,221,039	5,058,890	6,260,823	201,962	225
August	8,531,672	7,786,569	5,375,890	7,231,377	233,270	259
September	5,097,776	3,706,939	3,419,870	4,074,862	135,829	151
October	1,968,626	2,985,791	2,057,960	2,337,459	77,915	87
November	1,565,610	1,963,310	1,785,420	1,771,447	59,048	66
December	2,350,322	2,054,050	1,860,250	2,088,207	67,362	75
Total	43,865,059	37,554,812	33,686,110	38,368,660	105,120	117

Notes:
[1] Based on existing service population of 899.

As shown in Table 3-2, average day use based on the source flow data is 247,867 gpd. Conversely, average day use based on individual meter data is 105,120 gpd, indicating that over 142,747 gpd, or 58% of the water pumped into the system is lost or unaccounted for. As a rule of thumb, any amount of lost and unaccounted for water greater than 10 to 15% is considered excessive. Typically, water lost or unaccounted for in a system is the result of leaks, unmetered uses, inaccurate meters, and/or flushing of fire hydrants. In Harlowton, the largest known source of unaccounted for water is leaking distribution mains and service line connections.

When comparing source flow data and metered usage data, there is some water loss occurring in the system. To remain conservative and to account for water loss that will occur even after improvements in the distribution system are made (i.e. flowing hydrants, un-metered use, leaks in services, etc.) the source flow data is utilized to calculate existing and projected demand. The average day per capita use in Harlowton is therefore 276 gallons per capita per day.

The source flow data indicates a maximum day use of 408 gpcd (based on a maximum source flow month of August). The average day of the maximum month divided by the average day per capita use is 1.5. The definition of maximum day demand is the highest volume of water consumed on any day in a year. Daily flow records were not available for Harlowton so a true maximum day peaking factor cannot be calculated. Typical maximum day to average day peaking factors range from 2.5 to 3.5 based on communities in Montana of similar size. A maximum day to average day peaking factor of 3.0 was used to project future demands.

In summary, the following data is used in calculating future demand:

- Average Day Per Capita Use: 276 gpcd
- Maximum Day Peaking Coefficient: 3.0

Projected Water Demands

With a projected population and average per capita use, projected water demands can be made. The projected demands will establish the design criteria necessary to develop future improvements to the Town's water system. Based on population projections over the 20-year design period, projected water demands are calculated in Table 3-3. Because demand is based on the amount of water pumped into the system, once leakage throughout the system is reduced, water use should be reevaluated as it is logical to believe the overall system demand will also decrease.

Table 3-3 - Projected Water System Demands

City of Harlowton Projected Water System Demands					
Year	Estimated Service Population	Average Day Use		Maximum Day Use	
		(gpd)[1]	(gpm)	(gpd)[2]	(gpm)
2020	899	248,124	172	744,372	517
2025	945	260,820	181	782,460	543
2030	993	274,068	190	822,204	571
2035	1,044	288,144	200	864,432	600
2040	1,097	302,772	210	908,316	631
Notes: [1]Based on 276 gpcd [2]Based on a max. day to average day factor of 3.0					

The average per capita water estimate determined for Harlowton was compared to other metered communities similar in size. The average per capita water use of 276 gpcd is the highest of the values of similar communities in Montana, as seen in Table 3-4 below.

Table 3-4 - Water Use Comparison

Metered Community Water Usage Comparison	
Community	Average Water Use (gpcd)
Dutton	126
Roundup	130
Sun Prairie	132
Harlem	140
Hill County	146
Power	151
Shelby	190
Cascade	193
Melstone	196
Ennis	199
Fort Benton	228
Judith Gap	239
Wilsall	240
Ryegate	243
Harlowton	276
Average	*186*

Volume and Capacity for Growth

As shown in Table 3-5 Summary of Existing Well Capacity, all three wells pumping at their stated capacity will produce 930 gpm. However, DEQ Circular 1 section 3.2.1.1.a. states that the total developed groundwater source capacity must be sufficient to meet design maximum day demand with the largest producing source out of service. With the largest producing well out of service (Thompson Well) the total source capacity is reduced to 555 gpm.

Current average day (172 gpm) and maximum day (517 gpm) demands are met by the current source capacity with the largest producing well out of service (555 gpm) as shown in Table 3-5. Table 3-3 also shows that the design year (2040) average day demand of 210 gpm can also be met using the current well sources. But the 2040 maximum day demand of 631 gpm exceeds

the current source capacity of 555 gpm with the largest producing well out of service. The 2040 maximum day demand is estimated based on the assumption that population growth will occur at the rate of 1%/year.

To summarize, the current source capacity is sufficient to support growth at the current growth rate into the long-term. But if growth increases to 1%/year or more, it is expected that additional source capacity must be developed to meet maximum day demands by the year 2040. However, the CMRWA system is designed to provide the maximum day demand in Harlowton and it is anticipated that the segment from the wellfield down to Harlowton will be completed within the planning period.

Table 3-5 - Summary of Existing Well Capacity

Summary of Existing Well Capacity and Capacity for Growth					
Well	Capacity (gpm)	Current Avg Day Demand	Current Max Day Demand	2040 Avg Day Demand	2040 Max Day Demand
Pritchard Well (1)	275				
Thompson Well (2)	375				
South Well (2)	280				
Total	930				
Total well Capacity with highest producing well out of service	555 gpm	172 gpm	517 gpm	210 gpm	631 gpm

Sufficient source capacity for ADD at design population, but insufficient source capacity for MDD at design population; 555 gpm developed source capacity available with largest well out of service.

Notes:

(1) Western Groundwater Services, Pritchard Well Evaluation and Improvement Plan, 2013, pg.1.

(2) Great West Engineering PER, City of Harlowton, 2008

(3) current pop = 899; assume 2040 pop = 1097

Water Quality

The quality of the water is poor, highly corrosive, and triggers the Federal/State Action Level for lead and copper requiring that a treatment technique be employed to mitigate the elevated concentrations.

Historical water quality results reported in the 2008 Harlowton Water PER indicate that for the sources, total dissolved solids (TDS) and sulfate concentrations are elevated. Ranges for TDS are from 500-1,200 mg/L. Table 3-6 shows that the EPA Secondary MCL for TDS is 500 mg/L.

The Secondary MCL for sulfate (Table 3-6) is 250 mg/l. Sulfate ranges from 65mg/L in the South Well to 455 mg/L in the Thompson Well. pH levels are elevated, ranging between 8-9 s.u. The Secondary MCL range for pH is 6.5 – 8.5 s.u. Bicarbonate concentrations are also elevated, ranging from 335-630 mg/l. Calcium and magnesium concentrations are comparatively low, however. Water quality in the Pritchard and South wells is extremely soft with calcium at about 1 mg/l and magnesium < 0.300 mg/L. The Thompson water contains only marginally more calcium and magnesium, with calcium ranging from 5-60 mg/l and magnesium ranging from 3-30 mg/L. While the alkalinity and pH are quite high, there is likely insufficient calcium and magnesium available in the source water for precipitation onto the interior surfaces of pipes, hence, corrosion occurs. The City currently adds orthophosphate as a corrosion inhibitor to mitigate the harmful effects of the aggressive source water and to meet the EPA/DEQ-required treatment technique requirements for the control of lead and copper. Hydrogen sulfide, which is also very corrosive, is also present in the water supply.

Table 3-6 - EPA Secondary Drinking Water Standards

EPA Secondary Drinking Water Standards	
Constituent	Secondary Maximum Contaminant Level
Sodium, mg/L	250
Iron[6], mg/L	0.3
Manganese[7], mg/L	0.05
Chloride, mg/L	250
Sulfate[9], mg/L	250
Fluoride[8], mg/L	2
Total Dissolved Solids, mg/L	500
pH, s.u.	6.5-8.5

Aside from the 2006 violation for lead and copper, the water quality for Harlowton meets all Primary Maximum Contaminant Levels for drinking water. A summary of drinking water compliance and sampling records may be found in Appendix J.

Existing Water Supply

Even though the South Well is the City's smallest producing well, it can still provide about 280 gpm. At a total depth of 921 feet, the South Well is completed in the Cretaceous age Eagle Formation with perforations from 208-210 feet, 638 – 646 feet, and from 800 – 860 feet. The

Eagle Formation is a light gray to tan, fine- to medium-grained sandstone that often forms low cliffs and ridges.

The Pritchard Well total depth is 1,402 feet and is also completed in the Eagle Formation with perforations from 503-645 feet and from 825 – 858 feet. The current projected sustained yield of the Pritchard well is 275 gpm.

In 2013, the City commissioned the Pritchard Well Evaluation and Improvement Plan to evaluate and recommend solutions to particulate/sediment production in the Pritchard Well. It was found that the particulates being produced from the well were actually the corrosion byproducts of the well casing itself. In summary the Pritchard Well rehabilitation project consisted of:

- Installing an 8-inch PVC liner casing in the upper 10-inch diameter section of the well. The liner was sealed at both the top and bottom, enabling complete shut-in of the well when it is not being pumped,
- A new pump reduced the capacity of the well from 450 gpm to 275 gpm; the lower rate enables the City to still meet current DEQ source capacity requirements while increasing well longevity,
- A pump-to-waste provision was included to direct suspended particulates to waste, if present.

Groundwater contamination has been reported from numerous leaking underground storage tanks resulting in reported levels of free product (leaded gasoline) ranging from about 5 to about 9 feet floating on top of the shallow groundwater system. The site is included in the DEQ Mager LUST Trust Fund Site and is described in various reports. Copies of two reports may be found in Appendix K. Citations for other additional reports may be found in Chapter 9.0. The reports, prepared by a subconsultant for DEQ, describe a shallow groundwater flow system that functions separately from the deeper groundwater flow system in which the City's wells are completed.

The Thompson Well is currently the City's largest producing well with a capacity of about 375 gpm. With a total depth of 414 feet, the Thompson Well is the city's most shallow well. It appears to be completed in the Cretaceous age Claggett Shale with an open bottom. The Claggett Shale is a brown, fissile shale that contains numerous lenticular fine-grained sandstone beds. It should be noted that the Thompson Well flows artesian during some months.

The South Well also flows at surface under pressure (artesian flow). Thompson Well samples indicate that it has been affected by the hydrocarbon plume; benzene and 1,2,-DCA have been detected at very low concentrations. This would suggest the existence of a certain degree of hydraulic connectivity between the shallow flow system and the deeper flow system.

Table 3-7 provides petroleum hydrocarbon and volatile organic carbon (VOC) summary of sampling results from 2000 to 2011. Benzene and/or 1,2, DCA has been detected in the well every year of sampling at extremely low concentrations except for the years 2006, 2008, and 2009.

Susceptibility to Drought

Relative to shallow alluvial wells, or to other water table-type wells that more closely interact with surface water, the current groundwater sources are less susceptible to drought and seasonal water level fluctuations. The wells are completed in confined bedrock aquifers of the Eagle and Judith River Formations and are all under pressure. The Pritchard and the South wells will flow at surface. Recharge areas for the formations are probably in bedrock exposures several miles from the wells in the highlands surrounding the City, to the north and south. A more detailed explanation of the hydrogeology may be found in the City's Source Water Assessment Report in Appendix D.

Reliability

The hydrocarbon detections in the Thompson Well are well below any regulatory action levels and DEQ is not requiring treatment or an alternate source because of the low-level detections. The fact that the contaminants have occurred in bedrock at all is problematic and points to the likely hydraulic connection between the shallow and deep flow systems at this locale. The water quality in the Thompson well should continue to be monitored closely. The November 2011 DEQ Groundwater Monitoring Report Free Product Recovery and Groundwater Monitoring for Harlowton Montana (DEQ Contract 407033-TO-18) page 17 (Appendix K) suggests that the well be sampled more frequently to ensure that contaminant levels do not rise above the DEQ-7 Human Health Standards and the Risk Based Screening Level. Therefore, if sample results show an increasing trend in concentrations or range of contaminants and/or Congressional approval is not granted to the Central Montana Regional Water Authority for the regional water system, the City may need to seek a replacement source in the future. The fact that VOCs have been detected for 14 years with no appreciable change in concentration suggests that it is

unlikely that concentrations will increase to levels exceed MCLs and subsequently require replacement of the Thompson Well. Therefore, at this time the Thompson Well can continue to be used as a reliable drinking water source for the City.

Table 3-7 - Thompson Well Petroleum Sample Results

Mager LUST Trust Site - Harlowton, MT															
Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
5/15/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.26 J
6/14/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.21 J
7/16/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
11/25/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.21 J
11/15/2006	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
5/15/2007	<1.0	NA	0.60 J	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
9/4/2008	0.96 J	0.71	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
10/30/2008	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
3/20/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
11/30/2011	0.57 J	0.42 J	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0

Notes:

1. Excerpted from Dowl HKM, Final Free Product Recovery and Groundwater Monitoring Report, Mager Well LUST Trust Site, Harlowton MT, prepared for MT DEQ, Contract 407033 Task Order No. 18, May 2012, Appendices, Table 3.

2. MTDEQ Risk- Based Screening Level for Benzene is 5 µg/L

3. DEQ-7 Human Health Standard for 1,2 DCA is 4 µg/L.

3.Table Glossary:

VPH: volatile petroleum hydrocarbons

TPH: total petroleum hydrocarbons

J: estimated value. Analyte present but less than the reporting limit.

Source Water Delineation and Assessment Report

A Source Water Delineation and Assessment Report was completed for the City in 2003 and is included in Appendix D. The Susceptibility Assessment for Harlowton Inventory Region on page 2 of the Plan suggests a low to very low susceptibility to,

- VOCs from leaking underground storage tanks,
- nitrates and pathogens from septic systems, pasture land and municipal sewers, and
- VOCs, SOCs and other chemicals from highways and city streets.

Additional information is also found in the most recent DEQ Sanitary Survey found in Appendix F.

Water Rights

A water rights summary for the Harlowton supply may be found in Appendix L. The combined water rights for all three municipal wells equals about 2,200 gpm, an amount that is more than three times that of projected year 2040 maximum day demand of 631 gpm. Therefore, the current water rights are adequate for the long-term, beyond the 20-year design period. The projected capacity estimates account for a 1%/year population growth in the City.

3.3.2 Treatment

There are a large number of lead service lines in Harlowton. And in 2001, with a water sample lead concentration of 0.18 mg/L, the City violated the Federal/State Treatment Technique standard by exceeding the Lead Action Level of 0.15 mg/L. The City subsequently completed an Optimal Corrosion Control Treatment (OCCT) Plan to determine the best options and dosages for corrosion inhibition given their distinct water quality. Using positive displacement pumps the City now injects orthophosphate at each well house as a corrosion inhibitor. A review of the DEQ compliance records (Appendix J) shows that there have been no more exceedances of either the lead or copper action levels.

Gaseous chlorine is also injected at each well downstream from the orthophosphate injection to control and inactivate bacteria and other microbiological contaminants. The chlorine gas containers and injectors are housed in separate buildings or structures. At the Thompson well, the City relocated the chlorine tank to a separate structure in accordance with DEQ Circular 1 as part of the Phase 3 improvements.

The current treatment units and protocols are performing well. And there have been no known significant deficiencies, violations or exceedances of any other Maximum Contaminant Levels, Action Levels, or Treatment Techniques that would trigger a regulatory requirement for additional treatment.

3.3.3 Storage

The City's water storage consists of one 590,000 gallon glass-lined steel standpipe located on the Northside of town between Fourth and Fifth Streets NW. The tank was newly constructed in 2012 along with a new booster station and about 2,000 feet of 12" PVC main (Phase 1). The booster station supplies water to a new high-pressure zone on the north side of town. The rest of the water from the tank is gravity fed to the distribution system through a 12" main and subsequently to the rest of the network.

The City uses a radio telemetry system that controls operation of the three wells on the basis of water levels in the water tank. The telemetry system was also installed new in 2012 as part of the Phase 1 water project.

Water storage can generally be thought of as satisfying three needs, including operational storage, emergency storage, and fire suppression storage. Operational storage supplements water supply during peak periods. Whenever peak hourly demands exceed available flows from the supply, the difference must be provided with flows from storage. Emergency storage is not based on any particular formula, but rather on a judgement regarding the perceived vulnerability of the community's water supply. If several sources are available with auxiliary power, the need for emergency storage is minimal. None of Harlowton's water supply system sources include backup pumps but the system does have several sources of water. Fire suppression storage is dependent upon the community's firefighting capabilities, recommendations from the local fire authority, and Uniform Fire Codes. The Chief of the Harlowton Fire Department, in a letter dated 5-19-2011 (See Appendix M), requires a flow rate of 2,500 gpm for 2 hours. With this in mind, a maximum fireflow of 2,500 gpm for two hours is used in performing the storage analysis. Fire flows of 2,500 gpm over a two-hour period amounts to 300,000 gallons.

Circular DEQ 1, Section 7.0.1 requires that "storage facilities must be sufficient, as determined from engineering studies, to supplement source capacity to satisfy all system demands occurring on the maximum day, plus fire flow demands where fire protection is provided". Section 7.01.b in Circular DEQ 1 requires "the minimal allowable storage must be equal to the

average daily demand for a 24-hr period plus fire flow demand where fire protection is provided". Harlowton's storage requirements are summarized in Table 3-8.

Table 3-8 - Storage Requirements

City of Harlowton Storage Requirements		
Storage Need	Year 2020 Demand (gallons)	Year 2040 Demand (gallons)
Operational (average day demand)	248,124	302,772
Emergency	0	0
Fire Suppression (2,500 gpm for 2 hrs.)	300,000	300,000
Total Required	548,124	602,772
Storage Deficit(1)	-	12,772
(1)Based on existing storage capacity of 590,000 gallons.		

Available storage with the new tank is 590,000 gallons. Using year 2040 average day demand of 302,772 gpd + fire flow storage of 300,000 gallons, the 2040 required storage volume is equal to 602,772 gallons, an amount that is very close to the current 590,000 gallon tank. In summary the City's existing storage capacity is adequate to meet the community's needs for the 20-year design period, particularly if leakage in the distribution system can be reduced through replacement of failing lines. The condition of the storage tank is excellent.

3.3.4 Pumping Stations

Previous to the installation of the new storage tank low residual pressures were noted at various locations all over the City. With the new storage tank, adequate static pressures have been established throughout the City, except mostly for a portion of the Northside where ground surface elevations are high relative to the water tank elevation. To address this problem a new high pressure zone was established in 2012 on the Northside of town with the installation of two check valves and a booster station.

The two pumps are equipped with variable frequency drive motors to supply constant pressure. The booster station is able to provide 160 gpm with one pump out of operation at a Total Dynamic Head (TDH) of 90 ft. The condition of the station is excellent and the capacity is adequate.

3.3.5 Distribution System

Harlowton's water distribution system consists of a series of mains and laterals that transport water from the supply sources to individual service lines and to the storage tank. The original system was constructed in the 1930's and roughly 7,400 lineal feet of the original cast iron still remains and has outlived its useful life. The remainder of the system consists of pipe materials and sizes as shown in Table 3-9.

Table 3-9 - Pipe Inventory

Pipe Inventory of Estimated Pipe Lengths and Materials, feet								
Size	Cast Iron	PVC	Asbestos Cement	HDPE	Galv. & Plastic	Ductile Iron	Unknown	Total
1-inch							300	300
2-inch		550			2,000		200	2,750
3-inch			1,600					1,600
4-inch	4,500	270	1,300				700	6,770
6-inch	3,900	19,900	10,300	800		1,300	800	37,000
8-inch		3,800				300		4,100
10-inch		1,700						1,700
12-inch		3,600						3,600
Total	8,400	29,820	13,200	800	2,000	1,600	2,000	57,820

Significant upgrades have occurred over the last eight years. In 2012 about 2,000 feet of 12" and 600 feet of 6" PVC were installed (Phase 1). In 2013, an additional 5,500 feet of replacements were made with new 6" and 10" PVC pipe (Phase 2). In 2016, 1,000 feet of 12", 3,800 feet of 8" and 6,100 feet of 6" were installed (Phase 3). Phase 4 improvements are being completed in the summer of 2020 and will include installation of 650 feet of 12", 600 feet of 10", 800 feet of 8" and 5,600 feet of 6" piping. A general layout of the community's existing water system is shown in Figure 3-1. The figure also shows the general location of the DEQ Mager LUST Trust Fund site, the result of petroleum contamination of groundwater from multiple sources. Petroleum contamination and the potential ramifications to the proposed project will be discussed later in this report.

Undersized Mains and Fireflows

About 10,000 feet of pipe (18%) is less than 4-inches in diameter or less, which is in violation of DEQ Circular-1 design requirements for distribution systems providing fireflow, which states,

“the minimum size of water main for providing fire protection and serving fire hydrants must be six-inch diameter.”

Pipe Condition

The existing cast iron (CI) pipe is in a deteriorated state (see Figure 3-2). It has been subjected to about 70 years of corrosion prior to the addition of corrosion control inhibitors and is heavily encrusted with tubercles and corrosion byproducts. The cast iron pipe is primarily responsible for a very high frequency of main breaks. The photo shows a portion of an excavated CI pipe with a previous repair clamp. 85 pipe breaks have been recorded since 2011. More than half of these breaks are the result of cast iron pipe failure, although more recently the City is starting to see failures of the existing asbestos cement piping.

Figure 3-2 - Photo of Deteriorated Cast Iron Water Main

Lost and Unaccounted for Water

Lost and unaccounted for water is defined as the difference between metered source production and metered consumption, or that water that is lost between the water supply and the meter located at each home or business. “Lost” water includes any water loss due to leaks or unauthorized uses such as illegal service connections. “Unaccounted for water” also results from inaccurate meters, and water leaving the system for unmetered usage such as flushing of mains, fire flows, and unmetered services. Harlowton has water service meters on all water users, allowing the City to monitor water consumption. Meter source production is determined by flow meters located in each of the wellhouse buildings. Lost and unaccounted for water in Harlowton averaged 52 million gallons per year or 58% of the water produced over the previous 3-yr period. Up to 20% loss is considered acceptable in most systems and therefore the loss in Harlowton should be considered excessive. The unaccounted for water has increased by 13 million gallons per year from 2017 to 2019. This is after two phases of distribution system improvements that replaced approximately 16,000 lineal feet of cast iron water main. This not only suggests that the remaining cast iron mains continue to fail but also indicates that the asbestos cement piping in the distribution system is also beginning to fail.

The largest expected component of unaccounted water is leakage within the distribution system as a result of pipe degradation from a decrease in competent pipe wall thickness because of corrosion from the aggressive source water prior to the addition of corrosion inhibiting chemicals. Corrosion can form holes, pits and holidays on the pipe surface. It is likely that small leaks do not reach the surface. Most of the soil underlying Harlowton is mapped as the Niart-Rothiemay loam, derived from alluvial fan materials that were subsequently derived from limestone and sandstone. This is classed as a well-drained soil with a moderately-high to high-capacity to transmit water. The potential for backflow, inflow, or backsiphonage of groundwater and/or soil contaminants into the distribution piping exists whenever there is a leak or a break that can cause reduced static pressures.

Other unknown components of unaccounted water include residential service pipe leakage prior to the meters, water theft, hydrant flushing, and city irrigation.

Distribution System Modeling

To evaluate the hydraulic response of the Harlowton water system and determine priority areas for pipe replacement, a hydraulic model was constructed using the Water CAD computer

modeling package by Bentley systems. The computer model is used to identify specific problem areas and to determine the most effective modifications to improve the system. The Water CAD program uses an iterative procedure, similar to the Hardy Cross method, to solve standard loop equations to arrive at solutions for flow through the pipe network and determine resulting pressures at the system nodes (pipe junctions) using the relationship between flow and head loss defined by the Hazen-Williams equation. The Hazen-Williams equation uses a coefficient "C", which is based on the roughness of the pipe interior. Standard values can be assumed for different types of materials based on years of pipe service. The existing system model was created and calibrated using hydrant flow test data. The model closely replicated field conditions to acceptable industry guidelines.

Several scenarios were developed to define the hydraulic response of the system under multiple conditions of consumptive use. Among the scenarios modeled were average daily flow, maximum daily flow, and peak hourly flow at both current and projected daily demands. In addition, the fire flow available throughout the water system was evaluated by performing a steady state fire flow analysis. The analysis determines the maximum flow that can be obtained from a given location while maintaining a minimum residual pressure of 20 psi throughout the distribution system. The model has been utilized to determine the most effective improvmeents to the distribution system over multiple phases. Copies of the computer model results and figures are included in Appendix O.

Gate Valves and Fire Hydrants

An inspection of all gate valves and fire hydrants in the system was not within the scope of this analysis. Circular DEQ 1 suggests valve spacing at not more than 500-foot intervals in commercial districts and not more than one block or 800-foot intervals in other areas.

The location and spacing of fire hydrants should be as recommended by the fire protection agency. They should typically be located at each street intersection as well as at intermediate points between intersections.

Water Meters

In 2017, 90% of the existing water meters were replaced with new radio read residential and commercial water meters. The other 10% of the system meters had previously been replaced in 2013. Meter records were used in computing overall water usage.

Energy Consumption

The average of the yearly utility costs for well pumping over the fiscal years from 7/16 through 6/19 is shown below in Table 3-10. The average yearly costs for well pumping equal roughly $25,000. Flow records indicate that unaccounted water exceeds 50%. As leakage diminishes in time as a result of phased replacement of deteriorated cast iron and asbestos cement pipe, it is expected that energy consumption billed to the water fund would decrease proportionally with decreases in unnecessary pumping demands for water lost due to leakage. Average unaccounted water loss nationally is anticipated to be about 15-25%. Therefore, overall reductions of 15%-25% in energy consumption may be expected with the completion of all current and future water main replacement phases.

Table 3-10 - Water System Energy Consumption

Fiscal Year	Total Utility Costs (1)
7/16 – 6/17	$24,554
7/17 – 6/18	$25,217
7/18 – 6/19	$25,093
Average	$24,955

Notes:

1) Utility costs are primarily for well pumping

3.4 Operational and Management Practices and Capabilities

The Harlowton Water system is very well operated and maintained, a DEQ Sanitary Survey (found in Appendix F) from April 7, 2011 points out that, "*The system appears very well managed and certified operators are retained as required. Noticeable improvements to housekeeping and management of infrastructure were noted during this inspection."* The Sanitary survey goes on to state, *"Monitoring and reporting appeared adequate and the database showed no outstanding violations at the time of this survey…"*

The operators inspect each well house daily and record the meter readings at each well house. They also monitor chlorine and orthophosphate levels, system chlorine residuals, and perform sampling of the water system as required by the DEQ Drinking Water Supply Rules and the Federal Safe Drinking Water Act.

The very high frequency of main breaks and repairs has imposed a significant burden on the operational staff at Harlowton. The Public Works Director has reported that recently there have been so many breaks that he and his staff do not even have time to properly record all of them.

The City's Public Works Director received the System Manager of the Year Award from Montana Rural Water Systems (MRWS) in February 2016 as shown on the City's Facebook page in Figure 3.3 below.

Figure 3-3 - Ian Reed Public Works Director receives MRWS Manager of the Year Award

3.5 Financial Status of any Existing Facilities

Detailed income and expense reports for the City are included in Appendix P. A summary of the operating expenses and revenue for the water system for 2017, 2018, and 2019 is included in Table 3-11.

Table 3-11 - Summary of Expenses and Income

Summary of Income and Expenses			
Description	7/16-6/17	7/17-6/18	7/18-6/19
Expenses			
Operating Expenses	$212,879	$172,917	$210,794
Debt Service	$27,829	$29,951	$28,825
Depreciation and Amortization	$13,267	$61,413	$63,481
Total Expenses	$253,975	$264,281	$272,097
Income			
Water Revenues	$297,479	$309,467	$316,952
Hook up Charges	$2,880	$1,769	$3,170
Miscellaneous Revenue	$1,616	$1,271	$250
Bulk Water Sales	$225	$886	$3,514
Sale materials supplies	$484	$335	$2,482
Total Income	$302,684	$317,728	$326,368
Net Profit	$48,709	$53,447	$54,271

Currently, the City of Harlowton charges a base rate of $37.71/user/month for single-family residential dwellings. Multi-family residential units and some businesses are charged higher base rates depending on the number of units or business type. There is also a usage charge of $1.00 per 1,000 gallons of usage.

Equivalent dwelling units (EDU) based upon the number and size of water service connections equals 642. Average monthly water rates are currently $41.80 /EDU. Water base rates per EDU have increased yearly from $28.00 in 2015 to $37.71 in 2019. The income and expense history demonstrates that recent water rate increases have balanced expenses and income in a positive way.

3.6 Water/Energy/Waste Audits

There have been no water system, energy, or waste audits conducted in the recent past for the City of Harlowton.

4.0 NEED FOR PROJECT

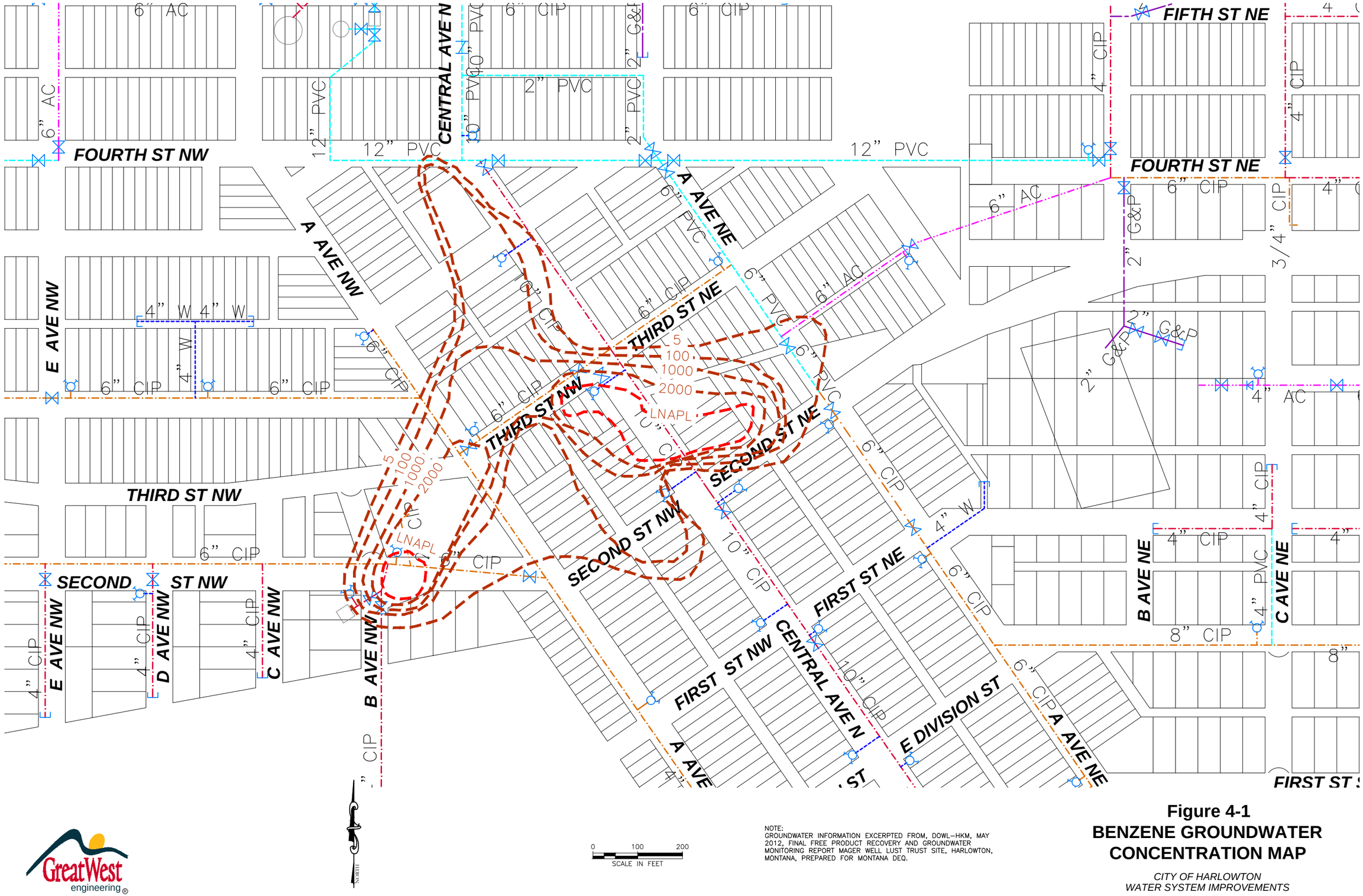
4.1 Health, Sanitation and Security

The very poor condition of the cast iron and asbestos cement pipe, the large amount of unaccounted water, and the high frequency of main breakage point to the extremely fragile condition of the remaining cast iron and asbestos cement distribution mains.

Additionally, the DEQ Mager LUST Trust Fund Site is generally located in the middle of town, shown as the circle called out in Figure 3-1. The DEQ discovered the presence of petroleum contamination in Harlowton in 1999. The following is excerpted from the DEQ's 2012 RDG Grant Application for the Petroleum Production Delineation and Mitigation of Threat to Harlowton Public Water Supply Well.

> *Water samples collected at the time (1999) contained benzene, ethylbenzene, methyl tertiary butyl ether (MTBE), gasoline range organics (GRO), and total purgeable hydrocarbons (TPH). LUST trust-funded investigations to date have determined that releases of petroleum hydrocarbons from multiple suspect and unknown sources have impacted groundwater beneath a large portion of Harlowton. Free and dissolved phase petroleum hydrocarbons threaten the Thompson Supply well. Free product is present in a monitoring well located approximately 180 feet northeast of the Thompson Well. Water samples obtained from the Thompson Well periodically have reported detections of benzene, 1, 2, DCA* (1, 2, DCA is an additive used in leaded gasoline products), *and in one instance, toluene. The reported contaminant concentrations, except for one benzene hit, are below the method reporting limits and thus were estimated concentrations. The presence of these chemicals in the Thompson Well indicates a direct connection with a plume of refined petroleum. Although concentrations of these chemicals have, so far, been below regulatory standards, their impact on the well could increase with changes in hydrogeologic conditions, water usage, or migrations of the contaminants in the aquifer. The presence of these contaminants in the drinking water supply is a threat to the health of Harlowton residents.*

A benzene plume as described in the 2012 DEQ Final Free Product Recovery and Groundwater Monitoring Report is depicted in Figure 4-1 Benzene Concentration Map below. The threat to groundwater is further defined by DEQ in the document above as follows.



NOTE:
GROUNDWATER INFORMATION EXCERPTED FROM, DOWL–HKM, MAY 2012, FINAL FREE PRODUCT RECOVERY AND GROUNDWATER MONITORING REPORT MAGER WELL LUST TRUST SITE, HARLOWTON, MONTANA, PREPARED FOR MONTANA DEQ.

0 100 200
SCALE IN FEET

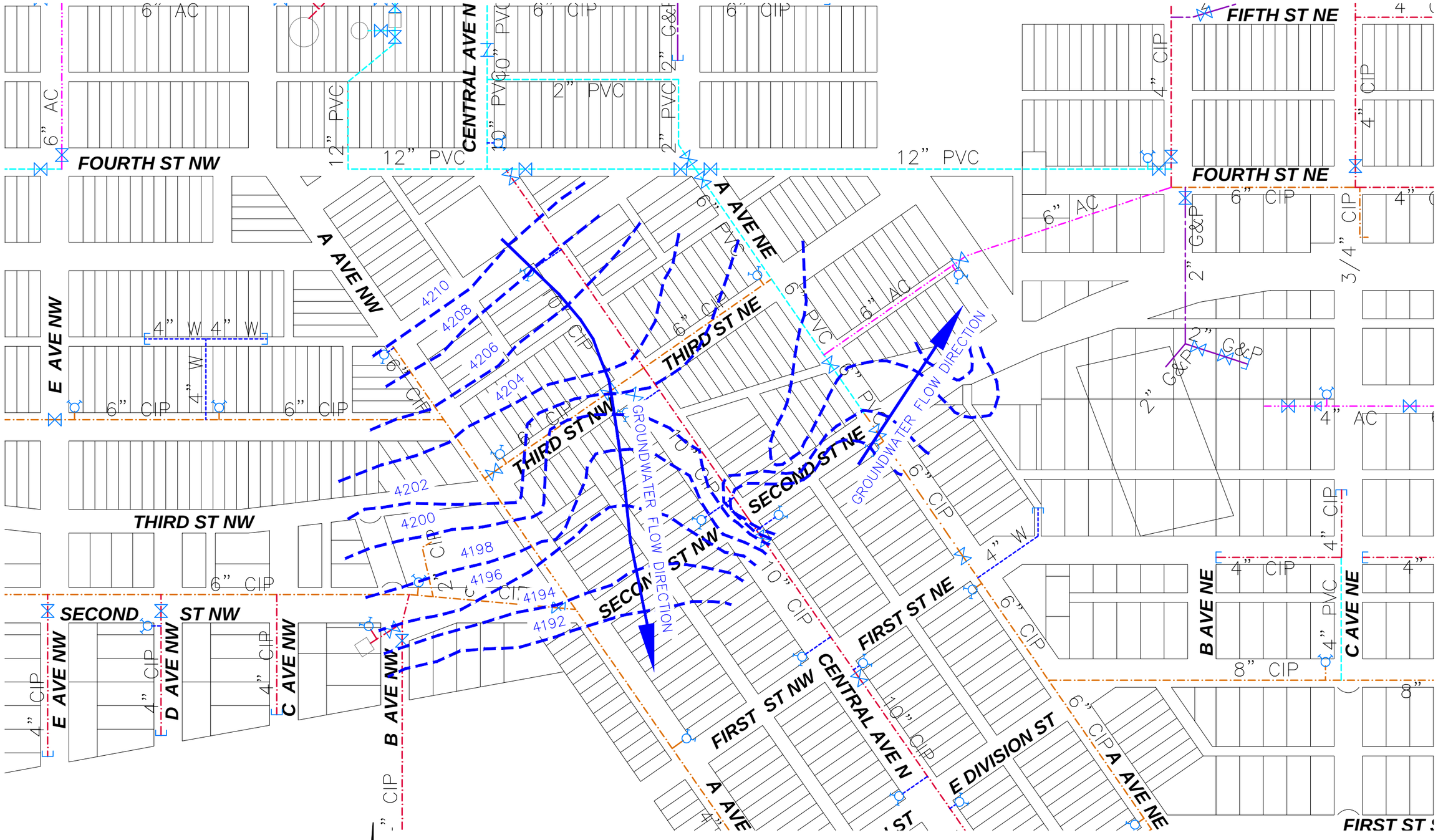
NORTH

GreatWest engineering®

Figure 4-1
BENZENE GROUNDWATER CONCENTRATION MAP

CITY OF HARLOWTON
WATER SYSTEM IMPROVEMENTS

F:\1-10111-Harlowton Water\CADD 1-10111 PER 2014\Exhibits\1-10111-Fig 4_1-Benzene.dwg



0 100 200
SCALE IN FEET

NOTE:
GROUNDWATER INFORMATION EXCERPTED FROM, DOWL–HKM, MAY 2012, FINAL FREE PRODUCT RECOVERY AND GROUNDWATER MONITORING REPORT MAGER WELL LUST TRUST SITE, HARLOWTON, MONTANA, PREPARED FOR MONTANA DEQ.

Figure 4-2
SHALLOW GROUNDWATER FLOW
NOVEMBER 2011

CITY OF HARLOWTON
WATER SYSTEM IMPROVEMENTS

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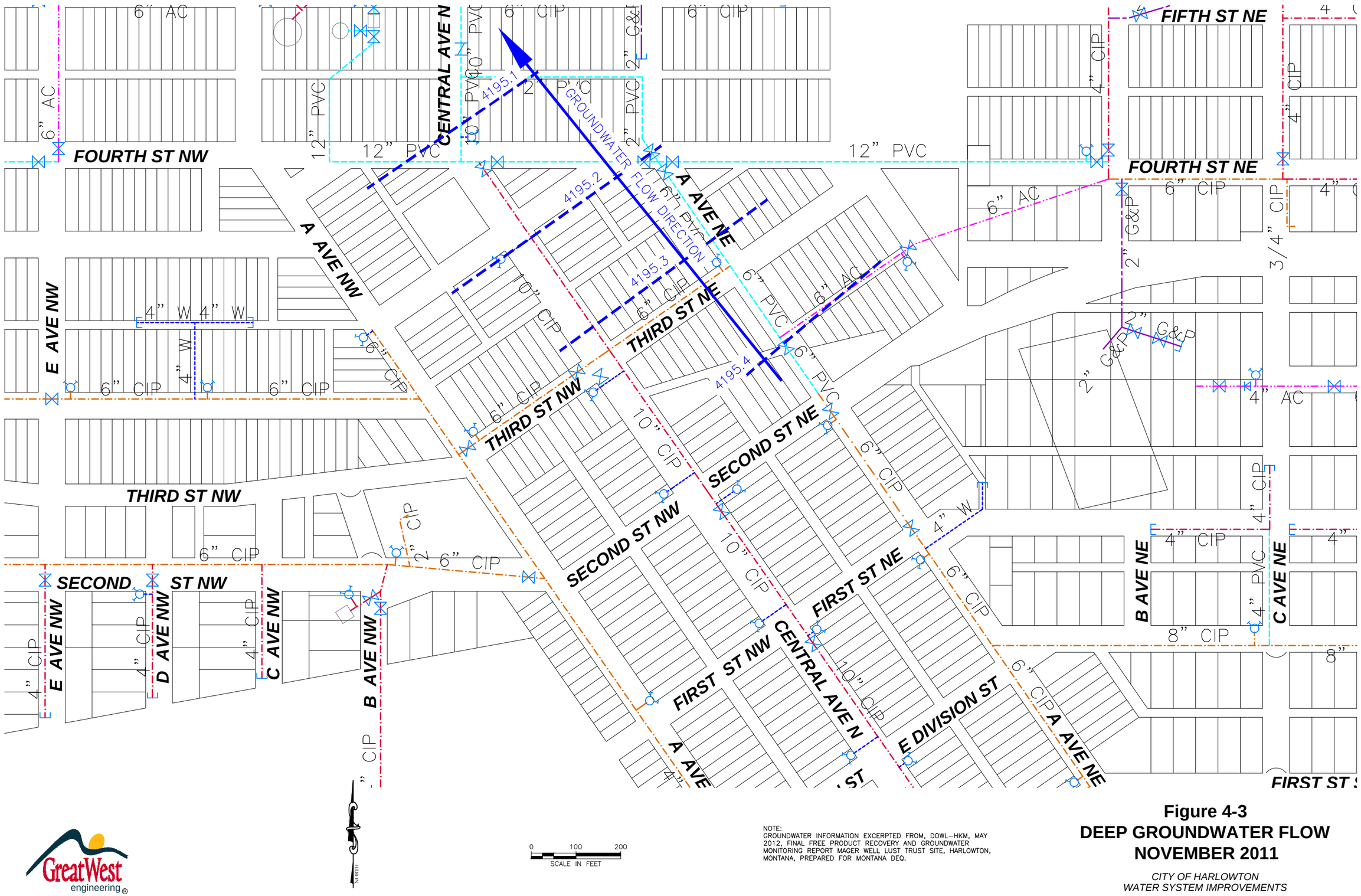
F:\1–10111–Harlowton Water\CADD 1–10111 PER 2014\Exhibits\1–10111–Fig 4_2–Shallow GW.dwg



NOTE:
GROUNDWATER INFORMATION EXCERPTED FROM, DOWL–HKM, MAY 2012, FINAL FREE PRODUCT RECOVERY AND GROUNDWATER MONITORING REPORT MAGER WELL LUST TRUST SITE, HARLOWTON, MONTANA, PREPARED FOR MONTANA DEQ.

Figure 4-3
DEEP GROUNDWATER FLOW
NOVEMBER 2011

CITY OF HARLOWTON
WATER SYSTEM IMPROVEMENTS

GreatWest engineering®

F:\1-10111-Harlowton Water\CADD 1-10111 PER 2014\Exhibits\1-10111-Fig 4_3-Deep GW.dwg

This contamination threatens public health through potential migration from the sources area(s) to the Thompson Well and domestic wells within the study area. A drilling moratorium has been emplaced to prevent the installation of additional domestic wells in Harlowton.

Reports of thickness of free product (leaded gasoline) floating on top of the shallow groundwater ranges from about 5 feet to about 9 feet. Delineation of the plume is ongoing, as are recovery efforts. DEQ LUST Trust currently operates a recovery and product separation facility in Harlowton. Previous efforts and the current status of DEQ remedial efforts are detailed in reports included and referenced in Appendix K and Chapter 9.

Monitoring well water levels of the most shallow groundwater (see Figure 4-2) as reported in the May 2012 DEQ Final Free Product Recovery and Groundwater Monitoring Report (Appendix K), reached as high as 12 feet below ground surface. Light Non-Aqueous Phase Liquid (LNAPL) (free product) has been reported in groundwater at depths as shallow as 16 feet below ground level. There is no continuous water level information so it is unknown how high groundwater levels may rise during spring runoff or other runoff events. The typical depth of bury of water main is 7 feet, with some installations buried deeper depending on site constraints and topography.

Lab results for soil samples collected during the 2012/2013 Harlowton LUST Trust Investigation (Appendix K) show petroleum contamination in soil in the 10 to 12-foot sampling interval. It is known that extensive soil contamination was discovered at the Crosston Exxon site, with subsequent excavation and soil removal.

DEQ reports indicate that operation of the Thompson Well and the Jawbone Creek Golf Course Irrigation Well appears to influence the configuration of the contaminant plume. Groundwater in the shallow aquifer flows to the southwest towards the Thompson well while groundwater in the deeper aquifer (see Figure 4-3) appears to flow to the north towards the Jawbone Creek Golf Course Irrigation Well.

Every time a leak or a main break occurs within a contaminated unsaturated (vadose) zone or saturated zone, it is an opportunity for contaminants to enter the system through backflow, inflow or backsiphonage. While no reports of distribution system contamination have been documented as a result of leaks or breaks, the risk of contamination is an imminent threat to public health.

It must be noted that the distribution system is not usually sampled for the presence of volatile or synthetic organic chemicals. These are analytes for which the required sampling sites are the source entry points.

The EPA Cross-Connection Manual states, *"Cross connections, which are defined as actual or potential connections between a potable and non-potable water supply, constitute a serious public health hazard."*

The public health significance of cross-connections is very well documented. Chapter 2 of the EPA Cross Connection Control manual is included in Appendix Q of this PER and includes examples of drinking water contamination from cross-connections, many of which resulted from main de-pressurization during main breaks and leaks. These examples include,

- Human blood in the water system,
- Heating system anti-freeze in the potable water,
- Paraquat in the water system,
- Propane gas in the water mains,
- Chlordane and heptachlor at a Housing Authority,
- Boiler water entering high school drinking water,
- Pesticide in drinking water,
- Etc.

Many of the above-cited examples specifically involved a main break repair.

Regulatory Requirements

The Safe Drinking Water Act (SDWA) was enacted by Congress in 1974 to provide a standard by which all persons in the United States could be provided safe drinking water through public water supplies. The Act was later amended in 1986 and 1996.

The State of Montana's regulatory role in drinking water systems is twofold; regulate the SDWA by meeting primacy requirements established by the EPA and ensure satisfaction of state established design criteria for the construction of public water systems. The State has defined public water systems as systems serving ten or more homes, or 25 or more persons. The State has satisfied the primacy requirements of the federal government by passing a state law that is equally as stringent as the SDWA. Accordingly, the EPA has granted the State, via the DEQ,

the right to enforce the SDWA. Some of the SDWA rules that apply to the City of Harlowton are discussed below.

National Primary Drinking Water Regulations

The National Primary Drinking Water Regulations are enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. The MDEQ has been given primacy for enforcing the primary maximum contaminant levels (MCLs). Because of the numerous contaminants with MCLs, the list is not included as part of this PER, but is available on the EPA's website (http://www.epa.gov).

The City of Harlowton's existing water supply meets all primary drinking water standards.

National Secondary Drinking Water Regulations

The National Secondary Drinking Water Regulations are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply, though; states may choose to adopt them as enforceable standards. At this time, the secondary contaminants are limited to aluminum, chloride, color, copper, corrosivity, fluoride, foaming agents, iron, manganese, odor, pH, silver, sulfate, total dissolved solids, and zinc. Please note, some constituents listed on the Secondary MCLs also have MCLs if the concentrations reach an elevated level. Because of the numerous contaminants with secondary MCLs, the list is not included as part of this PER but is available on the EPA's website (http://www.epa.gov).

The City of Harlowton's existing water supply exceeds secondary drinking water regulations for sulfates and total dissolved solids.

Montana Department of Environmental Quality Circular DEQ 1

The state also established a detailed set of design and construction standards for public water systems that must be satisfied in the design and construction of new water facilities. These standards are described in Circular DEQ 1. State review and approval of the design is necessary prior to the construction of any public water system. The alternative and recommended improvements evaluated in this preliminary engineering report will ensure compliance with all the state design standards specified in DEQ 1.

Disinfectants and Disinfection By-Products Rule

Stage 1 Disinfectants and Disinfection By-Products Rule (Stage 1 DBPR)

The Stage 1 Disinfectants and Disinfection By-Products Rule (Stage 1 DBPR) became effective in 1998 for the primary purpose of improving public health protection by reducing exposure to disinfection byproducts. Disinfectants used in water treatment can react with naturally occurring materials in the water to form unintended byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproduction effects in humans. The Stage 1 DBPR is the first of a staged set of rules aimed at reducing the levels of DBPs in drinking water.

The Stage 1 DBPR established maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) for total trihalomethanes, haloacetic acids, chlorite and bromate. The rule also established maximum residual disinfectant levels (MRDLs) and maximum residual disinfectant level goals (MRDLGs) for chlorine, chloramine, and chlorine dioxide. Table 4-1 provides a summary of the regulated contaminants.

Table 4-1 - Stage 1 DBPR – Regulated Contaminants/Disinfectants

Stage 1 DBPR – Regulated Contaminants/Disinfectants		
Regulated Contaminant	MCL (MG/L)	MCLG (MG/L)
Total Trihalomethanes (TTHM)	0.080	NA
Chloroform		NA
Bromodichloromethane		0
Dibromochloromethane		0.06
Bromoform		0
Five Haloacetic Acids (HAA5)	0.060	NA
Monochloroacetic acid		NA
Dichloroacetic acid		0
Trichloroacetic acid		0.3
Bromoacetic acid		NA
Dibromoacetic acid		NA
Bromate	0.010	0
Chlorite	1.0	0.8
Regulated Disinfectants	MRDL (MG/L)	MRDLG (MG/L)
Chlorine	4.0 as Cl_2	4
Chloramines	4.0 as Cl_2	4
Chlorine dioxide	0.8	0.8

The City of Harlowton's existing water supply meets the Stage 1 DBPR.

Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 DBPR)

The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) went into effect in 2006 for the primary purpose of increasing public health protection by reducing the potential risk of adverse health effects associated with disinfection byproducts throughout the distribution system. While the Stage 1 DBPR provided a major reduction in DBP exposure, data showed that Stage 1 DBPR monitoring sites may not be the locations where the highest DBP concentrations occur in distribution systems. The Stage 2 DBPR builds on the Stage 1 DBPR by focusing on risk-targeted monitoring for and reducing concentrations of two classes of DBPs (TTHM and HAA5) in drinking water. The rule covers all community water systems that either add a primary or residual disinfectant other than ultraviolet light or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light.

Under the Stage 2 DBPR, sampling requirements depend on source water type (groundwater or surface water), population served, and historical concentrations. Harlowton currently requires monitoring at one location once per year. Compliance is based upon a locational running annual average (LRAA), which is calculated at each monitoring location, for the contaminant levels listed in Table 4-2 below.

Table 4-2 - Stage 2 DBPR – Regulated Contaminants

Stage 2 DBPR – Regulated Contaminants		
Regulated Contaminant	MCL (MG/L)	MCLG (MG/L)
Total Trihalomethanes (TTHM)	0.080 LRAA	NA
Chloroform		0.07
Bromodichloromethane		0
Dibromochloromethane		0.06
Bromoform		0
Five Haloacetic Acids	0.060 LRAA	NA
Monochloroacetic acid		0.07
Dichloroacetic acid		0
Trichloroacetic acid		0.02
Bromoacetic acid		NA
Dibromoacetic acid		NA

The City of Harlowton's existing water supply meets the Stage 2 DBPR.

Arsenic Rule

The Arsenic Rule became effective in 2001 for the primary purpose of improving public health by reducing exposure to arsenic in drinking water. Studies have shown that arsenic can be linked to causing skin damage, problems with the circulatory system, and increased risks of cancer. As a result, the new rule changed the arsenic MCL from 50 µg/l to 10 µg/l and the MCLG to 0. In addition, the rule also requires monitoring for arsenic for new systems and new drinking water sources as well as clarifies the procedures for determining compliance with the MCLs for IOCs, SOCs, and VOCs.

The EPA estimates that implementation of the rule may avoid 16 to 26 non-fatal bladder and lung cancers per year; avoid 21 to 30 fatal bladder and lung cancers per year; and reduce the frequency of non-carcinogenic diseases. The actual implementation of the MCL became effective on January 23, 2006.

The City of Harlowton's existing water supply meets the arsenic standard.

Lead and Copper Rule

The Lead and Copper Rule became effective in 1991 for the primary purpose of protecting public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Lead and copper enter drinking water mainly from corrosion of plumbing materials containing lead and copper (i.e. pipes and/or joints).

The rule established action levels (AL) of 0.015 mg/l for lead and 1.3 mg/l for copper based on 90th percentile level of tap water samples. An action level exceedance is not a violation of the rule but can trigger other requirements that include water quality parameter monitoring, corrosion control treatment, source water monitoring/treatment, public education, and lead service line replacement.

Since the implementation of the Optimal Corrosion Control Plan, the City has not exceeded the action level for lead and copper. Thus, outside of continued monitoring for lead and copper, no further action has been required.

Radionuclides Rule

The Radionuclides Rule went into effect in 2000 for the primary purpose of reducing the exposure to radionuclides in drinking water to reduce the risk of cancer. The rule is also intended to improve public health protection by reducing exposure to all radionuclide. The EPA estimates that implementation of the rule will reduce uranium exposure for 620,000 persons and provide protection from toxic kidney effects of uranium as well as a reduced risk of cancer.

The rule retains the existing MCLs for combined radium-226 and radium-228 (5 pCi/l), gross alpha particle radioactivity (15 pCi/l), and beta particle and photon activity (4 mrem/yr), but regulates uranium for the first time. The new MCL for uranium under this rule was set as 30 µg/l. Systems were required to begin initial monitoring in December 2003.

The City of Harlowton's existing water supply meets the Radionuclides Rule.

Total Coliform Rule (TCR)

The Total Coliform Rule (TCR) went into effect in 1989 for the primary purpose of improving public health protection by reducing fecal pathogens to minimal levels through control of total

coliform bacteria, including fecal coliforms and Escherichia coli (E-coli). The rule establishes a maximum contaminant level based on the presence or absence of total coliforms; modifies monitoring requirements including testing for fecal coliforms or E-coli; requires use of a sample siting plan; and also requires sanitary surveys for systems collecting fewer than five samples per month. Implementation of the rule has resulted in reduction in the risk of illness from disease causing organisms associated with sewage or animal wastes, of which disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and associated headaches and fatigue.

Actual number of samples required per month under the TCR is dependent upon population size. Because the City of Harlowton's population is less than 1,000, one sample is required per month. If a routine sample tests positive for the presence of total coliforms it must be tested for the presence of fecal coliforms or E. coli and four repeat samples per positive routine sample (for population served between 25 and 1,000) must be collected and analyzed within 24 hours for total coliform. One of the repeat samples must be collected from the original sample site, one within five service connections upstream, one within five service connections downstream. If any repeat sample is total coliform positive, then the system must analyze the positive sample for fecal coliforms or E-coli. The system must also collect another set of repeat samples, as before, unless the MCL has been violated and the system has notified the State. A positive routine or repeat total coliform result requires a minimum of five routine samples be collected the following month unless otherwise waived by the State.

The results of routine and repeat samples are used to compute compliance with the TCR. For the City of Harlowton, a monthly MCL violation is triggered if one routine/repeat sample is total coliform positive. An acute MCL violation is triggered if the system has any fecal coliform or Ecoli positive repeat sample or has a fecal coliform or E-coli positive routine sample followed by a total coliform positive repeat sample.

The City's existing water system meets the requirements of the Total Coliform Rule.

4.2 Aging Infrastructure

The most immediate public health and safety need in the Harlowton Water system is associated with the aging distribution system. The distribution system still contains over 7,000 feet of the original 80-year old cast iron pipe and over 13,000 feet of asbestos cement mains, both have which have outlived their useful lives.

Water loss through the system exceeds 50%, with leakage through holes and undiscovered minor breaks and failures, being the largest likely source of loss. The potential for inflow and infiltration to the drinking water system creates an imminent threat to public health, not only from the petroleum-contaminated groundwater but also from other sources such as incidental and accidental spills at ground surface, and from backflow from household service connections.

An additional concern if future monitoring results show an increasing trend in contaminant concentrations is the longevity of the Thompson Well source. Currently the City plans to connect to the CMRWA Musselshell-Judith Rural Water system after construction. But if contaminant concentrations in well water samples rise or if significant delays in the construction of the CMRWA water system occur, this source should be re-evaluated for replacement or treatment.

4.3 Reasonable Growth

A reasonable growth capacity necessary to meet Harlowton's water system needs during the 20-year planning has been addressed in the planning process for this PER. A 1% per year population increase is used to predict year 2040 population, average day demands (ADD), and maximum day demands (MDD). This would result in a population of 1,097.

Supply capacity was analyzed above in prediction of the 2040 population growth and it was found that the current supply is adequate except for a minor shortfall in maximum day demand in 2040. Water conservation efforts, such as temporary lawn watering restrictions could be imposed to offset this identified potential future shortfall.

Storage and treatment was also found to be adequate into design year 2040.

Distribution system hydraulic modeling was performed on the basis of future MDD to allow for conservative sizing in pipe cost estimation and preliminary engineering. Ultimate total replacement of all of the cast iron and asbestos cement pipe in town requires a phased approach to project planning using a 10-year prospective design horizon while addressing those pipe sections that not only have the closest proximity to the contaminant plume, but are known to be vulnerable for other reasons such as located in areas of known high groundwater or have a history of breakage.

Existing customers (population 899) are committed to this project. Project planning is not dependent on population growth or support by new customers, but a reasonable growth rate is used for planning and design purposes.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative Screening

Various alternatives exist that will address deficiencies in the City's water system. However, some of the alternatives are not viable because of capital and operation and maintenance costs, or are more appropriate to be included in a later phase after additional data can determine trend information that will allow more informed decisions. In the case of Harlowton's water system, alternatives for distribution system improvements have been considered.

5.2 Supply Alternatives

The City has already committed to connecting to the Central Montana Regional Water Authority (CMRWA). The CMRWA will provide DEQ-compliant drinking water to the City that meets the City's peak day demand requirements. Harlowton will help pay for the CMRWA water infrastructure through the rates it will pay the Authority.

5.3 Treatment Alternatives

With the City's connection to the CMRWA, the City will no longer treat water. Therefore, no treatment alternatives were evaluated.

5.4 Storage Alternatives

No storage alternatives are brought forward for evaluation. The existing storage tank was new in 2012 and its condition is excellent. A storage analysis concludes that capacity is adequate into design year 2040.

5.5 Pumping Station Alternatives

No pumping station alternatives are brought forward for evaluation. The existing pumping station was new in 2012 and its condition is excellent. Design and capacity is sufficient for future needs.

5.6 Distribution System Alternatives

Discussion throughout this report has clearly established the need for distribution system improvements. Leakage in the distribution system has been excessive over past years, with leakage estimates exceeding 50%. The high frequency of pipe break repairs has been extremely burdensome to the Public Works Department staff, oftentimes diverting their time and attention from other important operational and maintenance duties.

Leaking, breaking, tuberculated, undersized cast iron and asbestos cement pipe and associated reduced static pressures are a source for potential contamination from backflow, inflow, and backsiphonage from high groundwater, overburden, and direct cross-connections within the distribution network. Undersized lines and leaking lines limit flows, which could be extremely critical in emergency fire situations. To bring the system into full MDEQ compliance, provide necessary fireflows for safety concerns, and to protect public health and safety from potential contaminants, all cast iron, asbestos cement and undersized pipe must be replaced as soon as possible. The evaluation and summary of the recommended improvements will be discussed further and the alternatives evaluation will be completed with the goal of meeting the following criteria:

- Replace cast iron mains installed in the 1930's
- Replace failing asbestos cement water mains
- Use the least permeable available pipe materials within and contiguous to contaminant zones
- Provide a distribution system capable of providing adequate fire protection
- Replace all substandard water mains in the system, including those that do not meet the minimum six-inch diameter size required by MDEQ for fire flow

The alternatives considered for water distribution include:

- No Action,
- Alt. D-1: Phase 5 Distribution System Improvements - Replace 7,900 LF of undersized and failing cast iron pipe
- Alt. D-2: Phase 6 Distribution System Improvements - Replace 7,200 LF of undersized and failing cast iron and asbestos cement pipe

No Action

No Action was rejected by the City as a viable alternative because of the potential public health and safety needs associated with the deteriorated cast iron and asbestos cement pipe, especially the pipe within and downgradient from the contaminant plume, and because of the increasing frequency of break repair callouts to the Public Works Department staff.

Alternatives D-1 and D-2

Alternatives D-1 and D-2 are brought forward for full evaluation.

5.6.1 Alternative D-1: Phase 5 - Replace 7,900 LF of undersized and failing cast iron pipe

Through previous analysis, the City has determined that a phased approach is the most cost-effective and efficient method of addressing the distribution system deficiencies. Alternative D-1 is Phase 5 of water system improvements. This alternative will consist of replacement of 7,900 lineal feet of undersized and failing cast iron pipe. The pipe replacement will include 7,200 lineal feet of 6-inch PVC pipe and 700 lineal feet of ductile iron pipe contiguous to the DEQ-defined Mager LUST Trust Fund Site. Replacement is needed to increase fire flow to the area and eliminate potential leaks. Old cast iron pipe in Harlowton's water distribution system is a significant contributor to 50% unaccounted for water in recent years.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the distribution alternatives will meet the requirements in Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 5-1 show locations of proposed improvements for Alt. D-1.

0.59 MG STANDPIPE WATER TANK

BOOSTER STATION

PRITCHARD WELL PUMP HOUSE

THOMPSON WELL PUMP HOUSE

SOUTH WELL PUMP HOUSE

DEQ - MAGER WELL LUST TRUST STUDY AREA

STATE HIWAY US 12

STATE HIGHWAY US 12

SIXTH ST NW

FIFTH ST NW

FOURTH ST NW

NW VIEW ST

NW PRICHARD ST

THIRD ST NW

SECOND ST NW

FIRST ST NW

W DIVISION ST

FIRST ST SW

SIXTH ST NE

FIFTH ST NE

FOURTH ST NE

THIRD ST NE

SECOND ST NE

FIRST ST NE

E DIVISION ST

FIRST ST SE

SE GORDON ST

SECOND ST SE

SE LOGAN ST

THIRD ST SE

E LOGAN ST

E SEVENTH ST

THIRD ST

FOURTH ST

MILL ST

SHAMUT AVE

DUNN AVE

KLOCK AVE

MILWAUKEE AVE

HAWKEYE ROAD

MILL TAIL NO.4D

CENTRAL AVE N

CENTRAL AVE S

A AVE NW

B AVE NW

C AVE NW

D AVE NW

E AVE NW

F AVE NW

G AVE NW

H AVE NW

I AVE NW

J AVE NW

K AVE NW

L AVE NW

M AVE NW

A AVE NE

B AVE NE

C AVE NE

D AVE NE

E AVE NE

F AVE NE

A AVE SE

C AVE SE

D AVE SE

E AVE SE

TO LAGOON SYSTEM

LEGEND

- UNKNOWN TYPE WATER LINE
- PVC WATER LINE
- HDPE WATER LINE
- CAST IRON WATER LINE
- ASBESTOS CEMENT WATER LINE
- GALVANIZED AND PLASTIC WATER LINE
- GATE VALVE
- FIRE HYDRANT

0 300 600
SCALE IN FEET

NORTH

PHASE 5

Figure 5-1
Phase 5
Proposed Water Distribution System Improvements

CITY OF HARLOWTON
2020 WATER PER

GreatWest engineering®

F:\1-16114-Harlowton On Call\TO 4 - 2020 Water PER and Grant Applications\CADD 1-16114-TO4\Exhibits\1-16114-

Environmental impacts

A portion of the improvements on the south end of Central Ave. will occur within a designated floodplain. A floodplain permit will be required for this work. There are no expected impacts to wetlands or other important land resources, endangered species, historical or archaeological properties. The proposed project will replace existing water mains in existing roadways, streets, alleyways and easements. No land acquisition is anticipated. No new effects on the human environment will be experienced as a result of the proposed project. Refer to Appendix A for environmental agency correspondence and the Environmental Checklist.

A mitigated environmental assessment is appropriate for the level of potential impacts that may be encountered during the course of the project. That is,

a. All impacts of the proposed action have been accurately identified,
b. All impacts will be mitigated below the level of significance, and
c. No significant impact is likely to occur.

Land Requirements

No land acquisition is required. The proposed alternatives will replace existing water mains in existing roadways, streets, alleyways and easements controlled by the City.

Potential Construction Problems

A review of DEQ static water level data for existing monitoring wells within the LUST Trust site indicate that the most shallow groundwater is at about 12 feet below ground surface; a distance that is about five feet below the anticipated maximum depth of bury of the replacement pipe.

The following measures will be taken to reduce any environmental impacts to an insignificant level.

- If petroleum contaminated soils or groundwater are encountered within the work area, work will be ceased where contamination is discovered until a change order for the extra work can be agreed upon by the Contractor, Owner, Engineer and the Montana DEQ Underground Storage Tank Program. Work will proceed with other elements of the project.

- Fugitive dust as a result of construction will be controlled within the work area. The Contractor will be required to have a water truck available for dust control prior to beginning construction tasks.
- Temporary erosion and sediment control measures include the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment offsite as result of construction activities.
- Comply with the County Noxious Weed Management Act, Title 7, Chapter 22, Part 21 and all county and contract noxious weed control requirements.

No other conditions that could affect the cost of construction or operation of the facility are known at this time.

Sustainability Considerations

Replacement of aging and deteriorated cast iron pipe is sustainable utility management. The following areas are benefited:

- Social
    - The current water quality resulting from corrosion byproducts from the cast iron pipe causes numerous complaints from residents and it is likely that it could be a determining factor in demographic and population growth patterns in and around Harlowton as families wish to avoid the poor water drinking water quality in Harlowton.
- Economic
    - The City will ultimately see an economic benefit in the long term because of fewer break repair callouts to their Public Works Department staff.

Water and Energy Efficiency

Current water leakage, which exceeds 50%, wastes a valuable State resource. This water could otherwise be put to a beneficial State use. As the main replacement phases progress, leakage will decrease proportionately.

Economic benefits from this alternative will be experienced from energy savings in the following ways:

- New pipe has less head loss and will reduce pumping costs,

- Reduced leakage will reduce pumping costs.

Green Infrastructure

Excessive leakage serves to provide recharge to the shallow contaminated aquifer, causing increased head differential between groundwater recharge and groundwater discharge (usually surface water, such as Musselshell River) areas. This can be a factor in contaminant transport of the petroleum hydrocarbons to surface water that increases the flow of contaminated shallow groundwater to surface water. As leakage is reduced, the additional potential head increase and subsequent contaminant transport mechanism will also be diminished.

Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment offsite as result of construction activities.

Cost Estimates

Table 5-1 presents an estimated opinion of probable cost for Alternative D-2. Overall, operation and maintenance costs are not anticipated to increase and in fact may decrease because of improvements. This report assumes no change to operation and maintenance costs.

Table 5-1 - Cost Estimate Alternative D-1 Phase 5

Opinion of Probable Cost City of Harlowton Water Main Replacement Project Alternative D-1 Phase 5					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	6" Ductile Iron Water Main	690	LF	$ 70.00	$ 48,300
2	6" PVC Water Main	7,200	LF	$ 48.00	$ 345,600
3	6" Fire Hydrant with Auxiliary Gate Valve	12	EA	$ 5,500.00	$ 66,000
4	6" Gate Valve with Valve Box	20	EA	$ 1,800.00	$ 36,000
5	6" Fittings	22	EA	$ 800.00	$ 17,600
6	Exploratory Excavation	60	HR	$ 250.00	$ 15,000
7	Connection to Existing Water Main	16	EA	$ 1,500.00	$ 24,000
8	Water Service Connections	120	EA	$ 1,100.00	$ 132,000
9	3/4" PE Water Service Lines	3,600	LF	$ 25.00	$ 90,000
10	Remove Existing Fire Hydrant	12	EA	$ 500.00	$ 6,000
11	Pavement Removal and Replacement	6,450	SY	$ 45.00	$ 290,250
12	Gravel Removal and Replacement	2,300	SY	$ 15.00	$ 34,500
13	Sidewalk Removal and Replacement	2,025	SF	$ 20.00	$ 40,500
14	Curb and Gutter Rem. and Replacement	400	LF	$ 50.00	$ 20,000
15	Temporary Water System	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				$ 1,186,000
	Mobilization		10%		$ 119,000
	Traffic Control		3%		$ 36,000
	Contingency		10%		$ 119,000
	Construction Subtotal				$ 1,460,000
	2022 Construction Cost [2]		6.0%		$ 1,549,000
	Engineering		20%		$ 292,000
	Legal & Administrative		5%		$ 73,000
	Total				$ 1,914,000

(1)Estimated unit costs area based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)Capital costs are projected to an anticipated construction date in 2022 using a 3% per year inflation rate.

5.6.2 Alternative D-2: Phase 6 - Replace 7,200 LF of undersized and failing cast iron and asbestos cement pipe

Alternative D-2 is Phase 6 of water system improvements. This alternative will consist of replacement of 7,200 lineal feet of undersized and failing cast iron and asbestos cement pipe. The pipe replacement will include 6,650 lineal feet of 6-inch PVC pipe, 200 lineal feet of 6-inch HDPE pipe and 350 lineal feet of ductile iron pipe contiguous to the DEQ-defined Mager LUST Trust Fund Site. Replacement is needed to increase fire flow to the area and eliminate potential leaks. Old cast iron and asbestos cement pipe in Harlowton's water distribution system is a significant contributor to 50% unaccounted for water in recent years. A stream crossing under Jawbone Creek will require installation of HDPE pipe through horizontal directional drilling.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the distribution alternatives will meet the requirements in Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

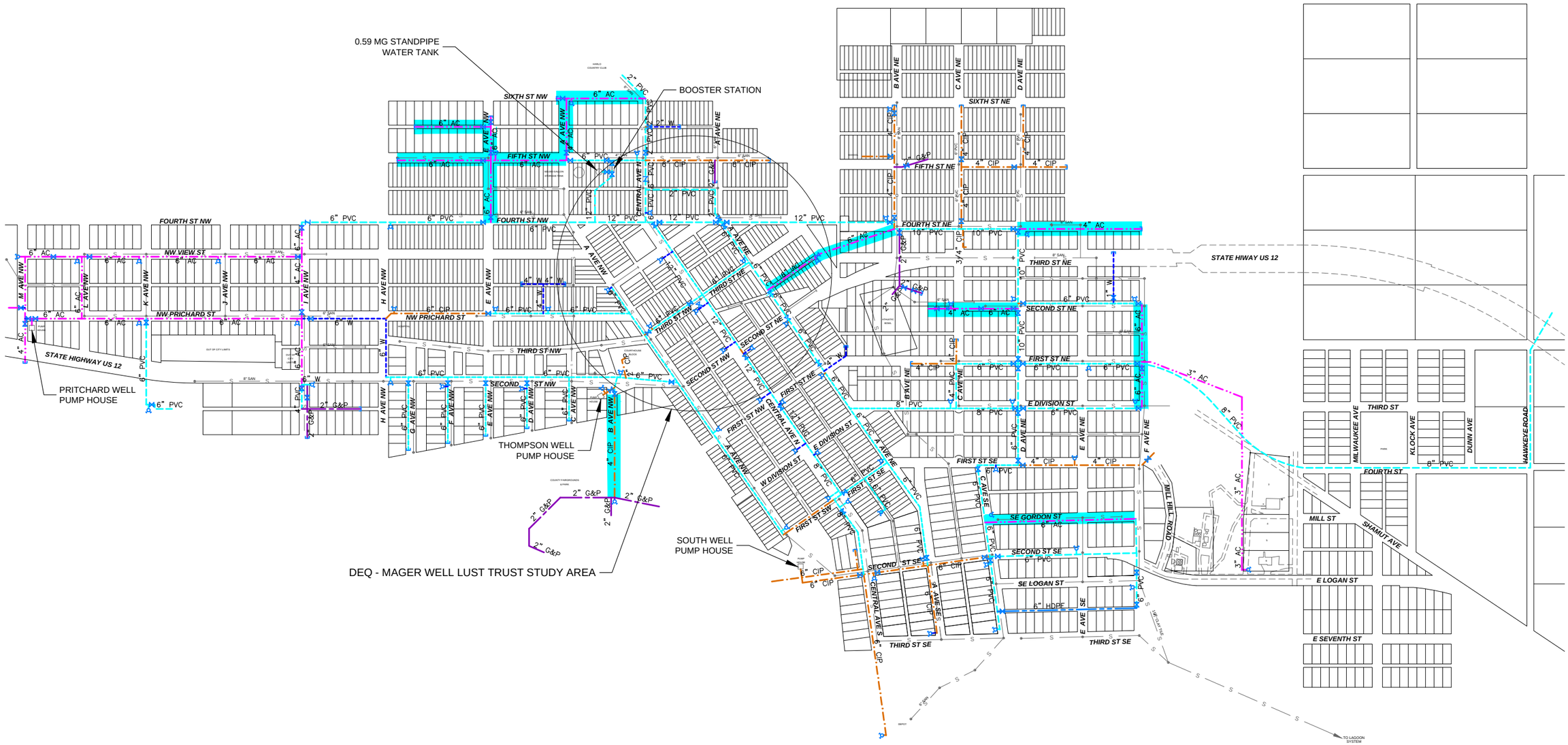
Map

Figure 5-2 show locations of proposed improvements for Alt. D-2.

Environmental impacts

There are no expected impacts to floodplains, wetlands, or other important land resources, endangered species, historical or archaeological properties. The proposed project will replace existing water mains in existing roadways, streets, alleyways and easements. No land acquisition is anticipated. No new effects on the human environment will be experienced as a result of the proposed project.

A stream crossing is part of Alt. D-2. Directional drilling is the preferred method for crossing the stream (Jawbone Creek), therefore a 410 permit from the Army Corps of Engineers is not necessary. Any additional permits from DNRC or the County Conservation District for the stream crossing will be sought and obtained if necessary.



LEGEND

- UNKNOWN TYPE WATER LINE
- PVC WATER LINE
- HDPE WATER LINE
- CAST IRON WATER LINE
- ASBESTOS CEMENT WATER LINE
- GALVANIZED AND PLASTIC WATER LINE
- GATE VALVE
- FIRE HYDRANT

0 300 600
SCALE IN FEET

NORTH

PHASE 6

GreatWest engineering®

Figure 5-2
Phase 6
Proposed Water Distribution System Improvements
CITY OF HARLOWTON
2020 WATER PER

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A mitigated environmental assessment is appropriate for the level of potential impacts that may be encountered during the course of the project. That is,

a. All impacts of the proposed action have been accurately identified,
b. All impacts will be mitigated below the level of significance, and
c. No significant impact is likely to occur.

Land Requirements

No land acquisition is required. The proposed alternatives will replace existing water mains in existing roadways, streets, alleyways and easements controlled by the City.

Potential Construction Problems

A review of DEQ static water level data for existing monitoring wells within the LUST Trust site indicate that the most shallow groundwater is at about 12 feet below ground surface; a distance that is about five feet below the anticipated maximum depth of bury of the replacement pipe.

The following measures will be taken to reduce any environmental impacts to an insignificant level.

- If petroleum contaminated soils or groundwater are encountered within the work area, work will be ceased where contamination is discovered until a change order for the extra work can be agreed upon by the Contractor, Owner, Engineer and the Montana DEQ Underground Storage Tank Program. Work will proceed with other elements of the project.
- Fugitive dust as a result of construction will be controlled within the work area. The Contractor will be required to have a water truck available for dust control prior to beginning construction tasks.
- Temporary erosion and sediment control measures include the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment offsite as result of construction activities.
- Comply with the County Noxious Weed Management Act, Title 7, Chapter 22, Part 21 and all county and contract noxious weed control requirements.

No other conditions that could affect the cost of construction or operation of the facility are known at this time.

Sustainability Considerations

Replacement of aging and deteriorated cast iron pipe is sustainable utility management. The following areas are benefited:

- Social
    - The current water quality resulting from corrosion byproducts from the cast iron pipe causes numerous complaints from residents and it is likely that it could be a determining factor in demographic and population growth patterns in and around Harlowton as families wish to avoid the poor water drinking water quality in Harlowton.
- Economic
    - The City will ultimately see an economic benefit in the long term because of fewer break repair callouts to their Public Works Department staff.

Water and Energy Efficiency

Current water leakage, which exceeds 50%, wastes a valuable State resource. This water could otherwise be put to a beneficial State use. As the main replacement phases progress, leakage will decrease proportionately.

Economic benefits from this alternative will be experienced from energy savings in the following ways:

- New pipe has less head loss and will reduce pumping costs,
- Reduced leakage will reduce pumping costs.

Green Infrastructure

Excessive leakage serves to provide recharge to the shallow contaminated aquifer, causing increased head differential between groundwater recharge and groundwater discharge (usually surface water, such as Musselshell River) areas. This can be a factor in contaminant transport of the petroleum hydrocarbons to surface water that increases the flow of contaminated shallow groundwater to surface water. As leakage is reduced, the additional potential head increase and subsequent contaminant transport mechanism will also be diminished.

Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment offsite as result of construction activities.

Cost Estimates

Table 5-2 presents an estimated opinion of probable cost for Alternative D-2. Overall, operation and maintenance costs are not anticipated to increase and in fact may decrease because of improvements. This report assumes no change to operation and maintenance costs.

Table 5-2 - Cost Estimate Alternative D-2 Phase 6

Opinion of Probable Cost City of Harlowton Water Main Replacement Project Alternative D-2 Phase 6					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	6" Ductile Iron Water Main	350	LF	$ 70.00	$ 24,500
2	6" PVC Water Main	6,650	LF	$ 48.00	$ 319,200
3	6" HDPE Water Main (Horizontal Direction Drilling)	200	LF	$ 200.00	$ 40,000
4	6" Fire Hydrant with Auxiliary Gate Valve	8	EA	$ 5,500.00	$ 44,000
5	6" Gate Valve with Valve Box	13	EA	$ 1,800.00	$ 23,400
6	6" Fittings	16	EA	$ 800.00	$ 12,800
7	Exploratory Excavation	60	HR	$ 250.00	$ 15,000
8	Connection to Existing Water Main	13	EA	$ 1,500.00	$ 19,500
9	Water Service Connections	64	EA	$ 1,100.00	$ 70,400
10	3/4" PE Water Service Lines	1,600	LF	$ 25.00	$ 40,000
11	Remove Existing Fire Hydrant	8	EA	$ 500.00	$ 4,000
12	Pavement Removal and Replacement	3,900	SY	$ 45.00	$ 175,500
13	Gravel Removal and Replacement	5,200	SY	$ 15.00	$ 78,000
14	Sidewalk Removal and Replacement	675	SF	$ 20.00	$ 13,500
15	Curb and Gutter Rem. and Replacement	135	LF	$ 50.00	$ 6,750
16	Temporary Water System	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				$ 920,000
	Mobilization		10%		$ 92,000
	Traffic Control		3%		$ 28,000
	Contingency		10%		$ 92,000
	Construction Subtotal				$ 1,132,000
	2024 Construction Cost [2]		12.5%		$ 1,274,000
	Engineering		20%		$ 226,000
	Legal & Administrative		5%		$ 57,000
	Total				$ 1,557,000

(1)Estimated unit costs area based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)Capital costs are projected to an anticipated construction date in 2024 using a 3% per year inflation rate.

6.0 SELECTION OF AN ALTERNATIVE

Typically, this section of the report would examine advantages and disadvantages of each of the alternatives in terms of life cycle costs, operational and maintenance considerations, permitting concerns, social impacts, environmental impacts, and other non-monetary considerations. A comparative analysis between alternatives would be completed and a preferred alternative selected to address the deficiencies identified in each part of the water system. However, with most of the alternatives presented, the options are to either make the improvements or not and a comparative analysis is not needed. The alternatives presented are priorities set by the City.

6.1 Life Cycle Cost Analysis

The cost of extensive capital improvements to meet minimum health and safety requirements, applicable regulations, and environmental impacts is a great concern to small communities with limited budgets and resources. At the same time, some alternatives may have a low capital cost but high O&M costs that will put a continual burden on the community. A life cycle cost analysis provides a method to compare the costs of each alternative to one another.

To complete the life cycle cost analysis, the anticipated annual increase to O&M costs, and estimated salvage value of any improvements based upon a straight-line depreciation are converted to present day dollars using the “real” discount rate from Appendix C of OMB A-94. The “real” interest rate for a 20-year project is 0.3 percent. The useful life of the pumps and electronics is assumed to be 20 years while pipelines and appurtenances are assumed to be 50 years. The net present value is then calculated for each alternative by adding the estimated capital cost and present worth of the increased O&M and then subtracting the present worth of the calculated salvage value. In the case of the alternatives evaluated here, there is no increase to the annual operation and maintenance costs.

Table 6-1 summarizes the 20-year life cycle cost analysis for the alternatives.

Table 6-1 - Life Cycle Cost Analysis

Life Cycle Cost Analysis						
Alternative	Capital Cost	Annual Increase to O&M	Present Worth of O&M Increase[1]	20-year Salvage Value	Present Worth of Salvage Value[2]	Net Present Value
Distribution System Alternatives						
D-1: Phase 5 Distribution System Improvements	$ 1,914,000	$ 0	$ 0	$ 687,000	$ 647,100	$ 1,227,000
D-2: Phase 6 Distribution System Improvements	$ 1,535,000	$ 0	$ 0	$ 521,000	$ 490,800	$ 1,014,000

[1]In accordance with the Uniform Preliminary Engineering Report Outline, annual O&M costs are converted to present day dollars based on a uniform series present worth calculation using the "real" discount rate from the Office of Management and Budget (OMB) and a 20-year life cycle.
[2]Based on a single payment present worth calculation using the "real" discount rate and a 20-year life cycle.

6.2 Recommended Improvement Program

The alternatives presented have been compiled into a recommended improvement program with priorities established by the City. The projects will be completed as funds allow. Table 6-2 presents a priority list of the recommended improvements. The City may wish to reprioritize the improvements over time as the need arises.

Table 6-2 - Recommended Improvement Program

City of Harlowton Water System Recommended Improvement Program		
ITEM	DESCRIPTION	ESTIMATED COST
Priority #1	D-1: Phase 5 Distribution System Improvements	$ 1,914,000
Priority #2	D-2: Phase 6 Distribution System Improvements	$ 1,535,000

At this time, the City intends to move forward with Alternative D-1 as the preferred project.

7.0 PROPOSED PROJECT

7.1 Preliminary Project Design

As discussed in Chapter 6, the preferred project is Alternatives D-1 – Phase 5 Distribution System Improvements. The preferred alternative will be discussed in this chapter.

7.1.1 Water Supply

The recommended project does not include improvements to City's water supply. The existing water supply will be abandoned once the Central Montana Regional Water connection to the City's system is completed.

7.1.2 Treatment

The recommended project does not include improvements to City's treatment facilities. The existing treatment will be abandoned once the Central Montana Regional Water connection to the City's system is completed.

7.1.3 Storage

The City's existing storage capacity is adequate to meet the community's needs for the 20-year design period. The condition of the storage tank is excellent. There are no storage improvements recommended as part of this project.

7.1.4 Pumping Stations

The condition of the existing booster station is excellent and the capacity is adequate. There are no pumping station improvements recommended as part of this project.

7.1.5 Distribution System

This alternative will consist of replacement of 7,900 lineal feet of undersized and failing cast iron pipe. The pipe replacement will include 7,200 lineal feet of 6-inch PVC pipe and 700 lineal feet of ductile iron pipe contiguous to the DEQ-defined Mager LUST Trust Fund Site. Existing fire hydrants and service connections will be replaced. Locations of the distribution system improvements in Phase 5 are shown in Fig. 5-1.

DEQ Circular 1, Chapter 8.1.2. Permeation of system by organic compounds, state that where distribution systems are installed in areas of groundwater contaminated by organic compounds:

a. Pipe and joint materials that are not subject to permeation of the organic compounds must be used,
b. Non-permeable materials must be used for all portions of the system including water main, pipe joint material, service connections and hydrant leads.

Ductile iron pipe is required in those areas where petroleum contamination is likely. Ductile iron pipe is somewhat more expensive than PVC. Polyethylene encased ductile iron with nitrile gaskets is significantly less permeable to organic (hydrocarbon) chemicals. Ductile iron pipe, gaskets, polyethylene encasement, and other fittings will comply with AWWA Standards American Water Works Standard (AWWA C 150) for drinking water systems.

7.2 Project Schedule

Chapter 8 of this report includes a detailed implementation schedule. Tasks associated with implementation of the project include securing funding, permitting, design, bidding, and construction. It is anticipated that funding will become available in July of 2021, at which point permitting and design will commence. Design plans and specifications for the distribution system improvements will be submitted to MDEQ and other required agencies for approval in Winter of 2021 and bidding and construction for the project will take place in the Winter and Spring of 2022. Construction is anticipated to be completed by Summer 2022.

7.3 Permit Requirements

The design phase of the project will include applying for and obtaining necessary permits related to work in the floodplain. Construction permits will likely include a Stormwater Pollution Prevention Plan (SWPPP), which will be the responsibility of the selected contractor.

7.4 Sustainability Considerations

Replacement of aging and deteriorated cast iron pipe is sustainable utility management. The following areas are benefited:

Social

The current water quality resulting from corrosion byproducts from the cast iron pipe causes numerous complaints from residents and it is likely that it could be a determining factor in demographic and population growth patterns in and around Harlowton as families wish to avoid the poor water drinking water quality in Harlowton.

Economic

The City will ultimately see an economic benefit in the long term because of fewer break repair callouts to their Public Works Department staff.

Water and Energy Efficiency

Current water leakage, which exceeds 50%, wastes a valuable State resource. This water could otherwise be put to a beneficial State use. As the main replacement phases progress leakage will decrease proportionately.

Economic benefits from this alternative will be experienced from energy savings in the following ways:

- New pipe has less head loss and will reduce pumping costs,
- Reduced leakage will reduce pumping costs.

Green Infrastructure

Excessive leakage serves to provide recharge to the shallow contaminated aquifer, causing increased head differential between groundwater recharge and groundwater discharge (usually surface water, such as Musselshell River) areas. This can be a factor in contaminant transport of the petroleum hydrocarbons to surface water that increases the flow of contaminated shallow groundwater to surface water. As leakage is reduced, the additional potential head increase and subsequent contaminant transport mechanism will also be diminished.

Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment offsite as result of construction activities.

7.5 Cost Estimates

Table 7-1 below presents an itemized estimate of the Preferred Alternative D-1 project cost based on construction occurring in 2022. Bid tabulations for similar projects completed in recent years and communication with manufacturers and suppliers were used to develop unit costs and are the basis for the estimated costs.

Table 7-1 - Cost Estimate Alternative D-1 Phase 5

Opinion of Probable Cost City of Harlowton Water Main Replacement Project Alternative D-1 – Phase 5					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	6" Ductile Iron Water Main	690	LF	$ 70.00	$ 48,300
2	6" PVC Water Main	7,200	LF	$ 48.00	$ 345,600
3	6" Fire Hydrant with Auxiliary Gate Valve	12	EA	$ 5,500.00	$ 66,000
4	6" Gate Valve with Valve Box	20	EA	$ 1,800.00	$ 36,000
5	6" Fittings	22	EA	$ 800.00	$ 17,600
6	Exploratory Excavation	60	HR	$ 250.00	$ 15,000
7	Connection to Existing Water Main	16	EA	$ 1,500.00	$ 24,000
8	Water Service Connections	120	EA	$ 1,100.00	$ 132,000
9	3/4" PE Water Service Lines	3,600	LF	$ 25.00	$ 90,000
10	Remove Existing Fire Hydrant	12	EA	$ 500.00	$ 6,000
11	Pavement Removal and Replacement	6,450	SY	$ 45.00	$ 290,250
12	Gravel Removal and Replacement	2,300	SY	$ 15.00	$ 34,500
13	Sidewalk Removal and Replacement	2,025	SF	$ 20.00	$ 40,500
14	Curb and Gutter Rem. and Replacement	400	LF	$ 50.00	$ 20,000
15	Temporary Water System	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				$ 1,186,000
	Mobilization		10%		$ 119,000
	Traffic Control		3%		$ 36,000
	Contingency		10%		$ 119,000
	Construction Subtotal				$ 1,460,000
	2022 Construction Cost [2]		6.0%		$ 1,549,000
	Engineering		20%		$ 292,000
	Legal & Administrative		5%		$ 73,000
	Total				$ 1,914,000

(1)Estimated unit costs area based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)Capital costs are projected to an anticipated construction date in 2022 using a 3% per year inflation rate.

7.6 Annual Operating Budget

Table 7-2 presents Harlowton's water system annual operating budget for year 2020. Appendix P includes detailed financial information for the City's 2020 budgeted revenues and expenses as well as actual revenues and expenses for the past three years.

Table 7-2 - Water System Annual Operating Budget

Water System Annual Operating Budget	
Water Revenues	Amount Budgeted
Water Sales	$322,000
Bulk Water Sales	$800
Hook-up Fees	$800
Total Revenues	$323,600
Water Expenses	Amount Budgeted
Administration	$108,020
Source of Supply and Pumping	$120,400
Debt Service	$73,820
Total Expenses	$302,280

7.6.1 Income

The financial status of the City of Harlowton Water Fund was discussed in Chapter 3.5. The current average monthly water rate is $41.80 /month/Equivalent Dwelling Unit (EDU). There are currently 642 EDUs calculated for the residential and nonresidential hookups in town. Water service charges and charges for permits, bulk water sales, and other miscellaneous water resulted in total water revenue of $302,684, $317,728, and $326,368 for the 2017, 2018, and 2019 fiscal years, respectively. Projected income as a result of user rate increase as a result of the proposed project is $3.38 per month per EDU, or about $26,000 annually.

Detailed income and expense reports may be found in Appendix P.

7.6.2 Annual O&M Costs

Average O&M expenses for the last three fiscal years are presented in Chapter 3.5. Annual expenses for the water system totaled $212,789, $172,917, and $210,794 for the 2017, 2018,

and 2019 fiscal years, respectively. See Table 3-11 in Chapter 3 for a breakdown of these expenses and Appendix P for additional detailed financial information containing personnel costs, administrative costs, water purchase or treatment costs, accounting and auditing fees, legal fees, interest, utilities, energy costs, insurance, annual repairs and maintenance, monitoring and testing, supplies, chemicals, residuals disposal, office supplies, printing, professional services, and miscellaneous.

7.6.3 Debt Repayments

It should be noted that the City currently has three outstanding loans for the Water Enterprise Fund with a fourth loan closing in June 2020. All loans are SRF loans with current balances as summarized below. The average annual payment to service the debt on these four loans will be approximately $100,000.

Year Issued	Purpose	Type of Bond/ Security	Amount	Maturity Date (mo/yr)	Debt Holder	Coverage Requirement	Avg. Annual Payment Amount	Outstanding Balance
2012	Storage & Distribution System Imp.	Revenue	$429,900.00	2032	DNRC/SRF	1.25	$29,000	$294,000.00
2013	Water Supply & Distribution System Imp.	Revenue	$412,500.00	2040	DNRC/SRF	1.25	$20,500	$357,000.00
2016	Water Distribution System Imp.	Revenue	$392,500.00	2036	DNRC/SRF	1.10	$25,000	$344,500.00
2020	Water Distribution System Imp.	Revenue	$391,500.00	2040	DNRC/SRF	1.10	$25,000	$391,500.00

Financing for the proposed project (See Table 8-2) would result in an additional annual debt service of $26,048. The resulting average annual debt repayments from all sources would be approximately $126,000.

7.6.4 Reserves

Debt Service Reserve

SRF requires a bond reserve in the amount of 1/2 year's payment.

For the proposed project the SRF Bond reserve is estimated to be $11,995.

Short-Lived Asset Reserve

Short-lived assets were included as part of the O&M costs. Therefore, there are no additional reserve requirements to be included as part of the project costs.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The previous chapters of this report have focused on the need for the project, physical and socioeconomic characteristics of the community, project costs and the technical viability. This chapter discusses financial strategy and project implementation schedule. This chapter will discuss available funding sources and develop various funding scenarios. A preferred funding scenario will be selected and analyzed along with an implementation plan.

8.1 Funding

Due to the high cost of the proposed improvements, the City plans to pursue outside assistance to fund the project in the form of grants and loans. Prior to examining the funding sources available to the City, it is important to understand the concept of "Target Rate" as established by the Montana Department of Commerce (MDOC). The target rate is used to determine if a municipality is paying its fair share of a project's cost. To apply for grant funding from the MDOC, user rates after completion of the project must meet or exceed the established target rates.

The target rates are calculated as a percentage of the median household income (MHI) for the municipality, as listed in the 2015 American Community Survey. The MDOC has determined, based on surveying communities that have undergone recent upgrades to their water and/or wastewater systems that the "fair share" of cost per user after completing a project should be approximately 1.4% of the median household income for water only, 0.9% for wastewater only, or 2.3% for water and wastewater combined.

According to the MDOC's website, the MHI for Harlowton is $29,814 and the combined target rate is $57.14. The existing average combined rate for the City is $75.70. The current combined rate is 132% of the target rate, prior to implementation of this project.

8.1.1 Funding Sources

The following sections provide a brief description of the potential funding sources and whether or not the City of Harlowton would be eligible for those funds.

Treasure State Endowment Program (TSEP)

TSEP is a state funded grant program, which is administered by the Montana Department of Commerce (MDOC). TSEP provides financial assistance to local governments for infrastructure improvements. Grants can be obtained from TSEP for up to $500,000 if the projected user rates are less than 125% of the target rate, for up to $625,000 if projected user rates are between 125% and 150% of the target rate, and for up to $750,000 if the projected user rates are over 150% of the target rate. TSEP grant recipients are required to match the grant dollar for dollar, but the match may come from a variety of sources including other grants, loans, or cash contributions.

At the completion of the project proposed and utilizing the preferred funding scenario, combined user rates will be at $79.08 per month, or 138% of target rate. This makes the City eligible to apply for a $625,000 TSEP grant.

Renewable Resource Grant and Loan Program (RRGL)

RRGL is a state program that is funded through interest accrues on the Resource Indemnity Trust Fund and the sale or Coal Severance Tax Bonds and is administered by the Montana Department of Natural Resources and Conservation (DNRC). The primary purpose of the RRGL is to enhance Montana's renewable resources. For public facilities projects that conserve, manage, develop, or protect renewable resources, grants of up $125,000 are available.

Although the RRGL program is competitive, the proposed project will be promoting water conservation efforts by eliminating sources of a severe leakage problem in Harlowton. Increased head on the shallow groundwater system resulting from the high leakage rates serves to accelerate petroleum contaminant transport from the groundwater system to its point of discharge, the Musselshell River. Eliminating the leakage and reducing the head on the shallow groundwater will protect the water quality of the Musselshell River. This improves the City's competitiveness in obtaining up to $125,000 of grant funds through the DNRC-RRGL program.

Community Development Block Grant (CDBG)

CDBG is a federally funded program that is also administered by the Montana Department of Commerce (MDOC). The primary purpose of CDBG funds is to benefit low to moderate income (LMI) families. Hence, a municipality must have an LMI of 51% or greater. This is usually

determined by the current Census. However, under certain circumstances, the MDOC may allow an income survey to be completed (such as there have been major economic changes since the Census or if a community is only slightly under the required LMI percentage).

The CDBG grant funds can be applied for in an amount of up to $450,000 with a limit of $15,000 per LMI household, so a community needs 30 LMI households to apply for the maximum grant funds. The use of CDBG funds requires a 25% local match that can be provided through cash funds, loans, or a combination thereof.

The City has an LMI of 51.7%, an amount that makes the City eligible to apply for up to $450,000 in CDBG funds. The City intends to apply for CDBG funding in September 2020.

State Revolving Fund (SRF)

SRF provides low-interest loan funds for both water and wastewater projects through the Drinking Water State Revolving Fund (DWSRF) and the Water Pollution Control State Revolving Fund (WPCSRF), respectively. The SRF program is administered by the Montana Department of Environmental Quality. Current loan terms include an interest rate of 2.5% for a 20-year period.

The City will be applying for a loan through the Drinking Water SRF program for the remainder of the project funds after TSEP, CDBG and RRGL have been fully leveraged. Previous discussions with Anna Miller with the SRF program indicate that a 50% rate of loan forgiveness is acceptable for planning purposes.

USDA Rural Development (RD)

RD provides grant and loan funding to municipalities for water and wastewater projects that improve the quality of life and promote economic development in Rural America. Municipalities with a population of less than 10,000 are eligible to apply, though; priority is given to those with a population of less than 5,500.

Grant eligibility and loan interest rates are based on the community's median household income (MHI) and user rates. If the area to be served has a MHI of $38,205 or lower and the project is necessary to alleviate a health and/or sanitation concern, up to 75% of the project costs are grant eligible. Up to 45% of the project costs are grant eligible if the planning area has an MHI between $38,205 and $47,757.

RD currently offers the following loan interest rates, effective until June 30, 2020:

- Poverty – 1.375%. A community qualifies for the poverty rate if its median household income (MHI) is less than $38,205 and the project is needed to alleviate a health and/or sanitary problem (potential threat not eligible).

- Intermediate – 1.875%. Applies to communities with an MHI greater than $38,205 and less than $47,757 without an existing health and/or sanitary problem. This rate also applies to communities with an MHI less than $38,205 and no documented health and/or sanitary problem.

- Market – 2.375%. Applies to communities with an MHI greater than $47,757.

The City's MHI is $29,814 and the population is approximately 899. Harlowton would qualify for the poverty rate for loan interest rates and they are eligible for up to a 75% grant through RD. However, the City has elected not to pursue RD funding because of the longer 40-year loan repayment period which is typically used to calculate the grant amount. Rural Development could be a fall back option for funding should the City not be successful in obtaining grant funds and SRF funding.

Montana Coal Board

The Coal Board provides grant funding to municipalities to adequately provide for the expansion of public services or facilities needed as a direct consequence of coal development activities. There is no maximum limit to the amount the Coal Board can fund, but available funding is very limited so it can be difficult to receive any funds from the Coal Board, especially large sums.

At this time the City will not pursue Montana Coal Board funds because of the limited funding available and the low likelihood of success.

Economic Development Administration (EDA)

EDA provides grant funding for projects that are demonstrated to be needed for the placement of a new business. The amount of grant is dependent on the number of jobs created.

Because the proposed project would not create a large number of jobs, the City has opted not to apply for an EDA grant.

INTERCAP

INTERCAP provides loan funds at a low cost, variable interest rate to local governments. INTERCAP is administered by the Montana Board of Investments and is very flexible in the variety of funding which would include both water and wastewater projects. There is no funding cycle (funds are always available), however, the maximum loan term is 10 years.

Due to the relatively large amount of loan financing required, an INTERCAP loan with the shorter loan term would cause an unacceptable increase in user rates for the residents and is not recommended for long-term funding.

8.1.2 Funding Strategy

Numerous options have been identified as potential funding sources for the City. Because of the nature of the project and anticipated user rates, the City would have a good chance of obtaining funds through TSEP, RRGL, CDBG, RD, and SRF, as well as a loan through a local bank.

The proposed project is Alt. D-1 Phase 5 Distribution System Improvements, a project to replace about 7,900 feet of failing cast iron pipe.

Combinations of various funding strategies are presented in Table 8-2. The City's preferred option is Funding Scenario #1. While a decrease in O&M costs is anticipated as a result of the proposed project, we have assumed no change in annual operation and maintenance costs to remain conservative. If the City does see the anticipated savings relative to the estimated O&M costs, they will use it to build up their reserves for future phases,

Therefore, the City's preferred funding package for the Alt. D-1 Phase 5 proposed project includes Funding Scenario #1:

- $625,000 TSEP Grant
- $125,000 DNRC-RRGL Grant
- $450,000 CDBG Grant
- $357,000 SRF Loan Forgiveness
- $357,000 SRF Loan

Using Funding Scenario #1 as a basis, a detailed project budget is presented in Table 8-2, which provides a breakdown of each of the line item costs by funding source.

Table 8-1 - Funding Scenarios for Harlowton

City of Harlowton Funding Options for Phase 5 Water Main Replacement Project				
	Scenario #1	Scenario #2	Scenario #3	Scenario #4
Item	TSEP, DNRC and CDBG Grants w/ SRF Loan (2.5% / 20 years) and Loan Forgiveness	TSEP and CDBG Grants w/ SRF Loan (2.5% / 20 years) and Loan Forgiveness	TSEP Grant w/ SRF Loan (2.5% / 20 years) and Loan Forgiveness	CDBG Grant w/ SRF Loan (2.5% / 20 years) and Loan Forgiveness
Phase 5 Water Main Replacement	$1,914,000	$1,914,000	$1,914,000	$1,914,000
Rounded Total	$1,914,000	$1,914,000	$1,914,000	$1,914,000
TSEP Grant	$625,000	$625,000	$625,000	
DNRC Grant	$125,000			
CDBG Grant	$450,000	$450,000		$450,000
SRF Loan Forgiveness	$357,000	$419,500	$500,000	$500,000
SRF Loan (20 Years)	$357,000	$419,500	$789,000	$964,000
Total Project Funds	$1,914,000	$1,914,000	$1,914,000	$1,914,000
SRF Bond Reserve (1/2 year payment)	$11,995	$14,095	$26,510	$32,390
Total Loan Amount	$368,995	$433,595	$815,510	$996,390
Annual Loan Payment	$23,680	$27,820	$52,320	$63,920
Total Loan Payments Over Life of Loan	$473,600	$556,400	$1,046,400	$1,278,400
Total Interest Paid Over Life of Loan	$104,605	$122,805	$230,890	$282,010
Annual Loan Coverage	$2,368	$2,782	$5,232	$6,392
Total Annual Capital Debt Service Cost	$26,048	$30,602	$57,552	$70,312
User Capital Cost/Month	*$3.38*	*$3.97*	*$7.47*	*$9.13*
Current Annual O&M [1]	$222,000	$222,000	$222,000	$222,000
Current Annual Debt Service	$100,000	$100,000	$100,000	$100,000
Additional O&M Due To Project	$0	$0	$0	$0
Total Annual O&M Costs	$322,000	$322,000	$322,000	$322,000
User O&M Cost/Month	*$41.80*	*$41.80*	*$41.80*	*$41.80*
User Cost/Month for Project [2]	$45.18	$45.77	$49.27	$50.92
Existing Average User Cost/Month/EDU	$41.80	$41.80	$41.80	$41.80
Cost/Month Increase/EDU	$3.38	$3.97	$7.47	$9.13
Existing Other System Cost/Month	$33.90	$33.90	$33.90	$33.90
Total Proposed Water & Sewer Cost/Month	$79.08	$79.67	$83.17	$84.83
Combined Systems Target Rate	$57.14	$57.14	$57.14	$57.14
Percent of Combined Target Rate	138%	139%	146%	148%
[1] Based on 2019 actual annual water O&M less budgeted depreciation values for facilities, pumping equipment, and distribution equipment.				
[2] Table is based on an estimated 642 EDU's				

Table 8-1 (cont.) Funding Scenarios for Harlowton

City of Harlowton Funding Options for Phase 5 Water Main Replacement Project		
	Scenario #5	Scenario #6
Item	SRF Loan (2.5% / 20 years) and Loan Forgiveness	SRF Loan only (2.5% / 20 years)
Phase 5 Water Main Replacement	$1,914,000	$1,914,000
Rounded Total	$1,914,000	$1,914,000
TSEP Grant		
DNRC Grant		
CDBG Grant		
SRF Loan Forgiveness	$500,000	
SRF Loan (20 Years)	$1,414,000	$1,914,000
Total Project Funds	$1,914,000	$1,914,000
SRF Bond Reserve (1/2 year payment)	$47,510	$64,310
Total Loan Amount	$1,461,510	$1,978,310
Annual Loan Payment	$93,760	$126,910
Total Loan Payments Over Life of Loan	$1,875,200	$2,538,200
Total Interest Paid Over Life of Loan	$413,690	$559,890
Annual Loan Coverage	$9,376	$12,691
Total Annual Capital Debt Service Cost	$103,136	$139,601
User Capital Cost/Month	*$13.39*	*$18.12*
Current Annual O&M [1]	$222,000	$222,000
Current Annual Debt Service	$100,000	$100,000
Additional O&M Due To Project	$0	$0
Total Annual O&M Costs	$322,000	$322,000
User O&M Cost/Month	*$41.80*	*$41.80*
User Cost/Month for Project [2]	$55.18	$59.92
Existing Average User Cost/Month/EDU	$41.80	$41.80
Cost/Month Increase/EDU	$13.39	$18.12
Existing Other System Cost/Month	$33.90	$33.90
Total Proposed Water & Sewer Cost/Month	$89.09	$93.82
Combined Systems Target Rate	$57.14	$57.14
Percent of Combined Target Rate	156%	164%

Table 8-2 - Detailed Project Budget

Administrative/Finance Costs	TSEP	DNRC	CDBG	SRF Loan	SRF Loan Forgiveness	Total:
Personnel Costs	$1,000	$0	$1,000	$0	$0	$2,000
Office Costs	$500	$0	$500	$0	$0	$1,000
Professional Services	$35,000	$0	$0	$0	$0	$35,000
Legal Costs	$500	$0	$0	$0	$500	$1,000
Audit Fees	$0	$0	$0	$8,000	$0	$8,000
Travel & Training	$500	$0	$500	$0	$0	$1,000
Loan Reserves	$0	$0	$0	$12,000	$0	$12,000
Bond Counsel & Related costs	$0	$0	$0	$0	$10,000	$10,000
Total Admin/Finance Costs:	$37,500	$0	$2,000	$20,000	$10,500	$70,000
Activity Costs						
Engineering Design	$103,000	$0	$0	$0	$0	$103,000
Construction Engr. Services	$0	$0	$0	$94,500	$94,500	$189,000
Construction	$484,500	$125,000	$448,000	$171,800	$181,300	$1,410,600
Contingency	$0	$0	$0	$70,700	$70,700	$141,400
Total Activity Costs	$587,500	$125,000	$448,000	$337,000	$346,500	$1,844,000
Total Project Costs	$625,000	$125,000	$450,000	$357,000	$357,000	$1,914,000

8.2 Implementation

Prior to implementation of the project, all funding must be in place. As noted earlier, the proposed funding package for the City of Harlowton uses TSEP, DNRC and CDBG grant funds along with an SRF loan package. Grant applications for TSEP and DNRC are due in June 2020. The results of those applications are expected around April 2021. CDBG applications are due in September 2020. Those results should be known by Spring of 2021. SRF funds are available on an open cycle and do not have a strict deadline.

Upon securing all funding, the project start-up for the grant programs is expected to be about a two-month process. It is anticipated that final design would be completed and bidding could take place in February 2022. Commencement of construction activities is anticipated to start in May 2022. Table 8-3 provides a summary of the Project Implementation Schedule.

Table 8-3 - Project Implementation Schedule

City of Harlowton Project Implementation Schedule	
Action	Date
Public Hearing on Draft PER & EA	June 2020
Prepare Final PER	June 2020
Apply for DNRC & TSEP Grants	June 2020
Apply for CDBG Grant	September 2020
Finalize Grant Financing	May/June 2021
Submit SRF Application	July 2021
Begin Design	July 2021
Design Basis Report/Cost Estimates to the City	October 2021
Submit Design Plans and Specifications to MDEQ	October 2021
MDEQ Review & Approval	December 2021
Advertise for Bids	February 2022
Finalize SRF Loan Financing	March 2022
Start Construction	May 2022
Complete Construction	November 2022

9.0 REFERENCES

DEQ, May 2012, RDG Grant Application for the Petroleum Product Delineation and Mitigation of Threat to Harlowton Public Water Supply Well, Harlowton MT.

Dowl-HKM, May 2012, Final Free Product Recovery and Groundwater Monitoring Report Mager Well LUST Trust Site Harlowton, Montana, prepared for Montana DEQ.

Pioneer Technical Services, 2014, Inc. Final 2012/2013 Harlowton Area-Wide LUST Trust Investigation, prepared for Montana DEQ.

Other Relevant Reports

Mager Well LUST Trust

HKM Engineering Inc. 2000. Draft Remedial Investigation Summary Report, Source Identification and Remedial Investigation of Petroleum Hydrocarbon Contaminated Groundwater, Mager Well, DEQ Contract #460002, Task Order No. 24, Harlowton, Montana.

HKM Engineering Inc. June 2003. Mager Irrigation Well Sample Results, Contract No. 401006, Task Order No. 7, Harlowton, Montana.

HKM Engineering Inc. July 2003. Semi-Annual Groundwater Monitoring Report, Source Identification of Petroleum Hydrocarbon Contamination, Contract No. 401006, Task Order No.7, Harlowton, Montana.

HKM Engineering Inc. September 2003. LNAPL Recovery Report, Wheatland County Courthouse Well, Source Identification of Petroleum Hydrocarbon Contamination, Contract No. 401006, Task Order No. 7, Harlowton, Montana.

HKM Engineering Inc. 2003. Summary Report, Subtask 1 UST Facility File Review, Source Identification of Petroleum Hydrocarbon Contamination, Contract No. 401006, Task Order No. 7, Harlowton, Montana.

HKM Engineering Inc. January 2004. Final Phase II Source Identification of Petroleum Hydrocarbon Contamination Summary Report, Mager Well LUST Trust Site, Contract

No. 401006, Task Order No. 7, Harlowton, Montana (report received by the DEQ on March 3, 2004)

HKM Engineering Inc. February 2007. Draft Phase III Summary Report Source Identification of Petroleum Hydrocarbon Contamination, Harlowton, Montana, Contract No. 401006, Task Order No. 23 (report received by the DEQ on February 22, 2007)

HKM Engineering Inc. September 7, 2007. Final Phase III Summary Report Source Identification of Petroleum Hydrocarbon Contamination, Harlowton, Montana, Contract No. 401006, Task Order No. 23 (report received by the DEQ on September 12, 2007)

HKM Engineering Inc. September 14, 2007. May 2007 Groundwater Monitoring Report Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 401006, Task Order No. 23 (report received by DEQ on September 17, 2007)

HKM Engineering Inc. March 2008. 2007 Aquifer Characteristics Report for the Mager Well LUST Trust Site, Harlowton, Montana, Subtask 5 – Phase III Remedial Investigation Report, Contract No. 401006, Task Order No. 23 (report received by the DEQ on March 10, 2008)

HKM Engineering Inc. March 2008. 2007 Aquifer Characteristics Report for the Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 401006, Task Order No. 23 (report received by the DEQ on March 10, 2008)

DOWL HKM May 2009. Plume Delineation, Assessment of Potential Sources, Groundwater Monitoring and Free Product Recovery, Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 407033, Task Order No. 8 (report received by the DEQ on May 18, 2009)

DOWL HKM June 2009. March 2009 Groundwater Monitoring Report, Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 407033, Task Order No. 8 (report received by the DEQ on June 3, 2009)

DOWL HKM March 2012. Draft Free Product Recovery and Groundwater Monitoring Report, Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 407033, Task Order No. 18 (report received by the DEQ on March 26, 2012)

DOWL HKM May 2012. Final Free Product Recovery and Groundwater Monitoring Report, Mager Well LUST Trust Site, Harlowton, Montana, Contract No. 407033, Task Order No. 18 (report received by the DEQ on May 14, 2012)

Croston's Exxon LUST Trust

HKM Engineering Inc. September 15, 2005. Croston's Exxon Status Report, Task No. 4 – Excavation of Impacted Soil, Harlowton, Montana, DEQ Contract No. 401006, Task Order No. 21, Facility ID# 54-03119. (report received by the DEQ on September 19, 2005)

HKM Engineering Inc. November 17, 2005. Amended Status Report – Soil Investigation Croston's Exxon, Facility ID# 54-03119, Harlowton, Montana, DEQ Contract No. 401006, Task Oder No. 21. (report received by the DEQ on November 21, 2005)

HKM Engineering Inc. May 2006. Remedial Investigation, UST Removal, Overexcavation, and Monitoring Well Installation Summary Report for Croston's Exxon, Harlowton, Montana, DEQ Contract No. 401006-TO-21. (report received by the DEQ May 2006)

DOWL HKM, December 2008. DRAFT Remedial Investigation Phase II Groundwater Monitoring Report for Former Croston's Exxon, Harlowton, Montana, MDEQ Contract Number 407033-TO-9 (report received by the DEQ on May 6, 2009)

DOWL HKM, May 1, 2009, Final Phase II Remedial Investigation Report, Former Croston's Exxon Harlowton, MT, Contract No. 407033, Task Order No. 9, Facility ID# 54-03119, Release #4434. (report received by the DEQ on May 6, 2009)

DOWL HKM, May 5, 2009, March 2009 Groundwater Monitoring Report, Task Order #9, Croston's Exxon Well LUST Trust Site, Harlowton, MT, Contract No. 407033-TO-9. (report received by the DEQ on May 11, 2009)

APPENDIX A

Environmental Checklist and Agency Correspondence

UNIFORM ENVIRONMENTAL CHECKLIST

As the engineer that prepared the preliminary engineering report, I Joel Pilcher, PE,
(print name of engineer)
have reviewed the information presented in this checklist and believe that it accurately identifies the environmental resources in the area and the potential impacts that the project could have on those resources. In addition, the required state and federal agencies were provided with the required information about the project and requested to provide comments on the proposed public facility project. Their comments have been incorporated into and attached to the Preliminary Engineering Report.

Engineer's Signature: _____ **Date:** 5/28/20

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

PHYSICAL ENVIRONMENT

Key	
N	1. **Soil Suitability, Topographic and/or Geologic Constraints (e.g., soil slump, steep slopes, subsidence, seismic activity)** *Comments and Source of Information*: Soils in the area are suitable for buried water lines. Topography is appropriate for pipeline installation and will not result in environmental damage. There are no identified geological constraints on the proposed project. -Great West Engineering -NRCS

Key	
M	2. **Hazardous Facilities (e.g., power lines, EPA hazardous waste sites, acceptable distance from explosive and flammable hazards including chemical/petrochemical storage tanks, underground fuel storage tanks, and related facilities such as natural gas storage facilities & propane storage tanks)** *Comments and Source of Information*: The DEQ Mager Well Lust Trust Site Study Area encompasses a portion of the project area. Petroleum contaminated groundwater and potentially contaminated soils exist within the designated area. Routine water main replacements will be mitigated by using poly-wrapped ductile iron pipe with nitrile gaskets. Mechanical restraints will be used where appropriate. If petroleum contaminated soils or groundwater are encountered within the work area, work will be ceased where contamination is discovered until a change order for the extra work can be agreed upon by the Contractor, Owner, Engineer and the Montana DEQ Underground Storage Tank Program. Work will proceed with other elements of the project. -Great West Engineering -Montana DEQ
Key	
N	3. **Effects of Project on Surrounding Air Quality or Any Kind of Effects of Existing Air Quality on Project (e.g., dust, odors, emissions)** *Comments and Source of Information*: The only impacts on air quality may be temporary dust due to construction activity. Reasonable efforts will be made during construction to control dust and minimize the temporary impacts. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key	
B	4. **Groundwater Resources & Aquifers (e.g., quantity, quality, distribution, depth to groundwater, sole source aquifers)** *Comments and Source of Information*: Selected alternative will protect ground-water and surface water resources because it will reduce leakage to groundwater that further provides petroleum contaminant transport to surface water. Minimum reported groundwater depths in the Harlowton area are 6 feet (MGMG GWIC); average reported static water levels are 33 feet. -MBMG Groundwater Information Center -Great West Engineering
N	5. **Surface Water/Water Quality, Quantity & Distribution (e.g., streams, lakes, storm runoff, irrigation systems, canals)** *Comments and Source of Information*: This project will have no impact on surface water resources. -Great West Engineering
P	6. **Floodplains & Floodplain Management (Identify any floodplains within one mile of the boundary of the project.)** *Comments and Source of Information*: A portion of the project lies within Zone A4 100-year floodplain (FEMA FIRM September 16, 1981) and permitting will be required. -Great West Engineering -FEMA
N	7. **Wetlands Protection (Identify any wetlands within one mile of the boundary of the project.)** *Comments and Source of Information*: No wetlands data are published on the USFWS National Wetland Inventory. Current unpublished mapping efforts through MT Natural Heritage Program were procured and are included in the Appendix. The preferred alternative will not encroach on any mapped wetlands. -Great West Engineering -U.S. FWS
N	8. **Agricultural Lands, Production, & Farmland Protection (e.g., grazing, forestry, cropland, prime or unique agricultural lands) (Identify any prime or important farm ground or forest lands within one mile of the boundary of the project.)** *Comments and Source of Information*: No lands currently used for farming will be taken out of production. The project will take place within City limits. -Great West Engineering -NRCS

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key	
N	9. **Vegetation & Wildlife Species & Habitats, Including Fish (e.g., terrestrial, avian and aquatic life and habitats)** *Comments and Source of Information*: : For the entire Township that encompasses Harlowton (T8N R15E) the Montana Natural Heritage Program noted one plant species, the Small dropseed, as a plant species of concern. Seven animal species of concern were noted within the Township. These are, • Ferruginous Hawk • Veery (thrush) • Mountain Plover • Long-billed Curlew • McCown's Longspur • Greater Short-horned Lizard, and • Northern Redbelly Dace (fish) Since the proposed project will take place in a semi-urban setting, it is not anticipated that negative impacts will occur to vegetation, wildlife, or habitat. Water main replacements will occur along established easements, below streets and alleys and is not expected to affect any species of concern. USFWS lists the following species as threatened, endangered and candidate species in Wheatland County as a whole: • Black-footed Ferret • Canada Lynx • Whitebark Pine USFWS does not anticipate adverse effects to threatened, endangered, or candidate species to result from implementation of the proposed project. -USFWS Based on a review of the Montana Sage Grouse Habitat Conservation Program Mapper (31TUhttps://sagegrouse.mt.gov/projectsU31T), the proposed project is not mapped in an Executive Order (EO) Area for Sage Grouse Habitat. As such, Sage Grouse are not anticipated to be adversely affected by this work. Within 12 months of the proposed construction date, the Owner will consult with the MSGHCP regarding the work. -MT Natural Heritage Program -Great West Engineering

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Key	
N	10. **Unique, Endangered, Fragile, or Limited Environmental Resources, Including Endangered Species (e.g., plants, fish or wildlife)** *Comments and Source of Information*: No endangered species are noted in the proposed project area. For the entire Township that encompasses Harlowton (T8N R15E) the Montana Natural Heritage Program noted one plant species, the Small dropseed, as a plant species of concern. Seven animal species of concern were noted within the Township. These are, • Ferruginous Hawk • Veery (thrush) • Mountain Plover • Long-billed Curlew • McCown's Longspur • Greater Short-horned Lizard, and • Northern Redbelly Dace (fish) Since the proposed project will take place in a semi-urban setting, it is not anticipated that negative impacts will occur to vegetation, wildlife, or habitat. Water main replacements will occur along established easements, below streets and alleys and is not expected to affect any species of concern. USFWS lists the following species as threatened, endangered and candidate species in Wheatland County as a whole: • Black-footed ferret • Canada lynx • Wolverine • Greater Sage Grouse • Sprague's Pipit • Whitebark Pine USFWS does not anticipate adverse effects to threatened, endangered, or candidate species or critical habitat to result from the proposed project implementation within the designated project area. -USFWS -MT Natural Heritage Program -Great West Engineering
Key	
N	11. **Unique Natural Features (e.g., geologic features)** *Comments and Source of Information*: No known unique natural features will be impacted by the proposed project. -Great West Engineering
Key	
N	12. **Access to, and Quality of, Recreational & Wilderness Activities, Public Lands and Waterways (including Federally Designated Wild & Scenic Rivers), and Public Open Space** *Comments and Source of Information*: Access to and quality of recreational and wilderness activities, public lands and water ways, and public open space are not anticipated to be impacted by this project. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

HUMAN POPULATION	
Key N	**1. Visual Quality – Coherence, Diversity, Compatibility of Use and Scale, Aesthetics** *Comments and Source of Information*: The proposed improvements will not impact visual quality. -Great West Engineering
Key N	**2. Nuisances (e.g., glare, fumes)** *Comments and Source of Information*: Temporary nuisances such as noise and exhaust fumes may occur during construction. Efforts will be made to minimize nuisances and address specific problems as they occur. No permanent adverse impacts are anticipated. -Great West Engineering
Key N	**3. Noise -- suitable separation between noise sensitive activities (such as residential areas) and major noise sources (aircraft, highways & railroads)** *Comments and Source of Information*: Nearby residences may be temporarily affected by noise from construction activity; however, no long-term impacts are anticipated. -Great West Engineering
Key N	**4. Historic Properties, Cultural, and Archaeological Resources** *Comments and Source of Information*: There are no known cultural properties that will be impacted by the proposed project. Correspondence from the State Historic Preservation Office states that there is a low likelihood that cultural properties will be impacted and they feel that a recommendation for a cultural resource inventory is unwarranted at this time. -Great West Engineering -SHPO
Key B	**5. Changes in Demographic (population) Characteristics (e.g., quantity, distribution, density)** *Comments and Source of Information*: The implementation of a new reliable water system will make the community a more desirable place to live. -Great West Engineering
Key N	**6. Environmental Justice – (Does the project avoid placing lower income households in areas where environmental degradation has occurred, such as adjacent to brownfield sites?)** *Comments and Source of Information*: This project will not force low income households into environmentally degraded areas. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key **N**	**7. General Housing Conditions - Quality, Quantity, Affordability** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key **N**	**8. Displacement or Relocation of Businesses or Residents** *Comments and Source of Information*: Not applicable to this project. -Great West Engineering
Key **B**	**9. Public Health and Safety** *Comments and Source of Information*: The old 1930's era cast iron main that is in extensive use in Harlowton today is fragile, experiences excessive leakage, and catastrophic breaks (see Appendix in 2014 PER for Photos and Water Break Repair Log). The project area is within and contiguous to the DEQ Mager Well Lust Trust Site which engenders the potential for the inflow/infiltration of contamination groundwater or soil in the distribution system during breaks or whenever transient low static pressures occur. The presence of explosive gases have been noted in a 2016 soils evaluation at locations near proposed improvements Replacement of the incompetent cast iron will largely mitigate this risk within the project area -Great West Engineering
Key **N**	**10. Lead Based Paint and/or Asbestos** *Comments and Source of Information*: There is no known lead based paint or asbestos that will be encountered on this project. -Great West Engineering
Key **B**	**11. Local Employment & Income Patterns - Quantity and Distribution of Employment, Economic Impact** *Comments and Source of Information:* An updated water system will make Harlowton a more desirable location for businesses. The proposed project will result in significant direct capital expenditures in the local economy. During construction, work crews would strengthen the economy by spending money on food, lodging, and recreation. Depending on the Contractor's workforce, the Contractor may look to hire local help for various construction positions. The induced impacts would have a positive impact on the local economy of Harlowton, and Wheatland County. -Great West Engineering
Key **B**	**12. Local & State Tax Base & Revenues** *Comments and Source of Information*: An updated water system will enable commercial and industrial growth to occur. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key B	**13. Educational Facilities - Schools, Colleges, Universities** *Comments and Source of Information*: An upgraded water system will be beneficial to the local school. -Great West Engineering
Key N	**14. Commercial and Industrial Facilities - Production & Activity, Growth or Decline** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**15. Health Care – Medical Services** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**16. Social Services – Governmental Services (e.g., demand on)** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**17. Social Structures & Mores (Standards of Social Conduct/Social Conventions)** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**18. Land Use Compatibility (e.g., growth, land use change, development activity, adjacent land uses and potential conflicts)** *Comments and Source of Information*: No adverse impacts are expected. -Great West Engineering
Key B	**19. Energy Resources - Consumption and Conservation** *Comments and Source of Information*: It is expected that as the project is completed and leakage is reduced, the runtimes on well pumps and the associated energy consumption will be reduced. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key N	**20. Solid Waste Management** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**21. Wastewater Treatment - Sewage System** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**22. Storm Water – Surface Drainage** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key B	**23. Community Water Supply** *Comments and Source of Information*: The proposed project will improve the overall quality, offered by the existing water system. -Great West Engineering
Key N	**24. Public Safety – Police** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**25. Fire Protection – Hazards** *Comments and Source of Information*: The proposed project will not introduce any fire protection hazards. -Great West Engineering
Key N	**26. Emergency Medical Services** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
Key N	**27. Parks, Playgrounds, & Open Space** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering

Key Letter: **N** – No Impact Anticipated **B** – Potentially Beneficial **A** – Potentially Adverse **P** – Approval/ Permits Required **M** – Mitigation Required

Key	
N	**28. Cultural Facilities, Cultural Uniqueness & Diversity** *Comments and Source of Information*: No impacts are anticipated. -Great West Engineering
N	**29. Transportation Networks and Traffic Flow Conflicts (e.g., rail; auto including local traffic; airport runway clear zones - avoidance of incompatible land use in airport runway clear zones)** *Comments and Source of Information*: Local traffic will be detoured in town as needed during construction. It is not anticipated that the proposed project will be incompatible with an airport runway clear zone. -Great West Engineering
N	**30. Consistency with Local Ordinances, Resolutions, or Plans (e.g., conformance with local comprehensive plans, zoning, or capital improvement plans)** *Comments and Source of Information*: All applicable local, state, and federal rules and regulations will be complied with during the project. -Great West Engineering
N	**31. Is There a Regulatory Action on Private Property Rights as a Result of this Project? (consider options that reduce, minimize, or eliminate the regulation of private property rights.)** *Comments and Source of Information*: The project will not result in regulatory action on private property rights. -Great West Engineering

Environmental Review Form

On a separate piece of paper, please answer the following as they apply to your proposed project:

1. **Alternatives:** Describe reasonable alternatives to the project.
   Reasonable alternatives to the project are discussed in detail in Chapter 5 of the PER and they are summarized here.

   Distribution System Alternatives:
   - No Action
   - Distribution System Improvements

2. **Mitigation:** Identify any enforceable measures necessary to reduce any impacts to an insignificant level.

   Fugitive dust, as a result of construction will be controlled within the work areas. The Contractor will be required to have a water truck available for dust control prior to beginning construction tasks.

   Temporary erosion and sediment control measures include the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soil and transport of sediment off site as a result of construction activities.
   The project will comply with all County Noxious Weed Management requirements.

   The project will require a floodplain permit. The project will comply with the requirements of all other permits deemed necessary during design.

3. **Is an EA or Environmental Impact Statement (EIS) required?** Describe whether or not an EA or EIS is required, and explain in detail why or why not.

   According to 75-1-201(1)(b)(iv) MCA, an EIS is a detailed environmental review that is required whenever an agency proposes a major action significantly affecting the quality of the human environment.

   The proposed project will not significantly affect the quality of the human environment and therefore, an EIS is not required. It has been demonstrated that a mitigated environmental assessment is appropriate for the level of potential impacts that may be encountered during the course of the project. That is, all impacts of the proposed action have been accurately identified; all impacts will be mitigated below the level of significance, and, no significant impact is likely to occur.

4. **Public Involvement:** Describe the process followed to involve the public in the proposed project and its potential environmental impacts. Identify the public meetings -- where and when -- the project was considered and discussed, and when the applicant approved the final environmental assessment.

   Due to the restrictions of COVID-19 on public meetings, the City was unable to effectively

meet with the public to discuss the proposed improvements and potential environmental impacts prior to the publication of the document. The City of Harlowton will continue to work with Great West Engineering on a plan for in-person public meetings as restrictions allow. The City of Harlowton is confident that public meetings will occur prior to August 1, 2020.

5. **Person(s) Responsible for Preparing**: Identify the person(s) responsible for preparation of this checklist.

   Joel S. Pilcher, PE (MT 11039PE)

6. **Other Agencies**: List any state, local, or federal agencies that have over-lapping or additional jurisdiction or environmental review responsibility for the proposed action and the permits, licenses, and other authorizations required; and list any agencies or groups that were contacted or contributed information to this Environmental Assessment (EA).

   MDEQ has overlapping review/approval authority for review of plans and specifications against Circular DEQ 1.

   The following agencies were contacted by letter to contribute additional information to this EA.

   - Department of Environmental Quality
   - Department of Fish, Wildlife and Parks
   - Department of Natural Resources and Conservation
   - Wheatland County Conservation District
   - Department of Transportation
   - State Historic Preservation Office
   - US Environmental Protection Agency
   - US Fish and Wildlife Service
   - US Army Corps of Engineers
   - National Park Service
   - Federal Aviation Administration
   - Bureau of Land Management
   - Natural Resource Conservation Service

Joel S. Pilcher, Project Manager
Authorized Representative, Title

5/28/20
Date

City of Harlowton

Paul Otten
Mayor

Date:

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Department of Environmental Quality
Permitting and Compliance Division
1520 E. 6th Ave.
PO Box 200901
Helena, MT 59620-0901

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

The City of Harlowton is planning an improvements project for their water distribution system. The area incorporates the census designated place of Harlowton, Montana. More specifically the project is located at:

- Township 8N Range 15E, Section 22,
- Latitude 46.43631 Longitude -109.83408

Enclosed is a map of the planning area to help identify the proposed project location.

The original distribution system was constructed in the 1930's of cast iron pipe. In recent years the City has been working diligently to improve their water system. Since 2011, the City has replaced approximately 23,000 lineal feet of the distribution system in four phases.

But almost 9,000 feet of old, deteriorated, and undersized cast iron pipe remain. The deteriorated pipe is subject to electrolysis, causing corrosion, pits, holes, and increases the amount of leakage in the system and minimizing conservation efforts. The cast iron pipe is also very subject to breakage, which can increase the risk for backflow/inflow of contaminated soil or groundwater.

The City of Harlowton has hired Great West Engineering to write a Preliminary Engineering Report (PER) and to develop water system alternatives for consideration. At this time, the City's primary goal and preferred alternative is to complete the distribution system improvements in remaining phases.

Enclosed are schematic drawings of the proposed improvements for your review and comment. The drawings show the water mains to be replaced under the next phases of improvements.

Construction of the proposed water distribution system improvements will likely be completed in 2022.

BILLINGS
6780 Trade Center Ave.
Billings, MT 59101
406.652.5000
Fax 406.248.1363

BOISE
3050 N. Lakeharbor Ln.
Suite 201
Boise, ID 83703
208.576.6646

GREAT FALLS
702 2nd Street South #2
Great Falls, MT 59405
406.952.1109

SPOKANE
9221 N. Division St.,
Suite F
Spokane, WA 99218
509.413.1430

We would appreciate feedback and comments regarding the project by April 14, 2020. Comments can be sent via email to jpilcher@greatwesteng.com or mailed to:

Great West Engineering
Attn: Joel Pilcher, PE
PO Box 4817
Helena MT 59604

If you need further information or wish to discuss the project, please do not hesitate to contact Joel at (406) 495-6186.

Funding agencies require that we send a follow-up request for comment if we do not receive a response from you.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☐ Department of Environmental Quality **have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature Date

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▫ 2501 Belt View Drive
Helena, MT 59604
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March 23, 2020

Department of Fish, Wildlife and Parks
1420 E. 6th Ave.
Helena, MT 59620

RE: City of Harlowton Phase 5 Water System Improvements

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☐ Department of Fish, Wildlife and Parks have reviewed the enclosed information and have no comment on the project at this time.

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

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PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
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March 23, 2020

Department of Natural Resources and Conservation
Attn: Resource Development Bureau Engineer
1625 11th Ave.
PO Box 201601
Helena, MT 59620-1601

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ Department of Natural Resources and Conservation **have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature Date

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

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406.449.8627 ▪ Fax 406.449.8631
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March 23, 2020

Department of Natural Resources and Conservation Water Resources Regional Office
Lewistown Regional Office
613 NE Main, Ste E
Lewistown, MT 59457-2020

RE: City of Harlowton Phase 5 Water System Improvements

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Funding agencies require that we send a follow-up request for comment if we do not receive a response from you.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☐ Department of Natural Resources and Conservation Water Resources Regional Office **have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

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PO Box 4817 ▪ 2501 Belt View Drive
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406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Wheatland County Conservation District
809 2nd Ave NW
Harlowton, MT 59036

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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9221 N. Division St.,
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Spokane, WA 99218
509.413.1430

Great West Engineering
Attn: Joel Pilcher, PE
PO Box 4817
Helena MT 59604

If you need further information or wish to discuss the project, please do not hesitate to contact Joel at (406) 495-6186.

Funding agencies require that we send a follow-up request for comment if we do not receive a response from you.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☐ **Wheatland County Conservation District have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Department of Transportation
2701 Prospect Ave
PO Box 201001
Helena, MT 59620

RE: City of Harlowton Phase 5 Water System Improvements

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Construction of the proposed water distribution system improvements will likely be completed in 2022.

BILLINGS
6780 Trade Center Ave.
Billings, MT 59101
406.652.5000
Fax 406.248.1363

BOISE
3050 N. Lakeharbor Ln.
Suite 201
Boise, ID 83703
208 576 6646

GREAT FALLS
702 2nd Street South #2
Great Falls, MT 59405
406.952.1109

SPOKANE
9221 N. Division St.,
Suite F
Spokane, WA 99218
509.413.1430

We would appreciate feedback and comments regarding the project by April 14, 2020. Comments can be sent via email to jpilcher@greatwesteng.com or mailed to:

Great West Engineering
Attn: Joel Pilcher, PE
PO Box 4817
Helena MT 59604

If you need further information or wish to discuss the project, please do not hesitate to contact Joel at (406) 495-6186.

Funding agencies require that we send a follow-up request for comment if we do not receive a response from you.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☐ Department of Transportation have reviewed the enclosed information and have no comment on the project at this time.

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 • 2501 Belt View Drive
Helena, MT 59604
406.449.8627 • Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

State Historic Preservation Office
Cultural Records Manager
1410 8th Ave.
PO Box 201202
Helena, MT 59620

RE: City of Harlowton Phase 5 Water System Improvements

Damon Murdo

The City of Harlowton is planning an improvements project for their water distribution system. The area incorporates the census designated place of Harlowton, Montana. More specifically the project is located at:

- Township 8N Range 15E, Section 22,
- Latitude 46.43631 Longitude -109.83408

Enclosed is a map of the planning area to help identify the proposed project location.

The original distribution system was constructed in the 1930's of cast iron pipe. In recent years the City has been working diligently to improve their water system. Since 2011, the City has replaced approximately 23,000 lineal feet of the distribution system in four phases.

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☐ State Historic Preservation Office have reviewed the enclosed information and have no comment on the project at this time.

_____

Signature Date

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Wheatland County Floodplain Administrator
Planning Office
PO Box 1256
Big Timber, MT 59011

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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Helena MT 59604

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If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☐ **Wheatland County Floodplain Administrator have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

City of Harlowton Floodplain Administrator
PO Box 292
Harlowton, MT 59036

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ City of Harlowton Floodplain Administrator **have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
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Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

US Environmental Protection Agency
Montana Office
Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59625

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ US Environmental Protection Agency have reviewed the enclosed information and have no comment on the project at this time.

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

US Fish and Wildlife Service
Ecological Services
585 Shepherd Way
Helena, MT 59601

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ **US Fish and Wildlife Service have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature Date

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▫ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

US Army Corps of Engineers
10 West 15th Street
Suite 2200
Helena, MT 59626

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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Signature Date

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Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631

www.greatwesteng.com

March 23, 2020

Bureau of Land Management
5001 Southgate Drive
Billings, MT 59101

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ **Bureau of Land Management have reviewed the enclosed information and have no comment on the project at this time.**

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Bureau of Indian Affairs
2021 4th Ave N.
Billings, MT 59101

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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_____

_____

Signature Date

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
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March 23, 2020

Natural Resource Conservation Service
10 E. Babcock St.
Bozeman, MT 59771

RE: City of Harlowton Phase 5 Water System Improvements

To Whom It May Concern

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☐ Natural Resource Conservation Service have reviewed the enclosed information and have no comment on the project at this time.

_____

Signature **Date**

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
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www.greatwesteng.com

March 23, 2020

Apache Tribe of Oklahoma
Lyman Guy
Chairman
PO Box 1330
Anadarko OK 73005

Re: City of Harlowton Phase 5 Water System Improvements Project

Dear To Whomever It May Concern,

The City of Harlowton is planning a construction project that would improve its drinking water system and is considering financing the project with funds from the United States Department of Agriculture Rural Development (RD) and Montana's Community Development Block Grant (CDBG) Programs. Harlowton has assumed the environmental review responsibilities associated with each funding program, which include tribal consultation related to historic properties. Historic properties include archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural places and landscapes, plant and animal communities, and buildings and structures with significant tribal association. The City of Harlowton resides in Wheatland County, Montana.

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406.652.5000
Fax 406.248.1363

BOISE
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Suite 201
Boise, ID 83703
208.576.6646

GREAT FALLS
702 2nd Street South #2
Great Falls, MT 59405
406.952.1109

SPOKANE
9221 N. Division St.,
Suite F
Spokane, WA 99218
509.413.1430

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Sincerely,

Great West Engineering, Inc.

Joel Pilcher

Phone: (406) 495-6186
Email: Jpilcher@greatwesteng.com
Fax: (406) 449-8631

HELENA
PO Box 4817 ▪ 2501 Belt View Drive
Helena, MT 59604
406.449.8627 ▪ Fax 406.449.8631
www.greatwesteng.com

March 23, 2020

Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
Michael Blackwolf
THPO
656 Agency Main Street
Harlem MT 59526

Re: City of Harlowton Phase 5 Water System Improvements Project

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March 23, 2020

Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
Mark Azure
President
656 Agency Main Street
Harlem MT 59526-9455

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March 23, 2020

Nez Perce Tribe
Mary Jane Miles
Tribal Chairman
PO Box 305
Lapwai ID 83540

Re: City of Harlowton Phase 5 Water System Improvements Project

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March 23, 2020

Nez Perce Tribe
Patrick Baird
THPO
PO Box 365
Lapwai ID 83540-0365

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March 23, 2020

Crow Tribe of Montana
Darrin Old Coyote
Chairperson
PO Box 159
Crow Agency MT 59022

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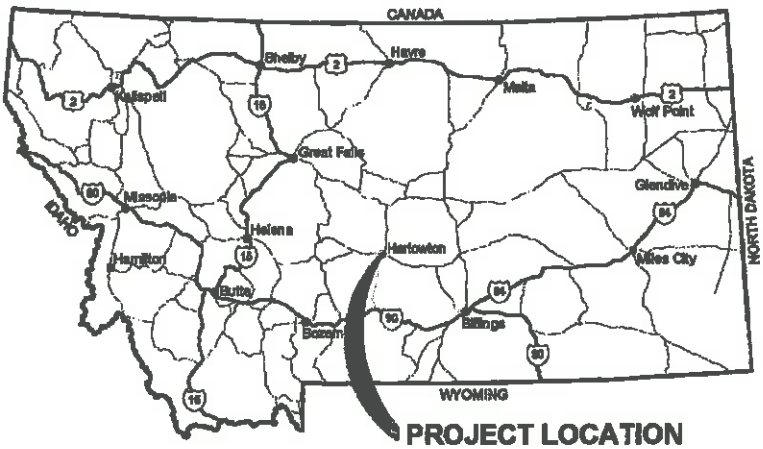

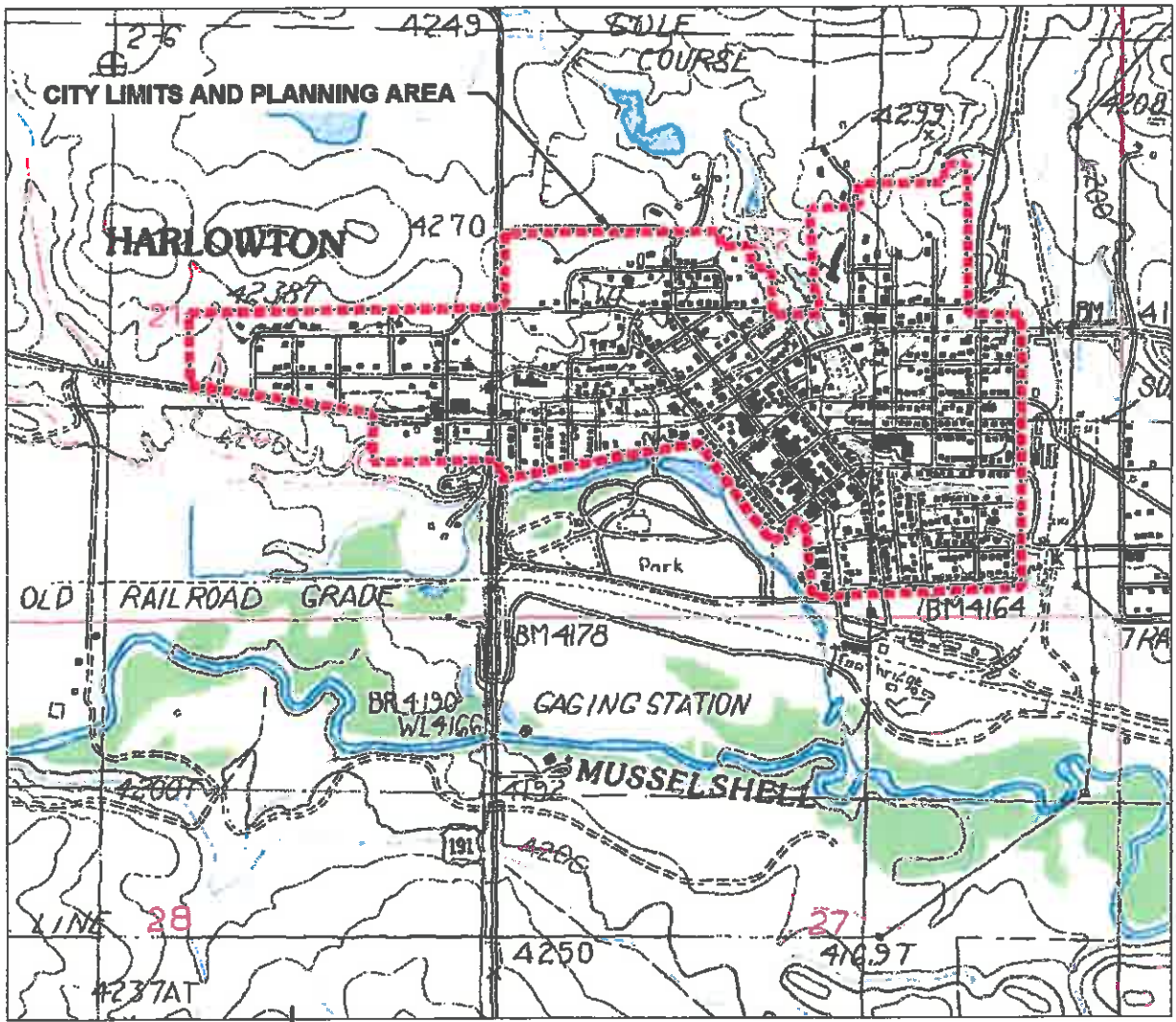

GreatWest engineering

NORTH

0 750 1500
SCALE IN FEET

FIGURE
TOPOGRAPHIC MAP AND PLANNING AREA

CITY OF HARLOWTON
WATER SYSTEM IMPROVEMENTS

F:\1-10111-Harlowton Water\CADD 1-10111 PER 2014\Exhibits\1-10111-Figure Topo and Planning Area.dwg

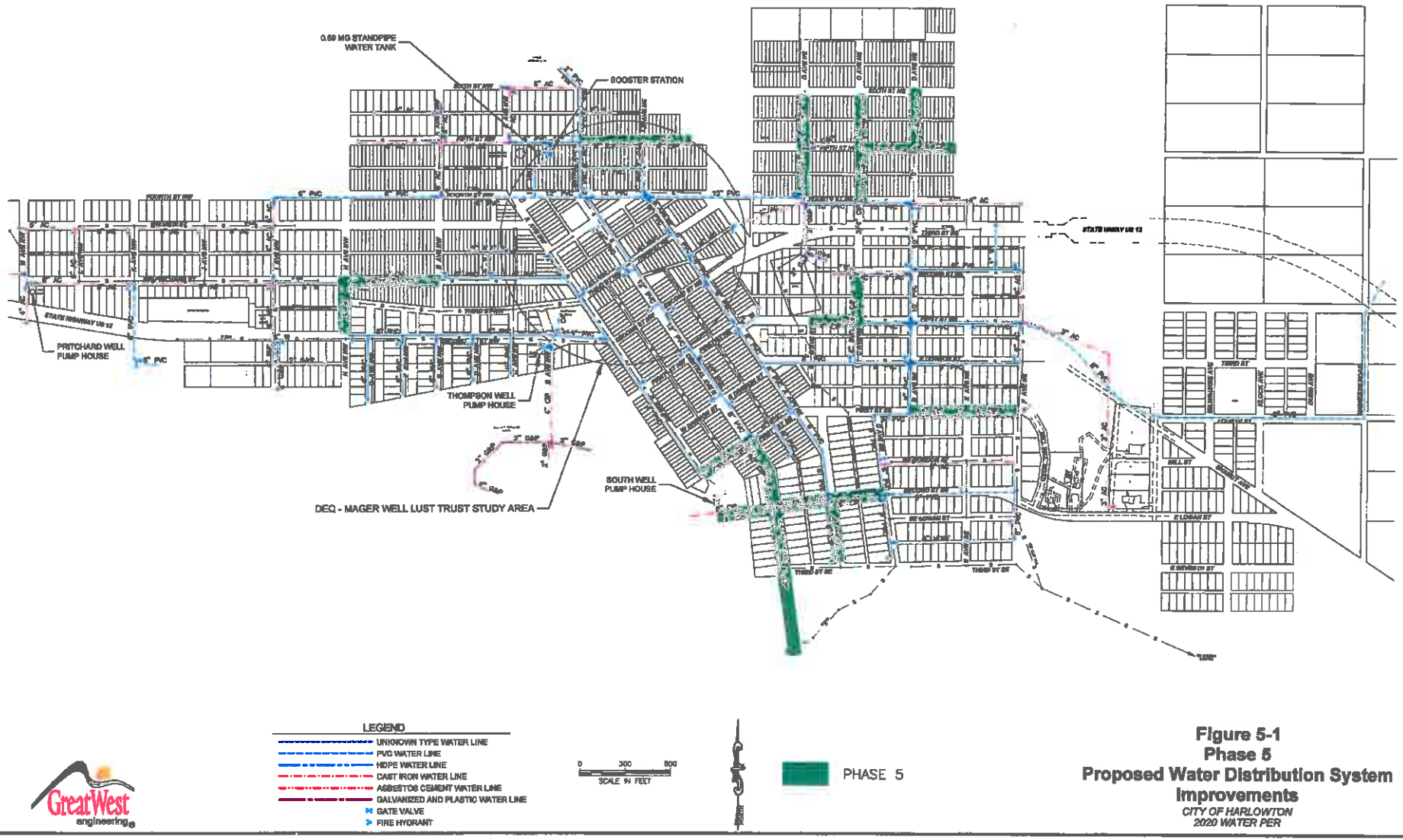

Figure 5-1
Phase 5
Proposed Water Distribution System Improvements
CITY OF HARLOWTON
2020 WATER PER

GreatWest engineering

F:\J--18114--Harlowton On Call\PD 4 -- 2020 Water PER and Grant Applications\CADD 1--18114--TDA\Exhibits\J--18114--PER Update 2020--Figure 5--1.dwg

Joel Pilcher

From: Murdo, Damon <dmurdo@mt.gov>
Sent: Thursday, March 26, 2020 11:44 AM
To: Joel Pilcher
Subject: CITY OF HARLOWTON PHASE 5 WATER SYSTEM IMPROVEMENTS
Attachments: Reports.pdf; Sites.pdf; 2020032604.pdf

Big Sky. Big Land. Big History.
Montana
Historical Society

March 26, 2020

Joel Pilcher
Great West Engineering
PO Box 4817
Helena MT 59604

RE: CITY OF HARLOWTON PHASE 5 WATER SYSTEM IMPROVEMENTS. SHPO Project #: 2020032604

Dear Mr. Pilcher:

I have conducted a cultural resource file search for the above-cited project located in Sections 21, 22, 27, T8N R15E. According to our records there have been several previously recorded sites within the designated search locales. In addition to the sites there have been a few previously conducted cultural resource inventories done in the areas. I've attached a list of these sites and reports. If you would like any further information regarding these sites or reports, you may contact me at the number listed below.

It is SHPO's position that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places. If any structures are to be altered and are over fifty years old, we would recommend that they be recorded, and a determination of their eligibility be made prior to any disturbance taking place.

As long as ground disturbance will be kept to existing disturbed roadways and there will be no disturbance or alteration to structures over fifty years of age, we feel that there is a low likelihood cultural properties will be impacted. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, should structures need to be altered or if cultural materials be inadvertently discovered during this project, we would ask that our office be contacted, and the site investigated.

If you have any further questions or comments, you may contact me at (406) 444-7767 or by e-mail at dmurdo@mt.gov. I have attached an invoice for the file search. Thank you for consulting with us.

Sincerely,

Damon Murdo
Cultural Records Manager
State Historic Preservation Office

File: DEQ/AWWM/2020

STATE HISTORIC PRESERVATION OFFICE
Montana Cultural Resource Database
CRABS Township,Range,Section Results
Report Date:3/26/2020

Township:8 N Range:15 E Section: 21

DAU BARRY J.

5/15/1995 MOORE TO BIG TIMBER AND HARLOWTOWN TO MARTINSDALE FIBER OPTIC TELEPHONE TRANSMISSION LINE

CRABS Document Number: ZZ 6 17316 Agency Document Number:

Township:8 N Range:15 E Section: 22

AXLINE JON A.

8/1/2001 SECOND STREET- HARLOWTON IN WHEATLAND COUNTY, MONTANA

CRABS Document Number: WL 4 23848 Agency Document Number: STPP14-3(15)99

Township:8 N Range:15 E Section: 21

BRUMLEY JOHN H. AND PATRICK J. RENNIE

10/1/2002 CENTRAL MONTANA COMMUNICATION'S 2002 HARLOWTON EXCHANGE CULTURAL RESOURCES INVENTORY IN WHEATLAND COUNTY MONTANA

CRABS Document Number: WL 6 25322 Agency Document Number:

Township:8 N Range:15 E Section: 22

BRUMLEY JOHN H. AND PATRICK J. RENNIE

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CRABS Document Number: WL 6 25322 Agency Document Number:

Township:8 N Range:15 E Section: 22

GRAY DALE

10/22/2004 HARLOWTON REST AREA, UTILITY CORRIDOR CULTURAL RESOURCE SURVEY AND ASSESSMENT IN WHEATLAND COUNTY, MONTANA

CRABS Document Number: WL 4 27565 Agency Document Number: STPP52-1(17)0

Township:8 N Range:15 E Section: 21

FRENCH SANDRA L., et.al.

7/10/2007 ANNUAL PA REPORT FOR PROJECTS CONDUCTED IN 2006 ON THE LEWIS AND CLARK NATIONAL FOREST

CRABS Document Number: ZZ 1 29494 Agency Document Number: 07-LC-00-007

Township:8 N Range:15 E Section: 27

AARERG STEPHEN A. AND CHRIS CROFUTT

12/1/2007 HARLOWTON FISHING ACCESS SITE CLASS III CULTURAL RESOURCE SURVEY RESULTS IN WHEATLAND COUNTY, MONTANA

CRABS Document Number: WL 6 29779 Agency Document Number:

Township:8 N Range:15 E Section: 21

KEIM KELLY M.

3/29/2008 HARLOWTON HOUSES CONVEYANCE

CRABS Document Number: WL 6 29994 Agency Document Number: 08-LC-06-013

Township:8 N Range:15 E Section: 21

FRENCH SANDRA L., et.al.

6/8/2009 LEWIS AND CLARK NATIONAL FOREST HERITAGE PROGRAM MANAGEMENT REPORT FOR PROJECTS CONDUCTED IN 2008 UNDER THE NORTHERN REGION PROGRAMMATICE AGREEMENT FOR CULTURAL RESOURCES

CRABS Document Number: ZZ 1 30968 Agency Document Number: 09-LC-00-31

Township:8 N Range:15 E Section: 21

KEIM KELLY

5/23/2007 HARLOWTON HOUSES DECOMMISSIONING

CRABS Document Number: WL 1 36520 Agency Document Number: 06-LC-06-070

Township:8 N Range:15 E Section: 22

PETERSON LYNN M.

8/25/2017 A CULTURAL RESOURCE INVENTORY FOR THE MUSSELSHELL-JUDITH RURAL WATER SYSTEM, PHASE 1 IN WHEATLAND, JUDITH BASIN, AND FERGUS COUNTY, MONTANA.

CRABS Document Number: WL 6 40334 Agency Document Number:

STATE HISTORIC PRESERVATION OFFICE
Cultural Resource Information Systems
CRIS Township, Range, Section Report
Report Date:3/26/2020

Site #	Twp	Rng	Sec	Qs	Site Type 1	Site Type 2	Time Period	Owner	NR Status
24WL0055	8N	15E	21	SE	Lithic Material Concentration		No Indication of Time	Forest Service	Undetermined*
24WL0056	8N	15E	21	SE	Historic Railroad		Historic Period	Forest Service	Undetermined*
24WL0058	8N	15E	21	Comb	Historic Road/Trail		Historic More Than One Decade	Private	Unresolved
24WL0058	8N	15E	22	Comb	Historic Road/Trail		Historic More Than One Decade	Private	Unresolved
24WL0080	8N	15E	22	SW	Historic Commercial Development		1900-1909	Private	Undetermined*
24WL0081	8N	15E	22	SE	Historic Commercial Development		1900-1909	Private	NR Listed
24WL0098	8N	15E	27	NE	Historic Railroad Building/Structure		1900-1909	Combination	NR Listed
24WL0128	8N	15E	27	Comb	Historic Railroad		Historic More Than One Decade	Private	Eligible
24WL0128	8N	15E	21	Comb	Historic Railroad		Historic More Than One Decade	Private	Eligible
24WL0128	8N	15E	22	Comb	Historic Railroad		Historic More Than One Decade	Private	Eligible
24WL0221	8N	15E	22	SE	Historic Vehicular/Foot Bridge		1930-1939	MDOT Other	Eligible
24WL0279	8N	15E	27	NW	Historic Irrigation System		Historic More Than One Decade	Combination	Unresolved
24WL0280	8N	15E	21	SE	Historic Residence		Historic More Than One Decade	Forest Service	Ineligible
24WL0281	8N	15E	21	SE	Historic Ranger Station		1950-1959	Forest Service	Ineligible

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
HELENA REGULATORY OFFICE
10 WEST 15TH STREET, SUITE 2200
HELENA, MONTANA 59626

REPLY TO
ATTENTION OF

March 31, 2020

Regulatory Branch
Montana State Program
Corps No. **NWO-2014-00446-MTB**

Subject: City of Harlowston – Phase 5 Water System Improvements – Musselshell River

Great West Engineering
Attn: Joel Pilcher
P.O. Box 4817
Helena, Montana 59604

Dear Mr. Pilcher:

We are responding to your request for comment, on behalf of the City of Harlowton, regarding the Water System Improvements project in Wheatland County, Montana. The project includes the proposed replacement of approximately 9,000 linear feet of water distribution main lines. Waterways located within or adjacent to the identified boundary include the Musselshell River, Jawbone Creek, Antelope Creek and adjacent wetlands. The project is located within Section 21/22, Township 8 N, Range 15 E, Harlowton, Wheatland County, Montana.

The mission of the U.S. Army Corps of Engineers (Corps) Regulatory Program is to protect the Nation's aquatic resources while allowing reasonable development through fair, flexible and balanced permit decisions. In particular, under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899, we work to protect the biological, physical, and chemical integrity of the Nation's aquatic resources. Projects are evaluated on a case-by-case basis to determine the potential benefits and detriments that may occur as a result of the proposal. In all cases an applicant must avoid and minimize impacts to aquatic resources to the greatest extent practicable.

Under the authority of Section 404 of the Clean Water Act (CWA), Department of the Army (DA) permits are required for the discharge of fill material into waters of the U.S. Waters of the U.S. include the area below the ordinary high water mark of stream channels and lakes or ponds connected to the tributary system, and wetlands adjacent to these waters. Isolated waters and wetlands, as well as man-made channels, may be waters of the U.S. in certain circumstances, which must be determined on a case-by-case basis. Under the authority of Section 10 of the Rivers and Harbors Act, DA permits are required for structures or work in, over, under or affecting navigable waters of the U.S.

Based on the information provided in your submittal, it appears that jurisdictional waters of the U.S. may be present within the project area, however we are unable to ascertain if regulated activities are proposed. If the final design includes the placement of fill or dredged material in any of the jurisdictional areas described in the paragraph above, or otherwise requires authorization by a DA permit, please submit a permit application to this office prior to starting any work. Any loss of an aquatic site may require mitigation. Mitigation requirements will be determined during the Department of the Army permitting review. After a review of the materials submitted we will determine what type of permit, if any, will be required. In order to provide the necessary information you may use the Montana Joint Permit Application Form,

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found at: http://www.dnrc.mt.gov/licenses-and-permits/stream-permitting. If you do not wish to use this form, or do not have internet access please contact our office at the address below to obtain more information.

Note that this letter is not a DA authorization to proceed. It only informs you of your need to obtain a DA permit if waters of the U.S. will be affected. If waters of the U.S. will not be affected by a jurisdictional activity a DA permit will not be required for the project.

Please refer to identification number **NWO-2014-00446-MTB** in any correspondence concerning this project. If you have any questions, please contact me at Post Office Box 7032, Billings, Montana 59103, by email at Marena.A.Gilbert@usace.army.mil, or by telephone at 406-657-5912 or 406-200-2689.

Sincerely,

Marena A. Gilbert
Regulatory Project Manager

Printed on Recycled Paper

Joel Pilcher

From: Gilbert, Marena CIV USARMY CENWO (USA) <Marena.Gilbert@usace.army.mil>
Sent: Tuesday, March 31, 2020 8:58 AM
To: Joel Pilcher
Subject: DA Response to Request for Comments - NWO-2014-00446-MTB City of Harlowton Water System Improvements (UNCLASSIFIED)
Attachments: NWO-2014-00446_Pre-Application Response Letter.pdf

CLASSIFICATION: UNCLASSIFIED

Mr. Pilcher,

Attached is our response to your Request for Comments on behalf of the City of Harlowton in regards to Department of the Army (DA) Section 404/10 Permitting for the Water System Improvements, Wheatland County, Montana. It was determined, based on the information provided, that we are unable to ascertain if regulated activities are proposed. Please note that deviations from the original plans and specifications of this project could require additional authorization from this office. Please retain a copy of this email and its attachments for your records. Please contact me if you have any questions, or would like a hardcopy of the letter mailed out to you.

As of March 26, 2020 applications can now be submitted electronically to Montana.Reg@usace.army.mil

Best regards,
Marena

Marena A. Gilbert
Regulatory Project Manager
U.S. Army Corps of Engineers
490 North 31st St., Suite 112
Billings, MT 59102
Phone: 406-657-5912
Cell Phone: 406-200-2689
Fax: 406-657-5911
https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Montana/

CLASSIFICATION: UNCLASSIFIED

Joel Pilcher

From: Martin, Jacob <jacob_martin@fws.gov>
Sent: Monday, March 30, 2020 11:20 AM
To: Joel Pilcher
Subject: City of Harlowton Phase 5 Water System Improvements

Dear Mr. Pilcher:

Thank you for your March 23, 2020, letter requesting U.S. Fish and Wildlife Service comment on the proposed subject project in Harlowton, Montana.

This email represents our official response to your inquiry for your records.

The U.S. Fish and Wildlife Service reviewed your letter and has no comments regarding federally-listed or proposed threatened or endangered species or other trust species. Additional information may be obtained using the IPaC project-planning tool, which streamlines the USFWS environmental review process at https://ecos.fws.gov/ipac/.

Thank you for the opportunity to comment. If you have any questions or comments about this correspondence please contact me via reply email (preferred) or at the address or phone number below.

Sincerely,

Jacob M. (Jake) Martin
Assistant Field Supervisor
Montana Ecological Services Office
Helena, Montana 59601
(406) 449-5225x215
jacob_martin@fws.gov

Joel Pilcher

From: Sundheim, Sterling <ssundheim@mt.gov>
Sent: Friday, March 27, 2020 11:05 AM
To: Joel Pilcher
Cc: Sears, Traci; Paul Otten; sgplanning
Subject: Harlowton
Attachments: Great West PER map.pdf; Great West PER letter.pdf

Joel Pilcher, PE
Project Manager
Great West Engineering

Subject: Harlowton Phase 5 Water System Improvements

Joel:

The DNRC is in receipt of your 3-23-2020 letter referencing the Harlowton Phase 5 Water System Improvements. Portions of the proposed project fall within the regulated floodplain (see map panel 3001750001A, city, and map panel 3001720234B, county) . Please coordinate with the city and county floodplain administrators for any floodplain permitting needs.

Wheatland County	Dringman, Page	sgplanning@itstriangle.com	(406) 932-5470
Harlowton, City of	Otten, Paul	ctyharlo@mtintouch.net	(406) 632-4598

The DNRC, Water Resources Division, has no other permitting requirements.

Feel free to call or email with any questions you may have.

Respectfully,

Sterling Sundheim
Montana DNRC, Water Resources Division
Lewistown Regional Office
ssundheim@mt.gov
406 538-7459

Joel Pilcher

From: Bradley, Kevin P <Kevin.Bradley@bia.gov>
Sent: Wednesday, May 06, 2020 2:50 PM
To: Joel Pilcher
Cc: Martin, Dolores
Subject: BIA response letter for Harlowton Phase 5 Water Project
Attachments: BIA review and response.pdf

For your records

Kevin Bradley, P.E.
U.S. Department of Interior
Bureau of Indian Affairs (BIA)
Rocky Mtn. Region
Water Resources Department
2021 Fourth Avenue North
Billings, MT 59101

(Direct) Phone: (406) 247-7861

Great West Engineering
Attn: Joel Pilcher, PE
PO Box 4817
Helena MT 59604

If you need further information or wish to discuss the project, please do not hesitate to contact Joel at (406) 495-6186.

Funding agencies require that we send a follow-up request for comment if we do not receive a response from you.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return it to the address listed above.

☒ Bureau of Indian Affairs have reviewed the enclosed information and have no comment on the project at this time.

Signature	Date
Kevin Bradley	5/6/2020

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Cc: City of Harlowton (Letter Only)

Enc

Joel Pilcher

From: Whitaker, Brianna <brwhitaker@mt.gov>
Sent: Friday, April 03, 2020 10:17 AM
To: Joel Pilcher
Subject: City of Harlowton - Phase 5 Water System Improvements

The Montana Department of Transportation (MDT) staff would like to thank you for the opportunity to provide input on the phase 5 water system improvements in the City of Harlowton.

This proposal appears to have potential impact on MDT facilities (US 12, US 191) in Harlowton; however we do not have enough information to make a determination at this time. Please contact , Tom Tilzey, Billings District Maintenance Chief regarding any permits that may be necessary for the proposed improvements. Tom can be reached at (406)657-0217.

Let me know if you have any questions.

Thanks,

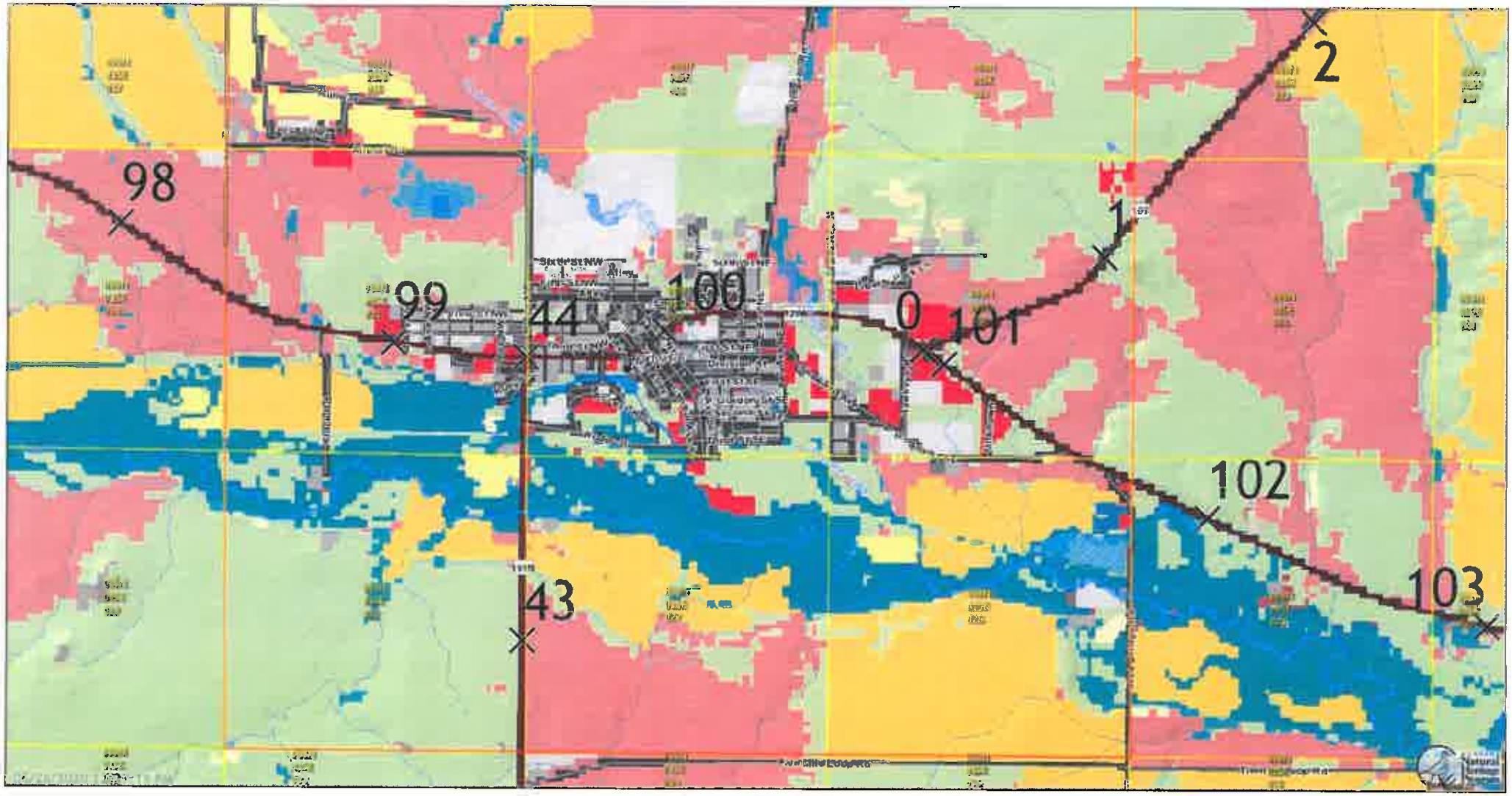
Brianna Whitaker | Transportation Planner | Policy, Program & Performance Analysis | Montana Department of Transportation | P.O. Box 201001 | Helena, MT | 59620-1001 | 406-444-9342 | brwhitaker@mt.gov

APPENDIX B

MTNHP Land Cover/Land Resources

MT Land Cover

Latitude	Longitude
46.41565	-103.27300
46.45345	-103.87793

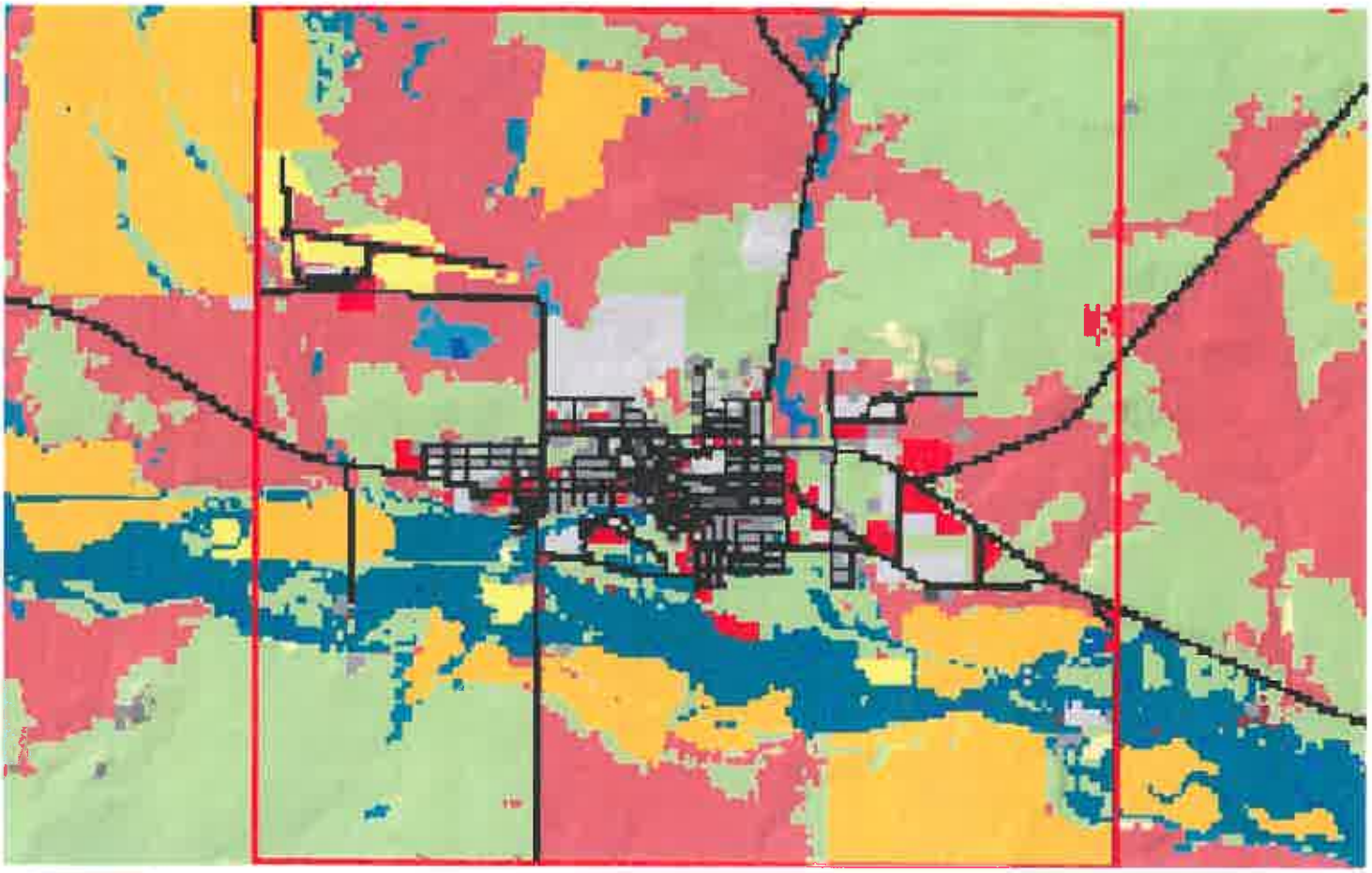


MONTANA Natural Heritage Program
A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Latitude	Longitude
46.41728	-109.79979
46.46105	-109.86283

Land Cover

Summarized by: **008N015E022** *(Buffered PLSS Section)*



34% (1,962 Acres)

Grassland Systems

Lowland / Prairie Grassland

Great Plains Mixedgrass Prairie

The system covers much of the eastern two-thirds of Montana, occurring continuously for hundreds of square kilometers, interrupted only by wetland/riparian areas or sand prairies. Soils are primarily fine and medium-textured. The growing season averages 115 days, ranging from 100 days on the Canadian border to 130 days on the Wyoming border. Climate is typical of mid-continental regions with long severe winters and hot summers. Grasses typically comprise the greatest canopy cover, and western wheatgrass (*Pascopyrum smithii*) is usually dominant. Other species include thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle and thread (*Hesperostipa comata*). Near the Canadian border in north-central Montana, this system grades into rough fescue (*Festuca campestris)* and Idaho fescue (*Festuca idahoensis*) grasslands. Remnants of shortbristle needle and thread *(Hesperostipa curtiseta)* dominated vegetation are found in northernmost Montana and North Dakota, and are associated with productive sites, now mostly converted to farmland. Forb diversity is typically high. In areas of southeastern and central Montana where sagebrush steppe borders the mixed grass prairie, common plant associations include Wyoming big sagebrush-western wheatgrass (*Artemisia tridentata* ssp. *wyomingensis/ Pascopyrum smithii*). Fire and grazing are the primary drivers of this system. Drought can also impact it, in general favoring the shortgrass component at the expense of the mid-height grasses. With intensive grazing, cool season exotics such as Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and Japanese brome (*Bromus japonicus*) increase in dominance; both of these rhizomatous species have been shown to markedly decrease species diversity. Previously cultivated acres that have been re-vegetated with non-native plants have been transformed into associations such as Kentucky bluegrass (*Poa pratensis*)/western wheatgrass *(Pascopyrum smithii)* or into pure crested wheatgrass (*Agropyron cristatum)* stands.

27% (1,546 Acres)

Recently Disturbed or Modified
Introduced Vegetation
Introduced Upland Vegetation - Annual and Biennial Forbland

Land cover is significantly altered/disturbed by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas are knapweed, oxeye daisy, Canada thistle, leafy spurge, pepperweed, and yellow sweetclover.

12% (706 Acres)

Human Land Use
Agriculture
Cultivated Crops

These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.

7% (421 Acres)

Wetland and Riparian Systems
Floodplain and Riparian
Great Plains Floodplain

This system occurs along the Missouri and Yellowstone Rivers and their larger tributaries, including parts of the Little Missouri, Clarkâ€™s Fork Yellowstone, Powder, Tongue, Bighorn, Milk, and Musselshell rivers. These are the big perennial rivers of the region, with hydrologic dynamics largely driven by snowmelt and rainfall originating in their headwater watersheds, rather than local precipitation events. In the absence of disturbance, periodic flooding of fluvial and alluvial soils and channel migration will create depressions and backwaters that support a mosaic of wetland and riparian vegetation, whose composition and structure is sustained, altered and redistributed by hydrology. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats, linked by underlying soils and flooding regimes. In the western part of the systemâ€™s range in Montana, the overstory dominant species is black cottonwood (*Populus balsamifera ssp. trichocarpa*) with narrowleaf cottonwood *(Populus angustifolia)* and eastern cottonwood (*Populus deltoides)* occurring as co-dominants in the riparian/floodplain interface near the mountains. Further east, narrowleaf cottonwood and Plains cottonwood become dominant. In relatively undisturbed stands, willow (*Salix* species), redosier dogwood (*Cornus sericea*) and common chokecherry (*Prunus virginiana*) form a thick, multi-layered shrub understory, with a mixture of cool and warm season graminoid species below.

In Montana, many occurrences are now degraded to the point where the cottonwood overstory is the only remaining natural component. The hydrology of these floodplain systems has been affected by dams, highways, railroads and agricultural ditches, and as a result, they have lost their characteristic wetland /riparian mosaic structure. This has resulted in a highly altered community consisting of relict cottonwood stands with little regeneration. The understory vegetation is dominated by non-native pasture grasses, legumes and other introduced forbs, or by the disclimax western snowberry (*Symphoricarpos occidentalis*) and rose (*Rosa* species) shrub community.

No Image

6% (336 Acres)

Human Land Use
Developed
Other Roads

County, city and or rural roads generally open to motor vehicles.

3% (198 Acres)

Human Land Use
Developed
Developed, Open Space

Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. This category often includes highway and railway rights of way and graveled rural roads.

2% (121 Acres)

Human Land Use
Developed
Low Intensity Residential

Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units in rural and suburban areas. Paved roadways may be classified into this category.

No Image

2% (104 Acres)

Human Land Use
Developed
Commercial / Industrial

Businesses, industrial parks, hospitals, airports; utilities in commercial/industrial areas.

2% (98 Acres)

Human Land Use
Agriculture
Pasture/Hay

These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands are included in this land cover type.

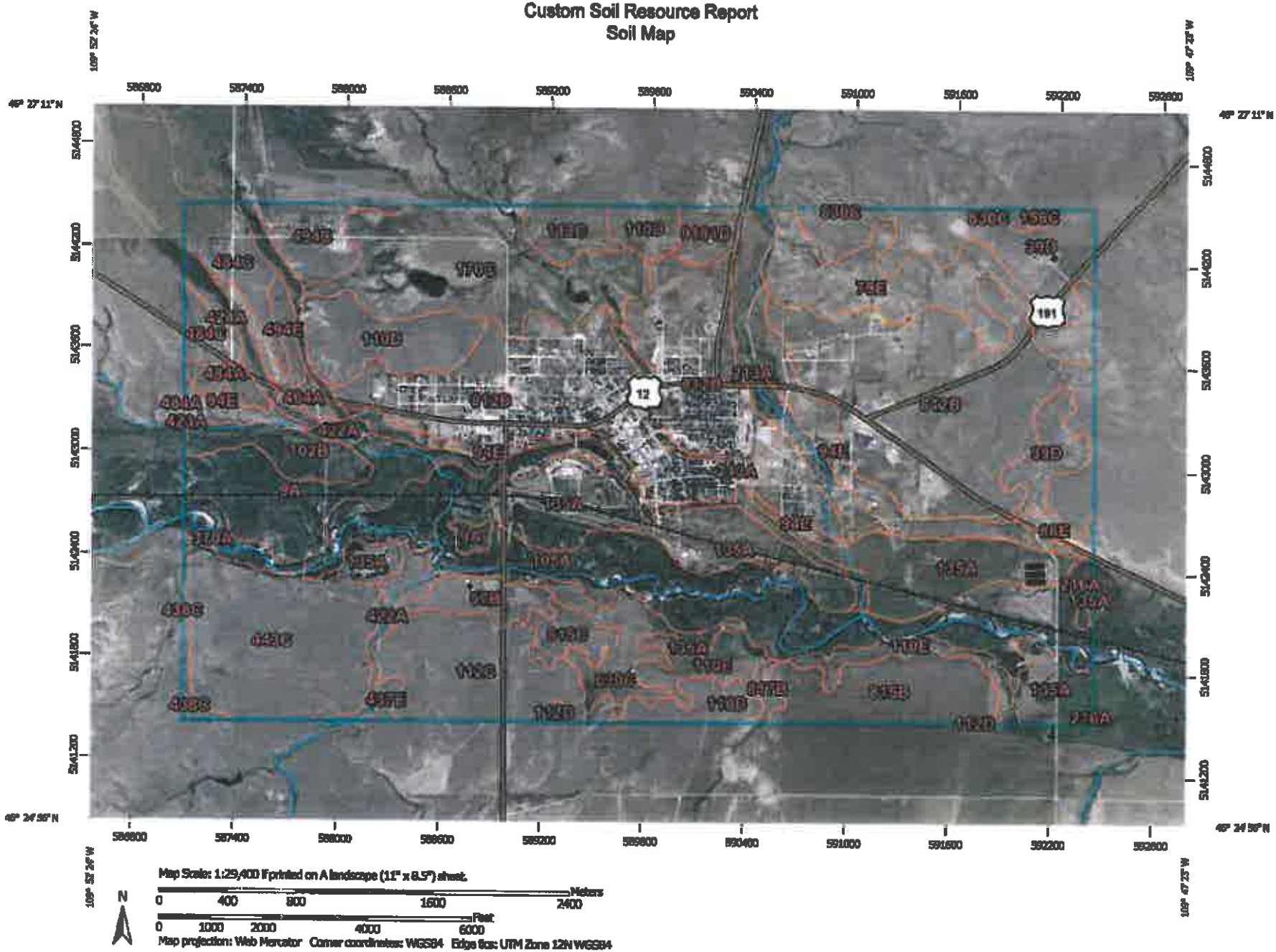
Additional Limited Land Cover

1% (*83 Acres*) Great Plains Riparian
1% (*73 Acres*) Major Roads
1% (*44 Acres*) Open Water
<1% (*25 Acres*) Great Plains Saline Depression Wetland
<1% (*21 Acres*) Big Sagebrush Steppe
<1% (*15 Acres*) High Intensity Residential
<1% (*5 Acres*) Introduced Riparian and Wetland Vegetation
<1% (*3 Acres*) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland
<1% (*2 Acres*) Great Plains Shrubland
<1% (*2 Acres*) Great Plains Sand Prairie
<1% (*2 Acres*) Great Plains Cliff and Outcrop
<1% (*0 Acres*) Great Plains Closed Depressional Wetland

APPENDIX C

NRCS Soils Report

Custom Soil Resource Report
Soil Map



Landform: Knolls on plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow Clay (SwC) RRU 58A-C 11-14" p.z. (R058AC059MT)

Rentsac
Percent of map unit: 2 percent
Landform: Knolls on plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (Sw) RRU 58A-C 11-14" p.z. (R058AC057MT)

Rock outcrop
Percent of map unit: 2 percent

135A—Fairway-Meadowcreek-Soapcreek complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting
Elevation: 3,700 to 4,900 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 43 to 48 degrees F
Frost-free period: 115 to 130 days

Map Unit Composition
Fairway and similar soils: 45 percent
Meadowcreek and similar soils: 25 percent
Soapcreek and similar soils: 15 percent
Minor components: 15 percent

Description of Fairway

Setting
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 39 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)

Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability (nonirrigated): 4w
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Loam
8 to 30 inches: Silt loam
30 to 45 inches: Silt loam
45 to 60 inches: Very gravelly sand

Description of Meadowcreek

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 39 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 10 inches: Loam
10 to 15 inches: Loam
15 to 31 inches: Loam
31 to 60 inches: Very gravelly sand

Description of Soapcreek

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 39 inches

Musselshell
Percent of map unit: 5 percent
Landform: Fans
Down-slope shape: Linear
Across-slope shape: Linear

Niart
Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

812B—Niart-Rothiemay loams, 0 to 4 percent slopes

Map Unit Setting
Elevation: 3,700 to 4,900 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 43 to 48 degrees F
Frost-free period: 115 to 130 days

Map Unit Composition
Niart and similar soils: 50 percent
Rothiemay and similar soils: 40 percent
Minor components: 10 percent

Description of Niart

Setting
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone and sandstone

Properties and qualities
Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 6 inches: Loam
6 to 24 inches: Gravelly loam
24 to 60 inches: Very gravelly loam

Description of Rothiemay

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone and shale

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 7 inches: Loam
7 to 23 inches: Loam
23 to 60 inches: Gravelly loam

Minor Components

Verson

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Crago

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

Attewan

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

APPENDIX D

Source Water Delineation and Assessment Report

Harlowton

The attached Source Water Delineation and Assessment Report (SWDAR) for Harlowton was completed by Bill O'Connell of Montana Rural Water Systems, Inc. and Lisa O'Connell of Montana Tech as part of a June, 2003 report entitled "Hydrogeologic Assessment of the Principal Aquifers in the Upper Musselshell River Basin, Montana in Support of Source Water Assessment and Delineation Reports for Public Water Systems". Additional regional background information and assessment methodology for the Musselshell Project area from the Hydrogeologic Assessment is available at

Regional Background Information and Assessment Methodology

The primary intent of a Source Water Delineation and Assessment Report is to provide the background information for the community to use in developing local drinking water protection strategies. The attached report for Harlowton incorporates delineation and assessment components and includes a limited management and emergency response plan. ***DEQ has not reviewed the report or plan to confirm that it meets the requirements of Montana's Source Water Protection Program or that it is protective of your drinking water supply.***

It is highly recommended that the water system and community:

- Review the delineation of the inventory region to ensure it is protective of the long-term water quality;
- "Enhance" or refine the identification of the potential contamination sources and susceptibility analysis through further research and local input;
- Ensure that the management plan adequately identifies and reduces the risks of groundwater contamination from all potential contaminant sources (existing and future) that may affect the drinking water supply; and
- Ensure that the emergency plan identifies the potential threats to the drinking water supply and provides the detail necessary to implement a response to contamination or disruption of the public water system.

Technical assistance is available through DEQ for communities that choose to move beyond the assessments and voluntarily develop a Drinking Water Protection Plan. Clean safe drinking water is fundamental to the viability of any community. Protecting the drinking water source is a wise and relatively inexpensive investment in the community's future.

For technical assistance with review of this assessment or in developing plans to protect your public water system contact:

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MONTANA RURAL WATER

WELLHEAD/ SOURCE WATER PROTECTION PLAN
HARLOWTON, MONTANA

WELLHEAD/ SOURCE WATER PROTECTION PLAN

HARLOWTON, MONTANA

Public Water System

PWSID # MT0000240

Report Date: June 30, 2003

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TABLE OF CONTENTS

GLOSSARY* 6

INTRODUCTION 8

PURPOSE 8
LIMITATIONS 8

BACKGROUND 9

THE COMMUNITY 9
GEOGRAPHIC SETTING 9
GENERAL DESCRIPTION OF THE SOURCE WATER 10
Table 1. List of geologic or hydrogeologic maps available for the Harlowton, Montana area. *10*
THE PUBLIC WATER SUPPLY 10
WATER QUALITY 11
INFLUENCING FACTORS 11
SOURCE WATER PROTECTION MANAGEMENT 11

DELINEATION 12

GEOLOGIC CONDITIONS AND AQUIFER CHARACTERISTICS 12
WELLS 12
Table 2. Well information for Harlowton. *13*
CONCEPTUAL MODEL AND ASSUMPTIONS 13
METHODS AND CRITERIA 14

INVENTORY 15

INVENTORY METHOD 15
INVENTORY RESULTS/CONTROL ZONE 15
INVENTORY RESULTS/INVENTORY REGION 16
Table 4, Results for Harlowton's Inventory Regions *16*
INVENTORY RESULTS/RECHARGE REGION 16
INVENTORY UPDATE 16
INVENTORY LIMITATIONS 16

SUSCEPTIBILITY ASSESSMENT 19

Table 5. Susceptibility to specific contaminant sources as determined by hazard and the presence of barriers. *19*
Table 6. Hazard potential for contaminant sources for Harlowton. *20*
Table 7. Susceptibility assessment for the Harlowton Inventory region. *20*

MANAGEMENT 21

CONTROL ZONE MANAGEMENT 21
INVENTORY REGION MANAGEMENT 21
RECHARGE REGION MANAGEMENT 21
MANAGEMENT IMPLEMENTATION 21

EMERGENCY PLAN 22

POSSIBLE DISRUPTION THREATS 22
EMERGENCY COORDINATOR 22
EQUIPMENT AND MATERIAL RESOURCES 22
PROCEDURES TO SHUT DOWN THE WELL 22
SECURITY 22

ALTERNATE WATER SOURCES 23

REFERENCES 24

Appendix I: Geologic maps
Appendix II: Well Logs

GLOSSARY*

Acute Health Effect. An adverse health effect in which symptoms develop rapidly.
Alkalinity. The capacity of water to neutralize acids.
Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.
Best Management Practices (BMPs). Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.
Coliform Bacteria. Bacteria found in the intestinal tracts of animals. Their presence in water is an indicator of pollution and possible contamination by pathogens.
Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.
Confining Unit. A geologic formation that inhibits the flow of water.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted in 1980. CERCLA provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.
Delineation. A process of mapping source water management areas.
Hardness. Characteristic of water caused by presence of various salts. Hard water may interfere with some industrial processes and prevent soap from lathering.
Hazard. A measure of the potential of a contaminant leaked from a facility to reach a public water supply source. Proximity or density of significant potential contaminant sources determines hazard.
Hydraulic Conductivity. A coefficient of proportionality describing the rate at which water can move through an aquifer.
Inventory Region. A source water management area that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified groundwater travel time.
Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act.
Nitrate. An important plant nutrient and type of inorganic fertilizer. In water the major sources of nitrates are septic tanks, feed lots and fertilizers.
Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet.
Pathogens. A bacterial organism typically found in the intestinal tracts of mammals, capable of producing disease.
Point-Source. A stationary location or fixed facility from which pollutants are discharged.
Public Water System. A system that provides piped water for human consumption to at least 15 service connections or regularly serves 25 individuals.
Pumping Water Level. Water level elevation in a well when the pump is operating.
Recharge Region. A source water management region that is generally the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute

water over long time periods or under different water usage patterns.

Resource Conservation and Recovery Act (RCRA). Enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

Source Water Protection Area. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply.

Static Water Level (SWL). Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS). The potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Synthetic Organic Compounds (SOC). Man made organic chemical compounds (e.g. herbicides and pesticides).

Total Dissolved Solids (TDS). The dissolved solids collected after a sample of a known volume of water is passed through a very fine mesh filter.

Transmissivity. The ability of an aquifer to transmit water.

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals.

Volatile Organic Compounds (VOC). Any organic compound which evaporates readily to the atmosphere.

* Definitions taken from EPA's Glossary of Selected Terms and Abbreviations (http://www.epa.gov/ceisweb1/ceishome/ceisdocs/glossary/glossary.html)

INTRODUCTION

This Report was completed by Bill O'Connell, Groundwater Technician with Montana Rural Water Systems inc. (MRWS), Lisa O'Connell with the Montana Bureau of Mines and Geology, and John Crowley, the licensed operator for Harlowton's Public Water System (PWS).

Purpose

This report uses the Source Water Assessment Program (SWAP) to meet the technical requirements for the completion of the Source Water Protection Plan (SWPP) for Harlowton combined with a watershed evaluation of the Upper Musselshell River drainage. A Source Water Assessment is required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996.

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is "delineation and assessment." Delineation is a process of mapping source water protection areas that contribute water used for drinking. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The purpose of the source water protection plan is to provide information to a PWS helping them protect their drinking water source.

Limitations

This report was prepared to assess threats to Harlowton's public water supply, and is based on published information and information obtained from local residents familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the community's public water supply and not any other public or private water supply. Also, not all potential or existing sources of groundwater or surface water contamination in the Harlowton area are identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum concentration levels (MCLs) have been specified under the national primary drinking water standards and certain constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

Harlowton is located in central Montana, along the junction of east-west running US highway 12, and north-south highway US 191 between Big Timber and Lewistown. The town has 1500 residents and provides services for the agricultural community in the surrounding area. The Public Water System (PWS) has 504 hook-ups. See the vicinity map in figure 1.

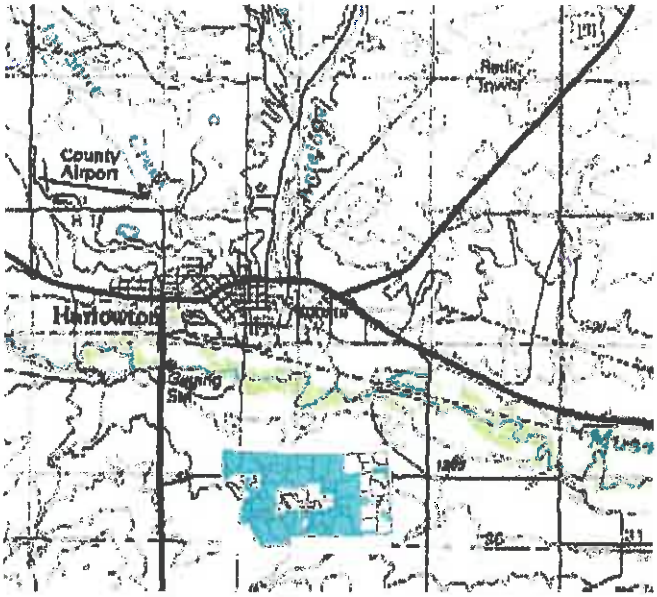

Figure 1. Harlowton vicinity map

Geographic setting

Harlowton is located in the Un-Glaciated Missouri Plateau of the Great Plains Physiographic Province. The Little Belt Mountains to the north and the Crazy and Castle Mountains to the south and west are the most visible geographic features in the area. The Musselshell River forms the southern boundary of the town.

The highlands south of town are part of the Shawmut Anticline and Lake Basin Fault Zone. These semi-arid rolling hills rise several hundred feet above the Musselshell River Valley and form the hydrologic divide between the Musselshell River and Yellowstone River Basins.

Harlowton is sited on the Cretaceous age, Judith River formation except along the Mussselshell River where Quaternary age Alluvial Terrace deposits remain (Wilde and Porter, 2001, Geologic Map of the Harlowton Quad.). The average annual temperature in the region is 44.2° F and the average annual precipitation is 14 to 18 inches (National Water and Climate Center).

General Description of the Source Water

Harlowton uses groundwater supplied by three wells (figure 3) to meet its' drinking water requirements. The Thompson Well, South Well, and the Pritchard Well are all completed in deep bedrock aquifers. The aquifers are recharged in the Little Belt Mountains north of town, where the bedrock formations are exposed. The groundwater is high in total dissolved solids, which is indicative of fairly long residence times in the ground. See the land use map in figure 2.

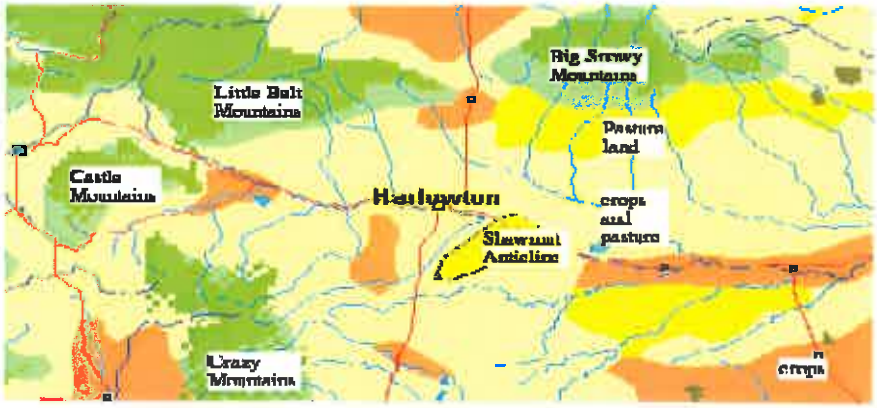

Figure 2. Land use map of Harlowton area

Table 1. List of geologic or hydrogeologic maps available for the Harlowton, Montana area.

Title or Description	Scale	Area Covered	Reference
topographical	1:24,000	Harlowton	NRIS, map finder
Geological	Various	Montana	Taylor and Ashley
Geological	1:100,00	Harlowton 30'x60' Quadrangle	Wilde and Porter

The Public Water Supply

The Public Water Supply consists of 3 wells that are tied directly into the distribution system. The Pritchard Well is located on the west side of Harlowton at the intersection of Pritchard and M streets. The well is completed in the Eagle Sandstone Formation. The water is treated with a polyphosphate for iron and manganese and then chlorinated. The Thompson well (Well #3) is located north of the city park at the main entrance along the south side of Highway 12, it is completed in the Claggett Shale. The South well (Well #1) is located northeast of the park next to the base of a large ridge of Judith River Sandstone and has multiple completions. See well locations in figure 3.

The excess water is stored in a 500,000 gallon tank. The distribution system has 504 hookups and serves 1500 people.

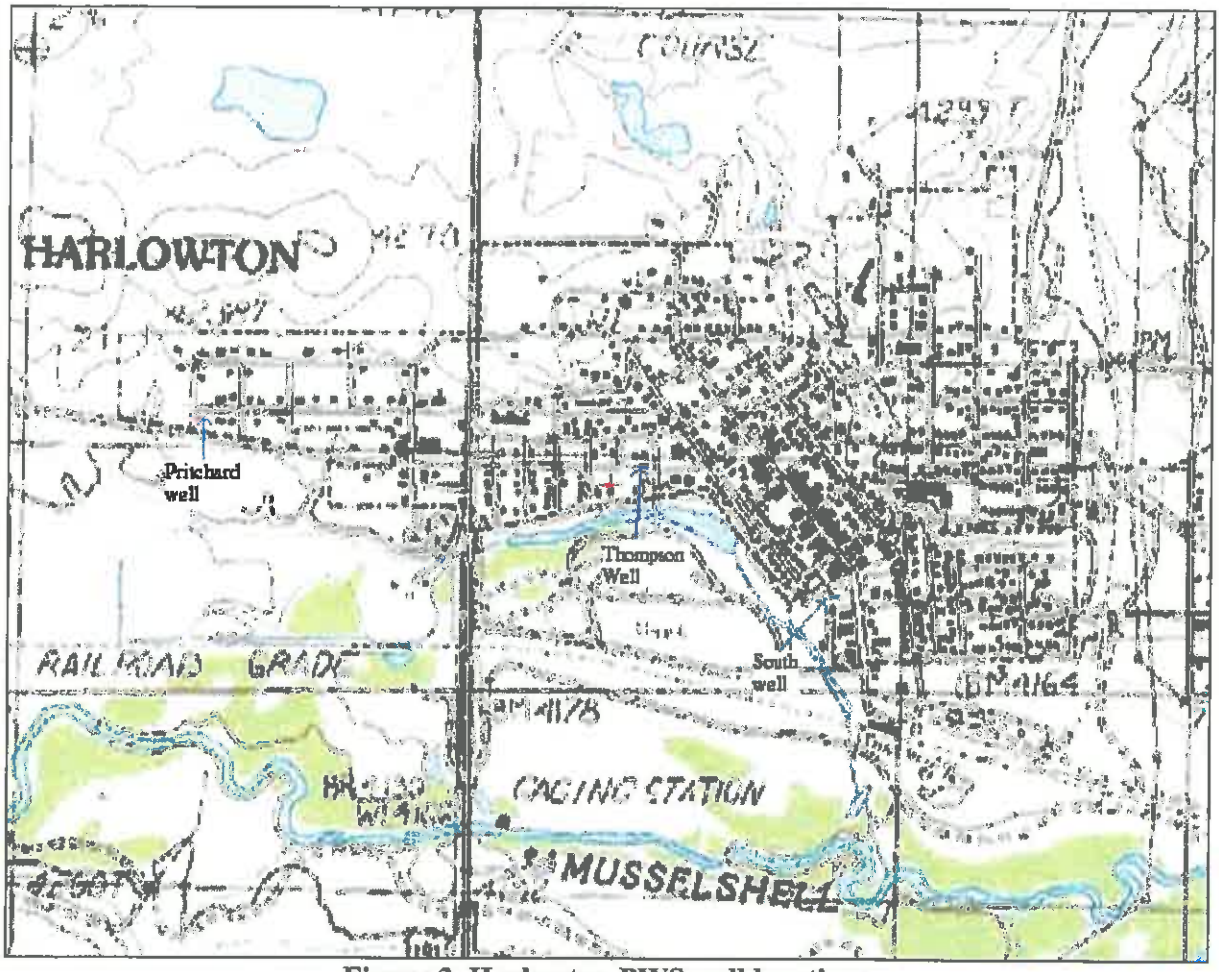

Figure 3. Harlowton PWS well locations

Water Quality

Harlowton is routinely monitored for compliance with drinking water standards. Bacteriological monitoring occurs monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules. The well water is hard and has a high iron and other mineral content.

Influencing Factors

The Source Water Protection Plan (SWAP) was started as part of a program to combine a watershed evaluation of the Upper Musselshell basin completed by the MBMG with the SWAP for public water systems including Harlowton completed by MRWS.

Source Water Protection Management

John Crowley, Harlowton's Public Works Director and licensed operator will oversee implementation of the SWPP.

CHAPTER 2
DELINEATION

The portions of the aquifer that contributes water to Harlowton's wells are identified in this chapter. Three management regions (the control zone, inventory region, and recharge region) are mapped for each source. The goal of management in the control zone is to protect against direct introduction of contaminants into the well or the immediate surrounding area.

Management in the inventory region should focus on pollution prevention activities where water is likely to flow to the wells within a relatively short time period. The goal of management in the recharge region is to maintain and improve the quality of groundwater that could reach the wells over longer times or with increasing water usage.

Geologic Conditions and Aquifer Characteristics

Harlowton uses groundwater supplied by three wells to meet its' drinking water requirements. The wells' depths range from 490 feet for the Thompson wells to 921 feet below the surface for the South Well. The wells tap bedrock aquifers. The deepest formation is the Eagle Sandstone followed by the Claggett Shale both of which are exposed several miles away in the surrounding highlands. The Judith River Sandstone aquifer also supplies Well 3 (Thompson Well). The Judith River is exposed throughout this area. The Pritchard and South wells have artesian flow.

The Little Belt Mountains and Big Snowy Mountains rise to the north and the Crazy and Castle Mountains form the southeast border of the basin. Highlands to the south of Harlowton form the hydrologic divide between the Yellowstone and Mussellshell-Missouri Rivers. The formations that contain the aquifers are exposed to the north and south.

The geology in this area is very complex on both large and small scale. The Little Belt and Big Snowy Mountains are part of two separate geologic (tectonic) blocks. These blocks are large sections of the Earth's crust that have formed independent of each other. South and east of Harlowton the Lake Basin Fault Zone and the Shawmut Anticline are a result of large tectonic forces shaping the landscape. On the smaller scale there are a series of normal faults that progress from the southeast to the northwest. The faults have dropped the west section down relative to the east section.

Wells

Harlowton's well #1 (South Well) is 921 feet deep and the casing is slotted from 208 feet to 210 (Judith River formation) feet, from 638 feet to 646 feet (Eagle Formation) and from 800 to 860 feet below the ground surface. The well has a closed in pressure of 98 psi and flowed at 180 gpm through an 8" pipe (original well log). The well produces 280 gpm, with a pumping water level of 187 feet. The pump is at 235 feet. The well is grouted with #2 cement (Haliburton) to 721 feet.

The Thompson Well (Well #3) is located south of Highway 12 and was drilled to a depth of 490 feet (personnel communication with John Crowley, 2001). The well casing has an open bottom and does not have a screened interval, recharge is through the open bottom. The well was drilled in 1941 and the well construction is not reported. The well produces 375 gpm.

The Pritchard Well was drilled to 900 feet and is an open hole (no casing) below 390 feet. There is no information on cementing the well. However, from onsite inspection the well is on a concrete floor in a new well house. The well produces 475 gpm from the Eagle Sandstone and the Claggett Shale. The Claggett Shale has highly mineralized water and the water is treated with an ortho-phosphate at the well. The ortho-phosphate sequesters the Fe and Mg preventing it from precipitating out of the water. See the well logs in appendix IV for additional information.

Table 2. Well information for Harlowton.

	Thompson Well (Well #3)	South Well (#1)	Pritchard Well
MBMG #	20847	20853	1636
Water Right #			
Latitude / Longitude	46.4363/-109.8371	46.4338/-109.8304	46.4366/-109.8361
Date Completed	Jan 1, 1941	Jul 23, 1975	June 7, 1948
Depth	414	921	900
Perforated Interval	Open bottom	208-210 638-646 800-860	Open bottom
SWL Depth	Nr	Flowing 180 gpm & 98 psi	Nr
PWL Depth	Nr	187'	Nr
Drawdown			
Test Pumping Rate			Gpm
Specific Capacity			
Pumping Rate	375 gpm	280 gpm	475 gpm
Source Type	bedrock confined	Bedrock confined	Bedrock confined

Conceptual Model and Assumptions

The aquifers are recharged from infiltrating surface water where the formations are exposed in the surrounding highlands. The geologic formations containing the aquifers are exposed within several miles of Harlowton in all directions. However, the complex geologic conditions in this region have eliminated some of the formation exposures as recharge sources. The best example

of this is the Eagle Formation.

The closest exposures of the Eagle sandstone formation are to the east and south of Harlowton. The Eagle formation is exposed on both sides of the Musselshell River approximately 3 miles east of Harlowton. A series faults have dropped the northwest block relative to the southeast block along a northwest trend. The topography rises to the north and west. The South well is completed in the Eagle Formation and is over 50 feet above the elevation of the River where it crosses over the exposed Eagle Formation 3 miles to the east. The South well is a flowing artesian well and has a closed in pressure of 98 psi. The Eagle Formation is 800 feet below the South Well and cannot be hydrologically connected to the exposed Eagle Formation south and east of the well.

Since the south and east exposures are hydrologically isolated from the wells. The recharge is from the north-northwest in the Little Belt Mountains.

Methods and Criteria

DEQ's Source Water Protection Program specifies methods and criteria used to delineate subregions of the source water protection areas for Harlowton. A one-hundred-foot radius control zones was delineated for each source. The Inventory region was delineated using a 1000-foot radius circle centered on the well. Hydrologic boundaries for the northern and western boundaries of the Basin were used to define the recharge area.

The 1000-foot radius circle, centered on the well is the default delineation in the Montana Wellhead/ Source Water Protection Program. This delineation method was used due to the depth and confined conditions of the aquifers used by Harlowton. The 10-year time-of-travel calculations extend out beyond the 1000-foot circle, but do not come near the recharge areas. See Figure 5. The wells are most susceptible to activities at or near the wells and protection and management activities should focus on the wells.

CHAPTER 3
INVENTORY

Potential sources of contamination were inventoried to assess the susceptibility of Harlowton's drinking water sources to contamination. Potential sources of all contaminants with primary drinking water standards and cryptosporidium were identified but a detailed inventory was conducted only for potential sources of contaminants that are the greatest threat to health. The contaminants of greatest concern to Harlowton are secondary groundwater constituents originating from the Claggett aquifer.

The inventory for Harlowton focuses on all activities in the control zone, major facilities in the inventory region, and general land uses in the recharge region.

Inventory Method

Databases were searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. The following steps were followed:
Step 1: Major road and rail transportation routes were identified throughout the inventory region.
Step 2. All land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region and identified on the base map.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

1.Large quantity hazardous waste generators
2) Landfills
3. Hazardous waste contaminated sites
4) Underground storage tanks
5. Major roads or rail transportation routes
6) Cultivated cropland
7. Animal feeding operations
8) Wastewater treatment or spray irrigation
9. Septic systems, Sewered residential areas
10) Storm sewer outflows

Inventory Results/Control Zone

The control zone is the 100-foot radius around each well. Within the control zone for the existing wells, the main potential contaminant is from outside the wells is from vehicle traffic near the wellheads.

Pritchard Well
The control zone around the Pritchard Well includes two streets and a sewer line. The Well is located in a small park at the corner of M and Pritchard streets. The sanitary sewer line is in the alley south of the Well.

Thompson Well
The control zone around the Park Well includes Highway 12 and the city street to the Park.

South Well
The South Well is located on the southern edge of Harlowton and sits away from the streets and the only road is a dirt driveway to the well. There are no contaminant sources in this area.

Inventory Results/Inventory Region

The Inventory Region for Harlowton's wells includes sanitary sewers, highways, city streets, and service stations. See figure 4 and figure 6.

Table 4, Results for Harlowton's Inventory Regions

	Contaminant source	Description
1	Septic system	Located at the athletic field, nitrates and pathogens
2	Roads	Chemical spills or leaks
3	Municipal sewer	Leaks, nitrates and pathogens
4	Highways	Chemical spills
5	LUST sites	Leaking Underground Storage Tanks, VOCs

Inventory Results/Recharge Region

The Recharge Region for the well outside the inventory region is located in forest and pasture land. See figure 2.

Inventory Update

The certified operator should update the inventory for his records every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. A complete inventory should be submitted to DEQ every five years.

Inventory Limitations

The potential sources of contaminants for Harlowton are determined from readily available data and reports. Unregulated activities or unreported contaminant releases may have been missed. The use of multiple sources of data, however, should ensure the major threats to the source water for Harlowton are identified.

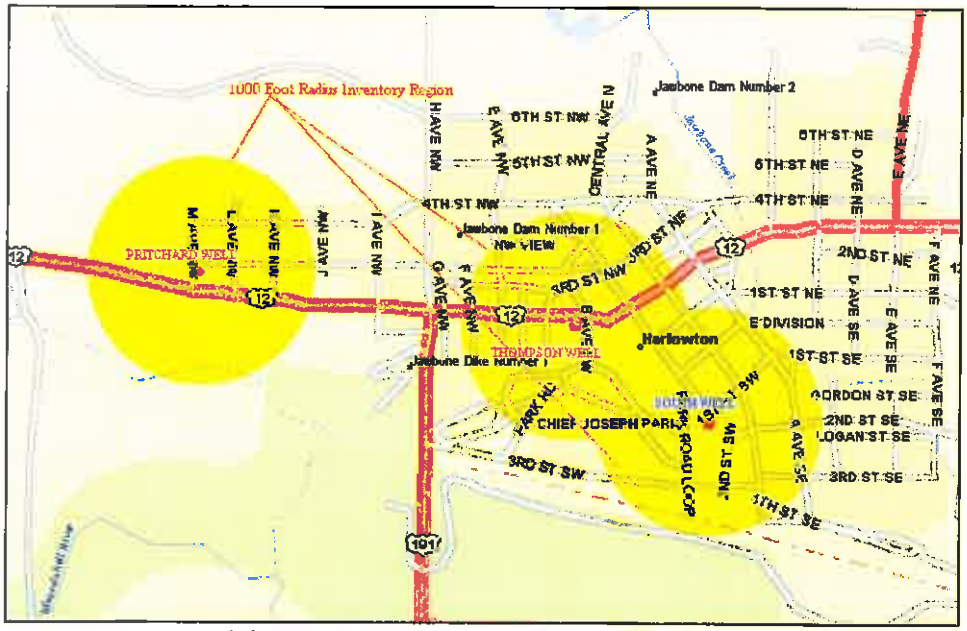

Figure 4. 1000 Foot Inventory Regions

The calculated fixed radius and the calculated capture zones for the Harlowton PWS wells are shown in Figure 5. Also in Figure 5, the 1000 foot delineated areas around the three other PWS in Harlowton are shown. The larger areas in Figure 5 are not recommended due to the deep confined nature of the aquifers used by Harlowton. The management strategies should focus on the 100-foot control zone around each well.

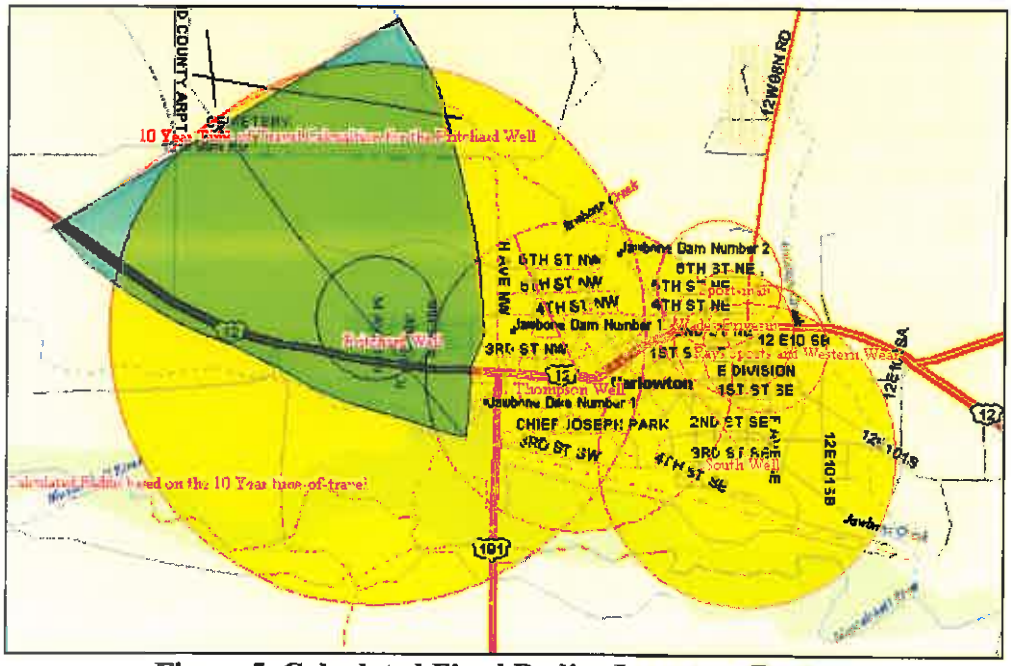

Figure 5. Calculated Fixed Radius Inventory Regions

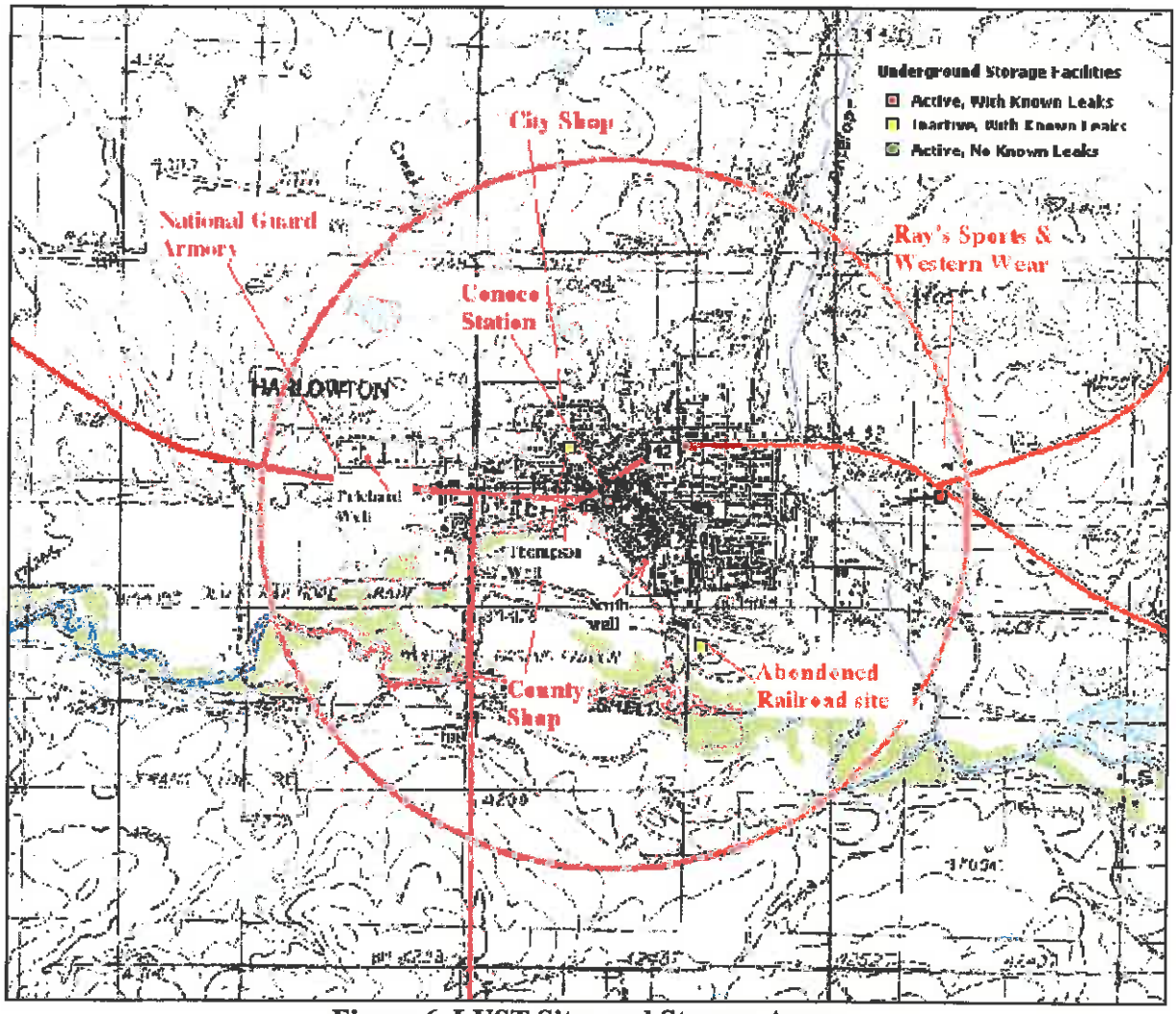

Figure 6. LUST Sites and Storage Areas

The leaking underground storage tanks (LUST) are undergoing remediation. There is a series of monitoring wells that a tested to see if the plume is moving from the County shop site. The great depth and pressurized nature of the aquifers used by Harlowton prevent the petroleum products from reaching the aquifer. However, as mentioned in the Management Section, the hydrocarbon plumes can still be a threat to the PWS.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

The susceptibility of Harlowton's wells to significant potential contaminant sources is assessed in this chapter to rank threats to the drinking water source. The degree of susceptibility is determined by the hazard associated with a source and the existence of barriers to contamination (Table 5). The proximity of point contaminant sources to the town's wells or the density of non-point sources in the inventory region determines hazard (Table 6). Barriers can be anything that decreases the likelihood that contaminated water will flow to the town's wells. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices can be considered management barriers. Thick clayey soils, a deep water table, or a thick saturated zone above the well intake can be natural barriers.

Susceptibility ratings are presented individually for each significant potential contaminant source in the inventory region. Harlowton is not considered susceptible to individual point sources in the recharge region because dispersion and dilution of contaminants should reduce concentrations of contaminants below levels associated with adverse health affects.

Table 5. Susceptibility to specific contaminant sources as determined by hazard and the presence of barriers.

	High Hazard	**Moderate Hazard**	**Low Hazard**
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Table 6. Hazard potential for contaminant sources for Harlowton.

	High Hazard	Moderate Hazard	Low Hazard
Point Sources of All Contaminants	Within one-year TOT	one to three years TOT	Over three years TOT
Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (Percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
Cropped Agricultural Land (Percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

The results of the susceptibility assessment for Harlowton are summarized in Table 7. The following are brief descriptions of the susceptibility assessments for each significant potential contaminant source.

Table 7. Susceptibility assessment for the Harlowton Inventory region.

Source	Contaminant	Hazard	Rating	Barriers	Susceptibility	Management
Municipal sewers	Pathogens and nitrates	Leaks	High	Well intake below 230 feet Well grouted to bedrock Flowing well	Very low	Routine monitoring
Pasture land	Pathogens, nitrates	Infiltration	Low	Well intake below 230 feet Well grouted to bedrock Flowing well	Very low	Routine monitoring
Highway & city streets	VOCs SOCs other chemicals	Spills	High	Well intake below 230 feet Confined aquifer	Very low	Routine monitoring
Septic system	Nitrates and pathogens	Infiltration	Low	Confined aquifer Distance to well Depth to groundwater	Very low	Routine monitoring
LUST	VOCs	Infiltration	High	Confined pressurized wells	Low	Routine monitoring

CHAPTER 5
MANAGEMENT

The goal of the Source Water Protection Program is to prevent Harlowton's drinking water source from being contaminated. All land uses have been inventoried and the potential for these activities to contaminate the drinking water have been ranked. Management activities can be considered as another barrier developed to reduce the susceptibility of a specific contaminant from entering Harlowton's water.

Control Zone Management

No chemicals will be used, stored or transported within the 100 foot radius of the well. The exception to this is the Thompson well. This well is located next to US Route 12. The Control Zone is the primary management area for Harlowton. Due to the corrosive nature of groundwater from the Claggett Aquifer, the aquifer was sealed off using a sleeve in the Prichard Well.

Inventory Region Management

Management of this region for Harlowton is based on the well's depth and location away from most land use activities. The City limits include all the land in this region and will control the land use near the wells. While not a threat to the aquifer (source water), certain petroleum products can penetrate water mains if they are constructed of PVC pipe. Harlowton does not use PVC pipe near contaminated areas.

Recharge Region Management

The recharge region for Harlowton is in the surrounding highlands several miles north and south of the town. The land between the Town and the highlands is agricultural. The recharge travel time makes land use management unrealistic.

Management Implementation

The management strategies have been in use as part of the Public Water Systems operation. The public works department for Harlowton is aware of that the main threat to the well comes from a casing failure.

CHAPTER 6
EMERGENCY PLAN

Procedures for responding to emergencies are described and an emergency coordinator is designated in this chapter. The equipment and materials needed to respond to an emergency and the source of a temporary water supply are also described.

Possible Disruption Threats

The main threat to the PWS has been identified as casing failure or line breaks. A failure of the casing could allow contaminated surface water or poorer quality water from a different aquifer to enter the well.

Emergency Coordinator

The emergency coordinator for Harlowton is John Crowley, Public Works Director.

Equipment and Material Resources

A catastrophic loss of water will require the services of an engineer and a well driller. Minor disruptions to the public water system will be handled by public works.

Procedures to Shut Down the Well

The wells can be isolated from the water distribution system by using the valves at the well sites. The wells can be turned off at the respective pump house but requires a key for access. The keys are located in the town shop.

Security

The wells are located in secure buildings and the doors are locked. The storage tank is also locked. The monitoring wells require a key for access. The water system is monitored daily by the Public Works Department as well as regular water quality testing on all the wells and throughout the PWS.

CHAPTER 7
ALTERNATE WATER SOURCES

Harlowton has sufficient water to meet the town's requirements and no new wells are planned at this time. However, a regional water system that would include much of the Musselshell River Basin, including Harlowton is being evaluated.

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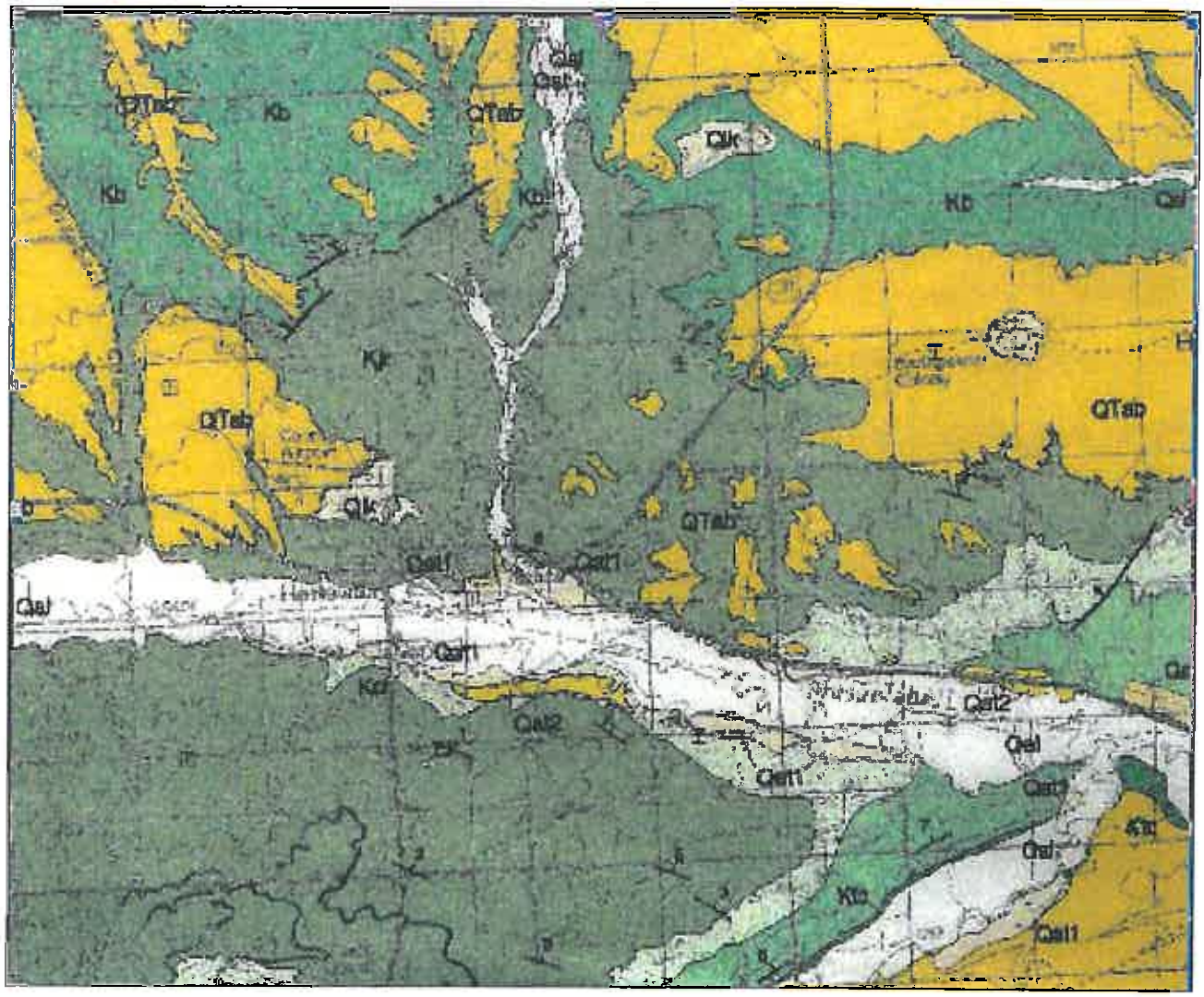
5. Wilde, Edith, M., and Porter, Karen, W., 2001, Geologic Map of the Harlowton 30' x 60' Quadrangle, Central Montana

Appendix I
Well Logs

Appendix II
Geologic Maps



Geologic Map of the Harlowton Area (Wilde and Porter)

APPENDIX E

NHP Species of Concern

Plant Species of Concern

1 Species of Concern
Filtered by the following criteria:
Species = Vascular Plants, Bryophytes, Lichens
Township = 8 N Range = 15 E

Species List Last Updated **06/10/2013**

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Species of Concern
1 Species
Filtered by the following criteria:
Species = Vascular Plants, Bryophytes, Lichens
Township = 8 N Range = 15 E

FLOWERING PLANTS - MONOCOTS (LILIOPSIDA)

1 SPECIES
FILTERED BY THE FOLLOWING CRITERIA:
SPECIES = VASCULAR PLANTS, BRYOPHYTES, LICHENS
TOWNSHIP = 8 N RANGE = 15 E

SCIENTIFIC NAME COMMON NAME TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY	HABITAT
Sporobolus neglectus Small Dropseed		**Poaceae** Grasses	G5	S1S2					Grasslands (low-elevation)
			Species verified in these Counties: Gallatin, Sanders, Wheatland **State Rank Reason:** Rare in Montana, where it is known from a few widely scattered and poorly documented sites.						

Citation for data on this website:
Montana Plant Species of Concern Report. Montana Natural Heritage Program. Retrieved on 1/15/2014, from http://mtnhp.org/SpeciesOfConcern/?AorP=p

Plant Species of Concern

407 Species of Concern
95 Potential Species of Concern
All Records (no filtering)

Species List Last Updated **06/10/2013**

MONTANA Natural Heritage Program

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Introduction

The Montana Natural Heritage Program (MTNHP) serves as the state's information source for Species of Concern (SOC) -- plants and animals that are rare, threatened, and/or have declining populations and as a result are at risk or potentially at risk of extirpation in Montana. This report is based on information gathered from field inventories, publications, reports, herbaria specimens, and the knowledge of botanists and other taxonomic experts. Taxa in the SOC category generally include all vascular plant taxa ranked S1, S2, S3 or SH. Nonvascular taxa (bryophytes and lichens) which are not as well documented or studied as vascular plant taxa in the state, are listed as SOC using similar criteria as vascular taxa but are more strictly limited to those taxa which are believed to be the rarest or most vulnerable to extirpation based on current information.

Designation as a Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to make proactive decisions regarding species conservation and data collection priorities in order to maintain viable populations and avoid extirpation of species from the state. MTNHP may designate additional taxa as Potential Species of Concern (PSOC). Taxa in this designation include species or subspecies which may be rare, have a restricted range in the state or are otherwise vulnerable to extirpation in at least part of their range but otherwise do not meet the criteria for inclusion as a SOC. An additional designation of Status Under Review is used for those taxa for which additional information is needed to accurately assign a status rank or for which conflicting information exists. Taxa designated as Status Under Review are not included in this document but can be found in the on-line **Fieldguide (http://fieldguide.mt.gov/)**.

This web-based report, which replaces the 2006 Plant Species of Concern publication, identifies vascular plant Species of Concern (SOC), bryophyte SOC and lichen SOC in Montana. The MTNHP continuously reviews and updates status ranks as new information and data become available through field surveys, research, and submitted observations. Status ranks and information supporting them are reviewed by botanists and resource specialists. If you wish to comment or contribute information to this process please contact the MTNHP Botanist. The information we receive from botanists and others throughout the state is essential in this process, and contributes to more accurate assessments of species' status. We continue to ask that all observations for SOC, PSOC and Review Status plants be reported to the Heritage Program. A copy of the field survey form specifying the information that should be submitted is available on our **website (http://mtnhp.org/)**.

Information concerning plant species contained on the SOC, PSOC or Review lists may be viewed on the MTNHP's on-line Montana Plant Field Guide. The Field Guide provides information for vascular and non-vascular plants, including species' characteristics, identification, habitat, distribution, state rank reasons and references, as well as technical illustrations and photographs of the plants and their habitats. For each species, a link to the NatureServe website (http://www.natureserve.org/) provides access to information on the status of the species throughout North America, assembled from state and provincial Natural Heritage databases. Information in the Montana Field Guide is continuously updated and expanded, so please check it often for current species' information. If you have questions concerning the field guide or find errors or omissions please contact the MTNHP.

Status lists of SOC plants may be queried on-line by county and/or township; taxonomic group or one of several rank/status criteria. More detailed information or additional assistance can be requested from MTNHP using the Information Request function on our **website**, or by phone, e-mail or mail.

How to Read the Lists

The SOC list is organized alphabetically by scientific name (Genus and specific epithet followed by subspecific epithet if any) within the major groups of Vascular Plants, Bryophytes (Mosses and Liverworts) and Lichens. Vascular plants are further sorted by the subgroups: Ferns and Fern Allies, Gymnosperms (if any), Flowering Plants-Dicots and Flowering Plants-Monocots. The list can also be sorted alphabetically by the common name. Additional scientific names as well as the Family name are included in adjacent columns for each species. The nomenclature and taxonomy for many groups of plants continues to change as new research is conducted and published, and as a result no one nomenclatural reference is followed. Publications and web resources which are most relevant to Montana plants include Vascular Plants of Montana (Dorn 1984), NatureServe Explorer, The USDA PLANTS database, Flora of North America (1993-), Grasses of Montana (Lavin and Seibert 2011) and Flora of the Pacific Northwest (Hitchcock and Cronquist 1973). Additionally, an abundance of scientific literature pertinent to Montana plants is available and indispensable in the process of determining the nomenclature and taxonomic concepts used in this report.

Species that have been added to or deleted from the SOC list due to changes in their global or state rank are reported in separate sections below. These changes are also reflected in the date displayed at the top of the report which shows when an addition or deletion to the list last occurred.

County Distribution

Montana counties of record are listed alphabetically with each species. County records of occurrence are determined directly from mapped species occurrences (SO's) in MTNHP databases. A record of occurrence for a particular county may be based on a historical observation which may no longer be extant. Additionally, some plant observations with vague locality information are not mapped in MTNHP databases and as result would not be included in the county distribution for that particular species.

Heritage Program Ranks

The international network of Natural Heritage Programs employs a standardized ranking system to denote **global** (range-wide) and **state** status (NatureServe 2006). Species are assigned numeric ranks ranging from 1 (highest risk, greatest concern) to 5 (demonstrably secure, least concern), reflecting the relative degree of risk to the species' viability, based upon available information. Global ranks are assigned by biologists at NatureServe (the international affiliate organization for the heritage network) in consultation with biologists in the natural heritage programs and other taxonomic experts, or by the MTNHP Botanist, who has the responsibility for reviewing and assigning global ranks for approximately 50 plant species that are either endemic to Montana or in which a large portion of the species' global range or population is within the state.

A number of factors are considered in assigning state ranks — the number, size and quality of known occurrences or populations, distribution, trends (if known), life history traits, habitat specificity, and definable threats. The process of assigning state ranks for each taxon relies heavily on factors of abundance (# of occurrences, population size and area of occupancy), viability of occurrences, threats to viability and trends in population size. The "State Rank Reason" field in the *Montana Field Guide* provides additional information on the reasons for a particular species' rank. The ranking process being used by MTNHP for plant species relies heavily on IUCN (2001) methodology and NatureServe/Heritage Network methodology presented in Master et al (2009), Faber-Langendoen et al (2009) and previously in Regan, Master and Hammerson (2004).

Rank definitions given below reflect some changes in terminology from that used by NatureServe. However, the meaning and criteria for ranks remain unchanged, to maintain consistency with international standards.

Rank		Definition
G1	**S1**	At very high risk of extinction or extirpation in the state due to **extremely limited** and/or **rapidly declining** population numbers, range and/or habitat. or extirpation in the state.
G2	**S2**	At high risk of extinction or extirpation in the state due to **very limited** and/or **declining** population numbers, range and/or habitat. or extirpation in the state.
G3	**S3**	At risk of extinction or extirpation in the state due to **limited** and/or **declining** numbers, range and/or habitat, even though it may be abundant in some areas.
G4	**S4**	Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining.
G5	**S5**	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
GX	**SX**	Presumed Extinct or Extirpated - Species is believed to be extinct throughout its range or extirpated in Montana. Not located despite intensive searches of historical sites and other appropriate habitat, and small likelihood that it will ever be rediscovered.
GH	**SH**	Historical, known only from records usually 40 or more years old; may be rediscovered.
GNR	**SNR**	Not Ranked as of yet.
GU	**SU**	Unrankable - Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNA	**SNA**	A conservation status rank is not applicable for one of the following reasons: 1) The taxa is of Hybrid Origin; is Exotic or Introduced; is Accidental or 2) is Not Confidently Present in the state. (see other codes below)

Combination or Range Ranks

G#G# or **S#S#** Indicates a range of uncertainty about the status of the species.
e.g. G1G3 = Global Rank ranges between G1 and G3 inclusive

Sub-rank

T# Rank of a subspecies or variety. Appended to the global rank of the full species, *e.g. G4T3*

Qualifiers

Q **Questionable** taxonomy that may reduce conservation priority-Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. Appended to the global rank, *e.g. G3Q*

? **Inexact Numeric Rank** - Denotes uncertainty; inexactness.

Federal Status

Designations in these columns reflect the status of a species under the U.S. Endangered Species Act (ESA), or as "sensitive" by the U.S. Forest Service (USFS) or the Bureau of Land Management (BLM).

U.S. Fish and Wildlife Service (Endangered Species Act)

Status, if any of a taxon under the federal Endangered Species Act of 1973 (16 U.S.C.A. § 1531-1543 (Supp. 1996)) is noted. Regulatory aspects of the Endangered Species Act affect plants only when they occur on federal lands or may be affected by federal actions. Currently, 3 plants in Montana have designations under the U.S. Endangered Species Act.

Designation Descriptions

LE **Listed endangered:** Any species in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)).

LT **Listed threatened:** Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)).

C **Candidate:** Those taxa for which sufficient information on biological status and threats exists to propose to list them as threatened or endangered. We encourage their consideration in environmental planning and partnerships; however, none of the substantive or procedural provisions of the Act apply to candidate species.

DM **Recovered, delisted, and being monitored** - Any previously listed species that is now recovered, has been delisted, and is being monitored.

Bureau of Land Management

BLM Sensitive Species are defined by the BLM 6840 Manual as those that normally occur on Bureau administered lands for which BLM has the capability to significantly affect the conservation status of the species through management. The State Director may designate additional categories of special status species as appropriate and applicable to his or her state's needs. The sensitive species designation, for species other than federally listed, proposed, or candidate species, may include such native species as those that:

1. could become endangered in or extirpated from a state, or within a significant portion of its distribution in the foreseeable future,
2. are under status review by FWS and/or NMFS,
3. are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution,
4. are undergoing significant current or predicted downward trends in population or density such that federally listed, proposed, candidate, or State listed status may become necessary,
5. have typically small and widely dispersed populations,
6. are inhabiting ecological refugia, specialized or unique habitats, or
7. are State listed but which may be better conserved through application of BLM sensitive species status. Such species should be managed to the level of protection required by State laws or under the BLM policy for candidate species, whichever would provide better opportunity for its conservation.

Designation Descriptions

Sensitive	Denotes species listed as sensitive on BLM lands
Special Status	Denotes species that are listed as Endangered or Threatened under the Endangered Species Act

U.S. Forest Service

U.S. Forest Service Manual (2670.22) defines Sensitive Species on Forest Service lands as those for which population viability is a concern as evidenced by a significant downward trend in population or a significant downward trend in habitat capacity. The Regional Forester (Northern Region) designates Sensitive species on National Forests in Montana. These designations were last updated in 2007 and they apply only on USFS-administered lands.

Designation Descriptions

Endangered	Listed as Endangered (LE) under the U.S. Endangered Species Act.
Threatened	Listed as Threatened (LT) under the U.S. Endangered Species Act.
Sensitive	Listed as a Sensitive Species by USFS Northern Region (R1).

Acknowledgements

We would like to gratefully acknowledge the many people who contributed information on plant species' occurrences and distribution throughout Montana over the years -- those contributions are the building blocks of the MTNHP databases and this publication. We encourage you to continue submitting data for SOC, PSOC and Under Review taxa so that status ranks and this document are as accurate and comprehensive as possible.

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Animal Species of Concern

1 Special Status Species
7 Species of Concern
Filtered by the following criteria:
Species = Mammals, Birds, Reptiles, Amphibians, Fish, Invertebrates
Township = 8 N Range = 15 E

Species List Last Updated **10/07/2013**

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Species of Concern

7 Species
Filtered by the following criteria:
Species = Mammals, Birds, Reptiles, Amphibians, Fish, Invertebrates
Township = 8 N Range = 15 E

BIRDS (AVES)

5 SPECIES

FILTERED BY THE FOLLOWING CRITERIA:
SPECIES = MAMMALS, BIRDS, REPTILES, AMPHIBIANS, FISH, INVERTEBRATES
TOWNSHIP = 8 N RANGE = 15 E

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	CFWCS TIER ID	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Buteo regalis Ferruginous Hawk	**Accipitridae** Hawks / Kites / Eagles	G4	S3B			SENSITIVE	2	11%	95%	Sagebrush grassland
		Species verified in these Counties: Beaverhead, Blaine, Broadwater, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, McCone, Meagher, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Prairie, Roosevelt, Rosebud, Sheridan, Stillwater, Teton, Toole, Valley, Wheatland, Yellowstone								
Catharus fuscescens Veery	**Turdidae** Thrushes	G5	S3B				2	6%	100%	Riparian forest
		Species verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, Granite, Jefferson, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Wheatland, Yellowstone								
Charadrius montanus Mountain Plover	**Charadriidae** Plovers	G3	S2B			SENSITIVE	1	20%	73%	Grasslands
		Species verified in these Counties: Blaine, Broadwater, Carbon, Fergus, Garfield, Golden Valley, Jefferson, Madison, Musselshell, Petroleum, Phillips, Rosebud, Teton, Toole, Treasure, Valley, Wheatland								
Numenius americanus Long-billed Curlew	**Scolopacidae** Sandpipers	G5	S3B			SENSITIVE	1	19%	100%	Grasslands
		Species verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer Lodge, Fallon, Fergus, Gallatin, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Madison, McCone, Meagher, Missoula, Musselshell, Petroleum, Phillips, Powder River, Powell, Prairie, Ravalli, Roosevelt, Rosebud, Sanders, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Rhynchophanes mccownii McCown's Longspur	**Calcariidae** Longspurs and Snow Buntings	G4	S3B			SENSITIVE	2	41%	79%	Grasslands
		Species verified in these Counties: Beaverhead, Blaine, Broadwater, Cascade, Chouteau, Daniels, Glacier, Golden Valley, Hill, Lewis and Clark, Liberty, Madison, McCone, Musselshell, Petroleum, Phillips, Pondera, Rosebud, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Valley, Wheatland, Yellowstone **State Rank Reason:** Species faces threats from covertype conversion and altered grazing and fire regimes and although populations in the core of their breeding range in northeast Montana appear to be relatively stable, declines are occuring in much of the species global breeding range.								

REPTILES (REPTILIA)

1 SPECIES

FILTERED BY THE FOLLOWING CRITERIA:
SPECIES = MAMMALS, BIRDS, REPTILES, AMPHIBIANS, FISH, INVERTEBRATES
TOWNSHIP = 8 N RANGE = 15 E

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	CFWCS TIER ID	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT

Phrynosoma hernandesi Greater Short-horned Lizard	**Phrynosomatidae** Sagebush / Spiny Lizards	G5	S3		SENSITIVE	SENSITIVE	2	19%	66%	Sandy / gravelly soils
		Species verified in these Counties: Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Gallatin, Garfield, Glacier, Golden Valley, Hill, Liberty, McCone, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Rosebud, Stillwater, Sweet Grass, Teton, Toole, Valley, Wheatland, Wibaux, Yellowstone							

FISH (ACTINOPTERYGII)

1 SPECIES

FILTERED BY THE FOLLOWING CRITERIA:
SPECIES = MAMMALS, BIRDS, REPTILES, AMPHIBIANS, FISH, INVERTEBRATES
TOWNSHIP = 8 N RANGE = 15 E

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	CFWCS TIER ID	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Chrosomus eos Northern Redbelly Dace	**Cyprinidae** Minnows	G5	S3				3	4%	27%	Small prairie rivers
		Species verified in these Counties: Blaine, Cascade, Chouteau, Daniels, Dawson, Fergus, Garfield, Golden Valley, Hill, Judith Basin, Lewis and Clark, McCone, Meagher, Musselshell, Petroleum, Phillips, Pondera, Richland, Roosevelt, Sheridan, Stillwater, Sweet Grass, Teton, Toole, Valley, Wheatland, Wibaux							

Citation for data on this website:
Montana Animal Species of Concern Report. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on 1/15/2014, from http://mtnhp.org/SpeciesOfConcern/?AorP=a

Animal Species of Concern

Species List Last Updated **10/07/2013**

1 Special Status Species
211 Species of Concern
95 Potential Species of Concern
All Records (no filtering)

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Introduction

The Montana Natural Heritage Program (MTNHP) serves as the state's information source for animals, plants, and plant communities with a focus on species and communities that are rare, threatened, and/or have declining trends and as a result are at risk or potentially at risk of extirpation in Montana.

This report on **Montana Animal Species of Concern** is produced jointly by the Montana Natural Heritage Program (MTNHP) and Montana Department of Fish, Wildlife, and Parks (MFWP). Montana Animal Species of Concern are native Montana animals that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution.

Also included in this report are **Potential Animal Species of Concern** -- animals for which current, often limited, information suggests potential vulnerability or for which additional data are needed before an accurate status assessment can be made.

We also include **Special Status Species** which are species that have some legal protections in place, but are otherwise not recognized as federally listed under the Endangered Species Act and are not Montana Species of Concern. Bald Eagles are a Special Status Species because, although they are no longer protected under the Endangered Species Act and are also no longer a Montana Species of Concern, they are still protected under the Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668c).

Over the last 200 years, 5 species with historic breeding ranges in Montana have been extirpated from the state; Woodland Caribou (*Rangifer tarandus*), Greater Prairie-Chicken (*Tympanuchus cupido*), Passenger Pigeon (*Ectopistes migratorius*), Pilose Crayfish (*Pacifastacus gambelii*), and Rocky Mountain Locust (*Melanoplus spretus*). Designation as a Montana Animal Species of Concern or Potential Animal Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to make proactive decisions regarding species conservation and data collection priorities in order to avoid additional extirpations.

Status determinations are made by MTNHP and MFWP biolgists in consultation with representatives of the Montana Chapter of the Wildlife Society, the Montana Chapter of the American Fisheries Society, and other experts. The process for evaluating and assigning status designations uses the Natural Heritage Program ranking system, described below, which forms the basis for identifying Montana Species of Concern.

How to Read the Lists

What Species are Included in this Report

Montana Species of Concern are defined as vertebrate animals with a state rank of S1, S2, or S3. Vertebrate species with a rank indicating uncertainty (SU), a "range rank" extending below the S3 cutoff (e.g., S3S4), or those ranked S4 for which there is limited baseline information on status are considered Potential Species of Concern. Because documentation for invertebrates is typically less complete than for vertebrates, only those ranked S1 or S2 are included as SOC. Invertebrates with a range rank extending below S2 (e.g., S2S3) are included as SOC only if their global ranks are G2G3 or G3, or if experts agree their occurrence in Montana has been adequately documented. Other invertebrates of concern with global ranks other than G1, G2, or G3 and with state ranks below S2 or range ranks extending below S2 (e.g., S3S4) are treated as Potential Species of Concern.

Organization of List

Both the list of Species of Concern and the list of Potential Species of Concern are grouped taxonomically in the following order: mammals, birds, reptiles, amphibians, fish, and various invertebrates. Within each taxonomic group you can sort species by common name or scientific name.

County Distribution

This column lists the documented county distribution for each species, including extant and historical occurrences. Any occurrences that cross county boundaries are counted for each county. Many older occurrence records and specimen collections are only known from vague location information and the area mapped as the potential area of observation may be quite large, leading to more than one county being counted.

Additions and Deletions

Species that have been added to or deleted from the SOC list due to changes in their state rank are reported in separate sections below; changes in global ranks are not tracked in this report.

Heritage Program Ranks

The international network of Natural Heritage Programs employs a standardized ranking system to denote **global** (range-wide) and **state** status (NatureServe 2006). Species are assigned numeric ranks ranging from 1 (highest risk, greatest concern) to 5 (demonstrably secure, least concern), reflecting the relative degree of risk to the species' viability, based upon available information. Global ranks are assigned by scientists at NatureServe (the international affiliate organization for the heritage network) in consultation with biologists in the natural heritage programs and other taxonomic experts.

A number of factors are considered in assigning state ranks — population size, area of occupancy in Montana, short and long-term population trends, threats, intrinsic vulnerability, and specificity to environment. Based on these factors, a preliminary rank is calculated and is reviewed by members of the Montana Chapter of the Wildlife Society and Montana Chapter of the American Fisheries Society or other key experts. A committee of biologists from MNHP and MFWP then review these rankings for consistent documentation and application of the criteria. Detailed documentation of the criteria and assessment process are available on the MTNHP website at: **http://mtnhp.org/animal/2004_SOC_Criteria.pdf**

Among other things, the combination of global and state ranks often helps describe the proportion of a species' range and/or total population occurring in Montana. For instance, a rank of G3 S3 often indicates that Montana comprises most or a very significant portion of an animal's total population. In contrast, an animal ranked G5 S1 often occurs in Montana at the periphery of its much larger range; thus, the state supports a relatively small portion of its total population.

Rank		Definition
G1	**S1**	At high risk because of **extremely limited** and/or **rapidly declining** population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
G2	**S2**	At risk because of **very limited** and/or **potentially declining** population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.
G3	**S3**	Potentially at risk because of **limited** and/or **declining** numbers, range and/or habitat, even though it may be abundant in some areas.
G4	**S4**	Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining.
G5	**S5**	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
GX	**SX**	Presumed Extinct or Extirpated - Species is believed to be extinct throughout its range or extirpated in Montana. Not located despite intensive searches of historical sites and other appropriate habitat, and small likelihood that it will ever be rediscovered.
GH	**SH**	Historical, known only from records usually 40 or more years old; may be rediscovered.
GNR	**SNR**	Not Ranked as of yet.
GU	**SU**	Unrankable - Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNA	**SNA**	A conservation status rank is not applicable for one of the following reasons: 1) The taxa is of Hybrid Origin; is Exotic or Introduced; is Accidental or 2) is Not Confidently Present in the state. (see other codes below)

Combination or Range Ranks

G#G# or **S#S#** Indicates a range of uncertainty about the status of the species.
e.g. G1G3 = Global Rank ranges between G1 and G3 inclusive

Sub-rank

T# Rank of a subspecies or variety. Appended to the global rank of the full species, *e.g. G4T3*

Qualifiers

Q **Questionable** taxonomy that may reduce conservation priority-Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. Appended to the global rank, *e.g. G3Q*

? **Inexact Numeric Rank** - Denotes uncertainty; inexactness.

A **Accidental** - Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the few occasions they were recorded.

B **Breeding** - Rank refers to the breeding population of the species in Montana. Appended to the state rank, *e.g. **S2B,S5N** = At risk during breeding season, but common in the winter*

N **Nonbreeding** - Rank refers to the non-breeding population of the species in Montana. Appended to the state rank, *e.g. **S5B,S2N** = Common during breeding season, but at risk in the winter*

M **Migratory** - Species occurs in Montana only during migration.

Federal Status

Designations in this column reflect the status of a species under the U.S. Endangered Species Act (ESA), or as "sensitive" by the U.S. Forest Service (USFS) or Bureau of Land Management (BLM).

U.S. Fish and Wildlife Service (Endangered Species Act)

Status, if any, of a taxon under the federal Endangered Species Act of 1973 (16 U.S.C.A. § 1531-1543 (Supp. 1996)) is noted.

Designation Descriptions

LE	**Listed endangered:** Any species in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)).
LT	**Listed threatened:** Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)).
C	**Candidate:** Those taxa for which sufficient information on biological status and threats exists to propose to list them as threatened or endangered. We encourage their consideration in environmental planning and partnerships; however, none of the substantive or procedural provisions of the Act apply to candidate species.
DM	**Recovered, delisted, and being monitored** - Any previously listed species that is now recovered, has been delisted, and is being monitored.
NL	**Not listed** - No designation.
XE	**Experimental - Essential population** - An experimental population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild.
XN	**Experimental - Nonessential population** - An experimental population of a listed species reintroduced into a specific area that receives more flexible management under the Act.
CH	**Critical Habitat** - The specific areas (I) within the geographic area occupied by a species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.
PS	**Partial status** - status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population, that has a record in the database has USESA status, but the entire species does not.
PS:value	**Partial status** - status in only a portion of the species' range. The value of that status appears in parentheses because the entity with status is not recognized as a valid taxon by Central Sciences (usually a population defined by geopolitical boundaries or defined administratively, such as experimental populations.) For example, Yellow-billed Cuckoo (*Coccyzus americanus*) is ranked **PS:C**. Partial Status - Candidate. Designated as a Candidate in the Western U.S. Distinct Population Segment (DPS) (subspecies *occidentalis*)
BGEPA	**The Bald and Golden Eagle Protection Act of 1940 (BGEPA)** - (16 U.S.C. 668-668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald or golden eagles, including their parts, nests, or eggs. The BGEPA provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The BGEPA defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.
MBTA	**The Migratory Bird Treaty Act (MBTA)** - (16 U.S.C. §§ 703-712, July 3, 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986 and 1989) implements four treaties that provide for international protection of migratory birds. The statute's language is clear that actions resulting in a "taking" or possession (permanent or temporary) of a protected species, in the absence of a U.S. Fish and Wildlife Service (USFWS) permit or regulatory authorization, are a violation of the MBTA. The MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill ... possess, offer for sale, sell ... purchase ... ship, export, import ... transport or cause to be transported ... any migratory bird, any part, nest, or eggs of any such bird .... [The Act] prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." The USFWS maintains a **list of species protected by the MBTA** at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. The USFWS also maintains a **list of species not protected by the MBTA.** MBTA does not protect species that are not native to the United States or species groups not explicitly covered under the MBTA; these include species such as the house (English) sparrow, European starling, rock dove (pigeon), Eurasian collared-dove, and non-migratory upland game birds.
BCC	The 1988 amendment to the Fish and Wildlife Conservation Act mandates the U.S. Fish and Wildlife Service to identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act. **Birds of Conservation Concern 2008 (BCC 2008)** is the most recent effort to carry out this mandate. The overall goal of this report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the Service's highest conservation priorities.

Bureau of Land Management

BLM Sensitive Species are defined by the BLM 6840 Manual as those that normally occur on BLM administered lands for which BLM has the capability to significantly affect the conservation status of the species through management. Such species should be managed to the level of protection required by State laws or under the BLM policy for candidate species, whichever would provide better opportunity for its conservation. The State Director may designate additional categories of special status species as appropriate and applicable to his or her state's needs. The sensitive species designation, for species other than federally listed, proposed, or candidate species, may include such native species as those that:

1. could become endangered in or extirpated from a state, or within a significant portion of its distribution in the foreseeable future.
2. are under status review by the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service,
3. are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution,
4. are undergoing significant current or predicted downward trends in population or density such that federally listed, proposed, candidate, or State listed status may become necessary,
5. have typically small and widely dispersed populations,
6. are inhabiting ecological refugia, specialized or unique habitats, or
7. are State listed but which may be better conserved through application of BLM sensitive species status.

Designation Descriptions

Sensitive	Denotes species listed as sensitive on BLM lands

Special Status Denotes species that are listed as Endangered or Threatened under the Endangered Species Act

U.S. Forest Service

U.S. Forest Service Manual (2670.22) defines Sensitive Species on Forest Service lands as those for which population viability is a concern as evidenced by a significant downward trend in population or a significant downward trend in habitat capacity. The Regional Forester (Northern Region) designates Sensitive species on National Forests in Montana. These designations were last updated in 2007 and they apply only on USFS-administered lands.

Designation Descriptions

Sensitive Listed as a Sensitive Species by USFS Northern Region (R1)

Endangered Listed as Endangered under the Endangered Species Act

Threatened Listed as Threatened under the Endangered Species Act

Acknowledgements

MTNHP and MFWP staff work together on a daily basis to manage information used to evaluate the status of Montana's animal species. We extend our thanks to these individuals and professional biologists that study and work to conserve species across Montana. We also thank a number of private citizens that spend a great deal of their free time contributing valuable information to statewide databases so that species can be better understood and managed.

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For general questions and zoology-related data requests please use the Information Request function on our website (**www.mtnhp.org**) or the general MTNHP contact info below.

Montana Natural Heritage Program
P.O. Box 201800
1515 E. 6th Ave.
Helena, MT 59620-1800

Phone: (406) 444-3290
Fax: (406) 444-0581
E-mail: mtnhp@mt.gov

Citation for data on this website:
Montana Animal Species of Concern Report. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on 2/10/2014, from http://mtnhp.org/SpeciesOfConcern/?AorP=a

APPENDIX F

DEQ Sanitary Survey

April 7, 2011

CITY OF HARLOWTON
ATTN: JEFF SELL
PO BOX 292
HARLOWTON MT 59036

Wheatland County

RE: Sanitary Survey-City of Harlowton PWSID#MT0000240

Dear water system owners:

On April 6, 2011 with the assistance of Ian Reed, I conducted a routine sanitary survey inspection of the City of Harlowton Public Water Supply System, PWSID # MT0000240. Sanitary Surveys are required in the Administrative Rules of Montana (ARM), section 17.38.231 to ensure adequate protection of public health through proper construction and maintenance of Public Water Supplies (PWS). In addition, it allows the PWS system owners/operators to be informed of current regulatory requirements. I would like to thank Ian and staff for their time, assistance and the tour of the entire system.

Harlowton is located in central Montana, along the junction of east-west running US highway 12, and north-south highway US 191 between Big Timber and Lewistown. The town provides services for the agricultural community in the surrounding area. The City of Harlowton has approximately 550 connections and is classified as a community water supply due to the nature of the population served.

The following report contains descriptions of each of the sections of the water system; any deficiencies and/or recommendations are numbered at the end of this report.

Sources:

(WL002) Well 1 Central South- was completed in 1975. Total depth is 921 ft. A copy of the well log is made a part of this report. The well is artesian and overflow exits the well house through a pipe to a drainage south of the building. The well is equipped with a 40 HP submersible pump at around 230 ft. of depth and produces 280 gpm.

(WL003) Well 2 Pritchard- was completed in 1961. Total depth is 1402 ft. A copy of the well log is made a part of this report. The well is artesian, mostly during the winter, and overflow exits the well house through a pipe to a drainage west of the building. The well is equipped with a 50 HP motor and vertical turbine pump extended to 230 ft of depth and produces around 475 gpm.

(WL004) Well 3 Thompson- was completed in 1948. Total depth is 390 ft. A copy of the well log is made a part of this report. The well is equipped with a 35 HP submersible pump at around 175 ft. of depth and produces 400gpm.

The wells all pump directly into the distribution system. All wells have treatment plants associated with them housed either alongside or in the buildings on site.

Source Water:
The Thompson Well, South Well, and the Pritchard Well are all completed in deep bedrock aquifers. The aquifers are recharged in the Little Belt Mountains north of town, where the bedrock formations are exposed. The groundwater is high in total dissolved solids, which is indicative of fairly long residence times in the ground. The Pritchard Well is located on the west side of Harlowton at the intersection of Pritchard and M streets. The well is completed in the Eagle Sandstone Formation. The Thompson well is located north of the city park at the main entrance along the south side of Highway 12; it is completed in the Claggett Shale. The South well is located northeast of the park next to the base of a large ridge of Judith River Sandstone and has multiple completions. *(Excerpts from source water delineation 2003)*

Treatment:
Treatment consists of the following:

(TP001)-Treatment plant for well 1 south central (WL002) includes injection of phosphate for sequestering iron and manganese followed by injection of gas chlorine for disinfection.

(TP002)-Treatment plant for well 2 pritchard (WL003) includes injection of phosphate for sequestering iron and manganese followed by injection of gas chlorine for disinfection.

(TP003)-Treatment plant for well 3 thompson (WL004) includes injection of phosphate for sequestering iron and manganese followed by injection of gas chlorine for disinfection.

Sequestering agent is injected into line leaving pumphouses with positive displacement pumps. Chlorine is ejected using chlorine booster pumps and 150 lb. cylinders at all well sites.

See recommendations regarding treatment process and safety at the end of this report.

Distribution System:
According to engineers reports the distribution system was installed in the early 1930's. The distribution lines range in size from 2 Inch to 10Inch, mostly 6 Inch and consist of Cast Iron, AC, with little PVC. Fire hydrants were discussed during this inspection and the system maintains 60 hydrants that are old and outdated. Flushing on dead end lines and routine flushing occurs regularly with assistance by the local fire department. There are numerous leaks throughout a normal year and water quality suffers due to the poor condition of the distribution system.

See recommendations regarding the distribution system at the end of this report.

Finished Water Storage Reservoirs:
(ST001) Storage Facility 1- appeared to be in acceptable sanitary condition for the safe storage of water. The operators should access the tank regularly to check for and seal any opening in old unused equipment penetrations and hatch covers. The concrete tank is seeping from cracks in the structure and exhibiting signs of potential failure over the entire outer circumference. A project for replacing the tank with an elevated tank and booster station is slated for this construction season. The proposed location is alongside the existing tank.

See recommendations regarding the storage tank(s) and low pressure zone at the end of this report.

Pumps, Pump Facilities and Controls:
The pumps and facilities appeared well cared for and adequately painted and protected. The pump controls are all located within the well houses and protected. The system operates off a dedicated tv cable system that operates from a tank level sensing device located in a valve vault at the tank. The wells all operate when the tank calls for water but in the following order 3-4 minutes apart; Pritchard, Thompson, and South Central. The wells in use are selected for better quality water during the low demand season.

Monitoring/Reporting/Data Verification:
Monitoring and reporting appeared adequate and the database shows no outstanding violations at the time of this survey. A violation for Nitrate and the CCR rule were noted as achieving compliance. Monitoring of chlorine residuals were discussed at the time of this inspection.

Management/Operator Compliance:
The system appears very well managed and certified operators are retained as required. Noticeable improvements to housekeeping and management of infrastructure were noted during this inspection.

Recommendations/Minor Deficiencies:

1. It is recommended that the system take measures to bring the chlorine gas storage and use areas up to current design standards for operator safety and system efficiency. In the interim a Standard Operating Procedure for operator safety should be written and followed while working around chlorine gas equipment. No chlorine gas area or enclosure currently in use at the system has the correct panic door hardware, proper ventilation, leak detection equipment, safety viewing window, proper heating and/or temperature controls, or sealed segregated use/storage area. The system also does not have a cylinder repair kit or Self Contained Breathing Apparatus available. The local fire department is relied on to respond to chlorine emergencies. While buildings such as the Pritchard well house could be easily retrofitted to be compliant; the other two well sites may benefit from a pre-fabricated chlorine enclosure to alleviate the safety concerns. In addition, the efficiency of utilizing the entire product in a 150# cylinder is normally achieved with the use of automatic switchover devices present to allow a bottle to empty and switch to a full bottle without interruption of service or operator estimation and presence. The above items may be viewed as maintenance items if repaired and the system is encouraged to work with the Departments review engineer, Matt Waite 406-247-4455 to determine necessary corrective action and approval in accordance with DEQ Circular 1, Standards for Water Works.

2. It is recommended that the Goodyear brand rubber hose in use for flexible line on the chlorine booster pumps be replaced with hose that is NSF approved for use with potable water. It is unclear if the hose is NSF approved and longevity is questionable. NSF approved hose for that pressure rating is available through local suppliers.

3. It is recommended that the system continue to prioritize the distribution system for replacement projects. The distribution system is quite old and increasing the pressure with the new storage tank may identify numerous problem areas in need of attention.

4. It is recommended that the storage tank be replaced as planned however attention should be given to demolition of the old tank as well as security or fencing of the new tank. Unauthorized access and vandalism of the old tank has been recently documented. Consideration should also be given to educating customers with individual booster pumps on the distribution system that pressure is adequate with the new tank and private booster and individual residence pumps should be removed to reduce the risk of backflow contamination events. Note that DEQ standards prohibit the use of individual booster pumps.

5. It was noted that irrigation for the park area and filling from a hydrant for bulk sales may be lacking the proper backflow prevention equipment required. Take measures to work with local pipe and plumbing suppliers and the Department to obtain proper backflow prevention assemblies for these and other connections if required. A cut sheet of a device recommended for a wash-down hose line noted at one of the pump houses has been made a part of this report.

Recommendations/Minor Deficiencies continued:

6. It was discussed that chlorine residuals are hard to maintain and tend to fluctuate. The Department agrees with the operator that gas chlorine feed is affected by the bottle temperature and upgrading the gas storage areas would help this public health concern however it also may be a function of not meeting proper breakpoint chlorination during disinfection of the water. A fact sheet to assist the operator has been made a part of this report. Measuring free and total chlorine residual was discussed.

Significant Deficiencies:

Important note: Significant deficiencies can be defined as a defective water supply component(s) having or likely to have an adverse influence on public health. Significant deficiencies require immediate corrective action in efforts to protect consumers. Documentation of the corrective action is required i.e.; photos of the correction and a letter signed by the operator in responsible charge. Future monitoring waivers will not be issued and current-monitoring waivers can be revoked if significant deficiencies are not corrected and documentation is not received by the inspector.

No significant deficiencies were noted.

In conclusion, the water system at the City of Harlowton appears to be in acceptable condition.

If you have any questions, comments, or corrections regarding this report, please feel free to contact me at 247-4444.

Sincerely,

Karl Carlson
Water Quality Specialist
MT. Dept. of Environmental Quality
Billings Regional Office
(406) 247-4444
kcarlson2@mt.gov

Attachments: Sanitary Survey Form w/topo map
Well Logs
Cut Sheets
-Hose bib Vacuum Breakers
-Breakpoint chlorination curve sheet
System Photos

Cc: Ian Reed (operator) 2008 and current reports copies
Wheatland County Sanitarian w/o attachments
Billings PWS File
Sanitary Survey File (Helena)

Sanitary Survey Pictures
City of Harlowton 3-6-2011
PWSIDMT#0000240

(WL002) Well 1 Central-Building

(WL002) Well 1 Central-Treatment (TP001) phosphate addition

(WL002) Well 1 Central-artesian overflow

(WL002) Well 1 Central-Treatment (TP001) disinfection

(WL002) Well 1 Central-well head

(WL002) Well 1 Central-chlorine gas enclosure

Sanitary Survey Pictures
City of Harlowton 3-6-2011
PWSIDMT#0000240

(WL003) Well 2 Pritchard-Building

(WL003) Well 2 Pritchard-Treatment (TP002) disinfection

(WL003) Well 2 Pritchard-Well head

(WL003) Well 2 Pritchard- Treatment (TP002) disinfection

(WL003) Well 2 Pritchard-Treatment (TP002) phosphate

(WL003) Well 2 Pritchard-chlorine gas enclosure

Sanitary Survey Pictures
City of Harlowton 3-6-2011
PWSIDMT#0000240

(WL004) Well 3 Thompson-Building

(WL004) Well 3 Thompson-Treatment (TP003) disinfection

(WL004) Well 3 Thompson-Well Head

(WL004) Well 3 Thompson-chlorine gas enclosure

(WL004) Well 3 Thompson-Treatment (TP003) phosphate

Sanitary Survey Pictures
City of Harlowton 3-6-2011
PWSIDMT#0000240

Storage facility 1 (ST001)-poor condition

Storage facility 1 (ST001)-valve vault w/contols

Storage facility 1 (ST001)-vents

Storage facility 1 (ST001)-hatch

SANITARY SURVEY FORM - INVENTORY

2/2/2005

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

DATE OF SURVEY **4/6/2011** | COUNTY **Wheatland** | SURVEYOR NAME –**Karl Carlson**

(SYSTEM REPRESENTATIVE) **Ian Reed** | (OTHER REPRESENTATIVE) **Geraldine Hensel**

SYSTEM ADDRESS – ADMINISTRATIVE CONTACT

Addressee Jeff Sell

Primary Address

Street PO BOX 292 _____

City Harlowton State MT Zip 59036

System Phone (406)632-5523 Fax (_____) _____

SYSTEM OWNER

Addressee City of Harlowton

Owners Address

Street PO BOX 292

City Harlowton State MT Zip 59036

Owner Phone (406) 632-5523 Fax (_____) _____

LOCATION OF SYSTEM

Nearest City Harlowton Description or Physical Address Intersection of Highway 12 and Highway 191

☐ seasonal operation dates:_____to_____

☒ year round operation

OPERATOR OF SYSTEM

Name Ian Reed

Certified Operator? ☒ Yes ☐ No ☐ Not required

Copy of Certificate? ☒ Yes ☐ No Certification # 7490

Phone # (406) 632-5523 Cell Phone # (406)240-1667

Fax # (_____) _____

ALTERNATE OPERATOR OF SYSTEM

Name Bob Schuchard-6619, Matt Hagl-7485

Certified Operator? ☐ Yes ☐ No ☐ Not required

Copy of Certificate? ☐ Yes ☐ No Certification # _____

Phone # (_____) _____ Cell Phone # (_____) _____

SYSTEM STATUS

☒ **A** = Active ☐ **P** = Pending *(Add New System)*

☐ **I** = Inactive

SYSTEM CLASS

☒ **C** = Community

☐ **NTNC** = Non-Transient Non-Community

☐ **TNC** = Transient Non-Community

Total Service Connections: Residential / Non-Transient: 548 Transient:_____

Total Active Connections: Residential / Non-Transient: 548 Transient: _____

Service Connections Metered? ☐ Yes ☒ No

Percent Metered 98 %

Resident Population 1050
(Number of permanent residents utilizing PWS daily)

Non-Transient Population _____
(Maximum number of non-transient persons utilizing PWS daily)

Transient Population _____
(Maximum number of transient persons served by PWS daily)

OWNER TYPE

☐ 1 Federal Government

☐ 2 Private Subdivision, Investor, Trust, Cooperative, Water Association, etc.

☐ 3 State Government

☒ 4 Local Government Authority, Commission, District, Municipality, City, etc.

☐ 5 Mixed Public/Private

☐ 6 Native American

SERVICE AREA CHARACTERISTICS LIST

☐ BR Bar
☐ DC Day Care Center
☐ DI Dispenser
☐ HS Head Start
☐ HA Homeowners Assoc.
☐ HM Hotel/Motel
☐ HR Highway Rest Area
☐ IA Industrial/Agricultural
☐ IC Interstate Carrier
☐ IN Institution
☐ MF Medical Facility
☐ MH Mobile Home Park
☒ MU Municipality
☐ OA Other Area
☐ ON Other Non-Transient Area (_____Average Daily Visitors TNC)
☐ OR Other Residential Area
☐ OT Other Transient Area

☐ PA Recreation Areas
☐ RA Residential Area
☐ RE Retail Employees
☐ RS Restaurant
☐ RV RV Park
☐ SC School
☐ SI Sanitary Improvement District
☐ SK Summer Camp
☐ SR Secondary Residences
☐ SS Service Station
☐ SU Subdivision
☐ WBWater Bottler
☐ WH Wholesaler (Sells Water)

Service Category Description Municipality of Harlowton

Comments: Harlowton is located in central Montana, along the junction of east-west running US highway 12, and north-south highway US 191 between Big Timber and Lewistown. The town provides services for the agricultural community in the surrounding area. The City of Harlowton has approximately 550 connections and is classified as a community water supply due to the nature of the population served.

SANITARY SURVEY FORM – WATER SYSTEM FACILITIES

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (i.e. source facility numbering starts with 002 and all non-source facilities start with 001). See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered *A*ctive, this includes systems that are seasonal. *I*nactive sources are those which are shut down but can return to active status, such as a system out of business. *P*roposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

***A water source facility** is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water:*

Total Number of Source Facilities 3

WATER SYSTEM FACILITIES SUMMARY (WSF)

WSF ID	Facility Name	Water Type Code	Purchased	Seller PWSID	Activity Status*
DS 001	Distribution System				
			☐ Yes ☐ No		
			☐ Yes ☐ No		
WL002	Well 1 Central	GW	☐ Yes ☒ No		A
TP001	Treatment Plant for well 1		☐ Yes ☐ No		A
			☐ Yes ☐ No		
WL003	Well 2 Prichard	GW	☐ Yes ☐ No		A
TP002	Treatment plant for well 2		☐ Yes ☐ No		A
			☐ Yes ☐ No		
WL004	Well 3 Thompson	GW	☐ Yes ☐ No		A
TP003	Treatment plant for well 3		☐ Yes ☐ No		A
			☐ Yes ☐ No		
ST001	Storage Tank		☐ Yes ☐ No		A
			☐ Yes ☐ No		
DS001	Distribution System		☐ Yes ☐ No		A
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		

Description of Water System Facility flow: Well 1 (WL002) to Treatment Plant (TP001) to Distribution (DS001), Well 2 (WL003) to Treatment Plant (TP002) to Distribution (DS001) , Well 3 (WL004) to Treatment Plant (TP003) to Distribution (DS001) to Storage Tank (ST001) to Distribution (DS001)

Example: Well 1 (WL002) to common header (CH001), Well 2 (WL003) to common header (CH001) to treatment plant (TP001) to pressure control assembly (PC001) to distribution system (DS001) to storage tank (ST001) to distribution system (DS001).

*(A)Active, (I)Inactive, (P)Proposed

EMERGENCY POWER

Does the system have emergency power? ☐ Yes ☒ No

If yes, what type: _____ Frequency of testing: _____

Record of primary power failures: _____ in last year Switchover: ☐ Automatic ☐ Manual

Comments: _____

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ (A)ctive ☐ (I)nactive ☐ (P)roposed

WSF ID WL002 *Entry Point ID* 502
These are State assigned identification numbers

Source Name Well 1 Central
Name of Source – Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) **T8N R15E Section 22**

Entry Point Name Entry point for well 1
Name of EP – Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Treatment plant

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production N/A
indicate units

Maximum Production N/A
indicate units

Date Drilled 1975
If well. . date drilled

Casing Size 8
size of casing installed in well

Case Depth 921
depth of casing installed in well

Well Depth 921
depth of well expressed in feet

Grout Depth 721
depth of grout used to seal well walls

Log SWL N/A
(static) expressed in feet below ground elevation

Log PWL N?A
(pumping) expressed in feet below ground elevation

Test Pump Rate flowing well
expressed in gallons per min

Intake Type holes, screen
type of intake mechanism

Screened Interval 208-210, 638-646, 800- 860
expressed in feet below ground elevation

Well Yield N/A
pump tested in gallons per minute

Latitude 46.433661°

Longitude 109.83218°

WELLS

	Yes	No	Unk	N/A
Is well metered?	☒	☐	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☐18 inches above outside ground level;	☐	☐	☐	☒
☐12 inches above finished floor inside well house; and	☒	☐	☐	☐
☐3 feet above 100 year flood elevation?	☐	☐	☒	☐
(Check for appropriate distance)				
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☐	☒	☐	☒
Is well vent properly screened and terminated in a downward position?	☐	☐	☐	☒
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☒	☐	☐	☐
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or fenced)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☒	☐	☐	☐

PUMPS

Type submersible
(example: 30 hp line shaft turbine)
Rated Capacity 40 hp

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? as needed			☐	☐
Are backup pumps/motors provided?	☐	☐	☒	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☒	☐	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☒	☐	☐	☐
Cross connection protection provided?	☐	☐	☐	☒

Comment: This is a flowing well with a closed in pressure of 98psi at the time of completion

Explain Controls: operates off tank level via communication line

Comment: 3rd in order of pump schedule from control

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ (A)ctive ☐ (I)nactive ☐ (P)roposed

WSF ID WL003 *Entry Point ID* 503
These are State assigned identification numbers

Source Name Well 2 Pritchard
Name of Source – Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) **T8N R15E Section 21**

Entry Point Name Entry point for well 2
Name of EP – Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Treatment plant

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production N/A
Indicate units

Maximum Production N/A
Indicate units

Date Drilled 1961
if well. . date drilled

Casing Size 10
size of casing installed in well

Case Depth 1220
depth of casing installed in well

Well Depth 1402
depth of well expressed in feet

Grout Depth unknown
depth of grout used to seal well walls

Log SWL N/A
(static) expressed in feet below ground elevation

Log PWL N/A
(pumping) expressed in feet below ground elevation

Test Pump Rate flowing well
expressed in gallons per min

Intake Type holes by gun
type of intake mechanism

Screened Interval 503-645, 825-858
expressed in feet below ground elevation

Well Yield N/A
pump tested in gallons per minute

Latitude 46.437381°

Longitude 109.85012°

WELLS

	Yes	No	Unk	N/A
Is well metered?	☒	☐	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☐18 inches above outside ground level;	☐	☐	☐	☒
☐12 inches above finished floor inside well house; and	☒	☐	☐	☐
☐3 feet above 100 year flood elevation? (Check for appropriate distance)	☐	☐	☒	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☐	☒	☐	☒
Is well vent properly screened and terminated in a downward position?	☐	☐	☐	☒
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☒	☐	☐	☐
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or fenced)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☒	☐	☐	☐

PUMPS

Type submersible
(example: 30 hp line shaft turbine)
Rated Capacity 50 hp

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? as needed			☐	☐
Are backup pumps/motors provided?	☐	☐	☒	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☒	☐	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☒	☐	☐	☐
Cross connection protection provided?	☐	☐	☐	☒

Comment: This is a flowing well mostly flows in the winter, in the summer it does not recover to flow

Explain Controls: operates off tank level via communication line

Comment: 1st in order of pump schedule from control

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ (A)ctive ☐ (I)nactive ☐ (P)roposed

WSF ID WL004 (These are State assigned identification numbers) *Entry Point ID* 504

Source Name Well 3 Thompson (Name of Source – Example: Well 1 or South well, etc.)

Location of Water Source (TRS or street address) T8N R15E Section 22

Entry Point Name Entry point for well 3 (Name of EP – Example: Entry point for North Well 1 & South Well 2)

Location of Entry Point Treatment plant

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production N/A (Indicate units)

Maximum Production N/A (Indicate units)

Date Drilled 1948 (if well. . date drilled)

Casing Size 10 (size of casing installed in well)

Case Depth 390 (depth of casing installed in well)

Well Depth 390 (depth of well expressed in feet)

Grout Depth unknown (depth of grout used to seal well walls)

Log SWL N/A (static) expressed in feet below ground elevation

Log PWL N/A (pumping) expressed in feet below ground elevation

Test Pump Rate 716gpm (expressed in gallons per min)

Intake Type unknown-open (type of intake mechanism)

Screened Interval _____ (expressed in feet below ground elevation)

Well Yield N/A (pump tested in gallons per minute)

Latitude 46°

Longitude 109°

WELLS

	Yes	No	Unk	N/A
Is well metered?	☒	☐	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☐18 inches above outside ground level;	☐	☐	☐	☒
☐12 inches above finished floor inside well house; and	☒	☐	☐	☐
☐3 feet above 100 year flood elevation? (Check for appropriate distance)	☐	☐	☒	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☐	☒	☐	☒
Is well vent properly screened and terminated in a downward position?	☐	☒	☐	☒
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☒	☐	☐	☐
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or fenced)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☒	☐	☐	☐

PUMPS

Type submersible
(example: 30 hp line shaft turbine)
Rated Capacity 35 hp

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? as needed			☐	☐
Are backup pumps/motors provided?	☐	☐	☒	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☒	☐	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☒	☐	☐	☐
Cross connection protection provided?	☐	☐	☐	☒

Comment: _____

Explain Controls: operates off tank level via communication line

Comment: 2nd in order of pump schedule from control

SANITARY SURVEY FORM - TREATMENT

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

Treatment Objective

- **B** = Disinfection Byproduct Control
- **C** = Corrosion Control
- **D** = Disinfection
- **E** = Dechlorination
- **F** = Iron Removal
- **I** = Inorganics Removal
- **M** = Manganese Removal
- **N** = *No Treatment at Source*
- **O** = Organics Removal
- **P** = Particulate Removal
- **R** = Radionuclides Removal
- **S** = Softening (Hardness Removal)
- **T** = Taste / Odor Control
- **Z** = Other _____

WATER TREATMENT FACILITIES

WSF ID	Treatment Plant Name	Treatment Objectives and Code
TP001	Treatment plant for well 1	F680 M680 D401
TP002	Treatment plant for well 2	F680 M680 D401
TP003	Treatment plant for well 3	F680 M680 D401

WSF ID	Location
	Latitude _____° Longitude _____°
TP001	Latitude 46.433661° Longitude 109.83218°
TP002	Latitude 46.437381° Longitude 109.85012°
TP003	Latitude 46.436174° Longitude 109.83665°
	Latitude _____° Longitude _____°

Treatment plant description: Treatment plants consist of positive displacement feed pumps injecting LPC-5 phosphate for sequestering iron and manganese with chlorine gas for disinfection. Gas is injected using chlorine booster pumps with ejectors at all sites

FOR SYSTEMS EMPLOYING FULL-TIME DISINFECTION

	Yes	No	Unk	N/A
What disinfectant is used? gaseous chlorine 150 lb cylinders				
Is the disinfectant used NSF approved?	☒	☐	☐	☐
Is the amount of disinfectant used recorded? If Yes, amount used: _____lbs/day _____ ppm _____ other (give units)	☒	☐	☐	☐
Is the amount of disinfectant used compared to water pumped to verify concentration?	☒	☐	☐	☐
Is chemical storage adequate and safe? If No, explain _____	☐	☒	☐	☐
Is disinfectant residual being monitored daily?	☒	☐	☐	☐
Are residual reports submitted monthly?	☒	☐	☐	☐
Is the disinfection equipment being operated and maintained properly?	☒	☐	☐	☐
Is operational standby equipment provided?	☒	☐	☐	☐
If not, are critical spare parts on hand?	☒	☐	☐	☐
Has disinfection system been free from failure during the past year – no interruption?	☒	☐	☐	☐

If No, give dates of interruptions _____

Describe provisions for providing contact time between disinfection point and the first point of use: no CT other than the length of distribution pipe to first point of use which is minimal in all cases

IF USING GAS CHLORINATION

	Yes	No	Unk	N/A
Is a manifold provided to allow feeding gas from more than one cylinder?	☐	☒	☐	☐
Is there automatic switchover from cylinder to cylinder?	☐	☒	☐	☐
Are scales provided for weighing of containers?	☒	☐	☐	☐
Are chlorine storage and use areas isolated from other work areas?	☒	☐	☐	☐
Are stored cylinders capped and labeled?	☒	☐	☐	☐
Is room vented to the outdoors with suction located no more than 6 inches above the floor level?	☒	☐	☐	☐
Is vent inlet near the ceiling?	☒	☐	☐	☐
Is room containing chlorination treatment labeled sufficiently (DANGER signs, etc.)?	☒	☐	☐	☐
Is a view port provided into the room storing chlorine?	☐	☒	☐	☐
Is a means of leak detection provided? Type? _____	☐	☒	☐	☐
Is a self-contained breathing apparatus available for use during repair of leaks? Where? Fire Department	☐	☐	☒	☐
Are personnel trained to use apparatus?	☐	☐	☒	☐
Are all doors hinged outward and equipped with panic bars?	☐	☒	☐	☐
Are all gas cylinders restrained near the top and about half way down by chaining to wall or by other means?	☒	☐	☐	☐

Comment: System needs to consider chlorine gas safety at all sites and bring the equipment up to current design standards as needed

SANITARY SURVEY FORM - STORAGE

PWSID MT0000240 | SYSTEM NAME City of Harlowton

COMPLETE ONE SECTION FOR EACH STORAGE FACILITY

Total storage provided? 500,000 gallons | Total treated storage provided 500,000 gallons | Storage provides 1 days of water reserve

STORAGE FACILITY

WSF ID ST001

Location: Description North elevated hill above town, concrete tank

Latitude: 46.439981°

Longitude: 109.83762°

Storage Volume? 500,000 gallons

Year constructed: mid-1940's

Condition: ☐Good ☐Fair ☒Poor

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☒	☐	☐	☐
Is the site protected against flooding?	☒	☐	☐	☐
Is the site protected against trespass/vandalism?	☐	☒	☐	☐
Ladders caged and locked?	☐	☒	☐	☒
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☒	☐	☐	☐
Overflow pad?	☐	☒	☐	☐
Is access hatch sealed properly and locked?	☒	☐	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☐	☐	☒	☐
Is tank protected against icing and corrosion?	☐	☐	☒	☐
Can tank be isolated from system?	☒	☐	☐	☐
Is all treated water storage covered?	☒	☐	☐	☐
Are tanks disinfected after repairs are made?	☐	☐	☒	☐
What is cleaning frequency for tanks? ____				
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☐	☒	☐

____ Date of last inspection ____ By whom

Comments: Tank is in need of replacement, construction of a replacement tank and booster station to serve upper pressure zone is slated for this summer construction season

STORAGE FACILITY

WSF ID ____

Location: Description ____

Latitude. ____

Longitude. ____

Storage Volume? ____ gallons

Year constructed: ____

Condition: ☐Good ☐Fair ☐Poor

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☐	☐	☐	☐
Is the site protected against flooding?	☐	☐	☐	☐
Is the site protected against trespass/vandalism?	☐	☐	☐	☐
Ladders caged and locked?	☐	☐	☐	☐
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☐	☐	☐	☐
Overflow pad?	☐	☐	☐	☐
Is access hatch sealed properly and locked?	☐	☐	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☐	☐	☐	☐
Is tank protected against icing and corrosion?	☐	☐	☐	☐
Can tank be isolated from system?	☐	☐	☐	☐
Is all treated water storage covered?	☐	☐	☐	☐
Are tanks disinfected after repairs are made?	☐	☐	☐	☐
What is cleaning frequency for tanks? ____				
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☐	☐	☐

____ Date of last inspection ____ By whom

Comments: ____

SANITARY SURVEY FORM - MISCELLANEOUS

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

DISTRIBUTION SYSTEM EVALUATION

Distribution description Mostly Cast Iron-2,4,5,8,10 Inch-Some PVC-4,6 Inch, Some AC-3,4,6 Inch

	Yes	No	Unk	N/A
System drawings available?	☒	☐	☐	☐
Accurate As-Built drawing(s) on-site?	☒	☐	☐	☐
Lines adequately sized?	☐	☒	☐	☐
Adequate pressure maintained?	☐	☒	☐	☐
Mains protected from freezing?	☒	☐	☐	☐
Distribution system free of leaks?	☒	☐	☐	☐
Asbestos concrete pipe used?	☒	☐	☐	☐
Fire hydrants?	☒	☐	☐	☐
Dead end lines minimized by looping mains?	☐	☒	☐	☐
Flushing program?	☒	☐	☐	☐
Pressure reducing stations? Number ____	☐	☒	☐	☐
Booster stations? Number ____	☐	☒	☐	☐
Are individual booster pumps on any service lines? (see DEQ-1 8.9.2)	☒	☐	☐	☐
Were cross connections observed?	☐	☒		

Comments: some areas of low pressure near the tank utilize service booster pumps

SAFETY

	Yes	No	Unk	N/A
Were confined spaces observed?	☒	☐	☐	☐
Confined space safety adequate?	☐	☐	☒	☐
Fall risks adequately mitigated?	☒	☐	☐	☐

Describe any confined spaces observed valve pit at tank

Note all safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, lightning protection for pumps, etc.) Numerous safety deficiencies associated with gas chlorine facilities are in need of attention.

MONITORING AND RECORDKEEPING EVALUATION

	Yes	No	Unk	N/A
Does the system have a current Monitoring Schedule?	☒	☐	☐	☐
Bacti monitoring records maintained? (5 years)	☒	☐	☐	☐
Bacti Sample Site Plan submitted?	☒	☐	☐	☐
Familiar with repeat sampling?	☒	☐	☐	☐
Chemical monitoring records maintained? (10 years)	☒	☐	☐	☐
System specific records / plans maintained? (DBP, PB/CU, treatments, waivers, violations, etc.)	☒	☐	☐	☐
Familiar with Public Notice requirements?	☒	☐	☐	☐
Did Surveyor take a bacteriological sample?	☐	☒		

If Yes, date of Sample: _____ Time of Sample: _____

Comments: Regulation summary distributed with Warn brochure and emergency preparedness bookmark

MANAGEMENT

	Yes	No	Unk	N/A
Are there sufficient personnel?	☒	☐	☐	☐
Are operators properly certified?	☒	☐	☐	☐
Are personnel adequately trained?	☒	☐	☐	☐
Is there a current O&M manual on-site?	☐	☐	☒	☐
Is an emergency plan on-site and workable?	☐	☐	☒	☐
Has system addressed concerns from previous sanitary survey(s) or technical visit(s)?	☒	☐	☐	☐
Budget exists?	☒	☐	☐	☐
Does system maintain an emergency fund?	☒	☐	☐	☐
Does system contribute to facility replacement fund?	☒	☐	☐	☐
Are abandoned wells present?	☒	☐	☐	☐
Do abandoned wells appear to be properly abandoned? (see ARM 36.21.670)	☒	☐	☐	☐

Comments: only observed one abandoned well site that appeared properly abandoned some years ago

PWSID MT0000240 | SYSTEM NAME City of Harlowton

The State, or an authorized agent, must conduct sanitary surveys for all public water supply systems in Montana. DEQ believes that periodic sanitary surveys, along with appropriate corrective actions, are indispensable for assuring the long-term quality and safety of drinking water. When properly conducted, sanitary surveys can provide important information on a water system's design and operations and can identify minor and significant deficiencies for correction before they become major problems.

Minor deficiencies do not pose serious health threats. However, corrective action of minor deficiencies can be critical in the long-term operation and safety of a public water system. Minor deficiencies are generally described as suggested or recommended corrections in the letter to system owner(s).

Significant deficiencies can be defined as a defective water supply component(s) having or likely to have an adverse influence on public health. Significant deficiencies require immediate corrective action in efforts to protect consumers.

EPA and ASDWA guidance identifies eight broad components that should be covered in a sanitary survey. Using these eight broad components as a guide, minor and significant deficiencies should be described in the letter to system owner(s).

1) Source
2) Treatment
3) Distribution system
4) Finished water storage
5) Pumps, pump facilities, and controls
6) Monitoring and reporting, and data verification
7) System management and operation
8) Operator compliance with State requirements

With consideration that significant deficiencies may influence regulatory decisions and monitoring requirements, please list all significant deficiencies observed and corrective action(s) taken below.

Comments:

No significant deficiencies

SANITARY SURVEY FORM - DIAGRAMS

PWSID MT0000240 | SYSTEM NAME City of Harlowton

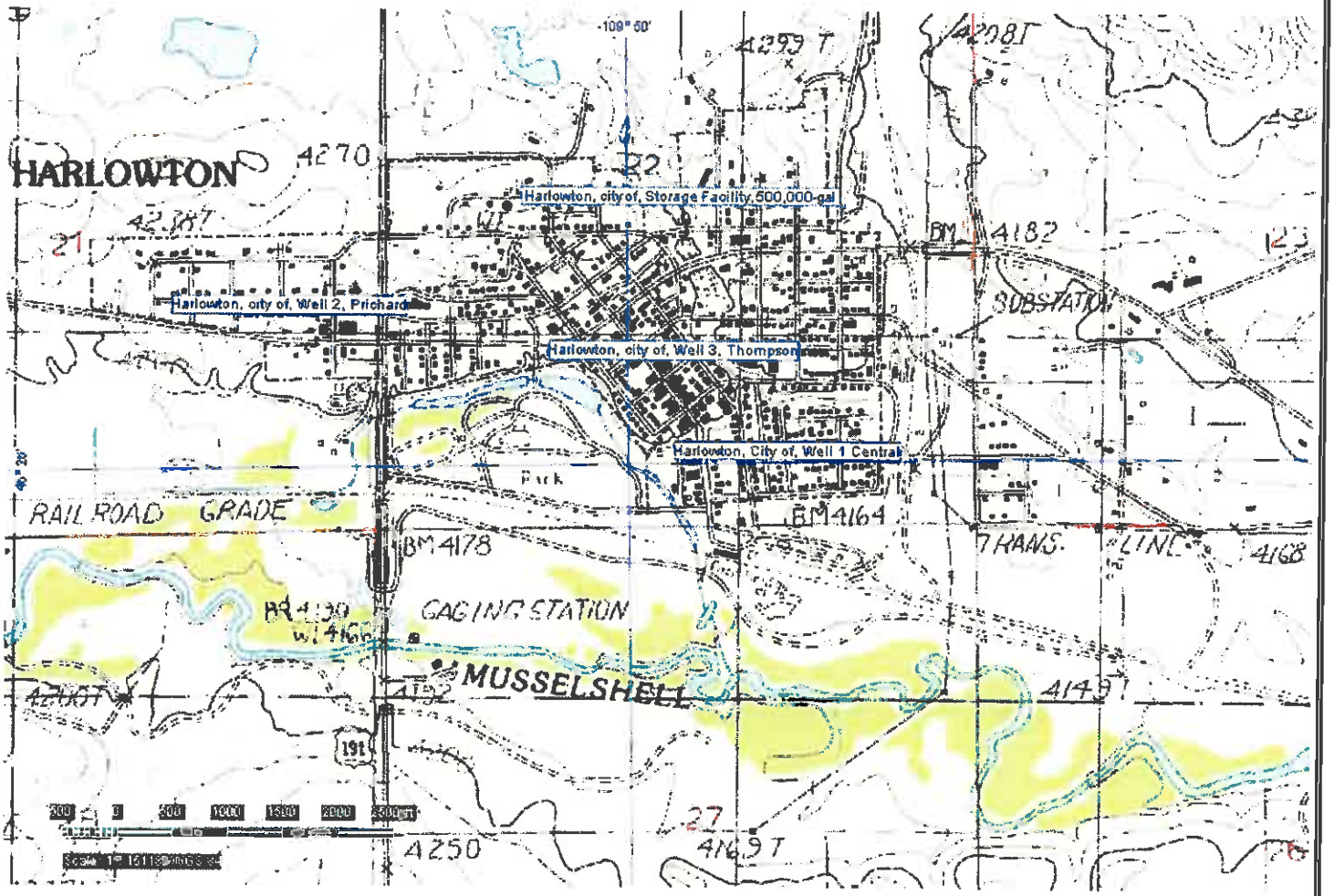
Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc. and label with appropriate facility designation. Include interconnections with other PWS's. Add additional pages as needed.

Draw brief schematic of pumphouse facilities (pressure control assemblies, treatment(s) valves, filters, meters, electrical controls, etc.)

SANITARY SURVEY FORM - DIAGRAMS

PWSID **MT0000240** | SYSTEM NAME **City of Harlowton**

Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc. and label with appropriate facility designation. Include interconnections with other PWS's. Add additional pages as needed.



Draw brief schematic of pumphouse facilities (pressure control assemblies, treatment(s) valves, filters, meters, electrical controls, etc.)

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map

WBN / South Central

WL002

Site Name: CITY OF HARLOWTON WELL 1
GWIC Id: 20853
DNRC Water Right:

Section 1: Well Owner

Owner Name
CITY OF HARLOWTON
Mailing Address

City	State	Zip Code
HARLOWTON	MT	59036

Section 2: Location

Township	Range	Section	Quarter Sections
06N	15E	23	SW¼ NW¼ SW¼ SE¼

County: Golden Valley

Latitude	Longitude	Geomethod	Datum
46 4336	109 8304	MAP	NAD27

Altitude	Method	Datum	Date
4290			

Addition | Block | Lot

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: FORWARD ROTARY

Section 5: Well Completion Date
Date well completed: Wednesday, July 23, 1975

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	104.5	15
104.5	721	11
721	921	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2.5	721.5	8				29 LB STEEL
-1	104.5	12				49 LB STEEL
701	925	6		200.00		STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
208	210	8		36 CALIPER	HOLES
638	646	8		36 CALIPER	HOLES
850	860	6		2/15	HOLES

Annular Space (Seal/Grout/Packer)

Section 7: Well Test Data

Total Depth: 921
Static Water Level:
Closed-in Pressure: 98 psi
Water Temperature:

Pump Test *

Depth pump set for test: _ feet
480 gpm pump rate with _ feet of drawdown after 1.5 hours of pumping
Time of recovery: _ hours
Recovery water level: _ feet
Pumping water level: 107 feet

* *During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
211JDRV - JUDITH RIVER FORMATION (OF MONTANA GROUP)

From	To	Description
0	15	EXISTING SURFACE PIPE
15	21	GRAY SHALE
21	28	TAN SANDSTONE
28	35	GRAY SHALE
35	41	GRAY SANDSTONE
41	199	GRAY SHALE WITH STREAKS OF SILTSTONE
199	205	FIRM GRAY SANDSTONE
205	253	HARD AND BROKEN GRAY SHALE AND SILTSTONE
253	257	HARD GRAY SANDSTONE AND SILTSTONE
257	393	HARD AND BROKEN GRAY SHALE AND SILTSTONE
393	402	HARD GRAY SANDSTONE AND SILTSTONE
402	412	HARD AND BROKEN GREY SILTSTONE
412	490	SOFT GRAY SHALE
490	504	HARD GRAY SANDSTONE AND SILTSTONE
504	555	HARD SANDY SHALE

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name
Company: R & H
License No: WWC 27

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View water quality for this site

well # Richard
WL003
Richard Well

Site Name: CITY OF HARLOWTON - WELL 2
GWIC Id: 20846
DNRC Water Right: W112931 00

Section 1: Well Owner

Owner Name
CITY OF HARLOWTON
Mailing Address

City	State	Zip Code
HARLOWTON	MT	59036

Section 2: Location

Township	Range	Section	Quarter Sections
08N	15E	21	SWX NWX NWX SEX

County: WHEATLAND
Geocode

Latitude	Longitude	Geomethod	Datum
46.4377	109.8499	MAP	WGS27

Altitude	Method	Datum	Date

Addition	Block	Lot
TUCKERS 2ND ADD	5	6

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method

Section 5: Well Completion Date

Date well completed: Sunday, August 13, 1961

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
2	1402	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	257	10				32 LB STEEL
245	751	8				28 LB STEEL
740	1220	7				24 LB STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
603	645	8			GUN
825	858	7			GUN

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well

Section 7: Well Test Data

Total Depth: 1402
Static Water Level:
Water Temperature:

Unknown Test Method *

Yield 1200 gpm.
Pumping water level _ feet
Time of recovery _ hours
Recovery water level _ feet

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
211EGLE - EAGLE SANDSTONE

From	To	Description
0	8	TOP SOIL
8	20	SAND AND GRAVEL
20	45	SANDSTONE WATER
45	208	SAND SHALE AND WATER
208	290	SANDY SHALE AND WATER
290	350	STICKY SHALE
350	395	SHALE
395	503	GRAY SHALE AND SHELLS
503	507	SANDSTONE AND WATER
507	570	GRAYSHALE
570	645	SHALE AND SANDSTONE AND WATER
645	730	GRAY SHALE
730	745	BENTONITE
745	825	SAND AND SHALE AND WATER
825	985	SAND AND SHALE

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name
Company: WHITAKER WELL DRILLING
License No: WWC-240
Date Completed: 8/13/1961

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map

well 3 Thompson
w2004

Thompson well 1

Site Name: CITY OF HARLOWTON #4
GWIC Id: 20648

Section 1: Well Owner

Owner Name
N/A

Section 2: Location

Township	Range	Section	Quarter Sections
7N	15E	22	

County: WHEATLAND

Geocode:

Latitude	Longitude	Geomethod	Datum
46.439835	109.831364	IRS-SEC	NAD83

Altitude	Method	Datum	Date
4110			

Addition: Block: Lot:

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method:

Section 5: Well Completion Data

Date well completed: Thursday, January 01, 1948

Section 6: Well Construction Details

There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	0	10				

There are no completion records assigned to this well.

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well.

Section 7: Well Test Data

Total Depth: 390
Static Water Level:
Water Temperature:

Unknown Test Method *

Yield: 716 gpm
Pumping water level: feet
Time of recovery: hours
Recovery water level: feet

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned
Lithology Data

There are no lithologic details assigned to this well.

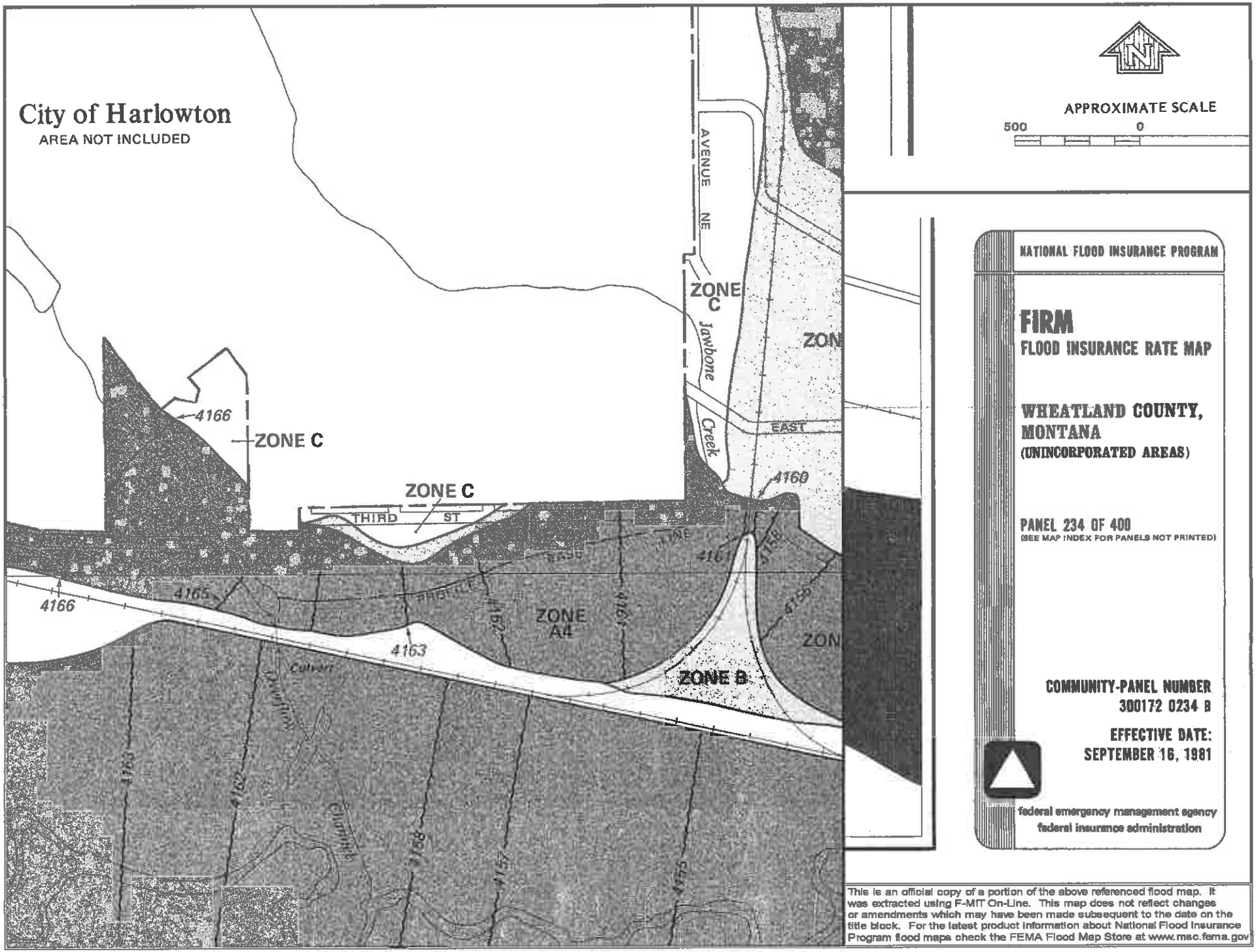
Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company:
License No:
Date Completed: 12/7/1948

APPENDIX G

Flood Insurance Rate Map



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

WHEATLAND COUNTY, MONTANA
(UNINCORPORATED AREAS)

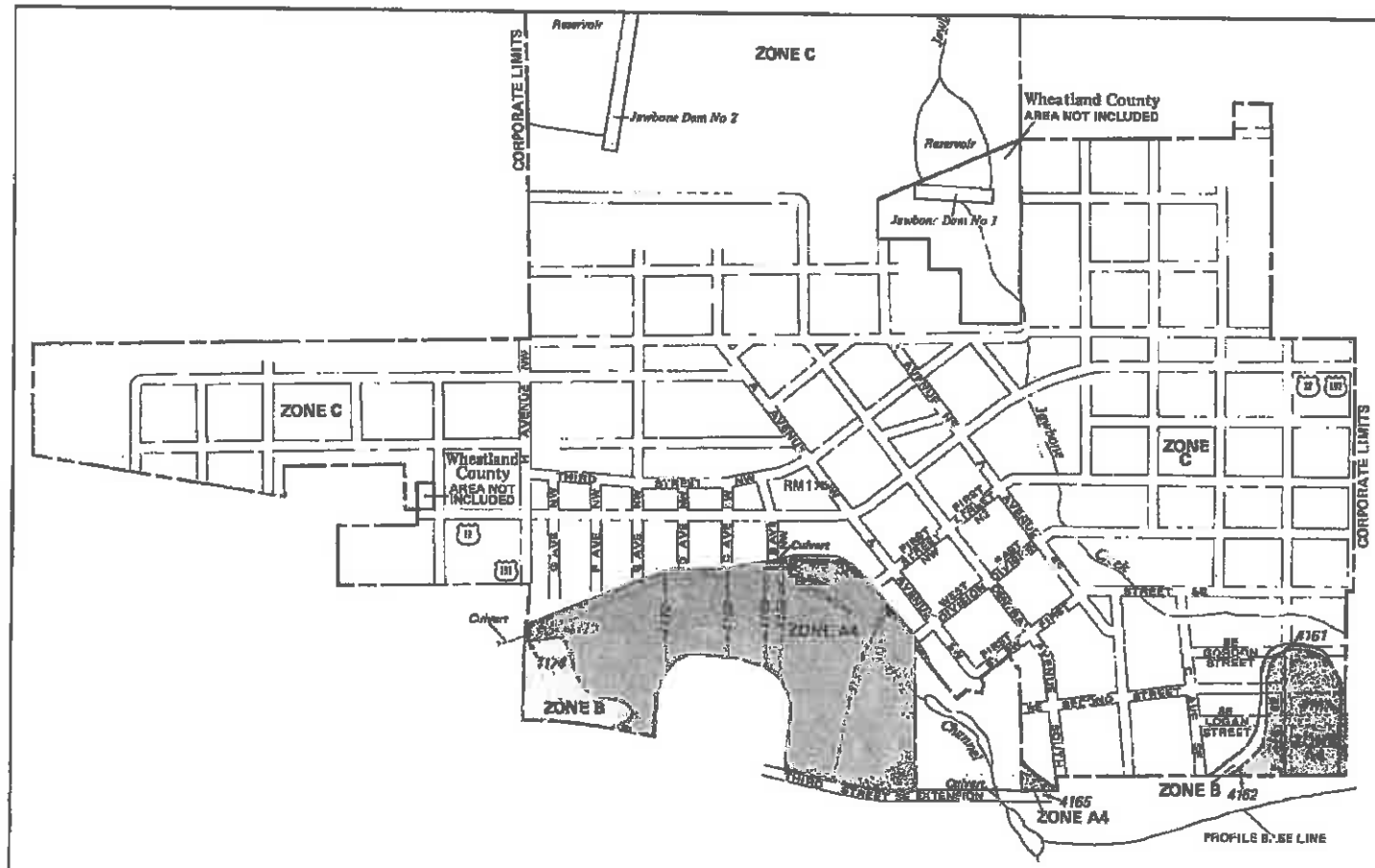
PANEL 234 OF 400
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
300172 0234 B

EFFECTIVE DATE:
SEPTEMBER 16, 1981

federal emergency management agency
federal insurance administration

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



APPROXIMATE SCALE

500 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
HARLOWTON,
MONTANA
WHEATLAND COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
300175 0001 A

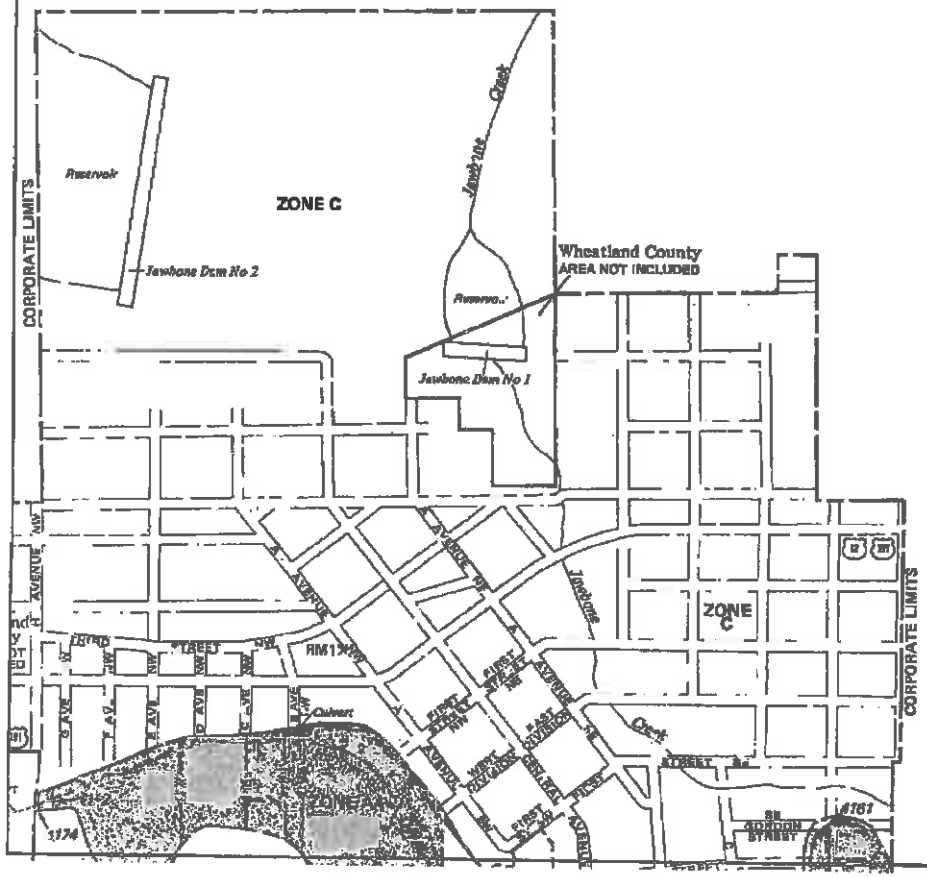
EFFECTIVE DATE:
SEPTEMBER 16, 1981

federal emergency management agency
federal insurance administration

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM1	4217.189	U.S. Geological Survey disk stamped "A 126", set vertically in east wall of county courthouse, 7 feet south of the center of main entrance and approximately 1 foot above ground.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



KEY TO MAP

500-Year Flood Boundary

100-Year Flood Boundary

Zone Designations* With Date of Identification e.g., 12/2/74

100-Year Flood Boundary

500-Year Flood Boundary

ZONE B

ZONE B

Base Flood Elevation Line With Elevation In Feet** 513

Base Flood Elevation In Feet Where Uniform Within Zone** (EL. 987)

Elevation Reference Mark RM7×

River Mile • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
AR	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

APPROXIMATE SCALE

500 0 500 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
HARLOWTON,
MONTANA
WHEATLAND COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
300175 0001 A

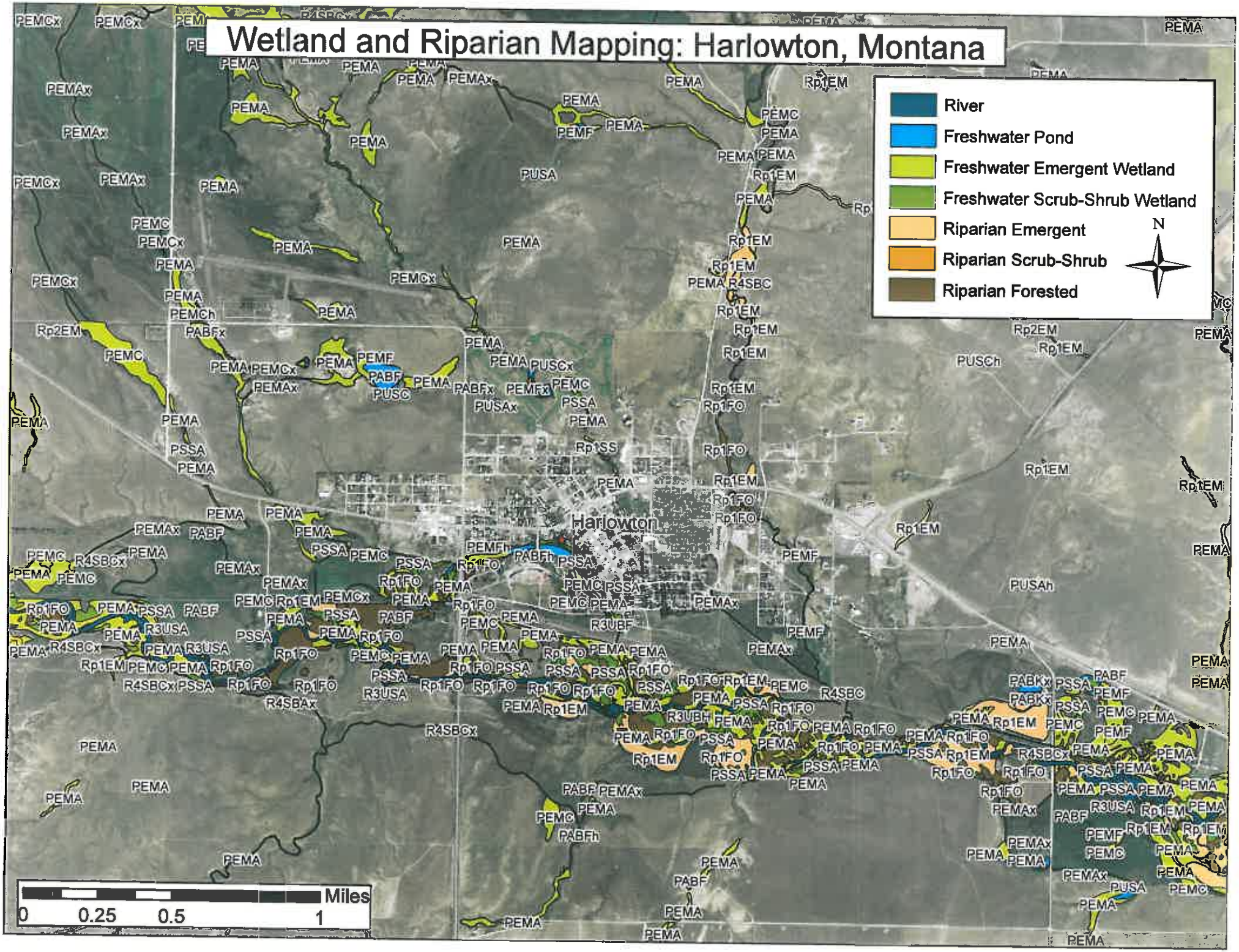
EFFECTIVE DATE:
SEPTEMBER 16, 1981

federal emergency management agency
federal insurance administration

This is an official copy of a portion of the above referenced flood map. It was extracted using FIRMETTE. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX H

Wetlands and Riparian Mapping


Wetland and Riparian Mapping: Harlowton, Montana
River
Freshwater Pond
Freshwater Emergent Wetland
Freshwater Scrub-Shrub Wetland
Riparian Emergent
Riparian Scrub-Shrub
Riparian Forested
N
Harlowton
Miles
0
0.25
0.5
1

U.S. Fish and Wildlife Service

National Wetlands Inventory

USFWS Wetlands Inventory

Jan 14, 2014

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuanne and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

1/14/14 No Wetlands Data available

Kate Miller

From: Kate Miller
Sent: Tuesday, January 14, 2014 2:47 PM
To: 'lsaul@mt.gov'
Subject: wetlands in Harlowton area?

Hi Linda,
I am putting together an environmental assessment for a project in Harlowton and found no wetlands data in the inventory database for USFWS. Does DEQ have any additional information?

Kate Miller, PE | Senior Engineer

Great West Engineering, Inc.
PO Box 4817
2501 Belt View Drive
Helena, MT 59604

DIRECT: 406-495-6154
FAX: 406-449-8631
OFFICE: 406-449-8627
www.greatwesteng.com

APPENDIX I

2015 ACS Census Data and Target Rate Information

COMMUNITY DEVELOPMENT DIVISION

Census and Target Rate 2015 Info

CDD Target Rate Calculation Resource

The Community Development Division (CDD) has updated the U.S. Census Bureau's American Communities Survey (ACS) data set 2011-2015 for the calculation of local government target rates. The Treasure State Endowment Program (TSEP) and Community Development Block Grant (CDBG) programs use ACS information as the base data set to calculate applicant target rates for community infrastructure systems.

These calculated rates, along with other demographic information, are components of the review and analysis of applications submitted to the programs for funding requests. Applications to be submitted in 2018 or later for TSEP or CDBG programs must use the 2015 ACS data for the calculation of target rates for an applicant.

Search below for 2015 American Communities Survey data used to calculate target rates when applying to the **Treasure State Endowment Program** and **Community Development Block Group Grant Program.**

Select a Location:

City/Designated location Harlowton city ▼ **or** County Choose County ▼

City	Harlowton city
County	*Wheatland County*
Total Population	899
Total Households	431
Median Household Income	$29,813
Low & Moderate Income Percent	51.74%
Percent Poverty	16.4 %

Target Rates

Water & Waste Water	$57.14
Water Only	$34.78
WasteWater Only	$22.36
Solid Waste Only	$7.45

Amounts are computed using the 2015 census and target percentage rationale reviewed biennially by Commerce. The target percentages are:

2.3% combined (water and wastewater)

1.4% for water alone
0.9% for wastewater alone
0.3% for solid waste

For example: Community median household income is $25,000 and the residents pay both water and wastewater rates, the calculation would be: $25,000 times 2.3% divided by 12 equals monthly target rate of $47.92. (25,000 x 2.3%)/12 = $47.92)

Having trouble finding data for your community? Some communities may not be listed in the resources above because the American Community Survey (ACS) did not provide 2015 MHI data for those areas. Please contact us at (406) 841-2770 or email **TSEP** or **CDBG** if you have any questions about this information.

Mapping

To see maps of the City/Town/CDP or County in which you are interested, please go to **http://ceic.mt.gov/**. For more information about the maps or tools available, please contact the Census and Economic Information Bureau at (406) 841-2713 or email **ceic@mt.gov**.

Contacts

Treasure State Endowment Program (TSEP)	406 841-2770
Community Development Block Grant Program (CDBG)	406 841-2770
Census & Economic Information Center	406 841-2740

Definitions

Census Designated Place (CDP): Census designated places (CDPs) have been created for each decennial census as the statistical counterparts of incorporated places. CDPs are delineated to provide census data for concentrations of population, housing, and commercial structures that are identifiable by name but are not within an incorporated place. CDP boundaries usually are defined in cooperation with state, local, and tribal officials. These boundaries, which usually coincide with visible features or the boundary of an adjacent incorporated place or other legal entity boundary, have no legal status, nor do these places have officials elected to serve traditional municipal functions.

Household: A household includes all the people who occupy a housing unit as their usual place of residence.

Income of households: This includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not.

Low and Moderate Income Percent: Low and Moderate Income Percent is calculated by U.S. Housing and Urban Development (HUD) using data from the U.S. Census Bureau's Decennial Census, specifically for the Community Development Block Grant Program (CDBG). LMI families are defined as those families whose income does not exceed 80% of the county median income for the previous year or 80% of the median income of the entire non-metropolitan area of the State of Montana, whichever is higher.

Median income: The median income divides the income distribution into two equal groups, one having incomes above the median, and other having incomes below the median.

Notes: Total Population and Total Households are from Summary File (SF) 1, 100% data. Poverty Rates and Median Household Income are from Summary File (SF) 3, Sample data. Low and Moderate Income Percentage was developed by HUD using Census 2010 data.

Sources: U.S. Census Bureau & HUD
Median Household Income
Census Bureau, American Community Survey 2011 - 2015 Estimates

Total Population & Households
U.S. Census Bureau, 2015 Census - Summary File 1 (SF1) 100% Data

APPENDIX J

Water Quality Reports

Drinking Water Branch

Links

Water System Facilities

Sample Schedules

Coliform/Microbial Sample Results

Coliform Sample Summary Results

Lead And Copper Sample Summary Results

Chem/Rad Samples/Results

Chem/Rad Samples/Results by Analyte

Violations/Enforcement Actions

Site Visits

Milestones

Return Links

Water Systems

Water System Search

County Map

Glossary

Water System Details

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

Points of Contact

Name	Job Title	Type	Phone	Address	Email
SCHUCHARD, ROBERT J	STREET & UTILITY OP	OP	406-632-5523	CITY OF HARLOWTON, PO BOX 292, HARLOWTON, MT-59036	Not Available
REED, IAN E	DIR PUBLIC WORKS	OP	406-632-5877	CITY OF HARLOWTON, PO BOX 292, HARLOWTON, MT-59036	ctyharlo@mtintouch.net
REED, IAN E	DIR PUBLIC WORKS	RM	406-632-5877	CITY OF HARLOWTON, PO BOX 292, HARLOWTON, MT-59036	ctyharlo@mtintouch.net
NEWLAND, KATHIE	FINANCIAL CNT	FC	406-632-5523	P O BOX 292, HARLOWTON, MT-59036	ctyharlo@itstriangle.com
PERRY, JEFFERY D	Operator	OP	406-632-5523	CITY OF HARLOWTON, PO BOX 292, HARLOWTON, MT-59036	cityharlo@itstriangle.com
OTTEN, PAUL	MAYOR	AC	406-632-5523	P O BOX 292, HARLOWTON, MT-59036	Not Available

Annual Operating Periods & Population Served

Start Month	Start Day	End Month	End Day	Population Type	Population Served
1	1	12	31	R	1050

Service Connections

Type	Count	Meter Type	Meter Size Measure
CB	577	UM	0

Sources of Water

Service Areas

Name	Type Code	Status
WELL 1 CENTRAL GWIC 20853	WL	A
WELL 2 PRICHARD GWIC 20846	WL	A
WELL 3 THOMPSON GWIC 20848	WL	A
WELL 4 GRAVES	WL	I

Code	Name
R	RESIDENTIAL AREA

Water Purchases

Seller Water System No.	Water System Name	Seller Facility Type	Seller State Asgn ID No.	Buyer Facility Type	Buyer State Asgn ID No.

Drinking Water Branch

Sample Schedules

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

TCR Schedules

Sample Count	Sample Type	Sample Frequency	Effective Begin Date	Effective End Date	Seasonal Start MM/DD	Seasonal End MM/DD	Analyte Code	Analyte Name
2	RT	MN	04-01-2006		1/1	12/31	3100	COLIFORM (TCR)

Total Number of Records Fetched = 1

Frequent Field Sample Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Code	Analyte Name	Days to Monitor per month	Samples Required per day	Effective Begin Date	Effective End Date	Summary Type
TP002	TP FOR WELL 2	0999	CHLORINE	31	1	01-01-2004		SERD
TP003	TP FOR WELL 3	0999	CHLORINE	31	1	01-01-2004		SERD
TP001	TP FOR WELL 1	0999	CHLORINE	31	1	01-01-2004		SERD

Total Number of Records Fetched = 3

Non-TCR Group Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Group Code	Analyte Group Name	Sample Count	Sample Type	Sample Frequency	Effective Begin Date	Effective End Date	Seasonal Start MM/DD	Seasonal End MM/DD
DS001	DISTRIBUTION SYSTEM	ASBE	CDS ASBESTOS	1	RT	9Y	01-01-2002		0/0	0/0
DS001	DISTRIBUTION SYSTEM	DBP2	CDS DBP ST 2	1	RT	YR	11-15-2016		8/1	8/30
DS001	DISTRIBUTION SYSTEM	PBCO	CDS LCR ORTHOPHOSPH	1	RT	YR	07-01-2017		1/1	12/31
DS001	DISTRIBUTION SYSTEM	PBCU	CDS LEAD COPPER ONLY	10	RT	3Y	08-14-2014		6/1	9/30
TP001	TP FOR WELL 1	ARSE	CDS ARSENIC	1	RT	3Y	01-01-1999		1/1	12/31
TP001	TP FOR WELL	PBCO	CDS LCR	1	RT	YR	07-01-		1/1	12/31

	1		ORTHOPHOSPH				2017			
TP001	TP FOR WELL 1	NITR	CDS NITRATE NITRITE	1	RT	YR	01-01-2000		0/0	0/0
TP001	TP FOR WELL 1	GRAL	CDS RAD GROSS ALPHA	1	RT	9Y	01-01-2008		0/0	0/0
TP001	TP FOR WELL 1	COMB	CDS RADIUMS COMBINED	1	RT	9Y	01-01-2008		0/0	0/0
TP001	TP FOR WELL 1	SOC	CDS SOC REGULATED	1	RT	3Y	01-02-2014		0/0	0/0
TP001	TP FOR WELL 1	VOC1	CDS VOC	1	RT	3Y	01-01-2002		1/1	12/31
TP001	TP FOR WELL 1	INO3	CDS W P2-5 INORGANIC	1	RT	9Y	01-01-2011		0/0	0/0
TP001	TP FOR WELL 1	SWW	STATE WIDE WAIVERS	1	RT	9Y	01-01-2020		0/0	0/0
TP002	TP FOR WELL 2	ARSE	CDS ARSENIC	1	RT	3Y	01-01-1999		1/1	12/31
TP002	TP FOR WELL 2	PBCO	CDS LCR ORTHOPHOSPH	1	RT	YR	07-01-2017		1/1	12/31
TP002	TP FOR WELL 2	NITR	CDS NITRATE NITRITE	1	RT	YR	01-01-2000		0/0	0/0
TP002	TP FOR WELL 2	GRAL	CDS RAD GROSS ALPHA	1	RT	9Y	01-01-2008		0/0	0/0
TP002	TP FOR WELL 2	COMB	CDS RADIUMS COMBINED	1	RT	9Y	01-01-2008		0/0	0/0
TP002	TP FOR WELL 2	SOC	CDS SOC REGULATED	1	RT	3Y	01-02-2014		0/0	0/0
TP002	TP FOR WELL 2	VOC1	CDS VOC	1	RT	3Y	01-01-2002		1/1	12/31
TP002	TP FOR WELL 2	INO3	CDS W P2-5 INORGANIC	1	RT	9Y	01-01-2011		0/0	0/0
TP003	TP FOR WELL 3	ARSE	CDS ARSENIC	1	RT	3Y	01-01-2011		0/0	0/0
TP003	TP FOR WELL 3	PBCO	CDS LCR ORTHOPHOSPH	1	RT	YR	07-01-2017		1/1	12/31
TP003	TP FOR WELL 3	NITR	CDS NITRATE NITRITE	1	RT	YR	01-01-2000		0/0	0/0
TP003	TP FOR WELL 3	GRAL	CDS RAD GROSS ALPHA	1	RT	6Y	01-01-2020		0/0	0/0
TP003	TP FOR WELL 3	COMB	CDS RADIUMS COMBINED	1	RT	9Y	01-01-2008		0/0	0/0
TP003	TP FOR WELL 3	SOC	CDS SOC REGULATED	1	RT	3Y	01-02-2014		0/0	0/0
TP003	TP FOR WELL 3	VOC1	CDS VOC	1	RT	3Y	01-01-2002		1/1	12/31
TP003	TP FOR WELL 3	INO3	CDS W P2-5 INORGANIC	1	RT	9Y	01-01-2011		0/0	0/0

Total Number of Records Fetched = 29

Non-TCR Individual Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Code	Analyte Name	Sample Count	Sample Type	Sample Frequency	Effective Begin Date	Effective End Date	Seasonal Start MM/DD	Seasonal End MM/DD

Total Number of Records Fetched = 0

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

****Please note**: some of these violations may have been resolved and/or returned to compliance. Please click on the violation to view more information on its compliance status.**

Group Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Group Code	Analyte Group Name	Water System Facility State Asgn ID	Water System Facility Name
2010-10705	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP003	TP FOR WELL 3
2010-10707	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP002	TP FOR WELL 2
2010-10706	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP001	TP FOR WELL 1
2009-10029	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP003	TP FOR WELL 3
2008-9907	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP003	TP FOR WELL 3
2007-8889	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	null	null
2007-8888	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	null	null
2005-7522	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	DS001	DISTRIBUTION SYSTEM
2005-6057	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2005-4360	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	DS001	DISTRIBUTION SYSTEM
2005-4414	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	DS001	DISTRIBUTION SYSTEM
2005-4415	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	DS001	DISTRIBUTION SYSTEM
2005-4413	V	53	WATER QUALITY PARAMETER M/R (LCR)	PBCQ	CDS LEAD COPPER WQP	DS001	DISTRIBUTION SYSTEM

Total Number of Records Fetched = 13

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2017-50526	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2010-50210	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2008-49108	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2007-45707	V	57	OCCT/SOWT RECOMMENDATION/STUDY (LCR)	5000	LEAD & COPPER RULE	null	null
2006-45606	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2005-45405	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2005-44405	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2005-44605	V	52	FOLLOW-UP OR ROUTINE TAP M/R (LCR)	5000	LEAD & COPPER RULE	null	null
2005-44505	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2004-42204	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
1984-1084	V	03	MONITORING, ROUTINE MAJOR	1050	SILVER	null	null
1984-884	V	03	MONITORING, ROUTINE MAJOR	1040	NITRATE	null	null
1984-784	V	03	MONITORING, ROUTINE MAJOR	1035	MERCURY	null	null
1984-684	V	03	MONITORING, ROUTINE MAJOR	1030	LEAD	null	null
1984-584	V	03	MONITORING, ROUTINE MAJOR	1025	FLUORIDE	null	null
1984-484	V	03	MONITORING, ROUTINE MAJOR	1020	CHROMIUM	null	null
1984-384	V	03	MONITORING, ROUTINE MAJOR	1015	CADMIUM	null	null
1984-284	V	03	MONITORING, ROUTINE MAJOR	1010	BARIUM	null	null
1984-984	V	03	MONITORING, ROUTINE MAJOR	1045	SELENIUM	null	null
1984-184	V	03	MONITORING, ROUTINE MAJOR	1005	ARSENIC	null	null
1981-40481	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null

Total Number of Records Fetched = 21

Drinking Water Branch

Coliform/Microbial Sample Results

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

This list displays results of all microbial analytes (TSAANLYT.TYPE_CODE = MOR) for the last 2 years by default. Sample/Results will be displayed regardless if the sample result is or is not associated to a monitoring period. If you need to search for a specific date range, use the following date fields (you can also pick a date from the pop-up calendar next to the field) and click on Search.

Sample Collection Date From **To** SEARCH

Type	Lab Sample No.	Collection Date & Time	Sampling Point	Sample Location	Presence/ Absence Indicator	Analyte Code	Analyte Name	Monitoring Period Begin Date	Monitoring Period End Date	Laboratory
RT	58306	05-01-2020 10:45:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	05-01-2020	05-31-2020	AQUA TECH LABORATORY
RT	58306	05-01-2020 10:45:00	SP001	SP FOR DS	A	3014	E. COLI	05-01-2020	05-31-2020	AQUA TECH LABORATORY
RT	58307	05-01-2020 10:35:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	05-01-2020	05-31-2020	AQUA TECH LABORATORY
RT	58307	05-01-2020 10:35:00	SP001	SP FOR DS	A	3014	E. COLI	05-01-2020	05-31-2020	AQUA TECH LABORATORY
RT	58158	04-02-2020 09:25:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	04-01-2020	04-30-2020	AQUA TECH LABORATORY
RT	58158	04-02-2020 09:25:00	SP001	SP FOR DS	A	3014	E. COLI	04-01-2020	04-30-2020	AQUA TECH LABORATORY
RT	58159	04-02-2020 09:15:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	04-01-2020	04-30-2020	AQUA TECH LABORATORY
RT	58159	04-02-2020 09:15:00	SP001	SP FOR DS	A	3014	E. COLI	04-01-2020	04-30-2020	AQUA TECH LABORATORY
RT	58033	03-09-2020 09:05:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	03-01-2020	03-31-2020	AQUA TECH LABORATORY
RT	58033	03-09-2020 09:05:00	SP001	SP FOR DS	A	3014	E. COLI	03-01-2020	03-31-2020	AQUA TECH LABORATORY
RT	58034	03-09-2020 09:15:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	03-01-2020	03-31-2020	AQUA TECH LABORATORY
RT	58034	03-09-2020 09:15:00	SP001	SP FOR DS	A	3014	E. COLI	03-01-2020	03-31-2020	AQUA TECH LABORATORY
RT	57834	02-04-2020 13:36:59	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	02-01-2020	02-29-2020	AQUA TECH LABORATORY
RT	57834	02-04-2020 13:36:59	SP001	SP FOR DS	A	3014	E. COLI	02-01-2020	02-29-2020	AQUA TECH LABORATORY
RT	57835	02-04-2020 13:43:59	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	02-01-2020	02-29-2020	AQUA TECH LABORATORY
RT	57835	02-04-2020 13:43:59	SP001	SP FOR DS	A	3014	E. COLI	02-01-2020	02-29-2020	AQUA TECH LABORATORY
RT	57715	01-08-2020 13:24:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	01-01-2020	01-31-2020	AQUA TECH LABORATORY
RT	57715	01-08-2020 13:24:00	SP001	SP FOR DS	A	3014	E. COLI	01-01-2020	01-31-2020	AQUA TECH LABORATORY
RT	57716	01-08-2020 13:31:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	01-01-2020	01-31-2020	AQUA TECH LABORATORY
RT	57716	01-08-2020 13:31:00	SP001	SP FOR DS	A	3014	E. COLI	01-01-2020	01-31-2020	AQUA TECH LABORATORY

RT	57520	12-04-2019 13:44:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	12-01-2019	12-31-2019	AQUA TECH LABORATORY
RT	57520	12-04-2019 13:44:00	SP001	SP FOR DS	A	3014	E. COLI	12-01-2019	12-31-2019	AQUA TECH LABORATORY
RT	57521	12-04-2019 13:30:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	12-01-2019	12-31-2019	AQUA TECH LABORATORY
RT	57521	12-04-2019 13:30:00	SP001	SP FOR DS	A	3014	E. COLI	12-01-2019	12-31-2019	AQUA TECH LABORATORY
RT	57359	11-06-2019 13:30:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	11-01-2019	11-30-2019	AQUA TECH LABORATORY
RT	57359	11-06-2019 13:30:00	SP001	SP FOR DS	A	3014	E. COLI	11-01-2019	11-30-2019	AQUA TECH LABORATORY
RT	57360	11-06-2019 13:37:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	11-01-2019	11-30-2019	AQUA TECH LABORATORY
RT	57360	11-06-2019 13:37:00	SP001	SP FOR DS	A	3014	E. COLI	11-01-2019	11-30-2019	AQUA TECH LABORATORY
RT	57275	10-22-2019 13:31:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	10-01-2019	10-31-2019	AQUA TECH LABORATORY
RT	57275	10-22-2019 13:31:00	SP001	SP FOR DS	A	3014	E. COLI	10-01-2019	10-31-2019	AQUA TECH LABORATORY
RT	57276	10-22-2019 13:25:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	10-01-2019	10-31-2019	AQUA TECH LABORATORY
RT	57276	10-22-2019 13:25:00	SP001	SP FOR DS	A	3014	E. COLI	10-01-2019	10-31-2019	AQUA TECH LABORATORY
RT	57041	09-16-2019 13:30:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	09-01-2019	09-30-2019	AQUA TECH LABORATORY
RT	57041	09-16-2019 13:30:00	SP001	SP FOR DS	A	3014	E. COLI	09-01-2019	09-30-2019	AQUA TECH LABORATORY
RT	57042	09-16-2019 13:37:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	09-01-2019	09-30-2019	AQUA TECH LABORATORY
RT	57042	09-16-2019 13:37:00	SP001	SP FOR DS	A	3014	E. COLI	09-01-2019	09-30-2019	AQUA TECH LABORATORY
RT	56707	08-05-2019 13:25:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	08-01-2019	08-31-2019	AQUA TECH LABORATORY
RT	56707	08-05-2019 13:25:00	SP001	SP FOR DS	A	3014	E. COLI	08-01-2019	08-31-2019	AQUA TECH LABORATORY
RT	56708	08-05-2019 13:31:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	08-01-2019	08-31-2019	AQUA TECH LABORATORY
RT	56708	08-05-2019 13:31:00	SP001	SP FOR DS	A	3014	E. COLI	08-01-2019	08-31-2019	AQUA TECH LABORATORY
RT	56525	07-08-2019 13:33:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	07-01-2019	07-31-2019	AQUA TECH LABORATORY
RT	56525	07-08-2019 13:33:00	SP001	SP FOR DS	A	3014	E. COLI	07-01-2019	07-31-2019	AQUA TECH LABORATORY
RT	56526	07-08-2019 13:38:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	07-01-2019	07-31-2019	AQUA TECH LABORATORY
RT	56526	07-08-2019 13:38:00	SP001	SP FOR DS	A	3014	E. COLI	07-01-2019	07-31-2019	AQUA TECH LABORATORY
RT	56365	06-06-2019 14:05:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	06-01-2019	06-30-2019	AQUA TECH LABORATORY
RT	56365	06-06-2019 14:05:00	SP001	SP FOR DS	A	3014	E. COLI	06-01-2019	06-30-2019	AQUA TECH LABORATORY
RT	56366	06-06-2019 14:00:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	06-01-2019	06-30-2019	AQUA TECH LABORATORY
RT	56366	06-06-2019 14:00:00	SP001	SP FOR DS	A	3014	E. COLI	06-01-2019	06-30-2019	AQUA TECH LABORATORY
RT	56136	05-06-2019 13:40:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	05-01-2019	05-31-2019	AQUA TECH LABORATORY
RT	56136	05-06-2019 13:40:00	SP001	SP FOR DS	A	3014	E. COLI	05-01-2019	05-31-2019	AQUA TECH LABORATORY
RT	56137	05-06-2019 13:46:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	05-01-2019	05-31-2019	AQUA TECH LABORATORY
RT	56137	05-06-2019 13:46:00	SP001	SP FOR DS	A	3014	E. COLI	05-01-2019	05-31-2019	AQUA TECH LABORATORY

RT	56007	04-09-2019 13:55:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	04-01-2019	04-30-2019	AQUA TECH LABORATORY
RT	56007	04-09-2019 13:55:00	SP001	SP FOR DS	A	3014	E. COLI	04-01-2019	04-30-2019	AQUA TECH LABORATORY
RT	56008	04-09-2019 13:50:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	04-01-2019	04-30-2019	AQUA TECH LABORATORY
RT	56008	04-09-2019 13:50:00	SP001	SP FOR DS	A	3014	E. COLI	04-01-2019	04-30-2019	AQUA TECH LABORATORY
RT	55864	03-19-2019 13:31:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	03-01-2019	03-31-2019	AQUA TECH LABORATORY
RT	55864	03-19-2019 13:31:00	SP001	SP FOR DS	A	3014	E. COLI	03-01-2019	03-31-2019	AQUA TECH LABORATORY
RT	55865	03-19-2019 13:39:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	03-01-2019	03-31-2019	AQUA TECH LABORATORY
RT	55865	03-19-2019 13:39:00	SP001	SP FOR DS	A	3014	E. COLI	03-01-2019	03-31-2019	AQUA TECH LABORATORY
RT	55700	02-14-2019 13:22:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	02-01-2019	02-28-2019	AQUA TECH LABORATORY
RT	55700	02-14-2019 13:22:00	SP001	SP FOR DS	A	3014	E. COLI	02-01-2019	02-28-2019	AQUA TECH LABORATORY
RT	55701	02-14-2019 13:29:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	02-01-2019	02-28-2019	AQUA TECH LABORATORY
RT	55701	02-14-2019 13:29:00	SP001	SP FOR DS	A	3014	E. COLI	02-01-2019	02-28-2019	AQUA TECH LABORATORY
RT	55508	01-09-2019 13:27:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	01-01-2019	01-31-2019	AQUA TECH LABORATORY
RT	55508	01-09-2019 13:27:00	SP001	SP FOR DS	A	3014	E. COLI	01-01-2019	01-31-2019	AQUA TECH LABORATORY
RT	55509	01-09-2019 13:36:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	01-01-2019	01-31-2019	AQUA TECH LABORATORY
RT	55509	01-09-2019 13:36:00	SP001	SP FOR DS	A	3014	E. COLI	01-01-2019	01-31-2019	AQUA TECH LABORATORY
RT	55259	12-03-2018 14:04:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	12-01-2018	12-31-2018	AQUA TECH LABORATORY
RT	55259	12-03-2018 14:04:00	SP001	SP FOR DS	A	3014	E. COLI	12-01-2018	12-31-2018	AQUA TECH LABORATORY
RT	55260	12-03-2018 14:03:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	12-01-2018	12-31-2018	AQUA TECH LABORATORY
RT	55260	12-03-2018 14:03:00	SP001	SP FOR DS	A	3014	E. COLI	12-01-2018	12-31-2018	AQUA TECH LABORATORY
RT	55175	11-13-2018 13:55:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	11-01-2018	11-30-2018	AQUA TECH LABORATORY
RT	55175	11-13-2018 13:55:00	SP001	SP FOR DS	A	3014	E. COLI	11-01-2018	11-30-2018	AQUA TECH LABORATORY
RT	55176	11-13-2018 14:02:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	11-01-2018	11-30-2018	AQUA TECH LABORATORY
RT	55176	11-13-2018 14:02:00	SP001	SP FOR DS	A	3014	E. COLI	11-01-2018	11-30-2018	AQUA TECH LABORATORY
RT	55011	10-15-2018 13:54:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	10-01-2018	10-31-2018	AQUA TECH LABORATORY
RT	55011	10-15-2018 13:54:00	SP001	SP FOR DS	A	3014	E. COLI	10-01-2018	10-31-2018	AQUA TECH LABORATORY
RT	55012	10-15-2018 14:00:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	10-01-2018	10-31-2018	AQUA TECH LABORATORY
RT	55012	10-15-2018 14:00:00	SP001	SP FOR DS	A	3014	E. COLI	10-01-2018	10-31-2018	AQUA TECH LABORATORY
RT	54861	09-24-2018 13:54:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	09-01-2018	09-30-2018	AQUA TECH LABORATORY
RT	54861	09-24-2018 13:54:00	SP001	SP FOR DS	A	3014	E. COLI	09-01-2018	09-30-2018	AQUA TECH LABORATORY
RT	54862	09-24-2018 13:54:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	09-01-2018	09-30-2018	AQUA TECH LABORATORY
RT	54862	09-24-2018 13:54:00	SP001	SP FOR DS	A	3014	E. COLI	09-01-2018	09-30-2018	AQUA TECH LABORATORY

RT	54538	08-08-2018 13:44:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	08-01-2018	08-31-2018	AQUA TECH LABORATORY
RT	54538	08-08-2018 13:44:00	SP001	SP FOR DS	A	3014	E. COLI	08-01-2018	08-31-2018	AQUA TECH LABORATORY
RT	54539	08-08-2018 13:36:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	08-01-2018	08-31-2018	AQUA TECH LABORATORY
RT	54539	08-08-2018 13:36:00	SP001	SP FOR DS	A	3014	E. COLI	08-01-2018	08-31-2018	AQUA TECH LABORATORY
RT	54288	07-09-2018 13:24:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	07-01-2018	07-31-2018	AQUA TECH LABORATORY
RT	54288	07-09-2018 13:24:00	SP001	SP FOR DS	A	3014	E. COLI	07-01-2018	07-31-2018	AQUA TECH LABORATORY
RT	54289	07-09-2018 13:28:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	07-01-2018	07-31-2018	AQUA TECH LABORATORY
RT	54289	07-09-2018 13:28:00	SP001	SP FOR DS	A	3014	E. COLI	07-01-2018	07-31-2018	AQUA TECH LABORATORY
RT	54072	06-05-2018 13:20:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	06-01-2018	06-30-2018	AQUA TECH LABORATORY
RT	54072	06-05-2018 13:20:00	SP001	SP FOR DS	A	3014	E. COLI	06-01-2018	06-30-2018	AQUA TECH LABORATORY
RT	54073	06-05-2018 13:28:00	SP001	SP FOR DS	A	3100	COLIFORM (TCR)	06-01-2018	06-30-2018	AQUA TECH LABORATORY
RT	54073	06-05-2018 13:28:00	SP001	SP FOR DS	A	3014	E. COLI	06-01-2018	06-30-2018	AQUA TECH LABORATORY

Total Number of Records Fetched = 96

Drinking Water Branch

Lead and Copper Sample Summary Results

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

This list displays Lead and Copper Sample Summary Results for the last 2 years by default. If you need to search for a specific date range, use the following date fields (you can also pick a date from the pop-up calendar next to the field) and click on Search.

Monitoring Period Begin Date From **To**

SEARCH

Data Quality Code	Monitoring Period Begin Date	Monitoring Period End Date	Number of Samples	Measure (mg/l)	Water System Facility State Asgn ID No.	Date Summary Received	Analyte
A	01-01-2015	12-31-2017	10	.248	DS001		Copper
A	01-01-2015	12-31-2017	10	.004	DS001		Lead

Total Number of Records Fetched = 2

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20020123-001A	**Collection Date :**	02-03-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
4006	COMBINED URANIUM	200.8	N	MRL	.0003 MG/L	0.0006 MG/L		

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20020123-001B	**Collection Date :**	02-03-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
4000	GROSS ALPHA, EXCL. RADON & U	900	N	MRL	2 PCI/L	4.0 PCI/L	01-01-2020	12-31-2025
4002	GROSS ALPHA, INCL. RADON & U	900	N	MRL	2 PCI/L	4.0 PCI/L		

Total Number of Records Fetched = 2

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001A	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1005	ARSENIC	200.8	Y	MRL	.001 MG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001B	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2020	12-31-2020

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001C	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2031	DALAPON	515.4	Y	MRL	2.5 UG/L		01-01-2020	12-31-2022
2040	PICLORAM	515.4	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2041	DINOSEB	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2105	2,4-D	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2106	2,4-DB	515.4	Y	MRL	1 UG/L			
2110	2,4,5-TP	515.4	Y	MRL	.25 UG/L		01-01-2020	12-31-2022
2206	DICHLORPROP	515.4	Y	MRL	1 UG/L			
2326	PENTACHLOROPHENOL	515.4	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2440	DICAMBA	515.4	Y	MRL	1 UG/L			

Total Number of Records Fetched = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001D	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2005	ENDRIN	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2010	BHC-GAMMA	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2015	METHOXYCHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2020	TOXAPHENE	525.2	Y	MRL	2 UG/L		01-01-2020	12-31-2022
2035	DI(2-ETHYLHEXYL) ADIPATE	525.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2037	SIMAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2039	DI(2-ETHYLHEXYL) PHTHALATE	525.2	Y	MRL	.6 UG/L		01-01-2020	12-31-2022
2042	HEXACHLOROCYCLOPENTADIENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2045	METOLACHLOR	525.2	Y	MRL	.1 UG/L			
2050	ATRAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2051	LASSO	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2065	HEPTACHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2067	HEPTACHLOR EPOXIDE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2070	DIELDRIN	525.2	Y	MRL	.1 UG/L			
2076	BUTACHLOR	525.2	Y	MRL	.1 UG/L			
2077	PROPACHLOR	525.2	Y	MRL	.1 UG/L			
2274	HEXACHLOROBENZENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2306	BENZO(A)PYRENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2356	ALDRIN	525.2	Y	MRL	.1 UG/L			
2383	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	525.2	Y	MRL	.5 UG/L			
2388	AROCLOR 1016	525.2	Y	MRL	.08 UG/L			
2390	AROCLOR 1221	525.2	Y	MRL	2 UG/L			
2392	AROCLOR 1232	525.2	Y	MRL	.5 UG/L			
2394	AROCLOR 1242	525.2	Y	MRL	.3 UG/L			
2396	AROCLOR 1248	525.2	Y	MRL	.1 UG/L			
2398	AROCLOR 1254	525.2	Y	MRL	.1 UG/L			
2400	AROCLOR 1260	525.2	Y	MRL	.2 UG/L			
2595	METRIBUZIN	525.2	Y	MRL	.1 UG/L			
2959	CHLORDANE	525.2	Y	MRL	1 UG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 29

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001E	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2030	P-ISOPROPYLTOLUENE	524.2	Y	MRL	.5 UG/L			
2210	CHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2212	DICHLORODIFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2214	BROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2216	CHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2218	TRICHLOROFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2246	HEXACHLOROBUTADIENE	524.2	Y	MRL	.5 UG/L			
2248	NAPHTHALENE	524.2	Y	MRL	.5 UG/L			
2378	1,2,4-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2380	CIS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2408	DIBROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2410	1,1-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2412	1,3-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2413	1,3-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2414	1,2,3-TRICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2416	2,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2418	1,2,4-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2420	1,2,3-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2422	N-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2424	1,3,5-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2426	TERT-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2428	SEC-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2430	BROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2941	CHLOROFORM	524.2	Y	MRL	.5 UG/L			
2942	BROMOFORM	524.2	Y	MRL	.5 UG/L			
2943	BROMODICHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2944	DIBROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2950	TTHM	524.2	Y	MRL	.5 UG/L			
2955	XYLENES, TOTAL	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2964	DICHLOROMETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2965	O-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2966	P-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2967	M-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2968	O-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2969	P-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2976	VINYL CHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2977	1,1-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2978	1,1-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2979	TRANS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2980	1,2-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2981	1,1,1-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2982	CARBON TETRACHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022

2983	1,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2984	TRICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2985	1,1,2-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2986	1,1,1,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2987	TETRACHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2988	1,1,2,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2989	CHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2990	BENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2991	TOLUENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2992	ETHYLBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2993	BROMOBENZENE	524.2	Y	MRL	.5 UG/L			
2994	ISOPROPYLBENZENE	524.2	Y	MRL	.5 UG/L			
2996	STYRENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2997	O-XYLENE	524.2	Y	MRL	.5 UG/L			
2998	N-PROPYLBENZENE	524.2	Y	MRL	.5 UG/L			

Total Number of Records Fetched = 57

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-001F	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2021	CARBARYL	531.1	Y	MRL	1 UG/L			
2022	METHOMYL	531.1	Y	MRL	1 UG/L			
2036	OXAMYL	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2043	ALDICARB SULFOXIDE	531.1	Y	MRL	1 UG/L			
2044	ALDICARB SULFONE	531.1	Y	MRL	1 UG/L			
2046	CARBOFURAN	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2047	ALDICARB	531.1	Y	MRL	1 UG/L			
2066	3-HYDROXYCARBOFURAN	531.1	Y	MRL	1 UG/L			

Total Number of Records Fetched = 8

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002A	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1005	ARSENIC	200.8	Y	MRL	.001 MG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002B	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	N	MRL	.01 MG/L	0.01 MG/L	01-01-2020	12-31-2020

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002C	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2031	DALAPON	515.4	Y	MRL	2.5 UG/L		01-01-2020	12-31-2022
2040	PICLORAM	515.4	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2041	DINOSEB	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2105	2,4-D	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2106	2,4-DB	515.4	Y	MRL	1 UG/L			
2110	2,4,5-TP	515.4	Y	MRL	.25 UG/L		01-01-2020	12-31-2022
2206	DICHLORPROP	515.4	Y	MRL	1 UG/L			
2326	PENTACHLOROPHENOL	515.4	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2440	DICAMBA	515.4	Y	MRL	1 UG/L			

Total Number of Records Fetched = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002D	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2005	ENDRIN	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2010	BHC-GAMMA	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2015	METHOXYCHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2020	TOXAPHENE	525.2	Y	MRL	2 UG/L		01-01-2020	12-31-2022
2035	DI(2-ETHYLHEXYL) ADIPATE	525.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2037	SIMAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2039	DI(2-ETHYLHEXYL) PHTHALATE	525.2	Y	MRL	.6 UG/L		01-01-2020	12-31-2022
2042	HEXACHLOROCYCLOPENTADIENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2045	METOLACHLOR	525.2	Y	MRL	.1 UG/L			
2050	ATRAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2051	LASSO	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2065	HEPTACHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2067	HEPTACHLOR EPOXIDE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2070	DIELDRIN	525.2	Y	MRL	.1 UG/L			
2076	BUTACHLOR	525.2	Y	MRL	.1 UG/L			
2077	PROPACHLOR	525.2	Y	MRL	.1 UG/L			
2274	HEXACHLOROBENZENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2306	BENZO(A)PYRENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2356	ALDRIN	525.2	Y	MRL	.1 UG/L			
2383	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	525.2	Y	MRL	.5 UG/L			
2388	AROCLOR 1016	525.2	Y	MRL	.08 UG/L			
2390	AROCLOR 1221	525.2	Y	MRL	2 UG/L			
2392	AROCLOR 1232	525.2	Y	MRL	.5 UG/L			
2394	AROCLOR 1242	525.2	Y	MRL	.3 UG/L			
2396	AROCLOR 1248	525.2	Y	MRL	.1 UG/L			
2398	AROCLOR 1254	525.2	Y	MRL	.1 UG/L			
2400	AROCLOR 1260	525.2	Y	MRL	.2 UG/L			
2595	METRIBUZIN	525.2	Y	MRL	.1 UG/L			
2959	CHLORDANE	525.2	Y	MRL	1 UG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 29

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002E	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2030	P-ISOPROPYLTOLUENE	524.2	Y	MRL	.5 UG/L			
2210	CHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2212	DICHLORODIFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2214	BROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2216	CHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2218	TRICHLOROFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2246	HEXACHLOROBUTADIENE	524.2	Y	MRL	.5 UG/L			
2248	NAPHTHALENE	524.2	Y	MRL	.5 UG/L			
2378	1,2,4-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2380	CIS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2408	DIBROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2410	1,1-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2412	1,3-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2413	1,3-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2414	1,2,3-TRICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2416	2,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2418	1,2,4-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2420	1,2,3-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2422	N-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2424	1,3,5-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2426	TERT-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2428	SEC-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2430	BROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2941	CHLOROFORM	524.2	Y	MRL	.5 UG/L			
2942	BROMOFORM	524.2	Y	MRL	.5 UG/L			
2943	BROMODICHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2944	DIBROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2950	TTHM	524.2	Y	MRL	.5 UG/L			
2955	XYLENES, TOTAL	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2964	DICHLOROMETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2965	O-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2966	P-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2967	M-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2968	O-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2969	P-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2976	VINYL CHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2977	1,1-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2978	1,1-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2979	TRANS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2980	1,2-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2981	1,1,1-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2982	CARBON TETRACHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022

2983	1,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2984	TRICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2985	1,1,2-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2986	1,1,1,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2987	TETRACHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2988	1,1,2,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2989	CHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2990	BENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2991	TOLUENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2992	ETHYLBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2993	BROMOBENZENE	524.2	Y	MRL	.5 UG/L			
2994	ISOPROPYLBENZENE	524.2	Y	MRL	.5 UG/L			
2996	STYRENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2997	O-XYLENE	524.2	Y	MRL	.5 UG/L			
2998	N-PROPYLBENZENE	524.2	Y	MRL	.5 UG/L			

Total Number of Records Fetched = 57

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-002F	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2021	CARBARYL	531.1	Y	MRL	1 UG/L			
2022	METHOMYL	531.1	Y	MRL	1 UG/L			
2036	OXAMYL	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2043	ALDICARB SULFOXIDE	531.1	Y	MRL	1 UG/L			
2044	ALDICARB SULFONE	531.1	Y	MRL	1 UG/L			
2046	CARBOFURAN	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2047	ALDICARB	531.1	Y	MRL	1 UG/L			
2066	3-HYDROXYCARBOFURAN	531.1	Y	MRL	1 UG/L			

Total Number of Records Fetched = 8

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003A	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1005	ARSENIC	200.8	Y	MRL	.001 MG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003B	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2020	12-31-2020

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003C	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2031	DALAPON	515.4	Y	MRL	2.5 UG/L		01-01-2020	12-31-2022
2040	PICLORAM	515.4	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2041	DINOSEB	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2105	2,4-D	515.4	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2106	2,4-DB	515.4	Y	MRL	1 UG/L			
2110	2,4,5-TP	515.4	Y	MRL	.25 UG/L		01-01-2020	12-31-2022
2206	DICHLORPROP	515.4	Y	MRL	1 UG/L			
2326	PENTACHLOROPHENOL	515.4	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2440	DICAMBA	515.4	Y	MRL	1 UG/L			

Total Number of Records Fetched = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003D	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2005	ENDRIN	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2010	BHC-GAMMA	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2015	METHOXYCHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2020	TOXAPHENE	525.2	Y	MRL	2 UG/L		01-01-2020	12-31-2022
2035	DI(2-ETHYLHEXYL) ADIPATE	525.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2037	SIMAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2039	DI(2-ETHYLHEXYL) PHTHALATE	525.2	Y	MRL	.6 UG/L		01-01-2020	12-31-2022
2042	HEXACHLOROCYCLOPENTADIENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2045	METOLACHLOR	525.2	Y	MRL	.1 UG/L			
2050	ATRAZINE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2051	LASSO	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2065	HEPTACHLOR	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2067	HEPTACHLOR EPOXIDE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2070	DIELDRIN	525.2	Y	MRL	.1 UG/L			
2076	BUTACHLOR	525.2	Y	MRL	.1 UG/L			
2077	PROPACHLOR	525.2	Y	MRL	.1 UG/L			
2274	HEXACHLOROBENZENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2306	BENZO(A)PYRENE	525.2	Y	MRL	.1 UG/L		01-01-2020	12-31-2022
2356	ALDRIN	525.2	Y	MRL	.1 UG/L			
2383	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	525.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2028
2388	AROCLOR 1016	525.2	Y	MRL	.08 UG/L			
2390	AROCLOR 1221	525.2	Y	MRL	2 UG/L			
2392	AROCLOR 1232	525.2	Y	MRL	.5 UG/L			
2394	AROCLOR 1242	525.2	Y	MRL	.3 UG/L			
2396	AROCLOR 1248	525.2	Y	MRL	.1 UG/L			
2398	AROCLOR 1254	525.2	Y	MRL	.1 UG/L			
2400	AROCLOR 1260	525.2	Y	MRL	.2 UG/L			
2595	METRIBUZIN	525.2	Y	MRL	.1 UG/L			
2959	CHLORDANE	525.2	Y	MRL	1 UG/L		01-01-2020	12-31-2022

Total Number of Records Fetched = 29

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003E	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2030	P-ISOPROPYLTOLUENE	524.2	Y	MRL	.5 UG/L			
2210	CHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2212	DICHLORODIFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2214	BROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2216	CHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2218	TRICHLOROFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2246	HEXACHLOROBUTADIENE	524.2	Y	MRL	.5 UG/L			
2248	NAPHTHALENE	524.2	Y	MRL	.5 UG/L			
2378	1,2,4-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2380	CIS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2408	DIBROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2410	1,1-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2412	1,3-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2413	1,3-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2414	1,2,3-TRICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2416	2,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2418	1,2,4-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2420	1,2,3-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2422	N-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2424	1,3,5-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2426	TERT-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2428	SEC-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2430	BROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2941	CHLOROFORM	524.2	Y	MRL	.5 UG/L			
2942	BROMOFORM	524.2	Y	MRL	.5 UG/L			
2943	BROMODICHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2944	DIBROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2950	TTHM	524.2	Y	MRL	.5 UG/L			
2955	XYLENES, TOTAL	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2964	DICHLOROMETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2965	O-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2966	P-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2967	M-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2968	O-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2969	P-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2976	VINYL CHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2977	1,1-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2978	1,1-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2979	TRANS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2980	1,2-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2981	1,1,1-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2982	CARBON TETRACHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022

2983	1,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2984	TRICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2985	1,1,2-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2986	1,1,1,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2987	TETRACHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2988	1,1,2,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2989	CHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2990	BENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2991	TOLUENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2992	ETHYLBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2993	BROMOBENZENE	524.2	Y	MRL	.5 UG/L			
2994	ISOPROPYLBENZENE	524.2	Y	MRL	.5 UG/L			
2996	STYRENE	524.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2022
2997	O-XYLENE	524.2	Y	MRL	.5 UG/L			
2998	N-PROPYLBENZENE	524.2	Y	MRL	.5 UG/L			

Total Number of Records Fetched = 57

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B20012106-003F	**Collection Date :**	01-29-2020

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2021	CARBARYL	531.1	Y	MRL	1 UG/L			
2022	METHOMYL	531.1	Y	MRL	1 UG/L			
2036	OXAMYL	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2043	ALDICARB SULFOXIDE	531.1	Y	MRL	1 UG/L			
2044	ALDICARB SULFONE	531.1	Y	MRL	1 UG/L			
2046	CARBOFURAN	531.1	Y	MRL	1 UG/L		01-01-2020	12-31-2022
2047	ALDICARB	531.1	Y	MRL	1 UG/L			
2066	3-HYDROXYCARBOFURAN	531.1	Y	MRL	1 UG/L			

Total Number of Records Fetched = 8

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B19080487-001A	**Collection Date :**	08-05-2019

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2941	CHLOROFORM	524.2	N	MRL	.5 UG/L	5.6 UG/L		
2942	BROMOFORM	524.2	N	MRL	.5 UG/L	1.4 UG/L		
2943	BROMODICHLOROMETHANE	524.2	N	MRL	.5 UG/L	7.8 UG/L		
2944	DIBROMOCHLOROMETHANE	524.2	N	MRL	.5 UG/L	6.5 UG/L		
2950	TTHM	524.2	N	MRL	.5 UG/L	21.00 UG/L	01-01-2019	12-31-2019

Total Number of Records Fetched = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B19080487-001B	**Collection Date :**	08-05-2019

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2450	MONOCHLOROACETIC ACID	552.2	Y	MRL	.75 UG/L			
2451	DICHLOROACETIC ACID	552.2	N	MRL	.75 UG/L	3.6 UG/L		
2452	TRICHLOROACETIC ACID	552.2	N	MRL	.5 UG/L	1.5 UG/L		
2453	MONOBROMOACETIC ACID	552.2	Y	MRL	.5 UG/L			
2454	DIBROMOACETIC ACID	552.2	N	MRL	.25 UG/L	2.4 UG/L		
2455	BROMOCHLOROACETIC ACID	552.2	N	MRL	.5 UG/L	2.8 UG/L		
2456	TOTAL HALOACETIC ACIDS (HAA5)	552.2	N	MRL	.25 UG/L	7.6 UG/L	01-01-2019	12-31-2019

Total Number of Records Fetched = 7

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B19031474-001A	**Collection Date :**	03-19-2019

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	N	MRL	.01 MG/L	0.02 MG/L	01-01-2019	12-31-2019

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B19031474-002A	**Collection Date :**	03-19-2019

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2019	12-31-2019

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B19031474-003A	**Collection Date :**	03-19-2019

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2019	12-31-2019

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-001A	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1032	MANGANESE	200.8	N	MRL	.001 MG/L	0.004 MG/L		
4006	COMBINED URANIUM	200.8	N	MRL	.0003 MG/L	0.0004 MG/L		

Total Number of Records Fetched = 2

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-001B	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
4000	GROSS ALPHA, EXCL. RADON & U	900	Y	MRL	3.7 PCI/L		01-01-2017	12-31-2025
4002	GROSS ALPHA, INCL. RADON & U	900	Y	MRL	3.7 PCI/L			
4010	COMBINED RADIUM (-226 & -228)	7500-RA	Y	MRL	.9 PCI/L		01-01-2017	12-31-2025
4020	RADIUM-226	903.0	Y	MRL	.1 PCI/L			
4030	RADIUM-228	RA-05	Y	MRL	.9 PCI/L			

Total Number of Records Fetched = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-002A	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1032	MANGANESE	200.8	N	MRL	.001 MG/L	0.010 MG/L		
4006	COMBINED URANIUM	200.8	Y	MRL	.0003 MG/L			

Total Number of Records Fetched = 2

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-002B	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
4000	GROSS ALPHA, EXCL. RADON & U	900	N	MRL	3.5 PCI/L	5.3 PCI/L	01-01-2017	12-31-2025
4002	GROSS ALPHA, INCL. RADON & U	900	N	MRL	3.5 PCI/L	5.3 PCI/L		
4010	COMBINED RADIUM (-226 & -228)	7500-RA	Y	MRL	.7 PCI/L		01-01-2017	12-31-2025
4020	RADIUM-226	903.0	Y	MRL	.2 PCI/L			
4030	RADIUM-228	RA-05	Y	MRL	.7 PCI/L			

Total Number of Records Fetched = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-003A	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1032	MANGANESE	200.8	N	MRL	.001 MG/L	0.008 MG/L		
4006	COMBINED URANIUM	200.8	Y	MRL	.0003 MG/L			

Total Number of Records Fetched = 2

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18110204-003B	**Collection Date :**	10-31-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
4000	GROSS ALPHA, EXCL. RADON & U	900	Y	MRL	2.3 PCI/L		01-01-2017	12-31-2025
4002	GROSS ALPHA, INCL. RADON & U	900	Y	MRL	2.3 PCI/L			
4010	COMBINED RADIUM (-226 & -228)	7500-RA	Y	MRL	.7 PCI/L		01-01-2017	12-31-2025
4020	RADIUM-226	903.0	Y	MRL	.2 PCI/L			
4030	RADIUM-228	RA-05	Y	MRL	.7 PCI/L			

Total Number of Records Fetched = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18091041-001A	**Collection Date :**	09-12-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2018	12-31-2018

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18091041-002A	**Collection Date :**	09-12-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2018	12-31-2018

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18091041-003A	**Collection Date :**	09-12-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	Y	MRL	.01 MG/L		01-01-2018	12-31-2018

Total Number of Records Fetched = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18080969-001A	**Collection Date :**	08-08-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2941	CHLOROFORM	524.2	N	MRL	.5 UG/L	4.0 UG/L		
2942	BROMOFORM	524.2	N	MRL	.5 UG/L	1.6 UG/L		
2943	BROMODICHLOROMETHANE	524.2	N	MRL	.5 UG/L	5.8 UG/L		
2944	DIBROMOCHLOROMETHANE	524.2	N	MRL	.5 UG/L	5.3 UG/L		
2950	TTHM	524.2	N	MRL	.5 UG/L	17.00 UG/L	01-01-2018	12-31-2018

Total Number of Records Fetched = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000240	**Federal Type :**	C
Water System Name :	HARLOWTON CITY OF	**State Type :**	C
Principal County Served :	WHEATLAND	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	B18080969-001B	**Collection Date :**	08-08-2018

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2450	MONOCHLOROACETIC ACID	552.2	Y	MRL	.75 UG/L			
2451	DICHLOROACETIC ACID	552.2	N	MRL	.75 UG/L	2.2 UG/L		
2452	TRICHLOROACETIC ACID	552.2	N	MRL	.5 UG/L	0.98 UG/L		
2453	MONOBROMOACETIC ACID	552.2	Y	MRL	.5 UG/L			
2454	DIBROMOACETIC ACID	552.2	N	MRL	.25 UG/L	1.7 UG/L		
2455	BROMOCHLOROACETIC ACID	552.2	N	MRL	.5 UG/L	2.7 UG/L		
2456	TOTAL HALOACETIC ACIDS (HAA5)	552.2	N	MRL	.25 UG/L	4.9 UG/L	01-01-2018	12-31-2018

Total Number of Records Fetched = 7

APPENDIX K

DEQ LUST Petroleum Contamination Reports

Soil

Table 10-1. Laboratory Analytical Results for Soil Samples Collected During the 2012/2013 Harlowton LUST Trust Investigation (all values presented are in mg/kg).

Sample ID	Sample Date	MTBE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C9-C10 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	Total Purgeable Hydrocarbons	PID Headspace Reading (ppm)
RBSL	—	0.08	0.04	10	10	200	9	100	200	1,000	500	—
PMW-27 (17.5'-19.5')	11/07/2012	<0.11	**0.20**	0.058	2.2	1.6	0.74	36	25	42	85	414
PMW-28 (22.5'-23.0')	10/30/2012	<0.12	**0.74**	5.3	3.5	19	1.7	52	40	66	140	479
PMW-29 (20' – 22')	11/06/2012	<0.11	<0.057	<0.057	<0.057	<0.057	<0.11	<2.3	<2.3	<2.3	<2.3	0.3
PMW-30 (15'-17')	11/06/2012	<0.11	<0.54	<0.54	0.095	<0.54	<0.11	3.8	5.3	12	16	110
PMW-31 (22.5'-23.0')	10/29/2012	<0.11	**0.30**	0.099	1.8	2.2	0.46	27	11	9.4	42	501
PMW-32 (22.5'-23.0')	10/29/2012	<0.11	**0.18**	0.043J	0.22	0.27	<0.11	2.0J	1.7J	<2.1	4.3	22.1
PMW-33 (26.5'-28.5')	11/08/2012	<0.11	<0.056	<0.056	<0.056	<0.056	<0.11	<2.2	<2.2	<2.2	<2.2	6.5
PMW-34 (30.0'-32.0')	11/02/2012	<0.12	**0.13**	<0.058	4.5	0.40	1.2	72	91	154	235	909
PMW-35 (48.0'-49.0')	9/05/2012	<14	<36	**219**	**476**	**2,020**	**219**	**9,060**	**7,750**	**9,000**	**24,700**	11,250
PMW-36 (40.0'-40.5')	11/01/2012	<0.11	<0.055	<0.055	<0.055	<0.055	<0.11	<2.2	<2.2	<2.2	<2.2	0.3
PMW-37 (22.5'-23.5')	10/31/2012	<0.11	<0.056	<0.056	<0.056	<0.056	<0.11	<2.2	<2.2	<2.2	<2.2	0.0

Sample ID	Sample Date	MTBE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C9-C10 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	Total Purgeable Hydrocarbons	PID Headspace Reading (ppm)
RBSL	---	0.08	0.04	10	10	200	9	100	200	1,000	500	---
PMW-38 (39.0')	9/04/2012	<0.12	**0.045**	<0.058	0.14	0.33	0.20	7.8	<2.3	2.5	14	48
PMW-39 (28.0')	9/06/2012	<0.11	<0.055	0.058	<0.40	0.11	0.29	16	4.7	16	38	465
PMW-40 (20.0')	9/05/2012	<4.3	<5.0	**11**	**37**	145	**13**	**749**	**805**	663	**2,140**	992
PMW-40 (30.0'-31.0')	9/05/2012	<0.12	**0.063**	0.095	0.41	1.5	0.21	9.8	2.7	9.0	22	460
PMW-41 (20.0'-20.3')	10/31/2012	<0.11	**0.11**	0.55	0.81	3.0	0.90	29	7.1	36	71	805
PMW-43 (20'-22')	11/07/2012	<0.11	**0.73**	0.21	5.3	6.7	2.9	114	73	141	276	667
PMW-46 (27.5'-29.5')	11/28/2011	<0.80	**1.7**	3.0	**12**	31	3.8	**253**	**405**	249	**740**	1,375
PMW-47 (10.0'-12.0')	10/30/2012	<0.11	**1.0**	0.50	5.4	3.7	2.7	**101**	89	145	264	938
PMW-47 (20.0'-20.5')	10/30/2012	<0.11	**0.98**	4.4	3.4	21	2.2	43	27	68	125	457
PMW-48 (20' – 22')	11/05/2012	<0.11	**0.35**	<0.056	1.1	0.29	0.82	25	25	41	82	147
PMW-49 (25' – 27')	3/28/2013	<0.11	**0.056**	0.18	1.9	2.2	0.88	25	13	34	52	460

Green highlight J = Estimate Value. The analyte was present but less than the reporting limit.
RBSL = Risk-Based Screening Level (Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases, (Montana DEQ Table 3 Tier 1 RBSLs, September 2009 values).
Blue Highlight = Reporting limit increased due to sample matrix interference.
Red Numbers = Compound was Detected.
Bold Red Numbers and Yellow Highlight = RBSL and/or DEQ-7 Standard Exceeded.

Table 10-2. EPH Soil Analytical Results (all values presented are in milligrams/kilograms [mg/kg]).

SAMPLE ID	Sample Depth (ft)	Sample Date	Extractable Hydrocarbons (Screen)	C11-C22 Aromatics	C9-C18 Aliphatics	C19-C36 Aliphatics	Total Extractable Hydrocarbons
RBSL	---	---	200	400	2,000	100,000	NA
PW-27	17.5'-19.5'	11/07/2012	73	NF	NF	NF	NF
PMW-28	22.5'-23.0'	10/30/2012	78	NF	NF	NF	NF
PMW-29	20.0' – 22.0'	11/06/2012	26	NF	NF	NF	NF
PMW-30	15.0'-17.0'	11/06/2012	<11	NF	NF	NF	NF
PMW-31	22.5'-23.0'	10/29/2012	30	NF	NF	NF	NF
PMW-32	22.5'-23.0'	10/29/2012	19	NF	NF	NF	NF
PMW-33	26.5'-28.5'	11/08/2012	<11	NF	NF	NF	NF
PMW-34	30.0'-32.0'	11/02/2012	167	NF	NF	NF	NF
PMW-35	48.0'-49.0'	9/05/2012	15,100	2,510	5,890	655	11,100
PMW-36	40.0'-40.5'	11/01/2012	22	NF	NF	NF	NF
PMW-37	22.5'-23.5'	10/31/2012	20	NF	NF	NF	NF
PMW-38	39.0'	9/04/2012	<12	NF	NF	NF	NF
PMW-39	28.0'	9/06/2012	114	NF	NF	NF	NF
PMW-40	20.0'	9/05/2012	1,420	245	654	81	1,180
PMW-40	30.0'-31.0'	9/05/2012	69	NF	NF	NF	NF
PMW-41	20.0'-20.3'	10/31/2012	266	57	153	23	244
PMW-43	20.0'-22.0'	11/07/2012	243	56	100	22	220
PMW-46	17.5'-19.5'	11/28/2011	394	65	136	17	288
PMW-47	10.0'-12.0'	10/30/2012	159	NF	NF	NF	NF
PMW-47	20.0'-20.5'	10/30/2012	96	NF	NF	NF	NF

SAMPLE ID	Sample Depth (ft)	Sample Date	Extractable Hydrocarbons (Screen)	C11-C22 Aromatics	C9-C18 Aliphatics	C19-C36 Aliphatics	Total Extractable Hydrocarbons
PMW-48	20.0'-22.0'	11/05/2012	131	NF	NF	NF	NF
PMW-49	25.0'-27.0'	3/28/2013	63	NF	NF	NF	NF

Red Values Indicate the Compound was Detected. Highlighted **Bold Red** Values Indicate RBSL Exceeded.
RBSL = Risk-Based Screening Level (based on September 2009 Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases for Soil deeper than 2 ft and groundwater is <10 ft from sample depth).
NF = Not Fractionated.

Table 10-3. VPH Analytical Results for Groundwater Collected at the Harlowton.

Sample ID	Sample Date	MTBE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C9-C10 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	Total Purgeable Hydrocarbons	1,2-Dichloroethane* (1,2-DCA)	1,2-Dibromoethane* (EDB)
DEQ-7 Human Health Standard		30	5	1,000	700	10,000	100	None	None	None	None	4	.004
RBSL		30	5	1,000	700	10,000	100	1,000	700	1,000	1,000	4	.004
MW-2	11/14/2012	<1.0	<0.5	0.6	0.41J	<0.5	<1.0	32	151	32	170	0.82J	<1.0
MW-5	11/14/2012	<1.0	<0.5	<0.5	0.88	0.43J	<1.0	<20	80	19J	78	3.9	<1.0
MW-7S	11/14/2012	<10.0	99	30	577	352	9.7	1,910	3,690	1,900	6,760	<5.0	<1.0
MW-7D	11/14/2012	<1.0	<0.5	0.42J	<0.50	<0.5	<1.0	21	138	27	146	4.2	<1.0
MW-8S	11/06/2012	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP

5.0 WELL DEVELOPMENT AND GROUNDWATER MONITORING

Groundwater monitoring began on November 12, 2012, and continued through November 19, 2012. A complete round of water level measurements was collected across the site to determine groundwater elevations to verify flow direction and gradient. Water level measurements began at 11:30 AM on November 12, 2012, and continued to 12:35 PM on November 13, 2012. Field personnel used a Solinst Model 101 water level meter to measure water levels and a Heron H.01L interface probe to measure wells with free product. Snow and ice on the ground hindered finding wells and access into the wells. Depth to water/product readings along with corresponding water level elevations are listed in Table 5-1. To avoid cross contamination between the wells, the water level probe was decontaminated between well measurements using a methanol rinse first followed by a tap water rinse.

Table 5-1. Depth to Water and Water Table Elevation Data for Measurements Made in November 2012.

Well Name	Measure Point Elevation	Depth to Water	Depth to Product	Product Thickness	Water Table Elevation
MW-2	4,261.38	66.77	ND	0.00	4,194.61
MW-4	4219.38	50.12	ND	0.00	4,169.26
MW-5	4,243.55	48.83	ND	0.00	4,194.72
MW-6	4214.05	28.90	ND	0.00	4169.26
MW-7S	4,246.07	51.49	ND	0.00	4,194.58
MW-7D	4,246.07	51.37	ND	0.00	4,194.70
MW-8S	4,228.14	30.52	29.32	1.20	4,198.58*
MW-8D	4,228.44	59.72	ND	0.00	4,168.72
MW-9	4,228.44	27.88	24.04	3.84	4,203.63*
MW-10D	4,227.55	32.38	ND	0.00	4,195.17
MW-11	4,222.78	23.13	ND	0.00	4,199.65
MW-12	4,216.03	21.41	ND	0.00	4,194.62
MW-15	4,224.84	23.56	ND	0.00	4,201.28
MW-16	4,214.28	17.88	ND	0.00	4,196.40
MW-17	4,217.33	22.04	ND	0.00	4,195.29
MW-18	4,225.93	27.75	27.23	0.52	4,198.18*
MW-19	4,208.45	17.16	ND	0.00	4,191.29
MW-20	4,219.11	19.67	ND	0.00	4,199.44
MW-21	4,235.87	27.87	ND	0.00	4,208.00
MW-22	4,252.61	42.78	ND	0.00	4,209.83
MW-23	4,231.58	28.90	ND	0.00	4,202.68
MW-24	4,227.18	28.69	ND	0.00	4,198.49
MW-25	4,219.32	20.42	19.00	1.42	4,200.04*
MW-26	4,218.78	13.97	ND	0.00	4,204.81
PMW-27	4212.58	18.87	ND	0.00	4,193.71
PMW-28	4215.42	24.41	ND	0.00	4,191.01
PMW-29	4215.84	20.87	ND	0.00	4,194.97

Well Name	Measure Point Elevation	Depth to Water	Depth to Product	Product Thickness	Water Table Elevation
PMW-30	4217.15	12.29	ND	0.00	4,204.86
PMW-31	4218.32	21.86	ND	0.00	4,196.46
PMW-32	4218.44	20.11	ND	0.00	4,198.33
PMW-33	4237.62	33.12	ND	0.00	4,204.50
PMW-34	4241.57	36.98	ND	0.00	4,204.59
PMW-35	4237.77	49.75	39.50	10.25	4,196.22*
PMW-36	4245.32	39.71	ND	0.00	4,205.61
PMW-37	4220.29	24.95	ND	0.00	4,195.34
PMW-38	4229.52	32.66	31.36	1.30	4,197.90*
PMW-39	4219.03	19.31	ND	0.00	4,199.72
PMW-40	4223.11	24.99	ND	0.00	4,198.12
PMW-41	4222.83	27.95	ND	0.00	4,194.88
PMW-43	4218.60	20.96	ND	0.00	4,197.64
PMW-46	4218.22	21.45	ND	0.00	4,196.77
PMW-47	4213.65	22.61	ND	0.00	4,191.04
PMW-48	4222.07	24.77	ND	0.00	4,197.30
MW-08-5	4,217.63	12.91	ND	0.00	4,204.72
MW-08-6	4,218.91	19.81	ND	0.00	4,199.10
MW-08-7	4,218.40	19.35	ND	0.00	4,199.05
MW-08-8	4,218.83	17.02	ND	0.00	4,201.81
MW-08-12	4,216.46	17.86	ND	0.00	4,198.60

ND – Not Detected

* Calculated water table elevation assuming that the specific gravity of the gasoline/diesel free product mix is 0.80.

10.0 RESULTS

This section presents the results of the investigation including groundwater elevations, groundwater contour maps and flow directions, laboratory analytical results, pumping test results, and LNAPL extent and recovery operations.

10.1 Groundwater Elevations and Flow Directions

Historically, the near-surface groundwater at the Harlowton LUST Trust site had been differentiated into three categories: the shallow groundwater, an intermediate groundwater zone, and a deep groundwater zone. The intermediate and deep groundwater zones appear to be controlled by the sandstone layers in which the groundwater is residing. The sandstone layers, dipping to the northeast, are separated by shale units that appear to isolate each sandstone layer from other sandstone members above or below.

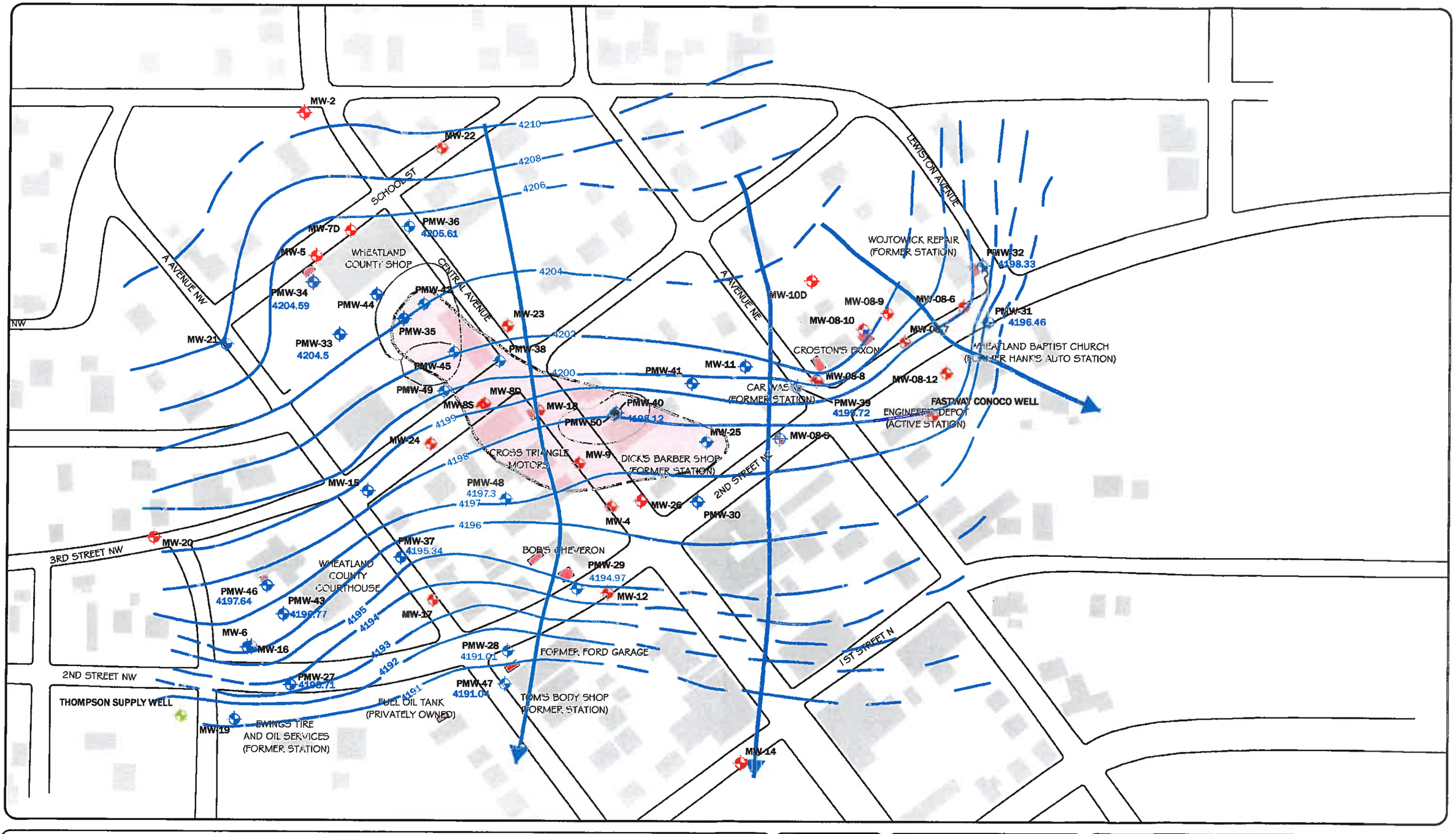
The groundwater elevations/potentiometric measured in November 2012 were plotted on the site map and contoured creating groundwater potentiometric maps for the various groundwater zones. While creating the maps, it was noted that some water levels in selected wells were significantly higher and did not accurately represent the shallow water table. The groundwater elevations in MW-08-5, MW-15, MW-26, and PMW-30 were 6 to 8 ft higher than surrounding wells. In reviewing the well logs, all four wells appear to be partially completed in a gravel layer on top of a shale unit that is likely creating perched groundwater conditions. Two zones of perched groundwater appear to exist in the area: one around MW-15 and the intersection of 3rd Street NW and A Avenue NW, and the second zone in the area along Central Avenue, north of 2nd Street. It is likely that the perched groundwater eventually drains downward, leaving the perched zones dry at certain times of the year.

Once the perched water levels were removed from the shallow groundwater data set, the contours for the shallow groundwater smoothed out creating a more plausible representation of shallow groundwater flow in the subsurface (Figure 10-1). The shallow groundwater contour map shows groundwater flowing generally to the south toward the Musselshell River. Slight variations in flow exist ranging from southeast to southwest. At the eastern end of the site near Lewistown Avenue, the groundwater contours appear to bend to the northeast, following the contours of the land surface and groundwater flow toward the low drainage area located east of the site. The hydraulic gradient for the shallow groundwater was calculated to be 0.021 ft/ft.

The water level in PMW-41 was not used in the shallow groundwater contour map data set because it was very slow to recover. During well development, the well went dry and was very slow to recover. Since the water level was likely still equilibrating when the water level measurements were taken, the level was not used in the overall data set.

The intermediate set of wells, including MW-2, MW-5, MW-7 Deep, and MW-10 D, are completed in an intermediate sandstone unit and indicate a groundwater flow direction of N 74° W (Figure 10-2) and a very shallow hydraulic gradient of 0.0005 ft/ft.

The deep aquifer wells include MW-4, MW-6, and MW-8 D that are completed in a deeper sandstone unit that has a significantly lower hydraulic potential of approximately 30 ft. The flow direction was determined to be N 35° E with a hydraulic gradient of 0.03 ft/ft (Figure 10-3).



LEGEND

- GROUNDWATER FLOW
- GROUNDWATER ELEVATION CONTOURS
- FREE PRODUCT
- EXISTING WELLS
- PIONEER WELLS
- WATER SUPPLY WELL

UNDERGROUND STORAGE TANK STATUS
- PRESENT
- REMOVED
- FREE PRODUCT PLUME

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INTERNATIONAL FEET
SOURCE: PIONEER/NRIS

0 75 150 300
Feet

FIGURE 10-1

SHALLOW WATER TABLE ELEVATION CONTOUR MAP
NOVEMBER 2012

PIONEER TECHNICAL SERVICES, INC.

DATE: 1/31/2014

Path: P:\DEQ\Harlowtom\Drawings\November-2013\HRLTN-GI-OPH-008-13.mxd

RECLAMATION AND DEVELOPMENT GRANTS PROGRAM

2012 RDG GRANT APPLICATION FOR THE PETROLEUM PRODUCT DELINEATION AND MITIGATION OF THREAT TO HARLOWTON PUBLIC WATER SUPPLY WELL HARLOWTON, MT

PREPARED BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

MAY 2012

STEP 1 - GRANT APPLICATION SUMMARY

I. APPLICANT INFORMATION

Applicant Name Montana Department of Environmental Quality

Mailing Address PO Box 200901

City, State, Zip Helena, Montana

Telephone Number(s) (406) 841-5051

Contact Person Scott Gestring

Address (if different from applicant)_

Telephone (406) 841-5051 Email sgestring@mt.gov
Federal Tax ID Number 81-0302402-06
Senate District 9 House District 17

II. PROJECT INFORMATION

Project Title Harlowton Montana Petroleum Product Delineation and Mitigation

Brief Project Description The project would entail delineating the extent of petroleum product proximal to the Thompson Supply well in Harlowton, Montana; identifying the sources of free product and mitigating the threat to the public water supply and groundwater underlying Harlowton.

Latitude (decimal degrees) 46.43623 Longitude (decimal degrees) 109.8369

Estimated project start date June 1, 2013 end date June 30, 2015

Project Budget: Please enter the source and amount of ALL funding that may be used to complete the proposed activity. Indicate if alternate sources of funding are other than cash, such as in-kind services.

Funding Source	**Amount**	**Committed (Yes or**
RDG Grant *(maximum $300,000)*	**$300,000**	
Applicant	**$87,678**	**Yes**
Other Source	**$**	
Other Source	**$**	
Other Source	**$**	
Other Source	**$**	
PROJECT TOTAL $387,678		

III. AUTHORIZING STATEMENT

I hereby certify that the information and all statements in this application are true, complete, and accurate to the best of my knowledge and that the project or activity complies with all applicable state, local, and federal laws and regulations.

I further certify that this project will comply with applicable statutory and regulatory standards protecting environmental quality. I further certify that I am (we are) authorized to enter into a binding agreement with the Department of Natural Resources and Conservation to obtain a grant if this application receives legislative approval.

_____ _____

Signature and Title of Authorized Representative Date

_____

Please print name and title of representative signing above

STEP 2 - PROJECT ABSTRACT

1. On May 4, 1999, the Department of Environmental Quality (DEQ) was notified of the presence of petroleum contamination in a private water supply well owned by Linda and Roger Mager, located at 505 North Central Avenue in Harlowton, Montana. A water sample collected by Roger Mager on April 7, 1999, contained benzene, ethylbenzene, methyl tertiary butyl ether (MTBE), gasoline range organics (GRO), and total purgeable hydrocarbons (TPH). LUST Trust funds have been used since 1999 in several investigations to determine the source of the contamination, delineate the extent of the groundwater contamination, and recover free product from select wells. The investigations to date have determined that releases of petroleum hydrocarbons from multiple suspect and unknown sources have impacted the groundwater beneath a large portion of Harlowton (see Figure 12, Appendix A for potential sources). Free and dissolved phase petroleum hydrocarbons threaten the Thompson Supply well, which is one of Harlowton's municipal drinking water supply wells. Free product is present in a monitoring well located approximately 180 feet northeast of the Thompson supply well (refer to Figure 7, Appendix A for well locations). Water samples obtained from the Thompson supply well periodically have reported detections of benzene, 1,2, DCA, and in one instance, toluene (see Table 3, Appendix B). The reported contaminant concentrations, except for one benzene hit, are below the method reporting limits and thus were estimated concentrations. The presence of these chemicals in the Thompson supply well indicates a direct connection with a plume of refined petroleum. Although concentrations of these chemicals have, so far, been below regulatory standards, their impact on the well could increase with changes in hydrologic conditions, water usage, or migration of the contaminants in the aquifer. The presence of these contaminants in the drinking water supply is a threat to the health of Harlowton residents.

This contamination threatens public health through potential migration from the source area(s) to the Thompson supply well and domestic wells within the study area. A drilling moratorium has been emplaced to prevent the installation of additional domestic wells in Harlowton. A portion of the petroleum release is eligible for monies from either the federal Leaking Underground Storage Tank Trust Fund (LUST Trust) or potentially from the Montana Petroleum Tank Release Cleanup Fund (Petro fund). However, LUST Trust funding is limited and Petro fund monies are only available after the responsible party has been identified and has been determined to be eligible for Petroleum Fund reimbursement. Resources necessary to identify unknown sources of this contamination cannot be expended from the Petro fund without a known responsible party. Over a 15-year period, DEQ has expended approximately $340,000 in LUST Trust funds investigating the contamination. By contrast, the entire statewide LUST Trust budget for FY 2013 is approximately $345,000. DEQ has identified two sources of petroleum contamination contributing to the overall plume threatening the water supply and pursued individual cleanups at those facilities. However, other contributing sources are still unidentified and require additional assessment. When viable responsible parties are identified, they are required to investigate and clean up contamination from their facilities. If a source cannot be attributed to viable responsible parties, other sources of funding are needed to continue to address the contamination.

2. The project goals are to delineate the extent of the free product plume, identify additional sources of petroleum, mitigate the threat to the Thompson public water well, determine if there are vapor intrusion risks and reduce environmental impacts associated with the petroleum releases.

3. The Department of Environmental Quality (DEQ) Remediation Division will be the lead agency for this project. All work will be coordinated with the City of Harlowton and Wheatland County. The

free product delineation and source identification phase is scheduled for September 2013 and should be completed within two months. The free product recovery phase of the project will continue for up to six months.

4. The project area comprises an area of approximately six city blocks in Harlowton, Montana. This area extends from B Avenue on the western side, eastward along 2nd Street NW to Lewistown Avenue, and north along Central Avenue up to Fourth Street. Within this area are eight (8) former gas stations, a former Ford garage, a former car dealership, a former bulk plant, an active gas station, and the Wheatland County Shop. The Wheatland County Sheriff's Department also had underground storage tanks. These are all potential sources of the petroleum contamination underlying Harlowton.

5. The well installation and development phase should take approximately one month. Chemical oxidation will last three months. Monitor well sampling and will last approximately two years.

STEP 3 - TECHNICAL DESCRIPTION & ALTERNATIVE ANALYSIS

Site Background

On May 4, 1999, the DEQ was notified of the presence of petroleum-contaminated groundwater in a newly installed private water supply well owned by Linda and Roger Mager, located at their primary residence at 505 North Central Avenue in Harlowton. The Magers had indicated that petroleum odors were detected in the well since the well was constructed in 1996. The Mager residence and well are located in the SE¼, SW¼, NW¼ of Section 22, Township 8 North, Range 15 East, within the city limits of Harlowton. The water well log submitted to the Montana Department of Natural Resources and Conservation (DNRC) indicates the well was constructed to a total depth of 125 feet bgs and was screened from 110 to 125 feet bgs. However, no annular seal was installed other than a shallow surface casing. This well was abandoned in September 2006 by the DEQ. Potable water is supplied to the Mager residence by the Harlowton public water supply (PWS).

A water sample from the well collected by Roger Mager on April 7, 1999, contained benzene, ethylbenzene, methyl tert-butyl ether (MTBE), gasoline range organics (GRO), and total purgeable hydrocarbons (TPH) at concentrations of 52, 1.6, 4.8, 179, and 231 micrograms per liter (µg/L), respectively. Confirmatory sampling performed by the DEQ on May 12, 1999, indicated that benzene, toluene, ethylbenzene, and xylenes (BTEX), MTBE, and 1,2-dichloroethene (1,2-DCA) were detected at concentrations of 52, 0.29, 0.89, 0.33, 8.9, and 4.6 µg/L, respectively (1,2-DCA is an additive used in leaded gasoline products). Prior to the May 12, 1999, sampling, the static water level in the well was measured at 72.55 feet below the top of the 6-inch steel surface well casing. A water sample from the well collected by DOWL HKM (DEQ's contractor) on July 15, 2003, contained BTEX and 1,2-DCA at concentrations of 1430, 91, 138, 156, and 9.0 µg/L (HKM, 2003).

After the DEQ investigation of the Mager well began, potentially contaminated source areas were sought. In June 22, 2000, DOWL HKM discovered an old unused well in the basement of the county courthouse. The well was gauged with an interface probe and it was determined that about 7 feet of a light, non-aqueous phase liquid (LNAPL) was floating on the water surface in the well. A LNAPL recovery system was installed in the courthouse well on June 26, 2000, and approximately 30 gallons of LNAPL were recovered between June 26, 2000 and August 14, 2000. A passive LNAPL recovery system installed on July 17, 2003 recovered about 1 gallon per month until LNAPL was no longer observed in early 2004. This well was approximately 56 feet deep and although no well log was available, the well was determined to be constructed with what appeared to be four- foot sections of stovepipe. This well was plugged and abandoned in the fall of 2006 by the DEQ.

Previous Remedial Investigations

During a Phase I remedial investigation, conducted in May and June 2000, DEQ's Contractor (DOWL HKM) installed six monitor wells to define the extent and magnitude of petroleum hydrocarbons in the groundwater and to determine the location of potential source areas. Based upon the results of the initial investigation, Bob's Chevron was identified as the likely source of the diesel and gasoline petroleum hydrocarbons in the groundwater. The details of the drilling and sampling conducted during the 2000 investigation have been submitted in previous reports (HKM, 2000).

Bedrock encountered during the drilling consisted predominately of thinly bedded, weak, friable,

dark gray shale containing occasional thinly bedded coal seams interbedded with hard, fractured sandstone beds. Field observations during drilling indicated that the sandstone beds produced the greatest amount of groundwater.

As previously stated, during June 2000, an unused well was discovered in the basement of the county courthouse. The well was gauged with an interface probe and it was determined that about 7 feet of a LNAPL was floating on the water surface in the well. A sample of the LNAPL was collected and submitted to Energy Laboratories, Inc. for analysis of volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method 8260
and a simulated distillation using American Society for Testing and Materials (ASTM) D3328. Laboratory analyses indicated that the LNAPL was a mixture of gasoline and diesel fuel.

One of the closest potential sources of fuel to the courthouse well was the former Wheatland County Sheriff's Department underground storage tank (UST) basin located approximately 75 feet northwest of the courthouse well. During 2001, a test pit investigation was conducted at the former Sheriff's UST location to determine if it was the source of the LNAPL in the courthouse well. Based upon the findings of the test pit investigation, it was determined that the Sheriff's UST location was not the source of LNAPL in the courthouse well.

1,2-DCA was detected in groundwater samples collected from the City of Harlowton Thompson supply well on May 15, 2000, and June 14, 2000. The May 15, 2000, sample contained 1,2-DCA at an estimated concentration of 0.26 µ g/L, and the June 14, 2000, sample contained 1,2-DCA at an estimated concentration of 0.21 µg/L (see Table 3, Appendix B for analytical results). Both of these values are estimated, since the concentrations are below the limit of laboratory quantitation. These levels are below the Circular DEQ-7 Montana Numeric Water Quality Standards Human Health Standard (DEQ-7 HHS) of 4 µg/L.

The volatile petroleum hydrocarbon (VPH) laboratory analytical results of groundwater samples collected from five of the six Phase I monitor wells and the Mager irrigation well in May and June 2000 confirmed the presence of dissolved gasoline constituents in the groundwater. The May and June 2000 VOC analytical results also indicated the presence of 1,2-DCA in the groundwater in monitor wells MW-2 and MW-5 at concentrations of 5.7 µg/L and 9.9 µg/L, respectively, exceeding the DEQ-7 HHS standard of 4 µg/L. The presence of benzene, MTBE, and 1,2-DCA in the monitor wells was attributed to a release of gasoline containing benzene, MTBE, and 1,2-DCA. The concentration gradient of TPH and 1,2-DCA between the Phase I monitor wells indicated the probable source area for the contaminants was located somewhere south of the Mager well.

A Phase II Source Identification Investigation (herein "Phase II Investigation") was conducted during 2003 using LUST Trust funds to further define the extent and magnitude of the contaminant plume impacting the Mager well. During June 2003, additional groundwater samples were collected from the six monitor wells and other selected private wells. The laboratory analytical results from this sampling event indicated substantial increases in benzene concentrations in several of the Phase I monitor wells. Eleven additional monitor wells were installed in the fall of 2003. These wells were installed to complement the Phase I wells and were installed at various depths and locations to help define the horizontal and lateral extent of the impacted groundwater. The most severely impacted groundwater present in the study area is a 2-3 block area located east and north of the courthouse. The shallow groundwater aquifer in this area has LNAPL and high levels of dissolved petroleum constituents. Simulated distillation testing in 2003 indicated that the LNAPL present in this area was

a mixture of #2 diesel fuel and gasoline. In November 2003, the shallow groundwater had an apparent southwesterly gradient, but the groundwater gradient was suspected to change seasonally or be affected by local influences such as pumping wells and/or irrigation practices. Individual sandstone beds in the Judith River Formation appear to provide preferential pathways, allowing impacted groundwater to move down dip to the north in response to local recharge and the influences of irrigation wells drawing water from the sandstone beds. As demonstrated by the LNAPL present in the courthouse well and high levels of dissolved petroleum in monitor wells, it appeared that a lobe of contaminants were being drawn to the southwest from the impacted area. The pumping and drawdown of Thompson well may be influencing this plume migration.

Qualitative indications of petroleum contamination were detected during the drilling and construction of monitoring well MW-4, which is located adjacent to the former Bob's Chevron gasoline retail facility at 201 North Central Avenue in Harlowton, MT (Bob's Chevron). Elevated levels of petroleum hydrocarbons were documented during the closure of eight USTs at Bob's Chevron in 1991; however, the release at this site was resolved by the DEQ in 1992. Groundwater samples collected in June 2000 and July 2003 from MW-4 did not contain petroleum or chlorinated compounds. This indicates that the residual petroleum contamination may have been present in soil above the screened interval of the monitoring well.

A Phase III Source Identification Investigation (Phase III Investigation) was completed during 2006 and 2007 using LUST Trust funding. The purpose of this additional work was to further define the extent and magnitude of the plume, abandon several wells to reduce the threat of aquifer cross contamination, remove LNAPL from the wells containing free product, determine aquifer parameters, and identify other potential contaminant sources.

Potential sources of contamination, indicated in the Phase III Identification report, continued to include Bob's Chevron and included Cross Triangle Motors, which are located to the south of the Mager well. However, fluid level measurements indicate that groundwater flow in the upper fractured sandstone aquifer is generally directed to the south and southwest. Fluid flow in the deeper aquifer is to the north. Pumping the Jawbone Creek Golf Course irrigation well may induce groundwater flow to the north in the shallow aquifer as evidenced by the response of MW-7S and increased benzene concentration in production water during the duration of the pump test. This may create a hydrologic divide in the shallow aquifer with groundwater being pulled to the north via the Jawbone Creek well when it is pumping and groundwater being pulled to the south by the Thompson supply well when it is actively pumping.

Aquifer testing indicates the pumping drawdown associated with the Jawbone Creek irrigation well has intercepted the dissolved phase contaminant plume associated with the Mager well. Benzene concentrations increased throughout the duration of the pumping test. Analytical results ranged from 0.41 µg/L to 3.8 µg/l at the end of the testing period that occurred over 3 days with approximately 30 hours of pumping time, compared to the standard human health standard of 5 ug/L.

The Mager and Courthouse domestic wells were abandoned along with monitoring well MW-1 to prevent potential cross contamination.

A LNAPL bail down test was conducted on monitoring well MW-8S. It appears that the LNAPL in the aquifer in the vicinity of MW-8 is approximately 0.11 feet thick.

Four additional groundwater monitoring wells were installed during late October and early November 2006 to further define the extent of the dissolved phase contaminant plume and to rule out additional potential contaminant sources. A four-inch diameter well was installed adjacent to the former Cross Triangle Motors underground storage tank basin; a second, shallow well was installed adjacent to MW-6; a third well was installed in the southeastern corner of the intersection of B Street and 2nd Avenue between the former Dempster's Service Station and the Thompson supply well; and the fourth was installed in the upper sandstone aquifer east of the Wheatland County Courthouse. Prior to well abandonment, monitor well MW-1 and the Mager well were sampled in September and the courthouse well was sampled in October 2006. Many of the monitoring wells that were sampled in November reported significantly lower concentrations of dissolved phase contamination than in previous sampling events. However, LNAPL was still present in monitoring well MW-8S and MW-9 and it was present in MW-16 in July 2007.

A Plume Delineation and Assessment of Potential Sources Investigation, and Groundwater Monitoring and Free Product Recovery report was completed during 2008 and 2009 under DEQ Contract. The purpose of this investigation was to initiate free product recovery from monitoring wells MW-8S, MW-9, and MW-16, further define the extent of the free and dissolved phase contaminant plumes, evaluate additional potential sources, evaluate current groundwater contamination concentrations; and, verify groundwater elevation and flow direction.

Seven monitoring wells (MW-20-08 through MW-26-08) and one new soil boring (SB-1-08) were installed during this investigation. Passive bailers were installed in monitoring wells MW8S, MW-9, and MW-16 for free product recovery. Monitoring Well MW-10S-03 was abandoned during this event because no groundwater had ever been observed in it.

Based upon the findings and results of this investigation, the former Bob's Chevron, Cross Triangle Motors, as well as the Wheatland County Shop, Dempster's Service Station, the Car Wash, and Croston's Exxon all appear to be contributing sources of contaminants present in the groundwater of the study area.

Regional Geologic Setting

Harlowton is located near the western edge of the Great Plains in Wheatland County, Montana, approximately 20 miles south of the Little Belt Mountains, 25 miles southwest of the Big Snowy Mountains, and 25 miles northeast of the Crazy Mountains. The central portion of the town site is located on the north flank of the Musselshell River valley at an approximate elevation of 4,216 feet above mean sea level (MSL). Most of Harlowton overlies the Judith River Formation of Late Cretaceous Age. The Judith River Formation may be 300 to 500 feet thick and appears to dip to the northeast. This formation is exposed in the immediate Harlowton study area and consists primarily of medium to fine-grained light brown to tan sandstone. The central part of the formation sometimes contains dark-brown interbedded siltstone, claystone, and coal.

Hydrogeologic Setting

The topography in the study area ranges from approximately 4208 feet above mean sea level (amsl) along Highway 12 near the Thompson Supply Well to over 4294 feet amsl at monitoring well MW-3, which is located near 6th Street. Groundwater in the Harlowton study area is present at depths ranging from approximately 17 feet below top of casing (btoc) to approximately 100 feet btoc at monitoring well MW-3. Impacted groundwater is present in multiple sandstone aquifers that are separated by shale interbeds. The sandstone aquifers are fractured and there is a connection between

the shallow contaminated aquifer and the deeper aquifers. The Thompson Supply Well and the Jawbone Creek Golf Course Irrigation Well appear to influence the configuration of the contaminant plume. Groundwater in the shallow aquifer flows to the southwest towards the Thompson Supply Well (see Figure 4 Appendix A) while groundwater in the deeper aquifer appears to flow to the north towards the Jawbone Creek Golf Course Irrigation Well (see Figure 5 Appendix A). The groundwater flow direction on the east side of the study presumably beyond the influence of the Thompson Supply Well and the Jawbone Creek Golf Course Irrigation Well is towards the northeast (see Figure 4 Appendix A).

Detailed site information can be found in the following reports:

DOWL HKM March 2012. Draft Free Product Recovery and Groundwater Monitoring Report Mager Well
LUST Trust Site, Contract 407033, Task Order #18. Harlowton, Montana.

DOWL HKM June 2009. March 2009 Groundwater Monitoring Report Mager Well LUST Trust Site, Contract 407033, Task Order #8. Harlowton, Montana.

DOWL HKM May 2009. Plume Delineation, Assessment of Potential Sources, Groundwater Monitoring and Free Product Recovery, Contract 407033, Task Order #8. Harlowton, Montana.

HKM Engineering Inc. June 2003. Mager Irrigation Well Sample Results, Contract No. 401006 Task Order #7. Harlowton, Montana.

HKM Engineering Inc. July 2003. Semi-Annual Groundwater Monitoring Report, Source Identification of Petroleum Hydrocarbon Contamination, Task Order #7. Harlowton, Montana.

HKM Engineering Inc. September 2003. LNAPL Recovery Report, Wheatland County Courthouse Well, Source Identification of Petroleum Hydrocarbon Contamination, Task Order #7. Harlowton, Montana.

HKM Engineering Inc. June 2001. Report of Findings, Well Sampling and Test Pit Investigation, HKM General Site Visit Task Order #5, Contract No. 460002-TO-05. Harlowton, Montana.

HKM Engineering Inc. 2003. Summary Report, Subtask 1 – UST Facility File Review, Source Identification of Petroleum Hydrocarbon Contamination, Contract No. 401006 – Task Order #07. Harlowton, Montana.

HKM Engineering Inc. 2005. Croston's Exxon Status Report, Subtask 3 – Removal of Underground Storage Tanks, Contract No. 401006 – Task Order #21. Harlowton, Montana.

HKM Engineering Inc. 2005. Croston's Exxon Status Report, Subtask 4 – Excavation of Impacted Soil, Contract No. 401006 – Task Order #21. Harlowton, Montana.

HKM Engineering Inc. 2007. Aquifer Characteristics Report for the Mager Well LUST Trust Site, Subtask

5 – Phase III Remedial Investigation Report, Contract No. 401006 -Task Order No. 23. Harlowton, Montana

HKM Engineering Inc. 2008. Croston's Exxon Status Report, Subtask 6 – Phase II Remedial Investigation Report, Contract No. 407033 -Task Order No. 9. Harlowton, Montana

MSE-HKM, Inc. September 1999. Report of Findings. MSE-HKM, Inc., Billings, Montana. MSE-HKM, Inc. March 2000. Summary Report of Findings - Subtask 1. MSE-HKM, Inc., Billings, Montana.

MSE-HKM, Inc. June 2000. Preliminary Monitoring Well Sampling Report. MSE-HKM, Inc., Billings, Montana.

2. Cost/Benefit Analysis

Costs

Based on the type of contaminants (mixed gasoline & diesel), the presence of an extensive petroleum free product plume, complex hydrogeology, and the proximity to one of Harlowton's drinking water supply well's, free product removal and then subsequent treatment of the impacted groundwater are the most technically feasible cleanup alternatives for this site. Replacement costs for the new production well, supply lines, etc. are anticipated to be approximately $250,000-$300,000 and the remediation costs are estimated to be $300,000-$400,000. The removal of petroleum product and treatment of highly contaminated groundwater will not only greatly reduce the mass of the petroleum contamination on site, it will also reduce the potential for these contaminants to adversely impact Harlowton's drinking water supply.

Benefits

The primary benefit of this project would be to reduce or eliminate the threat to the public drinking water supply for the City of Harlowton. Other benefits would include identifying contaminant sources and determining if there is a risk of vapor intrusion.

3. Project Alternatives

A. Replace the Supply well
Not only would the well have to be replaced but so would the water supply line. The new well and lines would have to be installed south or west of its existing location so its cone of depression would not intersect the dissolved phase plume. This approach would give residents of Harlowton a clean water source but would not address the existing groundwater contamination nor would it address the potential vapor intrusion threat.

B. Do nothing
This existing groundwater contamination will persist probably for decades if mitigation efforts are not initiated. The City of Harlowton's water supply will thus be threatened for as long as there is contamination proximal to the well. The potential vapor intrusion threat also would persist.

C. Equip the production well with a GAC filter
This would address the contaminants entering the well but would do nothing to eliminate the continued threat of contaminants migrating to the well. The well would have to be equipped with a filter for decades because this approach would not mitigate the groundwater contamination. The potential vapor intrusion threat would also not be evaluated with this approach.

D. Soil vapor extraction (SVE)
SVE only address contamination in the vadose zone. With the exception of a thin zone in monitoring well MW-4, vadose zone contamination has not been encountered. SVE is also not very effective for removing heavy hydrocarbons due to their low volatility. Since the contamination is a mixture of gasoline and diesel, only the more volatile compounds would be removed.

E. Soil vapor extraction/air sparging (SVE/AS)
The SVE system would primarily be used to capture fugitive gases generated by air sparging. Air sparging is not very effective for removing heavy hydrocarbons from the subsurface due to their low volatility. Since the contamination is a mixture of gasoline and diesel, only the more volatile compounds would be removed. The time for the SVE/AS system typically is 2 or more years.

Operation and maintenance costs would be incurred over the life of the project.

F. Excavation of Impacted soil
Excavation is not a feasible action since only limited vadose zone contamination has been encountered. Excavation to the water table is not feasible due to the presence of shallow bedrock and relatively deep groundwater. Excavation would not address the free product or dissolved phase plumes so risks to the drinking water supply and indoor air would persist.

4. Staffing and Administration

DEQ staff members that will be involved with this project include the following:
Mr. Scott Gestring, Environmental Specialist, DEQ LUST Trust Program
Mr. Jeff Kuhn, DEQ LUST Brownfields Section Manager
Mr. Mike Trombetta, Bureau Chief, DEQ Hazardous Waste Site Cleanup Bureau
Ms. Sandi Olsen, DEQ Remediation Division Administrator
Mr. Richard Opper, Director of DEQ
Mr. Ken Manchester, Pioneer (DEQ Contractor)

A. Describe the administrative structure, lines of authority, policy-making bodies, and other procedures for coordinating the project. Include a discussion of the relationship of the project to the applicant.

Mr. Gestring is the DEQ project manager and will be responsible for the day-to-day activities associated with the project such as technical review, oversight of contractors, and coordination with local representatives. Mr. Gestring will be working closely with Mr. Manchester, the project manager for Pioneer, on every aspect of the project. Mr. Kuhn and Mr. Trombetta will provide technical support, expertise, and guidance to Mr. Gestring on an as-needed basis to ensure that the project proceeds smoothly. Ms. Olsen and Mr. Opper will be involved if problems arise that require input from upper management.

5. Additional Information

For this project, we will need access agreements from the City of Harlowton to install monitoring wells on property belonging to the City of Harlowton.

Access agreements would have to be obtained from Wheatland County to install monitoring wells and install and operate remediation equipment on county property. The county property would include the areas where the courthouse and the county shop are located.

B. Permits

Encroachment permits will have to be obtained from the Montana Department of Transportation (MDT)
to install monitoring wells within the MDT right of Way. The date for the permit would be for June 2013.

C. Maps and Photos

This project will not affect structures in Harlowton, consequently the location of historical or archeological sites are not depicted. A goal of this project is to identify the sources that have contributed to the groundwater plume underlying Harlowton. Additional information obtained from the installation of additional wells and conducting additional groundwater monitoring should provide sufficient data to identify additional sources.

The following Figures are included in Appendix A:
Figure 1, Mager Well LUST Trust, Location and Vicinity Map from the Draft Free Product Recovery and Groundwater Monitoring Report (DOWL HKM, March 2012) depicts the study area within Harlowton.

Figure 4, Mager Well LUST Trust, Shallow Groundwater Map, November 2011 (DOWL HKM, March 2011)

Figure 5, Mager Well LUST Trust, Deep Groundwater Map, November 2011 (DOWL HKM, March 2011)

Figure 7 Mager Well LUST Trust TPH Concentration Map November 2011 (DOWL HKM, March 2012) shows the estimated extent of the free product and dissolved phase petroleum hydrocarbon plumes.

Figure 12, LUST Trust Facility Location Map depicts the location of potential sources of petroleum hydrocarbon contamination in Harlowton.

D. Plans and Specifications

Conceptual design.

The initial phase of the design includes the installation of approximately 24 groundwater monitoring wells which will serve to further delineate the extent of the free product plume. The groundwater monitoring wells will be installed in select locations to determine if the free product in well MW-16 is either an extension of the free product present in MW-08S, MW-09, MW-18, and MW-25, or if it a separate plume. Free product will be recovered from new and existing groundwater monitoring wells containing recoverable quantities of free product in the vicinity of the Courthouse and monitoring wells MW-08S, MW-9 and MW-18 utilizing active recovery systems and passive bailers in select recovery wells.

A pump test will be conducted on the Thompson Supply Well to determine the connectivity between the deep aquifer from which the drinking water is obtained and the shallow aquifer in which the

monitoring wells are completed. Four monitoring wells will be equipped with pressure transducers and data will be recorded using a multi-channel data logger. The length of the pumping test will be approximately 8 hours and at pumping rate of approximately 400 gallons per minute will produce approximately 192,000 gallons of water that will enter the distribution system and will be pumped into the new water tank. Water samples will be taken at the beginning, middle and end of the test to determine if water quality fluctuates during the duration of the test.

The vapor intrusion (VI) pathway will be evaluated at up to ten select structures overlying the contaminant plume. Sub-slab air samples will be obtained using SUMA canisters to determine the indoor air quality and evaluate if the VI pathway is complete. A duplicate air sample will also be collected. The canisters will be submitted for APH, TO-15 and TO-15 SIM analyses. The results will be compared with the 2011 EPA Region 9 regional screening levels for indoor air and the Montana DEQ VI calculator. The analytical results from the testing would be available approximately 30 days after the SUMA cans are submitted for analyses.

Select groundwater monitoring wells in the vicinity of the Thompson Supply well and Central Avenue will be utilized as portals for constructing ozone and hydrogen peroxide "reactors" within the wells. Supply lines will be trenched to each reactor well allowing oxidation chemicals to be delivered to the subsurface and react with petroleum contaminants. A remediation trailer housing the oxidation chemicals and injection controls will be operated on site for six (6) months). The purpose of the chemical oxidation is to reduce the dissolved phase contamination concentrations to reduce the threat posed to the public drinking water supply. Groundwater monitoring will be conducted following the six month injection period to determine the efficacy of the remediation efforts.

STEP 4 - SCOPE OF WORK

1. Goals and Objectives

Project Goals:
A. Delineate the extent of free product. Determine if there are distinct free product plumes or one extensive plume.

B. Eliminate or reduce the thickness of the free product plume.

C. Evaluate risk to human health from potential vapor intrusion into structures overlying the free product and dissolved phase plumes.

D. Determine the interaction between the shallow aquifer and the Thompson Supply Well.

E. Reduce the threat of petroleum and solvent contamination to the City of Harlowton water supply.

Project Objectives:

A. Install up to 24 additional groundwater monitoring wells to delineate the extent of free product in the vicinity of the Wheatland County Courthouse and monitoring wells MW-8S, MW-9, MW-18, and MW-25. Well installation would be initiated during September 2013 and would be completed by the end of November 2013.

B. Install free product remediation systems and initiate free product recovery and operate the recovery system for approximately one year.

C. Obtain indoor air samples from up to ten structures overlying the plume and compare analytical results with DEQ and EPA risk based screening levels. Air sampling would be initiated in September 2013 and would be completed by the end of November 2013.

D. Conduct a pumping test on the Thompson Supply Well using several groundwater monitoring wells proximal to the supply well by August 2013.

E. Initiate chemical oxidation of subsurface contamination by July 2014. Additional groundwater monitoring would be initiated during June 2014 and would be completed by June 30, 2015.

2. Tasks or Activities

If the grant application is successful, DEQ will execute a task order under an existing contract with Pioneer Technical Services, Inc. (Pioneer) to complete the free product delineation and pumping test phase. A tentative schedule follows:
May 2013: Prepare task order with Pioneer for free product delineation and pumping test phase of the project
June 2013: Prepare and distribute bid specifications
July 2013 – Review bids and award subcontract for well installation, vapor intrusion assessment, and

pumping test phase of the project
August 2013: Set final scheduling and coordination
September 2013: Initiate free product delineation, vapor intrusion assessment pumping test phase of the project, and groundwater monitoring
November 2013: Complete free product delineation, vapor intrusion assessment, and pumping test phase of the project
December 2013: Complete final Report for free product delineation, vapor intrusion assessment and pumping test phase of the project

Upon completion of the free product delineation and pumping test phase of the project, DEQ will execute a second task order for to install free product recovery systems and conduct groundwater monitoring. The first round of groundwater monitoring is tentatively scheduled for November/December 2013. Additional groundwater monitoring events will be conducted to monitoring the efficacy of the free product removal and chemical oxidation phases. Groundwater monitoring reports will be submitted to DEQ following each monitoring event. After the completion the groundwater monitoring events, the schedule will be reevaluated and adjusted as necessary.

For free product delineation, up to 24 additional groundwater monitoring wells will be installed at select locations using an auger drill rig starting in September 2013. Monitoring wells have been successfully installed with an auger drill rig in Harlowton during previous investigations. The wells will provide further delineation of the free product plume and select wells will serve as free product recovery wells and as reactor wells. Following installation and development of the newly installed wells, these, along with the previously installed wells, will be checked for the presence of free product using a dual phase interface probe. The configuration of the plume will then be mapped out based on the location of the wells exhibiting free product. This phase should take approximately one month.

Free product recovery will be initiated once the plume boundary has been defined. Free product systems will be installed and augmented with passive bailers in select wells. Groundwater monitoring will be conducted to verify the effectiveness of the free product removal.

The vapor intrusion (VI) pathway will be evaluated at up to ten select structures overlying the contaminant plume. Subslab samples will be obtained at each structure to determine the indoor air quality and evaluate if the VI pathway is complete. A duplicate air sample will also be collected. The canisters will be submitted for APH, TO-15 and TO-15 SIM analyses. The results will be compared with the 2011 EPA Region 9 regional screening levels for indoor air and the Montana DEQ VI calculator. The analytical results from the testing would be available approximately 30 days are SUMA cans are submitted for analyses.

Upon completion of the free product recovery phase of the project, DEQ will execute a third task order for Pioneer to install a chemical oxidation (Chem Ox) groundwater treatment system to address the dissolved phase groundwater contamination. Groundwater monitoring will occur during the chemical oxidation process to evaluate its effectiveness in reducing contaminant concentrations.

3. Project Schedule

A. Submittal dates for all required permits, licenses, and approval
No permits or licenses are required for this project.

B. Dates for advertising for bids and requests for proposals
June 2013

C. Contract award dates
July 2013

D. Dates on which work on each objective will start and end

Free product delineation would be initiated during September 2013 and would be completed by the end of November 2013

Obtain indoor air samples from up to ten structures overlying the plume and compare analytical results with DEQ and EPA risk based screening levels. Air sampling would be initiated in September 2013 and would be completed by the end of November 2013.

Pumping test on the Thompson Supply Well would be stated by September 2013 and completed by the end of November 2013.

Free product remediation systems installation and free product recovery operation for approximately twelve months. This would start in December 2013 and end November 2014.

Initiate chemical oxidation of subsurface contamination by December 2015 and would operate until June 30, 2015. Additional Groundwater monitoring would be initiated November 2013 would be completed by June 30, 2015. Cleanup and groundwater monitoring will continue past the end of the grant funding until the site is in compliance with groundwater standards.

E. Dates on which each task or activity will start and end

May 2013 to June 2013: Prepare task order with Pioneer for free product delineation and pumping test phase of the project.
June 2013 to July 2013: Prepare and distribute bid specifications
July 2013 to August 2013: Review bids and award subcontract for well installation, vapor intrusion assessment, and pumping test phase of the project
August 2013 to September 2013: Set final scheduling and coordination
September 2013 to November 2013: Initiate free product delineation, vapor intrusion assessment pumping test phase of the project, and groundwater monitoring
November 2013 to December 2013: Complete free product delineation, vapor intrusion assessment, and pumping test phase of the project
December 2013 to February 2014: Complete final Report for free product delineation, vapor intrusion assessment and pumping test phase of the project

Upon completion of the free product delineation and pumping test phase of the project, DEQ will execute a second task order for to install free product recovery systems and conduct groundwater monitoring. The first round of groundwater monitoring is tentatively scheduled for November/December 2013. Additional groundwater monitoring events will be conducted to monitoring the efficacy of the free product removal and chemical oxidation phases. Groundwater

monitoring reports will be submitted to DEQ following each monitoring event. After the completion the groundwater monitoring events, the schedule will be reevaluated and adjusted as necessary.

F. Project completion date

The free product delineation phase of the project is scheduled for completion by November 31, 2013. The groundwater monitoring will continue for up to one year after the chemical oxidation phase is completed. Monitoring results will be used to determine if there are remaining data gaps to be investigated.

4. Monitoring Plan

Free product thickness will be recorded on a periodic basis during the free product recovery phase to document the efficacy of the recovery system. Groundwater samples will be collected from groundwater monitoring wells and the Thompson supply well to document contaminant concentration fluctuations, depth to groundwater, and groundwater flow direction. This information will be obtained and compiled by the consultant.

5. Equipment

Identify and describe any equipment that would be purchased. Provide specific justification for all acquisitions.

The free product recovery system components will be purchased. The components would include but are not limited to: skimmer pumps, compressors, free product storage drums, pneumatic controls, and storage sheds to house the systems.

STEP 5 – BUDGET BUDGET INSTRUCTIONS

The costs for the project are broken out per task. Task 1 – free product plume delineation
Drillers
$35,700 - groundwater monitoring well installation hollow stem auger (HAZ Tech), well development, # of wells, estimated number of feet = 24 wells ~ 840 linear feet * ($17.50/ft drilling + $25/ft well installation)
$650 - Mobilization charges – $3.25/mile *200 miles
$920 - Per diem 2 people @ $23/day * 20 days
$3080 - Lodging 2 people @ $77/night/each * 20 nights
$1500 - Support Truck $75/day * 20 days
$2160 - Surface completion $90/well * 24 wells
$40,970 - Total drilling costs

Consultant charges
$15,000 - Monitor well installation/well development – 24 groundwater monitoring wells and traffic control plan and traffic control for installing wells in the Highway 112 (2nd Street NW) Right of Way – 200 hours
$460 - Per diem @ $23/day * 20 days
$1,540 - Lodging @ $77/night/each * 20 nights
$440 - Mileage - 4 trips – 200 miles per trip @ 0.55 per mile
$17,440 - Total Consultant charges
$5,000 - Surveying 24 new wells -Surveyor fees

$63,410 - Total Task 1 costs

Task 2 – Vapor intrusion pathway evaluation
$6,000 – 10 subslab vapor samples from select structures overlying the plume. Project geologist VI surveys, etc. – 80 hours
$230 -Per diem @ $23/day * 10 days
$770 - Lodging @ $77/night/each * 10 nights
$220 - Mileage - 2 trips – 200 miles per trip @ 0.55 per mile
$5,995- Lab fee for 11 SUMA canister analyses for APH, TO-15, TO-15 SIM plus shipping and individually certified cans and controllers ($525 per sample)

$12,775 - Total Task 2 costs

Task 3 - Thompson Supply well connectivity test
$1,000 - Equip monitoring wells MW-6, MW-16, MW-19, and a new well with transducers Equipment rental would include transducers, cabling, and data loggers
$1,500 - 20 hours consult time for set up and testing
$46 - Per diem @ $23/day * 2 days
$450 – Sampling during testing – 3 EPA Method 8260 analyses @ $150 each = $450

$1,996 - Total Task 3 costs - $1,996

Task 4 – free product system installation and free product recovery
$11,250 - Project management/free product recovery system design/installation oversight – 150 hours @
$75 per hour
$230 - Per diem @ $23/day * 10 days
$770 - Lodging @ $77/night/each * 10 nights
$120,000 - Free product recovery systems
System would consist of up to 10 free product recovery skimmer pumps (each skimmer pump costs ~$5,000), 2 Equipment shed, controls, tubing, trenching, free product recovery drums, 2 power drop/electrical hookup, utilities, and purchase of 4 additional passive canisters (already have 4 in use)
$12,000 - O&M for active systems and disposal of free product from passive canisters and active systems for six months (weekly visits for first 2 months then bi-monthly for 4 months) ~160 hours
$5,000 - Free Product disposal

$144,250 - Total Task 4 costs

Task 5 – chemical oxidation
$10,800 - 12 well reactors ~ $10,800
$18,000 - Chem ox trailer rental for 6 months - $18,000
$3,300 - Mobe/setup
$2,000 - Chem ox chemicals
$3,000 – utilities
$6,000 - Chem ox O &M for 6 months
$2,000 - Data reduction
$10,000 – System installation/trenching
$52,100 - Total chemical oxidation fees
Consultant charges
$7,500 - Chem ox observation/installation/maintenance – 100 hours – Project geologist
$230 - Per diem $23/day @ 10 days
$550 - Mileage – 5 trips - 200 miles per trip @ $0.55 per mile
$308 - Lodging - 4 nights @ $77/night

$60,380 - Total Task 5 costs

Task 6 Groundwater sampling
$18,000 – Consultant labor, 30 wells per event - 4 events – ~60 hours per event or ~240 hours total
$690 - Per diem @ $23/day * 30 days
$2,310 - Lodging @ $77/night/each * 30 nights
$440 - Mileage - 4 trips – 200 miles per trip @ 0.55 per mile
$48,000 –Lab analytical fees for 4 groundwater monitoring events. 30 wells per event VPH ($100), EPH without PAH's ($150), and EPA Method 8260b ($150). Analytical cost per well is ~$400 or a total of $12,000 per event

$69,440 - Task 6 total costs

Report preparation
$6,000 - RI report (well installation, free product recovery system design and installation, and pumping test results and vapor intrusion assessment and groundwater monitoring)
$4,000 - Remediation Report - Chemical oxidation system design and installation and results
$7,500 - Three groundwater monitoring reports @ $2500 each.

$17,500 - Total Reporting Charges

$369,711 Contracted services grand total

$15,323 - DEQ personnel task order prep, report review, oversight, etc.
$345 - Per diem @ $23/day * 15 days
$1,155 - Lodging @ $77/night/each * 15 nights
$1,144 - Mileage - 8 trips – 260 miles per trip @ 0.55 per mile

DEQ personnel costs – 17,967$ Project total - $387,678
Applicant's and Other Outside Funding Sources
The $87,355 provided by DEQ for this project during FY 2014-2015 will be obtained from the LUST Trust program. The DEQ has also requested ERRA funds.

Plan for Future Funding
Future funding will be necessary. The amount will be determined on the success of the free product recovery system and subsequent reduction of contaminant concentrations by chemical oxidation. Upon review of the data collected, DEQ will decide if additional groundwater treatment is necessary and what options are available at that time. Future groundwater monitoring will be needed to document groundwater contaminant concentrations and will help determine if there are data gaps that need to be filled.

BUDGET CATEGORY EXPLANATION

Administrative Costs

1. Salaries and ____ – Identify each employee needed to complete the project. List employees by and position, or by position only if not yet hired. List the estimated number of hours each work and the loaded hourly wage rate. Include in this category clerical, bookkeeping, and other staff

DEQ Staff	Position	Hours	Loaded Rate	Expenses
Scott Gestring	Project Manager	300	38.97	$11,691
Jeff Kuhn	Section Supervisor	50	47.11	$2,356
Holly LaBlounta	Clerical	30	14.60	$438
Sherry Blair	Bookkeeping	30	27.94	$838
	Total			$15,323

2. Supplies and Materials
None

3. Communications
None

4. Travel
$2644. Travel would include trips to and from Helena for one person during the free product delineation stage, free product recovery system and chemical oxidation system installations. I anticipated a week stay in Harlowton during each of the three major phases.

$345 - Per Diem ($23/day * 15 days)
$1,155 - Lodging ($77/night/each * 15 nights)
$1,144 - Mileage (8 trips *260 miles per trip @ 0.55 per mile)

5. Rent and Utilities
None

6. Equipment
None

6. Miscellaneous
$69,711

Activity Costs
1. Personnel Costs
None

2. Contracted Services
$300,000

Indirect Costs
Indirect costs will be covered by LUST Trust funds.

Project Budget Summary Form

Category	RDGP	LUST Trust	Source	Source	Total
Administrative Costs					
Personnel Cost		**$15,000**			
Supplies & Materials					
Communications					
Travel		**$2,644**			
Rent & Utilities					
Equipment					
Miscellaneous		**$69,711**			
Total Administrative Costs		**$87,678**			
Activity Costs					
Personnel Cost					
Contracted Services	**$300,000**				
Activity: Well installation					

Activity: VI assessment					
Activity: Pumping test					
Activity: Free product					
Activity: Chem ox					
Activity: groundwater monitoring					
Total Activity Costs					
TOTAL PROJECT COSTS					
TOTAL	**$300,000**	**$87, 678**			

Notes:
RDGP = Reclamation and Development Grant Program

STEP 6 - PUBLIC BENEFITS RANKING CRITERIA

_X_ The project repairs, reclaims, or mitigates environmental damage to natural resources from mineral development.

_X_ The project develops and ensures the quality of natural resources.

_X_ The project conserves natural resources.

_X_ The project protects the public health, safety, and welfare of Montanans.

_X_ Montanans will directly benefit from the project.

_X_ Montanans will indirectly benefit from the project.

_X_ Jobs are created by the project for people who need job training, receive public assistance, or are chronically unemployed.

_X_ The project benefits are certain and long term.

NARRATIVE:

The project develops and ensures the quality of natural resources.
The completion of the project will significantly improve groundwater quality and reduce or eliminate the threat to the Harlowton's public drinking water supply.

The project conserves natural resources.
This project conserves natural resources by protecting water quality for future generations.

The project protects the public health, safety, and welfare of Montanans
Contaminated groundwater is present in fairly close proximity to the Thompson Supply well and low concentrations of petroleum hydrocarbons and 1,2 DCA have been detected in the public drinking water. As long as the contaminated groundwater continues to be present, it is a threat to the public drinking water supply for the City of Harlowton. One of the goals of the project is to remediate the impacted groundwater and eliminate the threat to the public water supply.

Free product and highly contaminated groundwater may pose a risk of vapor intrusion to structures overlying the contaminant plume. Removal of the free product and reduction of dissolved phase contamination will mitigate the vapor intrusion risk thus improving indoor air quality.

Due to the presence of contaminated groundwater underlying a large portion of Harlowton, a moratorium has been emplaced to restrict drilling of new domestic wells in Harlowton. Residents are denied the opportunity to drill a well for drinking water or irrigation purposes. This infringement upon their right to obtain water from a source other than city water could be lifted once the impacted groundwater is remediated.

Montanans will directly benefit from this project

Residents of Harlowton will benefit from this project through improved drinking water quality and elimination of a threat to the public drinking water supply ensuring a long-term supply of contaminant-free drinking water. Removal of the free product and reduction of dissolved phase contamination will mitigate the vapor intrusion risk.

Montanans will indirectly benefit from the project.

Currently, there is moratorium on domestic well installation in Harlowton. By mitigating the free product and dissolved phase plumes, eventually the moratorium may be lifted, giving resident the opportunity to install their own domestic or irrigation wells.

The project benefits are certain and long term

Eliminating the free product and reducing dissolved phase contaminant concentrations in the groundwater will eliminate the threat to the public water supply and will eliminate the threat of vapor intrusion into structures that were overlying the contaminant plume.

STEP 7 - NEED AND URGENCY RANKING CRITERIA

1. The degree to which the information submitted identifies the need, who is affected, and how they are affected

Table 3 and Table 4 from DOWL HKM's Draft Free Product Recovery and Groundwater Monitoring Report, dated March 2012 are included in Appendix B. The analytical results indicate that the water supply from the Thompson supply well has been adversely impacted by low concentrations of Benzene, toluene, and 1,2 DCA. Figure 7, included above in Section 3, shows the relationship between the Thomson supply well and monitoring well MW-16 which contains free product and is located approximately 180 feet northeast of the Thomson supply well. The contaminants in the public water supply have the potential to impact the entire community of Harlowton. Benzene and 1,2 DCA are known carcinogens and exposure through ingestion could potentially increase the risk of getting cancer.

2. The immediacy of the need or problem, including the cause and how long it has existed

The Thompson supply well was initially sampled by the DEQ contractor on May15, 2000 and 1,2 DCA was reported at an estimated concentration of 0.26 ug/L. The DEQ 7 drinking water standard for 1,2 DCA is 4 ug/L. The cause of the contaminants in the drinking water supply is believed to be migration of petroleum contaminants into the groundwater. When pumping, the Thompson supply well presumably creates a cone of depression, inducing migration of the contaminant plume towards the well. The contaminants are drawn into the well and then the impacted water is pumped into the municipal water tank. The water is utilized through Harlowton via the water distribution system.

The threat to the water supply probably has existed since at least 1989 when the underground storage tanks were removed from several service stations along Second Avenue (Highway 12).

3. The impact of a "no action" alternative

The threat to Harlowton's drinking water supply will remain at risk if the petroleum contaminated groundwater proximal to the Thompson Supply well is not remediated. Petroleum vapors may also migrate and enter buildings at levels that can cause unacceptable human health and safety risks. Failure to remediate the groundwater will also prevent lifting of the moratorium on the installation of groundwater wells in Harlowton.

4. The severity of the problem or need, and the extent of the area involved

Based on the potential for petroleum hydrocarbons to impact the public water supply system and the potential for vapor intrusion, this site currently ranks in the top 1% of sites managed by the DEQ LUST/Brownfields Section. The portion of Harlowton most severely impacted by petroleum releases covers an area of approximately three by four block area extending east from B Avenue NW to Lewistown Avenue NE and 2nd street NW (Highway 12) north to Fourth Street N (see Figure 7 in Appendix A for extent of the Total Purgeable Hydrocarbons plume). The shallow groundwater aquifer in this area has LNAPL and high levels of dissolved petroleum constituents. For example, Benzene was reported at concentrations up to 3,700 ug/L while the drinking water standard is 5 ug/L. Drinking water and human health standards are exceeded in the majority of the monitoring wells.

Groundwater Analytical Tables 3 and 4 (Appendix B), report the contaminant concentrations from the monitoring, domestic, irrigation and public supply wells from various sampling events.

5. The number and type of natural resources affected

Groundwater is the primary natural resource impacted by the petroleum releases in Harlowton. The Harlowton drinking water supply is also threatened by this petroleum release due to contaminated groundwater being in close proximity to the Thompson Supply well. Low concentrations of benzene, toluene, and 1,2, DCA have been detected in water samples obtained from the Thompson Supply well.

STEP 8 - PROJECT MANAGEMENT AND ORGANIZATION CAPABILITY RANKING CRITERIA

1. The degree to which the applicant evidences ability to implement approaches resulting in effective and efficient work performance

The DEQ Remediation Division is responsible for overseeing the investigation and cleanup of all petroleum releases in the State of Montana that can be attributed to underground and aboveground storage tank systems. Not only does DEQ oversee cleanup actions completed by responsible parties, but the department also contracts directly with private engineering companies through the LUST Trust Program to complete cleanup actions. Approximately 3,000 petroleum releases have been cleaned up and resolved by DEQ since 1988.

2. The applicant's past record of performance

The Petroleum Release Section of DEQ Remediation Division submitted a Reclamation and Development Grant application for the former Harlem Equity Co-op Bulk Plant in 2004. The DEQ was awarded approximately $285,000 and the funds were expended in successfully excavating 12,000 cubic yards of impacted soil, replacing a water line and mitigating the threat to Harlem's drinking water supply.

3. The skills, qualifications, and experience of the project manager, key personnel, sponsors, and contractors in the appropriate fields

The DEQ project manager, Scott Gestring, has a Master's degree in Geology plus over 18 years of experience in the environmental field primarily dealing with the investigation and remediation of petroleum hydrocarbon impacted sites. For three of those years he worked as an environmental consultant with private consulting firms and for the past 15 years he has been with the Remediation Division with the State of Montana. In his current positions with the State of Montana, Mr. Gestring serves as the technical expert for petroleum investigation and remediation technology evaluation/implementation for the Petroleum Technical and the LUST/Brownfields Sections. He reviews site-specific data and corrective action plans and provides input to project managers regarding technical approaches utilized at their sites. He assists with research and review of innovative technologies for the investigation and remediation of petroleum releases. Mr. Gestring researches ways in which to apply the use of various conventional and innovative remediation technologies for implementation at petroleum release sites, and has evaluated new approaches for using technologies to facilitate more efficient petroleum investigations and cleanups. Mr. Gestring has prepared task orders for implementing subcontracted work at several LUST Trust sites. The task orders included detailed scopes of work and budgets. He has also worked on a significant number of military sites including Air Force facilities such as Malmstrom Air Force Base (AFB), Havre Air Force Station (AFS), various launch control facilities (LF) and missile alert facilities (MAFs) plus Del Bonita Radar Station, a formerly used defense (FUD) site. He coordinates with the Air Force and DSMOA personnel and their subcontractors to develop remedial investigations and remediation strategies. He also works with the DEQ DSMOA coordinator to develop and implement Joint Execution Plans (JEPs) for Malmstrom AFB, Havre AFS, and Del Bonita.

Mr. Gestring oversees remedial investigation and cleanup work conducted at petroleum release sites that are of a highly complex nature and aides in the selection of technically appropriate, cost

effective cleanup methods. Mr. Gestring shares technical expertise internally and externally in the application of both proven technologies and innovative and emerging technologies at petroleum release sites.

Mr. Jeff Kuhn has been employed by DEQ as the Petroleum Release Section Manager since 1988. Prior to his employment with DEQ, Mr. Kuhn worked as an environmental consultant in Minneapolis, MN. Mr. Kuhn earned a B.S. in Geology from Juniata College, Pennsylvania in 1981 and a M.S. degree in Geology from the University of Montana in 1986.

Mr. Mike Trombetta has been employed by DEQ since 1989 and has been the Hazardous Waste Site Cleanup Bureau Chief since 1997. Mr. Trombetta earned a B.S. degree from the University of Vermont in 1980 and a M.S. degree in Earth Science from Montana State University in 1986.

Ken Manchester, P.G., Pioneer Technical Services, Inc. Mr. Manchester has a Master's Degree in Hydrogeological Engineering, a Bachelor of Science Degree in Geological Engineering, and a Bachelor of Arts Degree in Geology. He has over twenty-five years of direct hydrogeological experience in managing and implementing a diverse set of projects for Federal, State, and private sector clients. He has been a project manager on numerous projects encompassing remedial investigations and remediation, remediation system design, emerging technologies demonstrations, pilot testing, and technology validation. He is experienced in numerous types of drilling including sonic, hollow stem auger, dual-rotary, air/mud rotary and direct push. He was responsible for building and managing a direct push business that included bidding and scheduling direct push work, ordering and designing tooling and well supplies, reporting, and invoicing. He has directed work for the Montana Department of Environmental Quality LUST/Brownfield's section under a master contract to perform UST removals, conduct remedial investigations, and design and implement remedial actions. Under the DEQ LUST Trust contract, Mr. Manchester was responsible for the remediation of one of the largest fuel contamination sites in Montana using electrical resistance heating coupled with pulsed air-sparging and soil vapor extraction. He is also experienced at technical report preparation, data interpretation, geologic analysis, geotechnical drilling, well design and construction, aquifer testing, geophysical logging, groundwater sampling, surveying, computer modeling of groundwater flow and contaminant transport using Visual ModFlow and MT3D software packages, and subsurface barrier design.

Leigh Beem, Owner Partner Johnston Leigh, Inc., Geologist/Hydrogeologist. Mr. Beem has a Master's Degree in Geology and a Bachelor of Science Degree in Geology. He is member of the National Groundwater Association. Mr. Beem was awarded a President's Excellence Award for Creative Problem Solving from the President of Waste Management. Mr. Beem is proficient in RockWorks, Aquifer Test Pro, Contour, and Visual Modflow, and uses these models routinely to develop site conceptual models.

As a project manager for Flying J Inc. he was responsible for a $5,000,000 annual budget for environmental and remediation projects at up to 85 retail truck fueling centers in 34 states and Canada and developed a nationwide UST compliance program for Flying J. His responsibilities included daily management of local consultants providing local oversight of investigation and remediation activities at the operating truck stops, interfacing with local regulators to maintain compliance for each site, designing investigation and remediation plans for use by local consultants in the field, nationwide management and oversight of emergency response for all spills associated with the transportation of fuels by Flying J Transportation and at the operating truck stops, and

personally performing soil and groundwater investigations, modeling, and remediation at the Flying J sites in the Rocky Mountain area. Remediation technologies used for Flying J nationwide included but were not limited to ART in-well air-stripper, soil vapor extraction, and air-sparge, chemical oxidation using hydrogen peroxide and ozone, soil vapor extraction with air injection, air sparge, dual phase and total fluids extraction and above ground separation, pump and treat using air stripper with activated carbon treatment, surfactant flush and reinjection, automatic NAPL seeking and removal using optical product pumps, and detailed natural attenuation monitoring.

STEP 9 - ENVIRONMENTAL CHECKLISTS

Applicant Montana Department of Environmental Quality Project Title Free Product Delineation and Mitigation of Threat to Harlowton Public Water Supply, Harlowton, MT

Project Description Delineate and remediate the free product plume in Harlowton to reduce the potential adverse impacts to the public drinking water supply

Person Preparing Checklist Scott Gestring Phone (406) 841-5051

POTENTIAL IMPACTS ON THE PHYSICAL ENVIRONMENT

	MAJOR	MODERATE	MINOR	NONE	UNKNOWN	COMMENTS
Topography				X		N/A
Geology: Stability				X		N/A
Soils: quality, quantity, distribution				X		N/A
Water: quality, quantity, distribution	X					Adverse
Air: quality				X		N/A
Terrestrial, avian, and aquatic: species and habitats				X		N/A
Vegetation: quantity, quality, species				X		N/A
Agriculture, grazing, crops, production				X		N/A
Unique, endangered, fragile or limited environmental resources	X					Adverse
Demands on environmental resources of land, water, air, and energy				X		N/A
Historical and archaeological sites				X		N/A
Aesthetics				X		N/A

STEP 9 - ENVIRONMENTAL CHECKLISTS (cont.)
POTENTIAL IMPACTS ON THE HUMAN ENVIRONMENT

	MAJOR	MODERATE	MINOR	NONE	UNKNOWN	COMMENTS
Social Structures & more				X		N/A
Cultural uniqueness, diversity				X		N/A
Population: quantity and distribution				X		N/A
Housing: quantity and distribution				X		N/A
Human health and safety	X					Adverse
Community and personal income				X		N/A
Employment: quantity, and distribution				X		N/A
Tax base: local and state				X		N/A
Government services: demand on				X		N/A
Industrial, commercial, and agricultural activities				X		N/A
Recreation and wilderness				X		N/A
Environmental plans and goals, local and regional				X		N/A
Demands for energy				X		N/A
Transportation networks and traffic flows				X		N/A

List all groups or agencies contacted and the contact person's phone number.
DNRC, Alicia Stickney (406) 444-0547
Central Montana Health District, (406) 535-7466
Wheatland County Commissioner, Tom Bennett (406) 632-4533
Wheatland County Commissioner, David Miller (406) 473-2321
Harlowton Mayor, Jeff Sell, (406) 632-5809

I have received letters of support for this project from the Central Montana Health District and Mr. Jeff Sells, the Mayor of Harlowton. The letters are included in Appendix C.

STEP 10 - LIABLE PARTY DETERMINATION

"A proposed project is not eligible for funding under the Reclamation and Development Grants Program if there is a liable party who would be relieved of financial or legal responsibility and who can reasonably be expected to be held responsible" (MCA §90-2-111). Liability **may** arise under the regulatory statutes or rules of a state or federal agency, such as the Montana Department of Environmental Quality, Montana Board of Oil and Gas Conservation, U.S. Forest Service, U.S. Bureau of Land Management, or U.S. Environmental Protection Agency. Or, it may arise under local rules or ordinances. **(Note: Existence of liability does not automatically rule a project ineligible for Reclamation and Development Grant Program funding.)** In order to assist DNRC in determining the existence of liability, the applicant **must** furnish the following information at the time of application submittal.

1. What is the legal description of the site?
Graves third addition (Harlowton), S22, T08 N, R15 E, Block 007, Lot 001

2. What is the name of the current owner? This information is available from records at the county courthouse. Wheatland County, PO Box 1903, Harlowton, MT 59036-1903. Information gathered as a result of this project may result in determination of potential liability.

3. When did the damage occur?
Unknown – the groundwater contamination was discovered in 1996 when a domestic well was installed and intersected the dissolved phase plume. Approximately 7 feet of free product was discovered in a well in the Wheatland County Courthouse on June 22, 2000.

4. Who was the owner/operator at that time? Provide as much identifying information as possible.
Wheatland County. The sources of contamination have not yet been fully identified. When they are they become responsible for cleanup activities required in the future.

5. Have there been subsequent owners/operators? Provide as much identifying information as possible. There have not been any subsequent owners of the court house. The building has been occupied by county offices since around 1940. Properties that may be the source of the plume have changed hands numerous times.

6. Who has been paying the property taxes the past 10 years? This information is available at the county tax assessor's office. The Wheatland County Courthouse is located on the subject property and it is exempt from paying county taxes.

7. Provide a statement from the current landowners that a nuisance action is not currently pending.
On May 1, 2012, the Wheatland County Appraisers Office was contacted and the representative indicated that to the best of her knowledge a nuisance action is not pending.

8. Is the project now, or has it ever been, permitted, licensed or regulated by federal, state, or local rules, regulations or statutes? The project is not currently nor has it ever been licensed or regulated by federal, state, or local regulations or statutes.

STEP 11 - CRUCIAL STATE NEED DOCUMENTATION

1. Potential threat to public health or safety

The Harlowton drinking water supply is threatened by this petroleum release due to contaminated groundwater being in close proximity to the Thompson Supply well. Low concentrations of benzene, toluene, and 1,2, DCA have been detected in water samples obtained from the Thompson supply well.

2. Validity of the problem or need

Contaminated groundwater is in close proximity to the Thompson Supply well. Low concentrations of benzene, toluene, and 1,2, DCA have been detected in water samples obtained from the Thompson supply well.

3. Consequences of no action or delayed action

The threat to Harlowton's drinking water supply will remain at risk if the petroleum contaminated groundwater proximal to the Thompson Supply well is not remediated. Petroleum vapors may also migrate and enter buildings at levels that can cause unacceptable health and safety risks. Failure to remediate the groundwater will also prevent lifting of the moratorium on the installation of groundwater wells in Harlowton.

4. Severity of the problem or need

Contaminated groundwater is in close proximity to the Thompson Supply well. Low concentrations of benzene, toluene, and 1,2, DCA have been detected in water samples obtained from the Thompson supply well. The groundwater contamination has the potential to impact the entire water supply of Harlowton. Drinking water from the Thompson Supply well along with water from two other supply wells is pumped up to the water storage tank and then the distributed through town.

5. Number of people affected

The groundwater contamination has the potential to impact the entire water supply of Harlowton and thus everyone on city water who consumes city water could potentially be affected.

6. Agency and public support for the project

This project is a priority at the State level and is supported at the local level by the City of Harlowton and the Central Montana Health District. Letters of support from the Wheatland County sanitarian and the Mayor of Harlowton are included in Appendix C.

7. That the project's stated objectives will meet the need

Implementation of the first two objectives, defining the free product plume, and conducting free product recovery will provide a significant reduction in the mass of petroleum contaminants on-site, will limit off-site migration of the petroleum hydrocarbon plume, and reduce the potential impact to the drinking water supply and will help facilitate natural attenuation. Implementation of the third

objective, groundwater treatment through chemical oxidation will reduce dissolved phase contamination concentrations and enhance natural attenuation. Groundwater monitoring is necessary to verify the effectiveness of the remedial actions.

STEP 12 - APPLICATION COMPLETION CHECKLIST

r Step 1 - Grant Application Summary

r Step 2 - Project Abstract

r Step 3 - Technical Description and Alternative Analysis

r Problem History
r Cost/Benefit Analysis
r Project Alternatives
r Staffing and Administration
r Additional Information

r Step 4 - Scope of Work

r Goals and Objectives
r Tasks or Activities
r Project Schedule
r Monitoring Plan
r Equipment

r Step 5 - Budget

r Budget Justification Narrative
r Budget Summary Form
r Budget Detail Form

r Step 6 - Public Benefits (Form and Narrative)

r Step 7 - Need and Urgency (Narrative and Supporting Documents)

r Step 8 - Project Management and Organization Capability (Narrative)

r Step 9 - Environmental Checklists

r Step 10 - Liable Party Determination

r Step 11 - Crucial State Need Documentation (Narrative and Supporting Documents)

r Step 12 - Application Checklist for Completeness

APPENDIX A
FIGURES

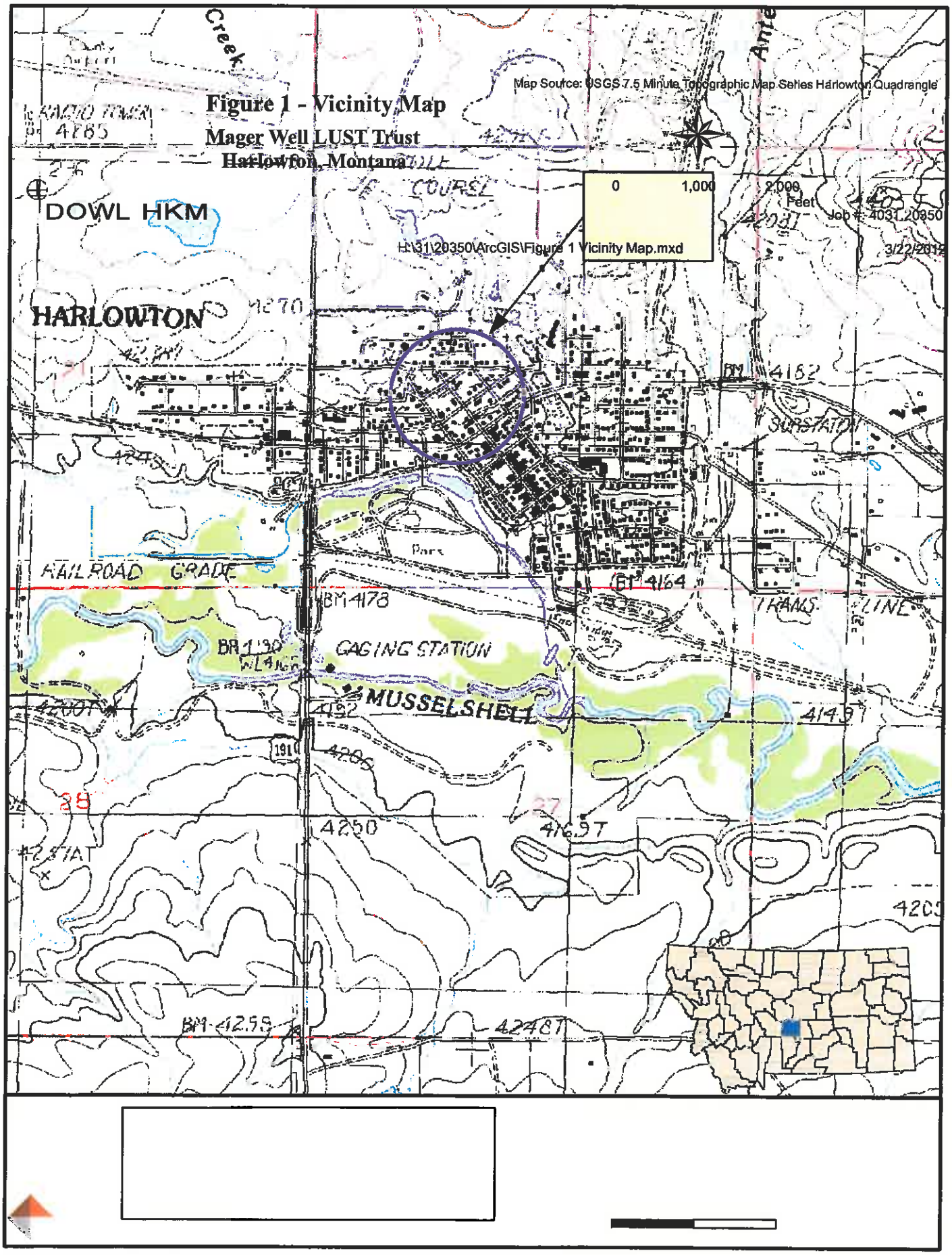


Figure 1 - Vicinity Map
Mager Well LUST Trust
Harlowton, Montana
Map Source: USGS 7.5 Minute Topographic Map Series Harlowton Quadrangle
0
1,000
2,000
Feet
Job #: 4031.20350
3/22/2012
H:\31\20350\ArcGIS\Figure 1 Vicinity Map.mxd
DOWL HKM
HARLOWTON
RAILROAD GRADE
GAGING STATION
MUSSELSHELL
SUBSTATION
TRANS. LINE
BM 4178
BM 4164
BM 4182
4250
4149T
4200T
4248T
191

Figure 4

MAGER WELL LUST TRUST
SHALLOW GROUNDWATER
MAP NOVEMBER 2011
(Croston's Exxon Wells Included)

Legend

Monitor Well Locations

4199.39 feet
Groundwater Elevation

Potentiometric Contours

4202 feet (2 foot interval)

N
W E
S

0 75 150 300
Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM

Job#: 4025.20350
3/19/2012

H:\31\20350\ArcGIS\Potentiometric Map Shallow.mxd

MAGER WELL LUST TRUST
DEEP GROUNDWATER MAP
NOVEMBER 2011
(Croston's Exxon Wells Included)

Legend

Monitor Well Locations

4195.19 feet

Potentiometric Contours

4195.2 feet (0.1 foot interval)
Groundwater Elevation

N
W E
S

0 75 150 300
Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350
3/19/2012

DOWL HKM

May 14, 2012

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Scott Gestring, Environmental Specialist
Department of Environmental Quality
1100 N. Last Chance Gulch
P.O. Box 200901
Helena, MT 59620

RE: November 2011 Groundwater Monitoring Report
Free Product Recovery and Groundwater Monitoring
Harlowton, Montana
Contract No. 407033-TO-18

Dear Mr. Gestring:

DOWL HKM has completed groundwater monitoring as required by Task Order #18 of Contract #407033 with the Montana Department of Environmental Quality (MDEQ). The enclosed data summary report presents groundwater monitoring activities performed by DOWL HKM during November 2011, for the Mager Well LUST Trust Site in Harlowton, Montana.

Please call me at (406) 586-8834 if you have any questions.

Sincerely,

DOWL HKM

James E Potts

James Potts E. I.
Hydrogeologist

Enclosure Report
Distribution: Addressee (1)

FINAL
FREE PRODUCT RECOVERY
AND
GROUNDWATER MONITORING REPORT

MAGER WELL LUST TRUST SITE
HARLOWTON, MONTANA

MDEQ Contract 407033
Task Order No. 18

Prepared for:

Montana Department of Environmental Quality

LUST Trust Program
Montana Department of Environmental Quality
P.O. Box 200901
Helena, Montana 59620-0901

Prepared by:

DOWL HKM

920 Technology Boulevard
Suite A
Bozeman, MT 59718

Principal Author: Jim Potts, Hydrogeologist
Reviewed By: Carla Van Siclen, Geologist / GIS Specialist

MAY 2012

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Site Background 1
1.2 Previous Remedial Investigations 2
1.3 Regional Geologic Setting 6
2.0 INVESTIGATION METHODOLGY 8
2.1 Investigation Objectives 8
2.2 Purpose of Investigation 8
2.3 Groundwater Monitoring, Water Quality Sampling, and Analytical Testing 8
3.0 INVESTIGATION RESULTS 10
3.1 Water Level Monitoring 10
3.2 Free Product Removal 13
3.3 LNAPL Analytical Results 14
3.4 Groundwater Sampling Results 14
4.0 CONCLUSIONS 16
5.0 RECOMMENDATIONS 18
6.0 REFERENCES 20

LIST OF TABLES

Table 1 Well List 11

LIST OF APPENDICES

Appendix A Figures
Figure 1 Vicinity Map
Figure 2 Mager Well LUST Trust Study Area and Analytical Data Map
Figure 3 Mager Well LUST Trust Site Groundwater Elevation History
Figure 4 Mager Well LUST Trust Shallow Groundwater Map
Figure 5 Mager Well LUST Trust Deep Groundwater Map
Figure 6 Mager Well LUST Trust Benzene Concentration Map
Figure 7 Mager Well LUST Trust TPH Concentration Map
Figure 8 Mager Well LUST Trust TEH Concentration Map
Figure 9 Mager Well LUST Trust 1,2 DCA Concentration Map
Figure 10 Mager Well LUST Trust Site Benzene (VPH) Concentration vs. Time
Figure 11 Mager Well LUST Trust Site TPH Concentration vs. Time
Figure 12 Mager Well LUST Trust Facility Location Map

Appendix B Tables

Table 1 Groundwater Elevation Data
Table 2 Groundwater Sample Water Quality Parameters
Table 3 Groundwater Laboratory Analytical Results - VPH and VOC's
Table 4 Groundwater Laboratory Analytical Results - EPH

Appendix C Groundwater Sampling Field Data Sheets

Appendix D Groundwater Analytical Laboratory Reports

LIST OF ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethene
ASTM	American Society for Testing and Materials
Bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
DEQ-7	Circular DEQ-7 Montana Numeric Water Quality Standards
DNAPL	dense non-aqueous phase liquid
DNRC	Department of Natural Resources and Conservation
DO	dissolved oxygen
DOWL HKM	DOWL HKM
DRO	diesel range organics
EPA	Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
GPM	gallons per minute
GRO	gasoline range organics
GWIC	Ground-Water Information Center
HHS	Human Health Standards
LNAPL	light non-aqueous phase liquid
LUST	leaking underground storage tanks
MBMG	Montana Bureau of Mines and Geology
MADEP	Massachusetts Department of Environmental Protection
MBWWC	Montana Board of Water Well Contractors
MDT	Montana Department of Transportation
MDEQ	Montana Department of Environmental Quality
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MSL	mean sea level
MTBE	methyl tert-butyl ether
MW	monitor well
NA	not analyzed
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
PID	photo-ionization detector
Ppm	parts per million
PRS	Petroleum Release Section
PVC	polyvinyl chloride
PWS	public water supply
QA	quality assurance
QC	quality control
RBSL	risk based screening level
SAP	Sampling and Analysis Plan
TEH	total extractable hydrocarbons
TPH	total purgeable hydrocarbons
TDS	total dissolved solids
µg/L	micrograms per liter
UST	underground storage tank
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon

EXECUTIVE SUMMARY

As part of the Mager Irrigation Well, Leaking Underground Storage Tank (LUST) Trust investigation, monitoring wells were gauged for light non-aqueous phase liquid (LNAPL), and water levels on November 21, 2011. Monitoring well MW-18 was gauged on both November 21 29, 2011. After monitoring, DOWL HKM purged and collected groundwater samples from 23 wells.

Light Non Aqueous Phase Liquid (LNAPL) was measured in four monitoring wells: MW-8S, MW-9, MW-16, and MW-18. On November 21, 2011, 2.4 feet of LNAPL was measured in monitor well MW-8S, 0.2 feet of LNAPL was measured in MW-9, and 0.64 feet of LNAPL was measured in MW-16. On November 29, 2011, 9.35 feet of LNAPL was measured in MW-18. Laboratory analyses indicated that the hydrocarbon profile from MW-18 does not resemble any single refined petroleum product. The profile contains gasoline through diesel range organics and resembles a weathered gasoline mixed with miscellaneous heavier hydrocarbons.

Although a decreasing trend has been noted in many of the onsite wells since monitoring began, the concentrations of dissolved phase hydrocarbons in the groundwater remains above regulatory limits in: MW-2, MW-7S, MW-7D, MW-8S, MW-9, MW-11, MW-12, MW-15, MW-16, MW-17, MW-18, MW-24, and MW-25.

Groundwater levels are approximately 2.5 feet higher in the shallow monitoring wells when compared to the previous monitoring event in March 2009. Groundwater levels are also higher in the deep monitoring wells, ranging from 0.02 feet to 1.85 feet.

The shallow aquifer flow direction and gradient is consistent with past monitoring events. For areas north of Third Street, the shallow groundwater flows approximately south 45^0 east at a gradient of 0.02 feet per foot. For areas south and west of Central Avenue, the shallow groundwater flows approximately south 10^0 east at a gradient of 0.02 feet per foot (ft/ft). For the area east of A Avenue, shallow groundwater flows approximately north 45^0 east at a gradient of 0.05 feet per foot. Shallow groundwater generally flows downhill.

The deep aquifer flow direction is generally consistent with past monitoring events, though MW-3 and the Jawbone Creek Golf Course irrigation well were not monitored during this event.

According to this monitoring event, the deep groundwater is flowing approximately north 50^0 west at a gradient of 0.0003 feet per foot. Deep groundwater generally flows the opposite direction of the shallow groundwater.

Contaminants were again detected in the Thompson Supply well. The detected levels are estimated values and are below DEQ-7 HHS and RBSLs, but this well is important to the City of Harlowton's water supply and should be monitored closely. Contaminants detected include: benzene, bromodichloromethane, bromoform, chlorodibromomethane, chloroform, and chloromethane.

1.0 INTRODUCTION

The following report summarizes free product recovery and groundwater monitoring for the Mager Irrigation Well, Leaking Underground Storage Tank (LUST) Trust investigation in Harlowton, Montana. The work was conducted in accordance with Contract 407033, Task Order 18, between DOWL HKM and the Montana Department of Environmental Quality (MDEQ) LUST Trust Program.

- Subtask No. 1: Free Product Recovery
- Subtask No. 2: Water Quality Monitoring
- Subtask No. 3: Reporting
- Subtask No. 4: Administration

This report describes the results and findings of subtasks 1 and 2, free product recovery and water quality monitoring. A location and vicinity map indicate the study area is presented in Figure 1 in Appendix A.

1.1 Site Background

On May 4, 1999, the MDEQ was notified of the presence of petroleum-contaminated groundwater in a newly installed private water supply well owned by Linda and Roger Mager, located at their primary residence at 505 North Central Avenue in Harlowton. The Magers had indicated that petroleum odors were detected in the well since the well was constructed in 1996. The Mager residence and well are located in the SE¼, SW¼, NW¼ of Section 22, Township 8 North, Range 15 East, within the city limits of Harlowton. The water well log submitted to the Montana Department of Natural Resources and Conservation (DNRC) indicates the well was constructed to a total depth of 125 feet bgs and was screened from 110 to 125 feet bgs. However, no annular seal was installed other than a shallow surface casing. The well remained in use for irrigation despite verbal and written recommendations by the MDEQ to the Magers not to use the well (HKM, 2003). This well was abandoned in September of 2006, by the MDEQ. Potable water is supplied to the Mager residence by the Harlowton public water supply (PWS).

A water sample from the well collected by Roger Mager on April 7, 1999, contained benzene, ethylbenzene, methyl tert-butyl ether (MTBE), gasoline range organics (GRO), and total purgeable hydrocarbons (TPH) at concentrations of 52, 1.6, 4.8, 179, and 231 micrograms per

liter (µg/L), respectively. Confirmatory sampling performed by the MDEQ on May 12, 1999, indicated that benzene, toluene, ethylbenzene, and xylenes (BTEX), MTBE, and 1,2-dichloroethene (1,2-DCA) were detected at concentrations of 52, 0.29, 0.89, 0.33, 8.9, and 4.6 µg/L, respectively. Prior to the May 12, 1999, sampling, the static water level in the well was measured at 72.55 feet below the top of the 6-inch steel surface well casing. A water sample from the well collected by DOWL HKM on July 15, 2003, contained BTEX and 1,2-DCA at concentrations of 1430, 91, 138, 156, and 9.0 µg/L (HKM, 2003).

After the MDEQ investigation of the Mager well began, potentially contaminated source areas were sought out. On June 22, 2000, DOWL HKM discovered an old unused well in the basement of the county courthouse. The well was gauged with an interface probe and it was determined that about 7 feet of a light, non-aqueous phase liquid (LNAPL) was floating on the water surface in the well. A LNAPL recovery system was installed in the courthouse well on June 26, 2000, and approximately 30 gallons of LNAPL were recovered between June 26, 2000, and August 14, 2000. This recovery was rented from Tsd Technical Specialists of Billings, MT; and, was a Geotech Product Recovery System (PRS) that incorporates a pneumatic control panel with a downwell stainless steel pneumatic bladder pump coupled with a floating skimmer. The system was set up with a timer to optimize operation durations, and recovered product was pumped into a 55-gallon drum. A passive LNAPL recovery system installed on July 17, 2003, recovered about 1 gallon per month until LNAPL was no longer observed in early 2004. This well was approximately 56 feet deep and although no well log was available, the well was determined to be constructed with what appeared to be four-foot sections of stovepipe. This well was plugged and abandoned in the fall of 2006, by the MDEQ.

1.2 Previous Remedial Investigations

During a Phase I remedial investigation, conducted in May and June 2000, DOWL HKM installed six monitor wells to define the extent and magnitude of petroleum hydrocarbons in the groundwater and to determine the location of potential source areas. Based upon the results of the initial investigation, Bob's Chevron was identified as the likely source of the diesel and gasoline petroleum hydrocarbons in the groundwater. The details of the drilling and sampling conducted during the 2000, investigation have been submitted in previous reports (HKM, 2000).

Bedrock conditions encountered during the drilling consisted predominately of thinly bedded, weak, friable, dark gray shale containing occasional thinly bedded coal seams interbedded with

hard, fractured sandstone beds. Field observations during drilling indicated that the sandstone beds produced the greatest amount of groundwater.

As previously stated, during June 2000, an unused well was discovered in the basement of the county courthouse. The well was gauged with an interface probe and it was determined that about 7 feet of a LNAPL was floating on the water surface in the well. A sample of the LNAPL was collected and submitted to Energy Laboratories, Inc. for analysis of volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method 8260 and a simulated distillation using American Society for Testing and Materials (ASTM) D3328. Laboratory analyses indicated that the LNAPL was a mixture of gasoline and diesel fuel.

One of the closest potential sources of fuel to the courthouse well was the former Wheatland County Sheriff's Department underground storage tank (UST) basin located approximately 75 feet northwest of the courthouse well. During 2001, a test pit investigation was conducted at the former Sheriff's UST location to determine if it was the source of the LNAPL in the courthouse well. Based upon the findings of the test pit investigation, it was determined that the Sheriff's UST location was not the source of LNAPL in the courthouse well.

1,2-DCA was detected in groundwater samples collected from the City of Harlowton Thompson supply well on May 15, 2000, and June 14, 2000. The May 15, 2000, sample contained 1,2-DCA at an estimated concentration of 0.26 µg/L, and the June 14, 2000, sample contained 1,2-DCA at an estimated concentration of 0.21 µg/L. Both of these values are estimated, since the concentrations are below the limit of laboratory quantitation. These levels are below the Circular DEQ-7 Montana Numeric Water Quality Standards Human Health Standard (DEQ-7 HHS) of 4 µg/L.

The volatile petroleum hydrocarbon (VPH) laboratory analytical results of groundwater samples collected from five of the six Phase I monitor wells and the Mager irrigation well in May and June 2000, confirmed the presence of dissolved gasoline constituents in the groundwater. The May and June 2000, VOC analytical results also indicated the presence of 1,2-DCA in the groundwater in monitor wells MW-2 and MW-5 at concentrations of 5.7 µg/L and 9.9 µg/L, respectively, exceeding the DEQ-7 HHS standard of 4 µg/L. The presence of benzene, MTBE, and 1,2-DCA in the monitor wells was attributed to a release of gasoline containing benzene, MTBE, and 1,2-DCA. The concentration gradient of TPH and 1,2-DCA between the Phase I

monitor wells indicated the probable source area for the contaminants was located somewhere south of the Mager well.

A Phase II Source Identification Investigation (herein "Phase II Investigation") was conducted during 2003, under LUST Trust contract No. 401006-TO-07 to further define the extent and magnitude of the contaminant plume impacting the Mager well. During June 2003, additional groundwater samples were collected from the six monitor wells and other selected private wells. The laboratory analytical results from this sampling event indicated substantial increases in benzene concentrations in several of the Phase I monitor wells. Eleven additional monitor wells were installed in the fall of 2003. These wells were installed to complement the Phase I wells and were installed at various depths and locations to help define the horizontal and lateral extent of the impacted groundwater.

The most severely impacted groundwater present in the study area is a 2-3 block area located east and north of the courthouse. The shallow groundwater aquifer in this area has LNAPL and high levels of dissolved petroleum constituents. Simulated distillation testing in 2003, indicated that the LNAPL present in this area was a mixture of #2 diesel fuel and gasoline. In November 2003, the shallow groundwater had an apparent southwesterly gradient, but the groundwater gradient was suspected to change seasonally or be affected by local influences such as pumping wells and/or irrigation practices. Individual sandstone beds in the Judith River Formation appear to provide preferential pathways, allowing impacted groundwater to move down dip to the north in response to local recharge and the influences of irrigation wells drawing water from the sandstone beds. As demonstrated by the LNAPL present in the courthouse well and high levels of dissolved petroleum in monitor wells, it appeared that a lobe of contaminants were being drawn to the southwest from the impacted area. The pumping and drawdown of Thompson well may be influencing this plume migration.

Qualitative indications of petroleum contamination were detected during the drilling and construction of monitoring well MW-4, which is located adjacent to the former Bob's Chevron gasoline retail facility at 201 North Central Avenue in Harlowton, MT (herein "Bob's Chevron"). Elevated levels of petroleum hydrocarbons were documented during the closure of eight USTs at Bob's Chevron in 1991; however, the release at this site was resolved by the MDEQ in 1992. Groundwater samples collected in June 2000, and July 2003, from MW-4 did not contain petroleum or chlorinated compounds. This condition indicates that petroleum

contamination may have been present in an interval above the screened interval of the monitoring well.

A Phase III Source Identification Investigation (herein "Phase III Investigation") was completed during 2006, and 2007, under LUST Trust Contract No. 401006-TO-23. The purpose of this additional work was to further define the extent and magnitude of the plume, abandon several wells to reduce the threat of aquifer cross contamination, remove LNAPL from the wells containing free product, determine aquifer parameters, and identify other potential contaminant sources.

Potential sources of contamination, indicated in the Phase III Identification report, include Bob's Chevron and Cross Triangle Motors, which are located to the south of the Mager well. However, fluid level measurements indicate that groundwater flow in the upper fractured sandstone aquifer is generally directed to the south and southwest. Fluid flow in the deeper aquifer is to the north. Pumping the Jawbone Creek Golf Course irrigation well may induce groundwater flow to the north in the shallow aquifer as evidenced by the response of MW-7S and increased benzene concentration in production water during the duration of the pump test. This may create a hydrologic divide in the shallow aquifer with groundwater being pulled to the north via the Jawbone Creek Golf Course irrigation well when it is pumping and groundwater being pulled to the south by the Thompson supply well when it is actively pumping.

Aquifer testing indicates the pumping drawdown associated with the Jawbone Creek Golf Course irrigation well has intercepted the dissolved phase contaminant plume associated with the Mager well. Benzene concentrations increased throughout the duration of the pumping test. Analytical results ranged from 0.41 parts per billion (ppb) to 3.8 ppb at the end of the testing period that occurred over 3 days with approximately 30 hours of pumping time.

The Mager and Courthouse domestic wells were abandoned along with monitoring well MW-1 to prevent potential cross contamination.

A LNAPL bail down test was conducted on monitoring well MW-8S. It appears that the LNAPL in the aquifer in the vicinity of MW-8 is approximately 0.11 feet thick.

Four additional groundwater monitoring wells were installed during late October and early November 2006, to further define the extent of the dissolved phase contaminant plume and to

contamination may have been present in an interval above the screened interval of the monitoring well.

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A LNAPL bail down test was conducted on monitoring well MW-8S. It appears that the LNAPL in the aquifer in the vicinity of MW-8 is approximately 0.11 feet thick.

Four additional groundwater monitoring wells were installed during late October and early November 2006, to further define the extent of the dissolved phase contaminant plume and to

rule out additional potential contaminant sources. A four-inch diameter well was installed adjacent to the former Cross Triangle Motors underground storage tank basin; a second, shallow well was installed adjacent to MW-6; a third well was installed in the southeastern corner of the intersection of B Street and 2nd Avenue between the former Dempster's Service Station and the Thompson supply well; and the fourth was installed in the upper sandstone aquifer east of the Wheatland County Courthouse. Prior to well abandonment, monitor well MW-1 and the Mager well were sampled in September and the courthouse well was sampled in October 2006. Many of the monitoring wells sampled in November reported significantly lower concentrations of dissolved phase contamination than in previous sampling events. However, LNAPL was still present in monitoring well MW-8S and MW-9 and it was present in MW-16 in July 2007.

A Plume Delineation and Assessment of Potential Sources Investigation, and Groundwater Monitoring and Free Product Recovery were completed during 2008, and 2009, under Contract 407033, Task Order 8, between DOWL HKM and MDEQ. The purpose of this investigation was to initiate free product recovery from monitoring wells MW-8S, MW-9, and MW-16, further define the extent of the free and dissolved phase contaminant plumes, evaluate additional potential sources, evaluate current groundwater contamination concentrations; and, verify groundwater elevation and flow direction.

Seven monitoring wells (MW-20-08 through MW-26-08) and one new soil boring (SB-1-08) were installed during this investigation. Passive bailers were installed in monitoring wells MW8S, MW-9, and MW-16 for free product recovery. Monitoring Well MW-10S-03 was abandoned during this event because no groundwater had ever been observed in it.

Based upon the findings and results of this investigation, the former Bob's Chevron, Cross Triangle Motors, Wheatland County Shop, Dempster's Service Station, the Car Wash, and Croston's Exxon sites all appear to be contributing sources of contaminants present in the groundwater of the study area.

1.3 Regional Geologic Setting

Harlowton is located near the western edge of the Great Plains in Wheatland County, Montana, approximately 20 miles south of the Little Belt Mountains, 25 miles southwest of the Big Snowy Mountains, and 25 miles northeast of the Crazy Mountains. The central portion of the town site

is located on the north flank of the Musselshell River valley at an approximate elevation of 4,216 feet above mean sea level (MSL).

Harlowton is located on a broad structural platform separating the Big Snowy Uplift to the north from the Crazy Mountains Basin to the south (Fanshawe, 1986). These structural features are the result of deformation related to the Laramide episode of mountain building, which took place during Late Cretaceous and Early Tertiary time (Grose, 1972). Harlowton is situated on the northwestern flank of the Shawmut Anticline (Wilde and Porter, 2001).

Most of Harlowton overlies the Judith River Formation of Late Cretaceous Age. The Judith River Formation is exposed in the immediate Harlowton study area and consists primarily of medium- to fine-grained, light brown to tan sandstone. The formation generally does not form prominent ridges or cliffs and the outcrops appear as sandy, grass-covered hills that sometimes have an orange tint when compared to surrounding formations. The central part of the formation sometimes contains dark-brown interbedded siltstone, claystone, and coal. The Judith River Formation ranges from 300 to 500 feet thick (Wilde and Porter, 2001) and dips to the northeast at approximately 6 degrees. The Claggett Shale lies below the Judith River and consists of primarily brown, fissile shale that contains numerous lenticular fine-grained sandstone beds Wilde and Porter, 2001). Based upon review of the bedrock encountered during the drilling programs, it appears that the monitor wells are all completed in the Judith River Formation. Bedding planes and fracture systems within the Judith River Formation influence the distribution of groundwater in the study area. The southern part of Harlowton sits on recent alluvial deposits of the Musselshell River.

2.0 INVESTIGATION METHODOLGY

2.1 Investigation Objectives

The objectives of this task order were to: 1) initiate free product recovery from monitoring wells MW-8S, MW-9, and MW-16; 2) sample groundwater from monitoring wells MW-2, MW-3, MW-5, MW-7S, MW-7D, MW-8S, MW-8D, MW-9, MW-10, MW-11, MW-12, MW-15 through MW-26; and, 3) measure depth to groundwater and LNAPL thickness in all monitoring wells prior to purging and sampling activities.

2.2 Purpose of Investigation

The purpose of this investigation was to conduct groundwater monitoring and continue free product recovery from select monitoring wells in the vicinity of the Mager well in Harlowton, Montana.

2.3 Groundwater Monitoring, Water Quality Sampling, and Analytical Testing

On November 21, 2011, the monitoring wells were gauged for light-non-aqueous–phase-liquid (LNAPL), and water levels.

Prior to sample collection from the monitor wells, the depth to groundwater was measured using an interface probe and the volume of water in each well was calculated based on the depth to water measurements, total depth of the well, and well diameter. In order to collect groundwater samples representative of the subsurface conditions, at least three well volumes of water were purged from each well prior to sample collection with a submersible purge pump. Purge water was discharged according to DOWL HKM's Standard Operating Procedures (SOP's), which is to the ground.

After monitoring, DOWL HKM purged and collected groundwater samples from 23 wells. A list of monitoring wells gauged and sampled is provided in Table 1 of Section 3.3. Monitoring records are included in Appendix B.

To ensure representative groundwater samples were collected, water quality parameters were monitored and allowed to stabilize during the purging process prior to sample collection. Temperature, conductivity, pH, dissolved oxygen (DO), and oxidation reduction potential (ORP)

were monitored during purging. Parameters were considered stable after successive readings varied less than 10% (or one tenth of a unit in the case of pH). Groundwater sampling field data sheets presenting water quality parameters collected during sampling are included in Appendix C. These records are also summarized in Table 2 of Appendix B.

Well purging methodology prior to sample collection varied dependent upon the use, type, and construction of the well. Groundwater samples from the Thompson supply well were collected from the sample port closest to the well. The tap was opened and allowed to run for approximately 5 minutes prior to sample collection.

Each groundwater sample was placed in an appropriate sample container and preserved as required by the laboratory, labeled, and packaged on ice to maintain a temperature near 4° C. Groundwater samples were collected and analyzed according to DOWL HKM's Standard Operating Procedures (SOP), revised 2009, and Environmental Protection Agency (EPA) protocols. Groundwater samples were then delivered to Energy Laboratories, Inc. in Billings, Montana with accompanying chain-of-custody documentation. Groundwater samples were analyzed for VPH and EPH by the October 2004, Massachusetts Department of Environmental Protection Methods (MADEP) and for Volatile Organic Compounds (VOC's) – short list by EPA Method 8260B.

3.0 INVESTIGATION RESULTS

3.1 Water Level Monitoring

On November 21, 2011, DOWL HKM personnel performed depth to groundwater and LNAPL thickness measurements in 32 monitoring wells, see Table 1. A vicinity map and a project site map indicating the monitoring locations are presented as Figures 1 and 2 in Appendix A. These monitoring wells were gauged to determine depth to water elevation using an electronic water interface probe.

Groundwater levels are approximately 2.5 feet higher in the shallow monitoring wells when compared to the previous monitoring event in March 2009. Groundwater levels are also higher in the deep monitoring wells, with elevation increases ranging from 0.02 feet to 1.85 feet. (Figure 3, Appendix A). Shallow and deep monitoring wells have been identified according to: their total depth, screen interval, lithology, and depth to groundwater. The list of monitoring wells in Table 1 indicates which wells are considered shallow, and which are considered deep. This list also indicates which wells were gauged, sampled, and includes pertinent comments according to this monitoring event.

Groundwater elevation data for the monitor wells is presented as Table 1 in Appendix B. The groundwater-potentiometric surface for the shallow aquifer wells is based on fluid level measurements collected on November 21, 2011, except well MW-18 which was re-measured on November 29, 2011, (Figure 4, Appendix A). The shallow aquifer flow direction and gradient is consistent with past monitoring events. For areas north of Third Street, the shallow groundwater flows approximately south 45^0 east at a gradient of 0.02 feet per foot (ft/ft). For areas south and west of Central Avenue, the shallow groundwater flows approximately south 10^0 east at a gradient of 0.02 feet per foot. For the area east of A Avenue, shallow groundwater flows approximately north 45^0 east at a gradient of 0.05 feet per foot. Shallow groundwater generally flows downhill.

The groundwater-potentiometric surface for deep wells, based on fluid level measurements collected November 21, 2011, is presented in Appendix A as Figure 5. The deep aquifer flow direction is generally consistent with past monitoring events, though MW-3 and the Jawbone Creek Golf Course irrigation well were not monitored during this event. According to this monitoring event, the deep groundwater is flowing approximately north 50^0 west at a gradient of 0.0003 feet per foot. Deep groundwater generally flows the opposite direction of the shallow

groundwater. Monitoring wells that are posted on these figures represent the monitoring wells included in these groundwater-potentiometric surface maps.

Four deep monitoring wells, MW-4, MW-6, MW-8D, and Fastway Conoco were not included in the deep wells groundwater-potentiometric surface map. This is because the groundwater elevation in these wells is on the order of 15 feet to 20 feet lower than the remaining deep wells, and because these monitoring wells are considered to be completed in a deeper formation.

Table 1. Well List

	WELL		GAUGED	SAMPLED	COMPLETION	COMMENT
1	MW-2	(MW-2-00)	Yes	Yes	Deep	
2	MW-3	(MW-3-00)	No	No	Deep	Not gauged or sampled because the monitoring well had been destroyed by crews constructing the new potable water storage tank for the City Of Harlowtown.
3	MW-4	(MW-4-00)	Yes	Yes	Deep	
4	MW-5	(MW-5-00)	Yes	Yes	Deep	
5	MW-6	(MW-6-00)	Yes	Yes	Deep	
6	MW-7S	(MW-7S-03)	Yes	Yes	Shallow	
7	MW-7D	(MW-7D-03)	Yes	Yes	Deep	
8	MW-8S	(MW-8S-03)	Yes	Yes	Shallow	
9	MW-8D	(MW-8D-03)	Yes	Yes	Deep	
10	MW-9	(MW-9-03)	Yes	No	Shallow	
11	MW-10D	(MW-10D-03)	Yes	Yes	Deep	
12	MW-11	(MW-11-03)	Yes	Yes	Shallow	
13	MW-12	(MW-12-03)	Yes	Yes	Shallow	
14	MW-14	(MW-14-03)	No	No	Shallow	Not gauged or sampled because the monitoring well was underneath a parked car and the car owner could not be contacted to move it.
15	MW-15	(MW-15-03)	Yes	Yes	Shallow	
16	MW-16	(MW-16-06)	Yes	No	Shallow	
17	MW-17	(MW-17-06)	Yes	Yes	Shallow	
18	MW-18	(MW-18-06)	Yes	No	Shallow	
19	MW-19	(MW-19-06)	Yes	Yes	Shallow	
20	MW-20	(MW-20-08)	Yes	Yes	Shallow	
21	MW-21	(MW-21-08)	Yes	Yes	Shallow	
22	MW-22	(MW-22-08)	Yes	Yes	Shallow	
23	MW-23	(MW-23-08)	Yes	Yes	Shallow	
24	MW-24	(MW-24-08)	Yes	Yes	Shallow	
25	MW-25	(MW-25-08)	Yes	Yes	Shallow	
26	MW-26	(MW-26-08)	Yes	Yes	Shallow	
27	Fastway Conoco		No	Yes	Deep	
28	Thompson Supply		No	Yes	Deep	Not gauged because there is no access at the well head to allow depth to water measurements.
29	Jaw Bone Creek		No	No	Deep	Not gauged or sampled because there is no access at the well head to allow depth to water measurements. Not sampled because the well is for seasonal use only and could not be operated, purged and sampled.
30	MW-08-5		Yes	No	Shallow	Not included on Task Order for sampling
31	MW-08-6		Yes	No	Shallow	Not included on Task Order for sampling
32	MW-08-7		Yes	No	Shallow	Not included on Task Order for sampling
33	MW-08-8		Yes	No	Shallow	Not included on Task Order for sampling
34	MW-08-9		Yes	No	Shallow	Not included on Task Order for sampling
35	MW-08-10		Yes	No	Shallow	Not included on Task Order for sampling
36	MW-08-11		Yes	No	Shallow	Not included on Task Order for sampling
37	MW-08-12		Yes	No	Shallow	Not included on Task Order for sampling

3.2 Free Product Removal

Light Non Aqueous Phase Liquid (LNAPL) was measured in four monitoring wells: MW-8S, MW-9, MW-16, and MW-18. On November 21, 2011, 2.4 feet of LNAPL was measured in monitor well MW-8S, 0.2 feet of LNAPL was measured in MW-9, and 0.64 feet of LNAPL was measured in MW-16. On November 29, 2011, 9.35 feet of LNAPL was measured in MW-18. The LNAPL present in Well MW-8S, and MW-9 was removed by use of a bailer. LNAPL present in MW-16, and MW-18 was removed by use of a submersible pump.

The passive bailers in monitoring wells MW-8S, MW-9, and MW-16 were emptied prior to monitoring and are now being stored in a fenced and locked yard at Power Play Sports, located at 212 N. Central Avenue, Harlowton Montana. An estimated four to eight ounces of product were removed from each location during each of the events. LNAPL measurements are presented in Table 1 in Appendix B.

On November 11, 2011, there was no LNAPL in MW-18 and the depth to water was 26.11 feet below ground surface (bgs). Upon returning back to the well to sample it on November 29, 2011, the depth to water was 39.55 feet bgs and the depth to product was 30.20 feet bgs. This equals a drop in water level of 13.44 feet and a LNAPL thickness of 9.35 feet. This dramatic change may have been caused by conditions of the PVC well cap and flush mount cover. On November 11, 2011, it was found that monitoring well MW-18 had been paved over, the steel flush mount cover gone, and only the orange well seal cap was left, which was completely encased in asphalt. These conditions may have not allowed the well to breath and groundwater conditions could not be in equilibrium with the atmosphere. After the asphalt seal was removed and the monitoring well was opened, the aquifer could re-equilibrate allowing groundwater levels to drop and product to move into the monitoring well.

All recovered LNAPL was temporarily stored in a 55-gallon drum in a fenced and locked yard at Power Play Sports, located at 212 N. Central Avenue, Harlowton Montana. Oily Waste of Great Falls was hired to pick up and dispose of waste product. The passive bailers are being stored in Power Play's fenced yard.

3.3 LNAPL Analytical Results

A LNAPL sample was collected on November 29, 2011, from MW-18 and submitted to Energy Laboratories, Inc. for simulated distillation testing using American Society for Testing and Materials (ASTM) D3328. Laboratory analyses indicated that the hydrocarbon profile from MW-18 does not resemble any single refined petroleum product. The profile contains gasoline through diesel range organics and resembles a weathered gasoline mixed with miscellaneous heavier hydrocarbons. LNAPL analytical laboratory reports are presented in Appendix D.

3.4 Groundwater Sampling Results

The November 2011, VPH analytical results indicate that VPH constituents are present in the groundwater from all monitor wells except; MW-8D, MW-19, MW-20, MW-21, MW-22, and the Fastway Conoco Well. VPH constituents were detected at concentrations exceeding MDEQ RBSLs in the groundwater samples analyzed, including benzene, ethylbenzene, C_9-C_{10} Aromatics, C_5-C_8 Aliphatics, C_9-C_{12} Aliphatics, and TPH. Benzene was detected at concentrations exceeding the MDEQ RBSL of 5 micrograms per liter (µg/L) in wells; MW-2, MW-7S, MW-10D, MW-11, MW-12, MW-15, MW-17, MW-24, and MW-25. Ethylbenzene was detected at concentrations exceeding the RBSL of 700 µg/L in the groundwater samples collected from monitor wells MW-15 and MW-25. TPH was detected at concentrations exceeding the MDEQ RBSL of 1,000 micrograms per liter in groundwater samples collected from; MW-2, MW-7S, MW-11, MW-12, MW-15, and MW-25.

The November 2011, VOC laboratory analytical results indicate the presence of 1,2-DCA in groundwater samples obtained from monitor wells MW-5 and MW-7D. The 1,2-DCA concentrations in both of these monitoring wells exceeds the DEQ-7 HHS standard of 4 µg/L.

MTBE was detected in groundwater samples collected from monitor wells MW-5 and MW-7D, but at only estimated values since the analyte was present but less than the reporting limit. Groundwater laboratory analytical results for petroleum hydrocarbons and VOC's are summarized in Table 3 in Appendix B. Copies of the laboratory analytical results are provided in Appendix D.

All groundwater samples collected during the November 2011, sampling event were submitted for Extractable Petroleum Hydrocarbon (EPH) Screen analysis. EPH constituents are present in the groundwater from monitor wells MW-2, MW-7S, MW-10D, MW-11, MW-12, MW-15,

MW-24, MW-25, and MW-26. Six groundwater samples reported Total Extractable Hydrocarbons (TEH) concentrations greater than 1,000 ug/L and consequently were analyzed for EPH fractionation. These include; MW-7S, MW-11, MW-12, MW-15, MW-25, and MW-26. Groundwater laboratory analytical results for EPH are summarized in Table 4 in Appendix B. Copies of the laboratory analytical results are provided in Appendix D.

VOC analyses indicate that low levels of chloroform are present in MW-19 and MW-22. Chloroform is a dense non aqueous phase liquid (DNAPL), and along with other trihalomethanes is a disinfection by-product that is commonly produced during the chlorination of water and wastewater. It is not known if Harlowton's water or sewer mains are nearby to these monitoring wells, but leaking mains may be the cause of these constituents.

Contaminant concentrations in MW-25 are high due to the likely presence of free product in the well. When MW-25 was monitored, no free product or indication of free product was observed; but, upon sampling petroleum staining, a sheen, and free product in the stream of water being pumped from well was noted.

Groundwater analytical results for all the wells sampled are plotted on Figure 2 in Appendix A. Benzene, TPH, TEH, and 1,2 DCA analytical results are displayed as isoconcentration maps on Figures 6, 7, 8, and 9 respectively in Appendix A. Additionally, the cumulative record of benzene and TPH concentrations over time is displayed on Figures 10, and 11, respectively, in Appendix A.

Several water samples were collected and submitted for laboratory analysis for quality assurance / quality control (QA/QC) purposes. A duplicate sample (labeled DUP) of groundwater from the Fastway Conoco well was collected and submitted for VPH, EPH, and VOC's – short list by EPA Method 8260B analyses. No VOCs were detected at concentrations exceeding the detection limit in any of the trip blanks, indicating that the samples were not cross-contaminated during transport. One QA/QC equipment blank sample was collected and submitted for VPH analyses, and again no VPH constituents were detected at concentrations exceeding the detection limit.

4.0 CONCLUSIONS

Based on the data presented in this report, DOWL HKM makes the following conclusions concerning this free product recovery and groundwater sampling event for the Meager Well LUST Site.

1. Compared to March 2009, groundwater levels are approximately 2.5 feet higher in the shallow groundwater monitoring wells. Groundwater levels are also higher in the deep monitoring wells, ranging from 0.02 feet to 1.85 feet.

2. The overall shallow groundwater flow direction remains the same; southeast in the area north of Third Street, nearly due south in the area south and west of Central Avenue, and northeast in the area east of A avenue. There is a low area with minimal gradient between MW-9, MW-11, and MW-25. This may be due to how groundwater monitoring wells are constructed, with some being shallower (MW-08-05) and some with screen intervals completed in both alluvial gravels and the underlying sandstone or shale formations. In addition, the geologic units appear to be quite flat in this area, which also contributes to the low gradients.

3. The deep groundwater flow direction is to the northwest and is generally consistent with past monitoring events. But, the same set of monitoring wells that have been used in the past were not available because MW-3 was destroyed, and the Jaw Bone Creek Golf Course irrigation well could not be accessed.

4. LNAPL is still present in monitoring wells MW-8S, MW-9, and MW-16; and, is now also present in MW-18. The source of LNAPL in MW-18 may be Cross Triangle Motors.

5. Although a decreasing trend has been noted in many of the onsite wells since monitoring began, the concentrations of dissolved phase hydrocarbons in the groundwater remains above regulatory limits in: MW-2, MW-7S, MW-7D, MW-8S, MW-9, MW-11, MW-12, MW-15, MW-16, MW-17, MW-18, MW-24, and MW-25. The groundwater contamination appears to be widespread and exceeds the MDEQ RBSL limits for many constituents.

6. Most of the contaminant plume (s) extent is in the vicinity of Cross Triangle Motors, Dicks Barber Shop, and the Car Wash (Figure 12, Appendix B). Contaminants were still detected in well MW-16 due to either, or both Bob's Chevron and Dempster's Service. In addition, most contaminant levels increased in MW-2, indicating that contaminant is still present in

the deep groundwater in the vicinity of the Mager Well and County Shop. Increased contamination levels may be attributed to the 2010-2011, winter where above average snowfall, infiltration, and likely consequent rise in groundwater levels.

7. Contaminants were once again detected in the Thompson Supply well. The detected levels are estimated values and are below DEQ-7 HHS and RBSLs, but this well is important to the City of Harlowton's water supply. Consequently, this well should to be closely monitored by the City of Harlowton and sampled more frequently to ensure that contaminant levels do no rise above the DEQ-7 HHS and RBSLs.

8. The presence of Chloroform in MW-19 and MW-22 indicates leaking water or sewer lines. Leakage could be recharging the shallow groundwater and in turn be mobilizing contaminants.

5.0 RECOMMENDATIONS

Based on the results, observations, and conclusions of this and previous investigations, DOWL HKM recommends the following actions be considered by the MDEQ:

1. Continued moratorium on the construction of private wells within the Harlowton City limits.

2. Present a copy of this report to the City of Harlowton to offer details of the findings of this report.

3. Conduct an inventory of each monitoring wells condition. A number of monitoring wells need maintenance including the replacement of: stripped out bolts, broken flush mount lids, the entire flush mount well heads. Most notably MW-9 and MW-18.

4. Properly abandon MW-3. This monitoring well was destroyed by the contractor installing the new public water supply water storage tank for the City of Harlowton. It is recommended to not replace this well since contaminant levels have dropped to non detection limits.

5. Install the passive bailers back into MW-8S, MW-9, and MW-16.

6. Install a new passive bailer MW-18, and empty all the bailers on a quarterly basis until product recovery becomes minimal.

7. The Thompson well operational parameters need to be evaluated at a greater level. This would include typical details such as pumping rates, pumping frequency, and identifying the sampling program being conducted by the City of Harlowton. At a minimum, annual sampling is recommended to ensure that contaminant levels have not risen above the DEQ-7 HHS and RBSLs.

8. Conduct an on-site site evaluation of the former Dempster's Service Station (facility ID #5405327) should be conducted to determine if this site is the source of LNAPL at the court house and trace contaminants observed in MW-19 and the Thompson Well.

9. Conduct a pilot study to design a remediation system for the removal of LNAPL in the area of monitor wells MW-8S, MW-9, MW-16, and MW-18.

10. Consider combining the groundwater monitoring and sampling programs of the Mager Well LUST Trust site with the Croston's Exxon site so that results from both programs can be jointly evaluated.

11. Discuss the possibility of leaking water or sewer lines with the City of Harlowton to determine if their records indicate leakage.

12. Conduct annual groundwater monitoring and water quality monitoring to better track contaminant plume movement.

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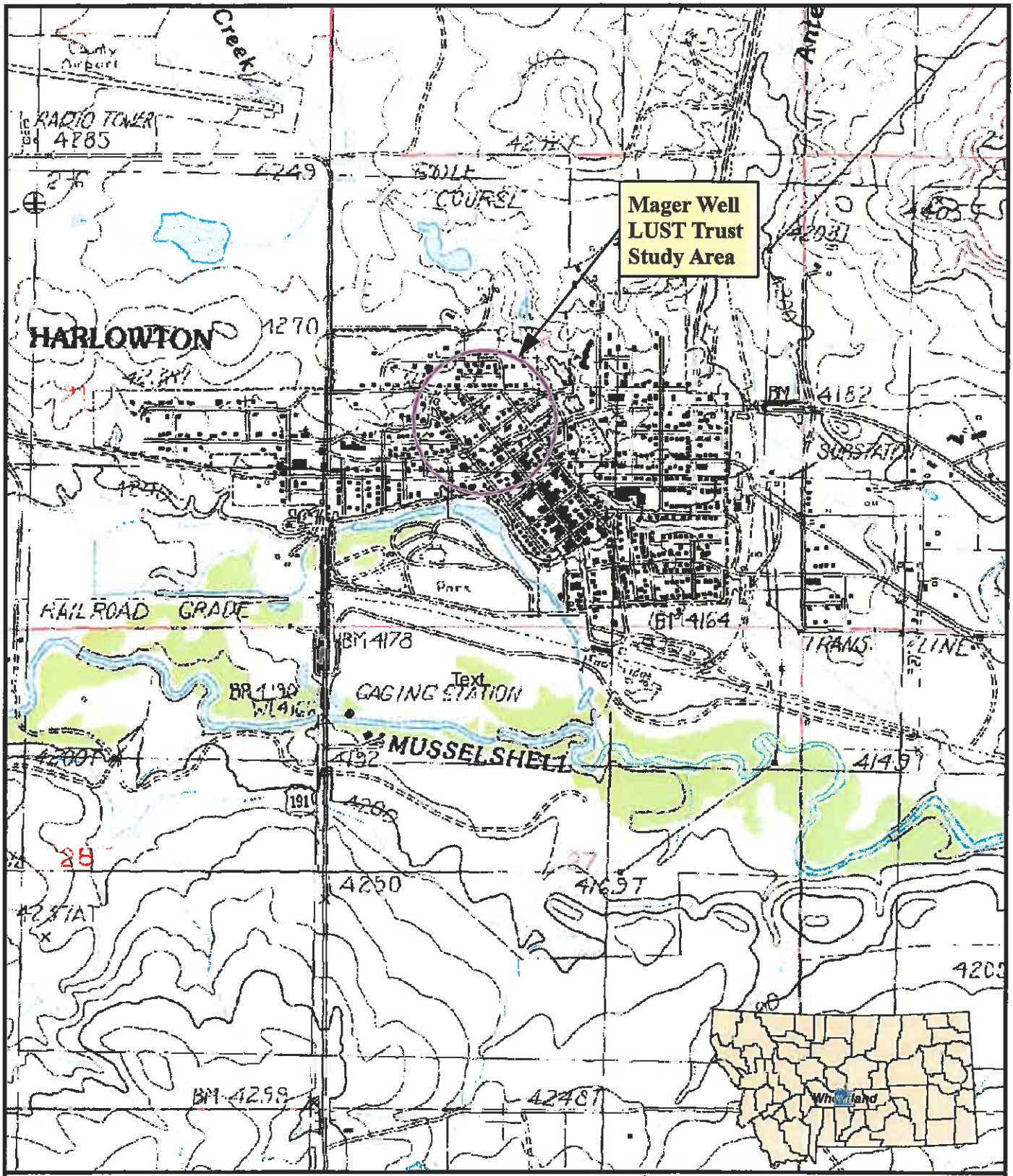
APPENDIX A
FIGURES



Map Source: USGS 7.5 Minute Topographic Map Series Harlowton Quadrangle

Figure 1 - Vicinity Map

Mager Well LUST Trust
Harlowton, Montana

0 1,000 2,000 Feet

DOWL HKM

Job #: 4031.20350

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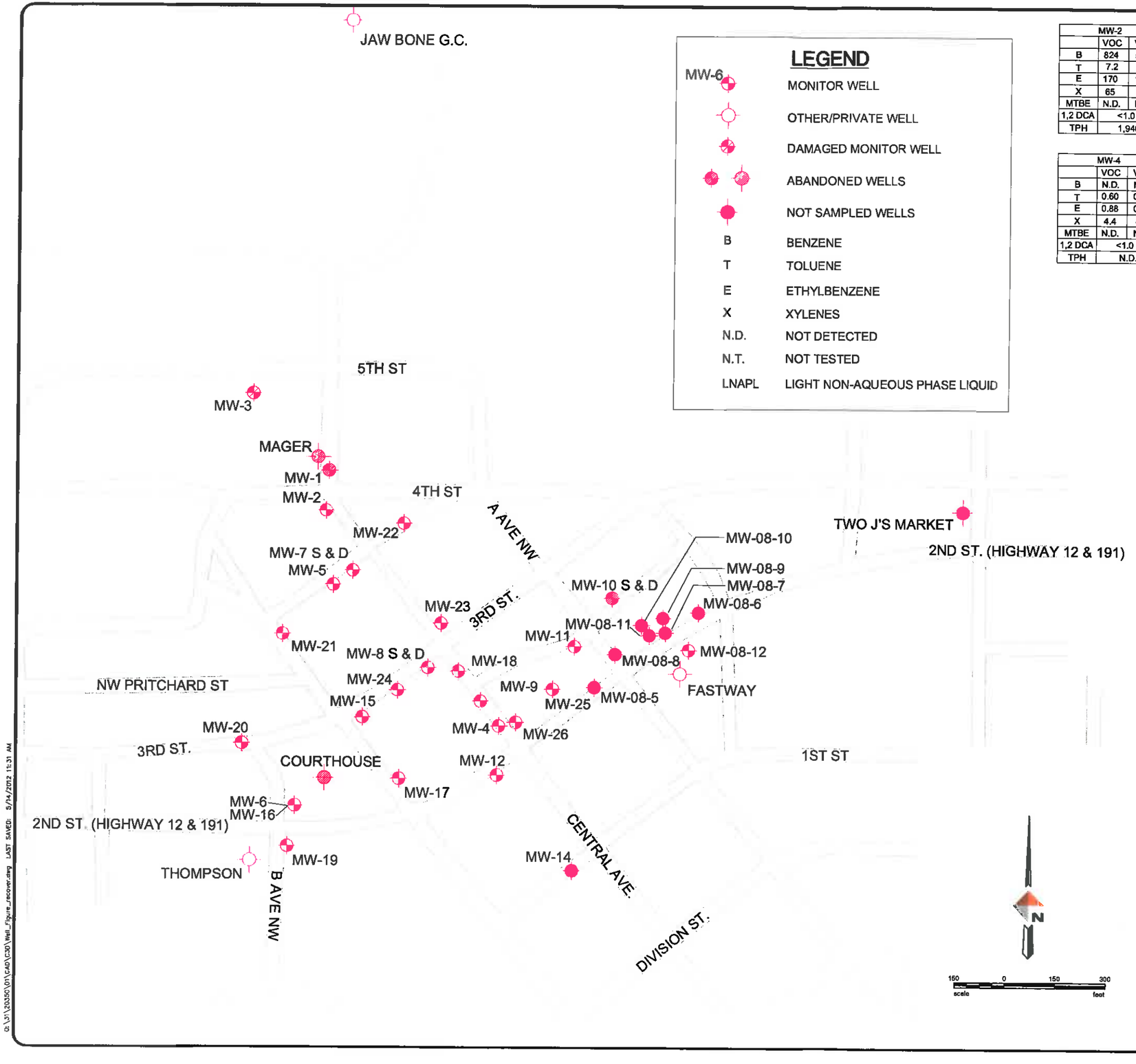
3/22/2012



LEGEND

MW-6	MONITOR WELL
	OTHER/PRIVATE WELL
	DAMAGED MONITOR WELL
	ABANDONED WELLS
	NOT SAMPLED WELLS
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	XYLENES
N.D.	NOT DETECTED
N.T.	NOT TESTED
LNAPL	LIGHT NON-AQUEOUS PHASE LIQUID

MW-2	VOC	VPH
B	824	593
T	7.2	6.9
E	170	127
X	65	50
MTBE	N.D.	N.D.
1,2 DCA	<1.0	
TPH	1,940	

MW-5	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	N.D.
MTBE	0.60 J	N.D.
1,2 DCA	5.7	
TPH	52	

MW-11	VOC	VPH
B	28	28
T	2.2	5.0
E	48	47
X	38	34
MTBE	< 1.0	< 1.0
1,2 DCA	17	
TPH	2,510	

MW-21	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	N.D.
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

MW-4	VOC	VPH
B	N.D.	N.D.
T	0.60	0.55
E	0.88	0.82
X	4.4	4.4
MTBE	N.D.	N.D.
1,2 DCA	<1.0	
TPH	N.D.	

MW-6	VOC	VPH
B	N.D.	N.D.
T	0.37	N.D.
E	0.53	0.42
X	2.0	1.7
MTBE	N.D.	N.D.
1,2 DCA	<1.0	
TPH	N.D.	

MW-12	VOC	VPH
B	398	235
T	266	132
E	163	57
X	316	124
MTBE	< 1.0	< 10 D
1,2 DCA	<1.0	
TPH	1,720	

MW-22	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	1.2
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

MW-7S	VOC	VPH
B	184	182
T	46	43
E	472	398
X	65	50
MTBE	< 5.0	< 50 D
1,2 DCA	<5.0	
TPH	5,900	

MW-15	VOC	VPH
B	2,930	2,100
T	460	384
E	1,270	1,090
X	883	758
MTBE	< 5.0	< 20 D
1,2 DCA	< 5.0	
TPH	13,100	

MW-23	VOC	VPH
B	N.D.	N.D.
T	0.68	0.56
E	1.0	0.83
X	4.9	4.3
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

MW-7D	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	N.D.
MTBE	0.76 J	N.D.
1,2 DCA	6.0	
TPH	173	

MW-16	VOC	VPH
B	LNAPL	LNAPL
T	LNAPL	LNAPL
E	LNAPL	LNAPL
X	LNAPL	LNAPL
MTBE	LNAPL	LNAPL
1,2 DCA	LNAPL	
TPH	LNAPL	

MW-24	VOC	VPH
B	58	53
T	5.7	6.1
E	10	9.6
X	37	37
MTBE	< 1.0	< 1.0
1,2 DCA	<1.0	
TPH	287	

MW-8S	VOC	VPH
B	LNAPL	LNAPL
T	LNAPL	LNAPL
E	LNAPL	LNAPL
X	LNAPL	LNAPL
MTBE	LNAPL	LNAPL
1,2 DCA	LNAPL	
TPH	LNAPL	

MW-17	VOC	VPH
B	9.1	8.5
T	1.4	2.1
E	2.4	2.5
X	1.2	1.8
MTBE	< 1.0	< 1.0
1,2 DCA	<1.0	
TPH	190	

MW-25	VOC	VPH
B	5,560	3,700
T	332	279
E	5,240	1,070
X	11,800	2,320
MTBE	< 50	< 100
1,2 DCA	< 50	
TPH	66,300	

MW-8D	VOC	VPH
B	< 1.0	< 0.5
T	< 1.0	< 0.5
E	< 1.0	< 0.5
X	< 1.0	< 0.5
MTBE	< 1.0	< 0.5
1,2 DCA	< 1.0	
TPH	< 20	

MW-18	VOC	VPH
B	LNAPL	LNAPL
T	LNAPL	LNAPL
E	LNAPL	LNAPL
X	LNAPL	LNAPL
MTBE	LNAPL	LNAPL
1,2 DCA	LNAPL	
TPH	LNAPL	

MW-26	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	1.2
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

MW-9	VOC	VPH
B	LNAPL	LNAPL
T	LNAPL	LNAPL
E	LNAPL	LNAPL
X	LNAPL	LNAPL
MTBE	LNAPL	LNAPL
1,2 DCA	LNAPL	
TPH	LNAPL	

MW-19	VOC	VPH
B	N.D.	N.D.
T	0.12 J	N.D.
E	N.D.	N.D.
X	N.D.	N.D.
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

THOMPSON	VOC	VPH
B	0.57 J	0.42 J
T	< 1.0	< 0.5
E	< 1.0	< 0.5
X	< 1.0	< 0.5
MTBE	< 1.0	< 0.5
1,2 DCA	< 1.0	
TPH	< 2.0	

MW-10D	VOC	VPH
B	3.4	3.6
T	0.32	< 4.0 D
E	2.3	2.8
X	1.6	1.6
MTBE	< 1.0	< 1.0
1,2 DCA	<1.0	
TPH	921	

MW-20	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	N.D.	N.D.
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

FASTWAY CONOCO	VOC	VPH
B	N.D.	N.D.
T	N.D.	N.D.
E	N.D.	N.D.
X	0.26	N.D.
MTBE	N.D.	N.D.
1,2 DCA	N.D.	
TPH	N.D.	

MAGER WELL LUST TRUST STUDY AREA
AND ANALYTICAL DATA MAP
HARLOWTON, MONTANA

● Project No. 4031.20350.01 ● Date March 2012

DOWL HKM
920 TECHNOLOGY BLVD.
SUITE A
BOZEMAN, MT 59718
406-586-8834
406-586-1730 (FAX)
DOWLHKM.COM

FIG 2

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Figure 3. Mager Well - LUST Trust Site Groundwater Elevation History

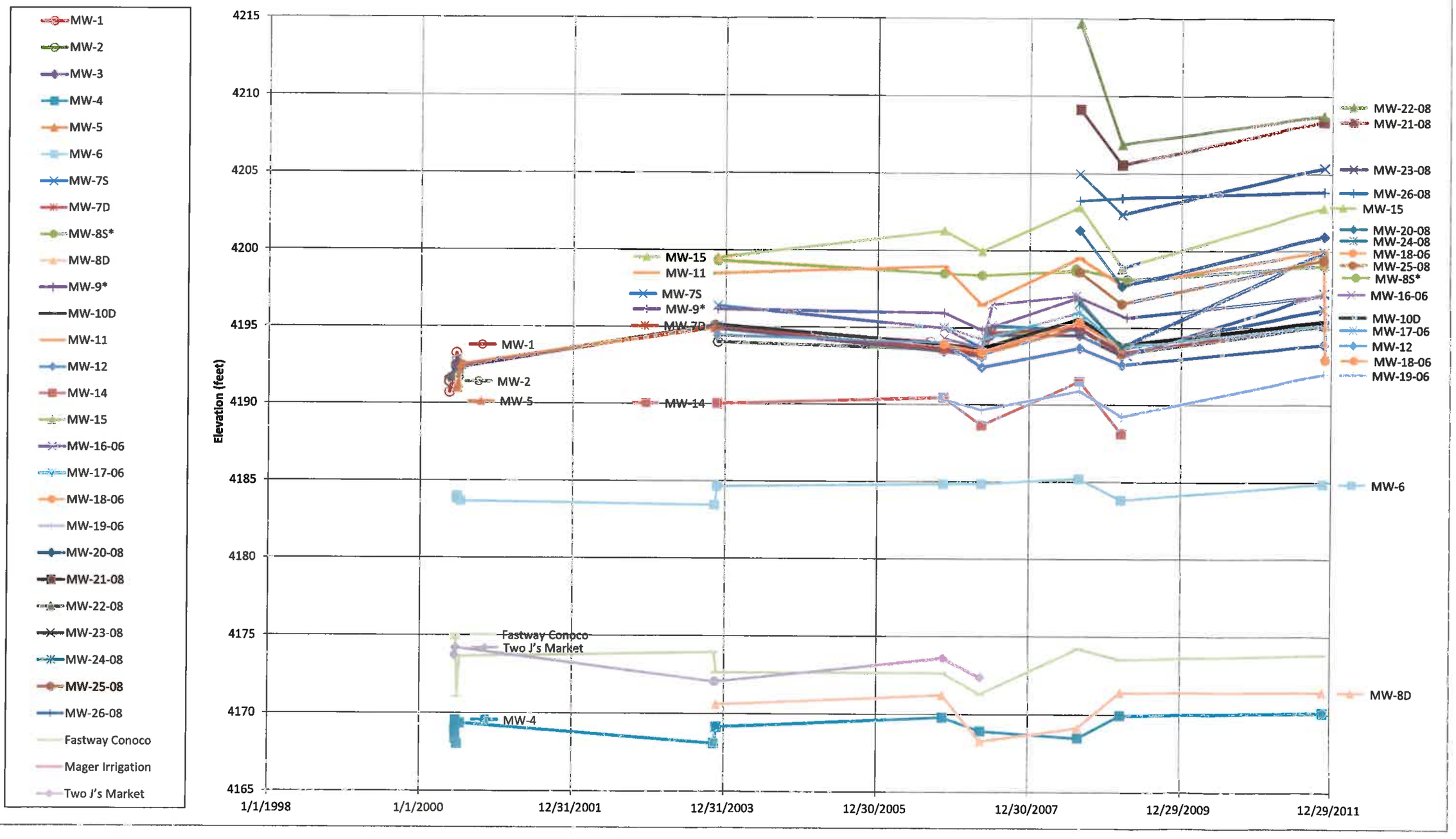

Figure 3 GW-Elev Chart

Figure 4

MAGER WELL LUST TRUST
SHALLOW
GROUNDWATER MAP
NOVEMBER 2011
(Croston's Exxon Wells Included)

Legend

Monitor Well Locations

⊕ 4199.39 feet
Groundwater Elevation

Potentiometric Contours

- - - 4202 feet (2 foot interval)

N
W E
S

0 75 150 300
Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350

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Figure 5

MAGER WELL LUST TRUST
DEEP GROUNDWATER MAP
NOVEMBER 2011
(Croston's Exxon Wells Included)

Legend

Monitor Well Locations

⌖ 4195.19 feet

Potentiometric Contours

- - - - 4195.2 feet (0.1 foot interval) Groundwater Elevation

N
W E
S

0 75 150 300
Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM **Job#: 4025.20350**

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3/19/2012

Figure 6

MAGER WELL LUST TRUST
BENZENE
CONCENTRATION MAP
NOVEMBER 2011

Legend

Monitor Wells

- LNAPL
- 2,100 ug/L - Benzene
- Other Wells (Not Sampled)

Isoconcentration Contours

- LNAPL
- 2,000 ug/L - Benzene

ND - Non-Detect

N
W E
S

0 75 150 300
Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350

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5/11/2012

Figure 7

MAGER WELL LUST TRUST TPH CONCENTRATION MAP NOVEMBER 2011

Legend

Monitor Wells

- LNAPL
- 2,510 ug/L - TPH
- Other Wells (Not Sampled)

Isoconcentration Contours

- LNAPL
- 5,000 ug/L - TPH

ND - Non-Detect

N
W E
S

0 75 150 300 Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350

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Figure 8

MAGER WELL LUST TRUST
TEH CONCENTRATION MAP
NOVEMBER 2011

Legend

Monitor Wells

- LNAPL
- Sampled-Detected; Sampled
- 1,950 ug/L - EPH Screen
- Other Wells (Not Sampled)

Isoconcentration Contours

- LNAPL
- 5,000 ug/L - TEH

ND - Non-Detect

N
W E
S

0 75 150 300 Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350

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Figure 9

MAGER WELL LUST TRUST
1,2 DCA
CONCENTRATION MAP
NOVEMBER 2011

Legend

Monitor Wells

- LNAPL
- 17 ug/L -1,2 DCA
- Other Wells (Not Sampled)

Isoconcentration Contours

- LNAPL
- 4 ug/L - 1,2 DCA

ND -- Non-Detect

N
W E
S

0 75 150 300 Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM Job#: 4025.20350

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5/11/2012

FIGURE 10. Mager Well - LUST Trust Site, Benzene (VPH) Concentration vs. Time

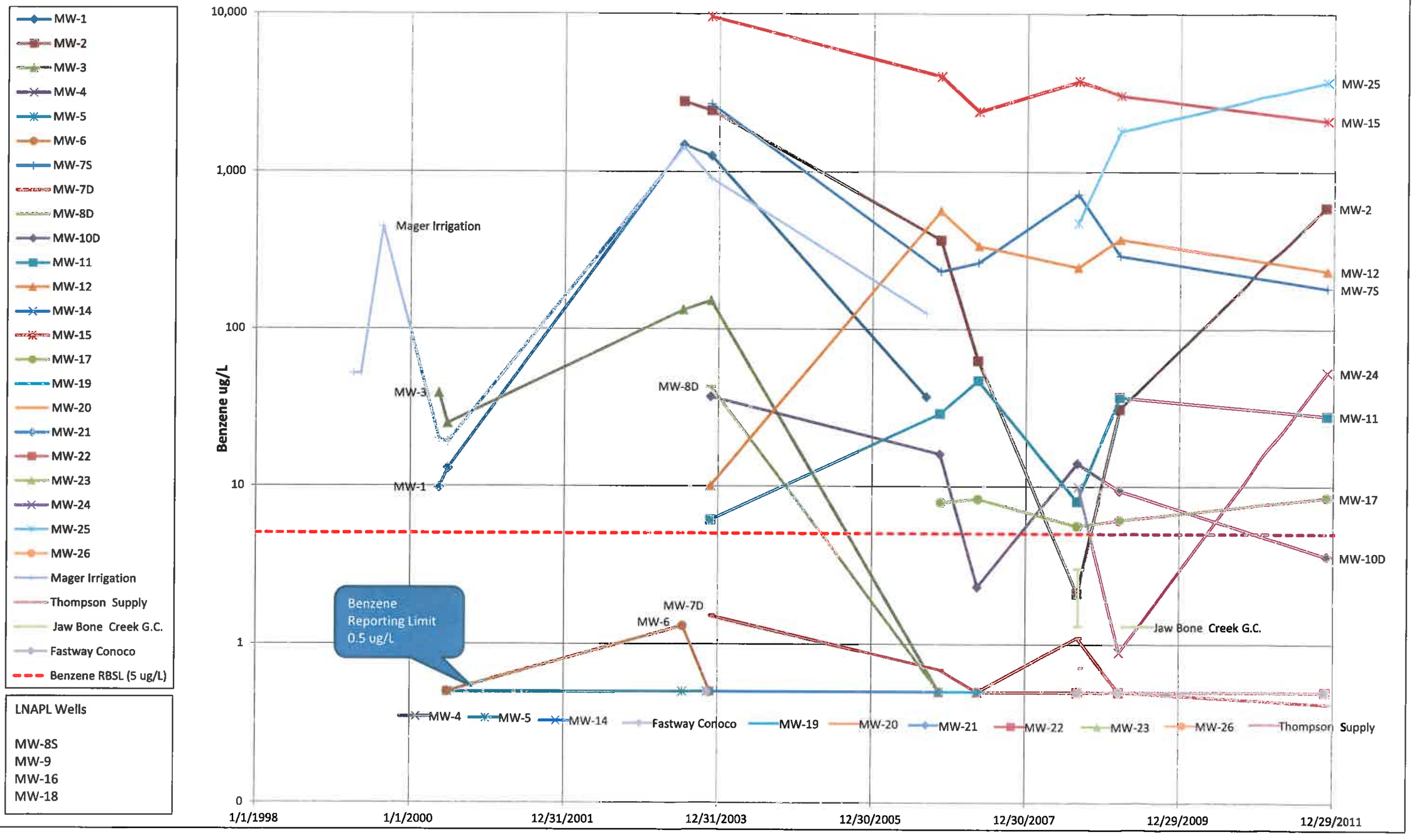
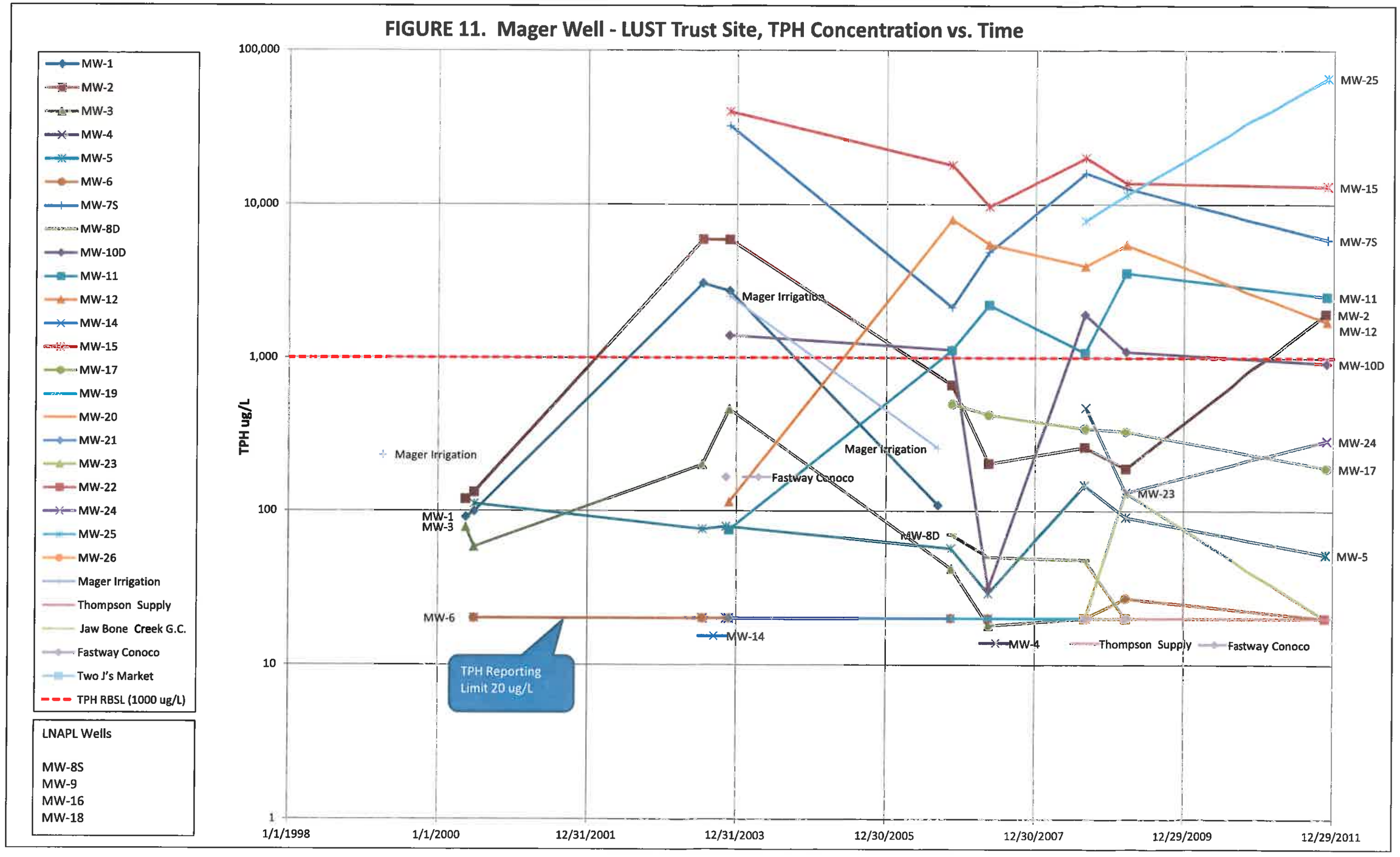


FIGURE 11. Mager Well - LUST Trust Site, TPH Concentration vs. Time



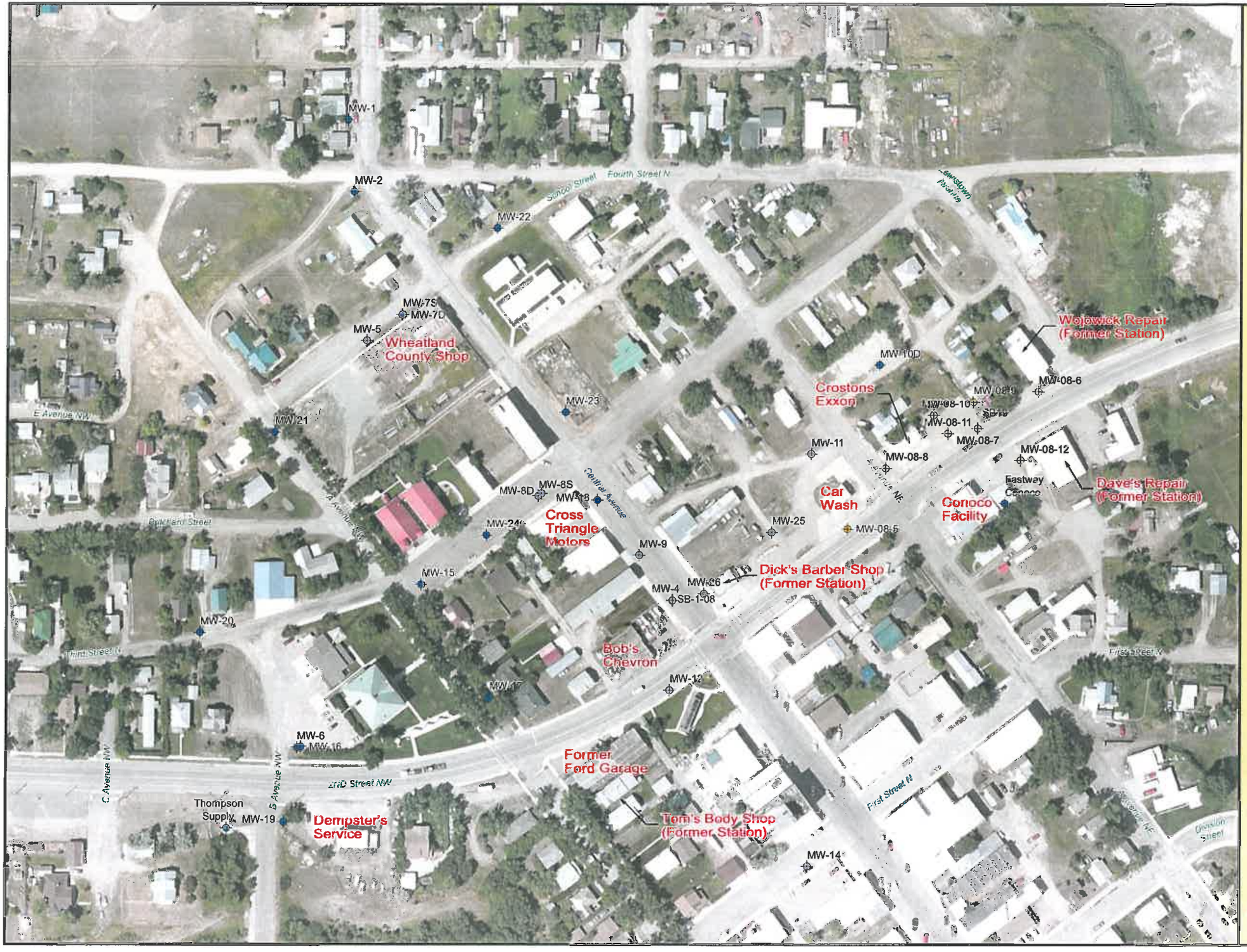


Figure 12

Mager Well LUST Trust Facility Location Map

Legend

Monitor Well Location and Name

Mager Well LUST Trust Wells

MW-9

Croston's Exxon LUST Trust Wells

MW-08-5

N
W E
S

0 75 150 300 Feet

Background Imagery: Bing Aerials TM
Accessed through ESRI ArcGIS online data

DOWL HKM

Job#: 4025 20350

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5/11/2012

APPENDIX B
TABLES

TABLE 1
GROUND WATER ELEVATION DATA
MAGER WELL - LUST TRUST SITE
HARLOWTON, MT

Well Name	Date	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-1	5/9/00(1)	4262.87	ND	≈71	4191.87
	5/16/2000		ND	72.15	4190.72
	6/14/2000		ND	70.44	4192.43
	6/21/2000		ND	69.61	4193.26
	6/27/2000		ND	70.93	4191.94
	7/11/2000		ND	70.43	4192.44
	11/11/2003		ND	67.75	4195.12
	11/24/2003		ND	67.86	4195.01
Well Abandoned 2006	9/11/2006		ND	68.80	4194.07
MW-2	5/10/00(1)	4261.38	ND	≈67	4194.38
	5/15/2000		ND	69.98	4191.40
	6/14/2000		ND	69.00	4192.38
	6/21/2000		ND	68.54	4192.84
	6/27/2000		ND	69.71	4191.67
	7/11/2000		ND	68.96	4192.42
	7/19/2000		ND	68.92	4192.46
	11/11/2003		ND	66.27	4195.11
	11/24/2003		ND	67.36	4194.02
	11/15/2006		ND	67.82	4193.56
	5/15/2007		ND	68.15	4193.23
	7/1/2007		ND	66.76	4194.62
	8/27/2008		ND	66.46	4194.92
	3/17/2009		ND	68.09	4193.29
	11/21/2011		ND	66.24	4195.14
MW-3	5/12/00(1)	4293.59	ND	≈93	4200.59
	5/16/2000		ND	101.94	4191.65
	6/14/2000		ND	101.26	4192.33
	6/21/2000		ND	100.97	4192.62
	6/27/2000		ND	100.92	4192.67
	7/11/2000		ND	101.24	4192.35
	11/11/2003		ND	98.52	4195.07
	11/24/2003		ND	98.70	4194.89
	11/15/2006		ND	100.15	4193.44
	5/15/2007		ND	100.48	4193.11
	7/1/2007		ND	99.09	4194.50
	8/27/2008		ND	98.76	4194.50
	3/17/2009		ND	100.40	4193.19
Well Abandoned November 2011					

TABLE 1
GROUND WATER ELEVATION DATA
MAGER WELL - LUST TRUST SITE
HARLOWTON, MT

Well Name	Date	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-4	6/20/00(1)	4219.38	ND	≈51	4168.38
	6/20/2000		ND	50.40	4168.98
	6/21/2000		ND	51.05	4168.33
	6/22/2000		ND	49.85	4169.53
	6/28/2000		ND	51.37	4168.01
	7/11/2000		ND	50.05	4169.33
	11/11/2003		ND	48.61	4168.08
	11/24/2003		ND	48.50	4169.12
	11/15/2006		ND	49.59	4169.79
	5/15/2007		ND	50.47	4168.91
	8/27/2008		ND	50.91	4168.47
	3/17/2009		ND	49.45	4169.93
	11/21/2011		ND	49.26	4170.12
MW-5	6/20/00(1)	4243.55	ND	≈42	4201.55
	6/22/2000		ND	52.55	4191.00
	6/27/2000		ND	52.27	4191.28
	7/11/2000		ND	51.02	4192.53
	11/11/2003		ND	48.61	4194.94
	11/24/2003		ND	48.50	4195.05
	11/15/2006		ND	49.91	4193.64
	5/15/2007		ND	50.28	4193.27
	8/27/2008		ND	48.54	4195.01
	3/17/2009		ND	50.18	4193.37
	11/21/2011		ND	48.36	4195.19
MW-6	6/21/00(1)	4214.05	ND	≈30	4184.05
	6/22/2000		ND	30.20	4183.82
	6/26/2000		ND	30.03	4183.99
	7/11/2000		ND	30.36	4183.66
	11/11/2003		ND	30.62	4183.43
	11/24/2003		ND	29.40	4184.65
	11/15/2006		ND	29.22	4184.83
	5/15/2007		ND	29.20	4184.85
	8/27/2008		ND	28.85	4185.20
	3/17/2009		ND	30.24	4183.81
	11/21/2011		ND	29.19	4184.86

TABLE 1
GROUND WATER ELEVATION DATA
MAGER WELL - LUST TRUST SITE
HARLOWTON, MT

Well Name	Date	Measuring Pomt Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-7S	11/24/2003	4246.07	ND	49.68	4196.39
	11/15/2006		ND	51.12	4194.95
	5/15/2007		ND	52.39	4193.68
	7/1/2007		ND	50.94	4195.13
	8/27/2008		ND	51.22	4194.85
	3/17/2009		ND	52.47	4193.6
	11/21/2011		ND	49.89	4196.18
MW-7D	11/24/2003	4246.07	ND	51.02	4195.05
	11/15/2006		ND	52.47	4193.60
	5/15/2007		ND	52.81	4193.26
	7/1/2007		ND	51.41	4194.66
	8/27/2008		ND	51.08	4194.99
	3/17/2009		ND	52.70	4193.37
	11/21/2011		ND	50.87	4195.20
MW-8S*	11/24/2003	4228.14	28.75	28.95	4199.33
	11/15/2006		29.58	29.81	4198.49
	5/15/2007		29.72	29.85	4198.38
	8/6/2008		29.43	29.53	4198.68
	8/10/2008		29.30	29.35	4198.83
Passive bailer installed in well, 2008	4/11/2009		30.03	30.08	4198.10
	11/22/2011		28.40	30.8	4199.02
MW-8D	11/24/2003	4228.44	ND	57.87	4170.57
	11/15/2006		ND	57.23	4171.21
	5/15/2007		ND	60.21	4168.23
	8/27/2008		ND	59.31	4169.13
	3/17/2009		ND	57.04	4171.4
	11/21/2011		ND	57.02	4171.42
MW-9*	11/24/2003	4222.29	ND	26.15	4196.14
	11/15/2006		26.20	26.71	4195.94
	5/15/2007		27.31	27.85	4194.82
	8/6/2008		25.20	25.95	4196.87
	8/10/2008		25.20	25.34	4197.05
Passive bailer installed in well. 2008	4/11/2009		ND	26.65	4195.64
	11/21/2011		25.15	25.35	4197.08

TABLE 1 GROUND WATER ELEVATION DATA MAGER WELL - LUST TRUST SITE HARLOWTON, MT					
Well Name	Date	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-10S	11/24/2003	4227.29	ND	14.97 (T.D.)	Dry
	11/15/2006		ND	14.97 (T.D.)	Dry
	5/15/2007		ND	14.97 (T.D.)	Dry
Well Abandoned 2008	8/27/2008		ND	14.97 (T.D.)	Dry
MW-10D	11/24/2003	4227.55	ND	22.39	4195.16
	11/15/2006		ND	33.65	4193.90
	5/15/2007		ND	33.90	4193.65
	8/27/2008		ND	31.97	4195.58
	3/17/2009		ND	33.65	4193.90
	11/21/2011		ND	32.15	4195.40
MW-11	11/24/2003	4222.78	ND	24.30	4198.48
	11/15/2006		ND	23.82	4198.96
	5/15/2007		ND	26.32	4196.46
	8/27/2008		ND	23.27	4199.51
	3/17/2009		ND	25.00	4197.78
	11/21/2011		ND	22.83	4199.95
MW-12	11/24/2003	4216.03	ND	21.57	4194.46
	11/15/2006		ND	22.02	4194.01
	5/15/2007		ND	23.60	4192.43
	8/27/2008		ND	22.36	4193.67
	3/17/2009		ND	23.44	4192.59
	11/21/2011		ND	22.11	4193.92
MW-14	11/24/2003	4211.79	ND	21.77	4190.02
	11/15/2006		ND	21.35	4190.44
	5/15/2007		ND	23.14	4188.65
	8/27/2008		ND	20.29	4191.50
	3/17/2009		ND	23.68	4188.11
Traffic over well	11/21/2011		NM	NM	NM
MW-15	11/24/2003	4224.84	ND	25.32	4199.52
	11/15/2006		ND	23.57	4201.27
	5/15/2007		ND	24.90	4199.94
	8/27/2008		ND	22.02	4202.82
	3/20/2009		ND	25.97	4198.87
	11/21/2011		ND	22.06	4202.78

TABLE 1
GROUND WATER ELEVATION DATA
MAGER WELL - LUST TRUST SITE
HARLOWTON, MT

Well Name	Date	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-16-06	11/15/2006	4214.28	ND	19.99	4194.29
	5/15/2007		ND	20.63	4193.65
	7/2/2007		17.66	18.10	4196.48
	8/12/2008		17.18	17.33	4197.06
Passive bailer installed in well, 2008	4/11/2009		21.06	21.08	4193.21
	11/21/2011		16.86	17.50	4197.23
MW-17-06	11/15/2006	4217.33	ND	22.28	4195.05
	5/15/2007		ND	23.11	4194.22
	8/27/2008		ND	21.33	4196.00
	3/17/2009		ND	23.61	4193.72
	11/21/2011		ND	22.15	4195.18
MW-18-06	11/15/2006	4225.93	ND	32.03	4193.90
	5/15/2007		ND	32.52	4193.41
	8/27/2008		ND	30.60	4195.33
	3/17/2009		ND	32.24	4193.69
	11/21/2011		ND	26.11	4199.82
	11/29/2011	Corrected for product thickness	30.2	39.55	4192.93
MW-19-06	11/15/2006	4208.45	ND	18.14	4190.31
	5/15/2007		ND	18.81	4189.64
	8/27/2008		ND	17.56	4190.89
	3/17/2009		ND	19.22	4189.23
	11/21/2011		ND	16.45	4192
MW-20-08	8/27/2008	4219.11	ND	17.79	4201.32
	3/17/2009		ND	21.43	4197.68
	11/21/2011		ND	18.19	4200.92
MW-21-08	8/27/2008	4235.87	ND	26.73	4209.14
	3/17/2009		ND	30.32	4205.55
	11/21/2011		ND	27.54	4208.33
MW-22-08	8/27/2008	4252.61	ND	37.93	4214.68
	3/17/2009		ND	45.74	4206.87
	11/21/2011		ND	43.88	4208.73
MW-23-08	8/27/2008	4231.58	ND	26.61	4204.97
	3/17/2009		ND	29.25	4202.33
	11/21/2011		ND	26.24	4205.34
MW-24-08	8/27/2008	4227.18	ND	30.58	4196.60
	3/17/2009		ND	33.43	4193.75
	11/21/2011		ND	27.29	4199.89

TABLE 1

GROUND WATER ELEVATION DATA

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Date	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-25-08	8/27/2008	4219.32	ND	20.72	4198.60
	3/17/2009		ND	22.78	4196.54
	11/21/2011		ND	19.93	4199.39
MW-26-08	8/27/2008	4218.78	ND	15.55	4203.23
	3/17/2009		ND	15.39	4203.39
	11/21/2011			14.97	4203.81
Mager Irrigation	6/14/2000	4264.12	ND	71.62	4192.50
	6/27/2000		ND	73.16	4189.74
	7/11/2000		ND	71.59	4191.31
	11/24/2003		ND	69.10	4195.02
Well Abandoned	9/11//06		ND	71.00	4193.12
Town Pump	6/20/2000	4222.15	ND	23.60	4198.55
Fastway Conoco	6/14/2000	4219.14	ND	44.11	4175.03
	6/21/2000		ND	44.37	4174.77
	6/27/2000		ND	48.10	4171.04
	7/11/2000		ND	45.51	4173.63
	11/11/2003		ND	45.20	4173.94
	11/24/2003		ND	46.50	4172.64
	11/15/2006		ND	46.50	4172.64
	5/15/2007		ND	47.85	4171.29
	8/27/2008		ND	44.91	4174.23
	3/17/2009		ND	45.61	4173.53
	11/21/2011		ND	45.32	4173.82
Two J's Market	6/14/2000	4230.35	ND	56.64	4173.71
	6/21/2000		ND	56.15	4174.19
	11/11/2003		ND	58.30	4172.05
	11/24/2003		ND	58.30	4172.05
	11/15/2006		ND	56.77	4173.58
	5/15/2007		ND	57.99	4172.36
Jaw Bone Creek GC	7/1/2007	4241.60	ND	68.94	4172.66
Croston's Exxon Wells					
MW-08-5	11/21/2011	4217.63	ND	12.12	4205.51
MW-08-6	11/21/2011	4218.91	ND	18.68	4200.23
MW-08-7	11/21/2011	4218.4	ND	19.14	4199.26
MW-08-8	11/21/2011	4218.83	ND	16.73	4202.10
MW-08-9	11/21/2011	4219.53	ND	23.77	4195.76
MW-08-10	11/21/2011	4219.07	ND	18.15	4200.92
MW-08-11	11/21/2011	4218.7	ND	18.43	4200.27

TABLE 1 *GROUND WATER ELEVATION DATA* MAGER WELL - LUST TRUST SITE HARLOWTON, MT					
Well Name	**Date**	Measuring Point Elevation (feet)	Depth to LNAPL (feet)	**Depth to Water (feet)**	**Groundwater Elevation (feet)**
MW-08-12	11/21/2011	4216.46	ND	18.23	4198.23

** Corrected for LNAPL thickness* $[\,[\,DTW - [(DTW - DTP)] \times 0.7]\,] - \underline{MP}_{elev}\,]$

ND = not detected

(1) Date Drilled

TD = Total Depth

≈ = Approximate measured with steel tape by driller

TABLE 2

GROUNDWATER SAMPLE WATER QUALITY PARAMETERS

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Sample Date	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Conductivity (mmhos)	Dissolved Oxygen	ORP	Comments
MW-1	5/17/2000	150	10.9	7.91	2,540			Odor
	6/27/2000	60	12.8	7.0	2,800			Odor
	11/24/2003	25	11.1	7.70	2,700			Strong Odor
Well Abandoned	9/11/2006	25	N.M.	N.M.	N.M.			Slight Odor
MW-2 - 00	5/17/2000	50	12.8	8.24	2,540			Odor
	6/27/2000	30	12.1	7.2	2,700			Slight Odor
	11/25/2003	25	10.3	7.24	2,800			Strong Odor
	11/17/2006	30	10.4	7.24	2,187			Moderate Odor
	5/16/2007	26	10.6	6.74	2,360			Moderate Odor
	8/28/2008	40	10.6	7.16	2,046			Slight Odor
	3/19/2009	35	10.4	6.88	2,462			Slight Odor
	11/22/2011	36	10.14	9.18	5,842	0.57	-188.3	Strong Odor
MW-3 - 00	5/17/2000	460	11.9	8.06	2,800			Slight Odor
	6/26/2000	60	13.1	7.2	3,000			Slight Odor
	11/25/2003	40	11.5	7.53	3,100			Slight Odor
	11/16/2006	40	10.7	7.15	2,599			Slight Odor
	5/16/2007	37	10.7	6.92	2,592			Slight Odor
	8/29/2008	40	11.16	7.10	2,614			No Odor
Well Abandoned	3/18/2009	40	10.6	7.29	2,536			No Odor
MW-4 - 00	6/28/2000	45	13.5	7.40	3,000			No Odor
	11/11/2003	10	10.7	7.38	2,300			No Odor
	11/15/2006	17	10.5	7.94	2,740			No Odor
	5/16/2007	17	10.7	6.93	2,709			No Odor
	8/28/2008	30	11.0	6.94	2,781			No Odor
	3/18/2009	25	7.2	7.20	2,735			No Odor
	11/22/2011	11	10.6	7.11	2,764	0.12	-114.9	No Odor
MW-5 - 00	6/27/2000	51	12.5	7.2	2,300			Slight Odor
	11/11/2003	40	10.9	6.84	1,500			Slight Odor
	11/15/2006	22	10.1	6.82	2,190			No Odor
	5/16/2007	25	10.3	6.77	2,169			Slight Odor
	8/28/2008	30	10.7	7.05	2,232			Slight Odor
	3/19/2009	30	10.3	6.85	2,299			Slight Odor
	11/22/2011	15	10.07	8.19	4,543	1.20	-48.3	Slight Odor

TABLE 2

GROUNDWATER SAMPLE WATER QUALITY PARAMETERS

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Sample Date	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Conductivity (mmhos)	Dissolved Oxygen	ORP	Comments
MW-6 - 00	6/26/2000	15	12.3	6.9	2,800			No Odor
	11/25/2003	10	11.4	7.37	3,100			No Odor
	11/16/2006	6	10.7	7.10	2,575			No Odor
	5/16/2007	18	10.9	6.55	2,503			No Odor
	8/28/2008	35	11.4	6.60	2,698			No Odor
	3/18/2009	25	11.1	6.85	2,599			No Odor
	11/22/2011	10	10.58	6.67	2,700	0.23	-98.0	No Odor
MW-7S - 03	11/25/2003	15	10.0	7.29	2,100			Strong Odor
	11/17/2006	7	10.0	7.15	2,558			Strong Odor
	5/16/2007	3	11.6	7.02	3,005			Moderate Odor
	8/29/2008	10	10.6	8.80	3,275			Moderate Odor
	3/19/2009	6	10.5	6.92	3,134			Strong Odor
	11/29/2011	4	9.8	7.45	3,175	3.00	-145.0	Strong Odor
MW-7D - 03	11/25/2003	25	10.2	7.29	1,700			Strong Odor
	11/16/2006	25	10.2	7.14	2,290			Moderate Odor
	5/16/2007	25	10.4	6.62	2,305			Slight Odor
	8/28/2008	20	10.5	7.07	2,179			Moderate Odor
	3/19/2009	30	10.3	6.83	2,241			Slight Odor
	11/22/2011	17	9.83	8.4	4,296	1.04	-43.7	Slight Odor
MW-8D - 03	11/25/2003	40	10.6	7.72	2,300			Strong Odor
	11/16/2006	30	10.4	7.19	2,676			Moderate Odor
	5/16/2007	26	10.6	6.97	2,544			Moderate Odor
	8/28/2008	40	10.6	7.27	2,681			Slight Odor
	3/19/2009	35	10.4	6.88	2,619			Slight Odor
	11/22/2011	35	10.22	6.81	2,694	0.10	-86.0	H2S Smell
MW-9	11/25/2003	25	11.2	7.73	950			Strong Odor
MW-10S *Well abandoned*								
MW-10D - 03	11/25/2003	25	10.5	7.22	980			Strong Odor
	11/16/2006	13	10.6	7.18	1,732			Moderate Odor
	5/16/2007	15	10.6	6.69	2,358			Slight Odor
	8/28/2008	25	10.8	7.30	1,724			Slight Odor
	3/19/2009	19	10.4	6.90	1,538			Moderate Odor
	11/28/2011	20	10.19	7.15	1,490	0.15	-119.0	Strong Odor

TABLE 2

GROUNDWATER SAMPLE WATER QUALITY PARAMETERS

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Sample Date	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Conductivity (mmhos)	Dissolved Oxygen	ORP	Comments
MW-11 - 03	11/25/2003	3	10.8	7.11	1,890			Slight Odor
	11/16/2006	5	10.7	6.69	5,060			Slight Odor/Sheen
	5/17/2007	3.5	10.7	5.99	5,404			Slight Odor
	8/29/2008	4	11.1	7.45	5,445			Slight Odor
	3/19/2009	2.5	11.2	6.31	5,530			Slight Odor
	11/28/2011	4.5	10.82	6.27	4,624	1.06	-131.0	Moderate Odor
MW-12 - 03	11/25/2003	7	11.0	7.21	1,650			No Odor
	11/16/2006	6	11.6	6.18	3,295			Slight Odor
	5/17/2007	6	11.7	5.33	3,222			Moderate Odor
	8/29/2008	8	11.2	7.41	3,557			Moderate Odor
	3/19/2009	6	11.1	5.59	3,459			Moderate Odor
	11/29/2011	5	9.7	5.33	3,288	2.15	-93.0	Strong Odor
MW-14 - 03	11/25/2003	25	11.2	7.11	1,650			No Odor
	11/15/2006	10.5	11.0	6.75	4,226			No Odor
	5/15/2007	11	13.0	5.69	4,420			No Odor
	8/28/2008	20	11.0	5.10	4,494			No Odor
	3/19/2009	12	11.3	4.91	4,896			No Odor
MW-15 - 03	11/25/2003	28	10.7	7.67	1,340			Moderate Odor
	11/17/2006	9	9.9	7.10	2,554			Slight Odor/Sheen
	5/16/2007	9	11.8	6.84	2,557			Strong Odor
	8/29/2008	13	11.1	7.47	2,847			Moderate Odor
	3/20/2009	12	11.4	7.35	2,629			Strong Odor /Sheen
	11/29/2011	10	9.9	6.99	2,608	1.84	-109.0	Odor/Sheen
MW-16-06	11/20/2006	10	11.9	7.18	2,225			Moderate Odor
	5/17/2007	7	11.23	6.55	2,069			½" Free Product
MW-17-06	11/20/2006	9	11.0	7.20	1,235			Moderate Odor
	5/17/2007	11	10.8	6.88	1,402			Slight Odor
	8/28/2008	11	11.2	8.10	1,504			Moderate Odor
	3/19/2009	20	11.0	6.83	1,354			Moderate Odor
	11/28/2011	20	10.6	6.85	1,719	1.30	-140.0	Strong Odor
MW-18-06	11/20/2006	12	10.6	7.22	1,890			Moderate Odor
	5/17/2007	11	11.4	6.65	2,955			Moderate Odor
	8/29/2008	11	11.5	7.15	2,560			Moderate Odor
	3/20/2009	8	11.6	6.99	2,560			Moderate Odor/Sheen
MW-19-06	11/20/2006	2	10.9	7.11	2,162			No Odor
	5/17/2007	3	11.8	6.41	2,659			No Odor
	8/28/2008	2	13.6	6.50	2,872			No Odor
	3/18/2009	2	12.2	6.65	2,498			No Odor
	11/22/2011	4	10.8	6.57	2,927	3.96	-44.0	No Odor

TABLE 2

GROUNDWATER SAMPLE WATER QUALITY PARAMETERS

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Sample Date	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Conductivity (mmhos)	Dissolved Oxygen	ORP	Comments
MW-20-08	8/29/2008	12	10.3	6.54	3,256			No Odor
	3/18/2009	5	10.6	6.75	2,773			No Odor
	11/22/2011	15	10.7	6.51	3,226	0.60	21.7	No Odor
MW-21-08	8/29/2008	12	10.5	7.18	2,191			No Odor
	3/18/2009	8	10.7	7.23	2,019			No Odor
	11/22/2011	9	9.9	7.19	2,087	0.91	21.0	
MW-22-08	8/29/2008	28	10.9	6.72	2,066			No Odor
	3/18/2009	25	10.5	7.16	2,235			No Odor
	11/22/2011	18	10.1	7.14	2,077	5.51	-97.2	No Odor
MW-23-08	9/3/2008	5	10.5	7.14	3,439			No Odor
	3/18/2009	2	10.3	7.02	4,214			No Odor
	11/22/2011	7	9.6	7.12	3,574	8.21	-95.0	No Odor
MW-24-08	9/2/2008	5	11.5	6.76	4,470			No Odor
	3/19/2009	3	11.5	6.57	4,970			No Odor
	11/28/2011	5	10.15	5.84	4,785	0.64	-123.0	Odor/Sheen
MW-25-08	8/29/2008	7	10.6	7.74	5,320			Slight Odor
	3/20/2009	5	11.4	6.22	6,359			Moderate Odor/Sheen
	11/21/2011	5	10.15	5.84	4,785	0.64	-76.0	Odor/Sheen
MW-26-08	9/4/2008	6	12.2	7.62	1,186			No Odor
	3/18/2009	5	10.6	7.13	1,241			No Odor
	11/22/2011	5	12.23	7.23	1,481	8.59	-79.0	No Odor
Mager Irrigation	5/17/2000	500	10.7	7.61	2,510			Slight Odor
	6/27/2000	>100	N.M.	N.M.	N.M.			Strong Odor
	11/25/2003	35	10.2	7.67	1,130			Strong Odor
Well Abandoned	9/11/2006	40	N.M.	N.M.	N.M.			Slight Odor
Thompson Supply	5/16/2000	>1,000	N.M.	N.M.	N.M.			No Odor
	11/15/2006	>1,000	10.1	7.47	1,682			No Odor
	5/15/2007	>1,000	10.8	7.03	1,702			No Odor
	9/4/2008	>1,000	11.3	7.17	2,432			No Odor
	3/20/2009	>1,000	10.3	7.32	1,661			No Odor
	11/30/2011	>1,000	N.M.	N.M.	N.M.	N.M.	N.M.	No Odor
Fastway Conoco	5/16/2000	50	11.2	7.92	2,110			No Odor
	6/27/2000	60	12.7	N.M.	2,100			No Odor
	11/11/2003	50	10.7	7.24	1,700			No Odor
	11/16/2006	200	10.4	7.08	2,287			No Odor
	5/16/2007	205	10.5	6.70	2,287			No Odor
	8/28/2008	200	10.8	6.87	2,299			No Odor
	3/18/2009	140	10.6	7.03	1,980			No Odor
	11/22/2011	50	9.96	6.80	1,834	0.10	-94	No Odor

TABLE 2

GROUNDWATER SAMPLE WATER QUALITY PARAMETERS

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Well Name	Sample Date	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Conductivity (mmhos)	Dissolved Oxygen	ORP	Comments
Two J's Market	11/17/2006	240	10.3	7.22	2,646			No Odor
	5/16/2007	250	10.5	6.76	3,013			No Odor
Jaw Bone Creek	5/15/2007	>1,000	12.5	7.79	1,395			No Odor
	9/4/2008	>1,000	12.5	8.22	1,247			No Odor
	9/4/2008	>1,000	11.05	8.16	1,235			No Odor

N.M. Not Measured

TABLE 3

GROUNDWATER LABORATORY ANALYTICAL RESULTS

PETROLEUM HYDROCARBONS AND VOLATILE ORGANIC COMPOUNDS in µg/L

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
MW-1	5/16/2000	**9.5**	**9.8**	0.18 J	<0.50	0.19 J	<0.50	0.37 J	<0.50	4.8	<5.0[1]	22	74	7.6	91	2
	6/27/2000	**13**	**13**	<0.50	<0.50	0.15 J	<0.50	0.30 J	<0.50	3.5	5.9	20	83	15	99	2
	7/17/2003	**1,640**	**1,480**	75	63	90	79	94	78	2.2	<5.0[1]	120	**1,640**	140	**3,080**	**7.3**[2]
	11/25/2003	NA	**1,260**	NA	27	NA	90	NA	54	NA	<10[1]	177	**2,460**	221	**2,740**	NA
Well Abandoned	9/11/2006	**33**	**37**	0.57	1	0.39 J	0.57	0.36 J	0.72	1.6	2	<20	61	28	109	1.1
MW-2	5/15/2000	<0.50	<0.50	<0.50	<1.0[1]	<0.50	<0.50	<0.50	<0.50	<0.50	<10[1]	55	102	<20	119	**5.7**
	6/27/2000	1.1	1	<0.50	<0.50	0.15 J	<0.50	0.20 J	<0.50	3.1	5.3	31	120	26	132	**4.3**
	7/17/2003	**3,000**	**2,780**	162	145	215	162	213	181	<5.0	<10[1]	256	**3,070**	286	**5,930**	**9.7**[2]
	11/25/2003	NA	**2,440**	NA	68	NA	172	NA	117	NA	<10[1]	241	**4,430**	330	**5,910**	NA
	11/17/2006	**306**	**369**	<1.0	0.65	0.70 J	0.88	<1.0	0.71	1.1	<2.0	40	354	27	665	<1.0
	5/16/2007	**35**	**63**	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	2.9	2.8	38	147	26	204	<1.0
	8/28/2008	2.1	2.1	<1.0	<0.50	1.4	1.5	<1.0	0.55	11	10	63	193	64	261	1.4
	3/19/2009	**30**	**31**	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	4.6	4	27	127	39	189	3.4
	11/22/2011	**824**	**593**	7.2	6.9	170	127	65	50	<1.0	<5.0	211	**1,140**	307	**1,940**	<1.0
MW-3	5/16/2000	**35 D**	**39**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<2.0[1]	<20	55	<20	78	1.9
	6/26/2000	**20 D**	**25**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	1.9	<20	47	<20	58	1.8
	7/16/2003	**133**	**132**	0.28 J	<0.50	<0.50	<0.50	0.35	<0.50	1.7	1.8	<20	101	<20	201	2.6[2]
	11/25/2003	NA	**152**	NA	0.98	NA	1	NA	3.1	NA	<2.0[1]	110	223	174	461	NA
	11/16/2006	<1.0	<0.50	0.53 J	0.72	<1.0	<0.50	0.64 J	1.1	1.3	1.5	<20	41	19 J	42	2.5
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	0.5	<1.0	<0.50	1.2	1.4	<20	17 J	<20	18 J	2.4
	8/29/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	1.4	1.6	<20	<20	<20	<20	1.9
Well Abandoned	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	2.2	1.9	<20	<20	<20	<20	1.7
MW-4	6/28/2000	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<20	<20	<20	<20	<0.50
	7/17/2003	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<20	<20	<20	<20	<0.50
	11/11/2003	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<20	<20	<20	<20	<0.50
	11/15/2006	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	8/28/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.5	0.6	0.55	0.88	0.82	4.4	4.4	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-5	6/27/2000	0.39 J	<0.50	0.35 J	0.72	0.33 J	<0.50	0.41 J	0.6	1.1	2.7	<20	120	26	111	**9.9**
	7/17/2003	<0.50	<0.50	<0.50	<0.50	0.55	0.47 J	<0.50	<0.50	1.5	1.5	<20	63	25	76	**7.6**
	11/11/2003	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	1.3	17 J	66	11 J	79	**8.1**
	11/15/2006	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.84 J	0.96 J	<20	67	17 J	57	**6.4**
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.67 J	<1.0	<20	33	<20	29	**5.7**
	8/28/2008	**6.5**	**7**	<1.0	<1.0[1]	1.8	1.9	2.1	2.5	0.92 J	<2.0[1]	20 J	114	24	147	**7.3**
	3/19/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.98 J	<1.0	<20	79	25	91	**6.9**
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.60 J	<1.0	<20	58	<20	52	**5.7**

TABLE 3

GROUNDWATER LABORATORY ANALYTICAL RESULTS

PETROLEUM HYDROCARBONS AND VOLATILE ORGANIC COMPOUNDS in µg/L

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
MW-6	6/26/2000	0.22 J	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	0.51	<0.50	<1.0	<20	<20	<20	<20	<0.50
	7/17/2003	1.4	1.3	0.30 J	<0.50	<0.50	<0.50	0.32	<0.50	<0.50	<1.0	<20	<20	<20	<20	<0.50
	11/25/2003	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<1.0	<20	<20	<20	<20	NA
	11/15/2006	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	8/28/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	17 J	<20	27	<1.0
	11/22/2011	<1.0	<0.50	0.37	<0.50	0.53	0.42	2.6	1.7	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-7S	11/25/2003	NA	**2,680**	NA	**5,410**	NA	1,170	NA	5,990	NA	<50[1]	**4,140**	**20,600**	**4,820**	**32,500**	NA
	11/17/2006	**192**	**233**	94	131	145	173	103	149	<1.0	<5.0[1]	428	**1,130**	290	**2,140**	<1.0
	5/16/2007	**266**	**265**	216	168	476	170	833	340	<1.0	<25[1]	**1,650**	**3,120**	**960**	**4,910**	<1.0
	8/29/2008	**772**	**723**	464	307	**1,000**	**995**	1,860	1,630	<2.0	<25[1]	**3,130**	**9,310**	**2,810**	**16,000**	<2.0
	3/19/2009	**370**	**294**	301	196	968	777	1,600	1,100	<10	<20[1]	**2,950**	**7,100**	**2,950**	**12,800**	<20[1]
	11/29/2011	**184**	**182**	46	43	472	398	446	382	<5.0	<50 D	**1,460**	**3,220**	**1,830**	**5,900**	<5.0
MW-7D	11/25/2003	NA	1.5	NA	3.6	NA	1.6	NA	10	NA	2.1	72	252	128	354	NA
	11/16/2006	<1.0	0.69	0.87 J	1.1	0.58 J	0.87	1.1	2	1.5	1.6	56	223	60	229	**8.4**
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	0.49 J	1.5	1.8	37	158	26	164	**9.8**
	8/28/2008	0.84 J	1.1	<1.0	<1.0[1]	1.1	1.6	0.58 J	0.97	<1.0	<1.0	75	244	78	337	**5.8**
	3/19/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	0.64	1.3	<1.0	36	171	57	222	**6.1**
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.76 J	<1.0	33	158	32	173	**6**
MW-8S	11/25/2003	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/15/2006	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	5/15/2007	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/18/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-8D	11/25/2003	NA	**43**	NA	201	NA	123	NA	612	NA	<10[1]	752	**1,760**	**830**	**3,090**	NA
	11/16/2006	<1.0	<0.50	<1.0	<0.50	0.70 J	0.95	<1.0	0.82	<1.0	<1.0	19 J	40	14 J	70	<1.0
	5/16/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	17 J	38	8.1 J	50	<1.0
	8/28/2008	<1.0	<0.50	<1.0	<0.50	2.2	3.6	<1.0	<0.50	<1.0	<1.0	<20	25	26	48	<1.0
	3/19/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-9	11/25/2003	NA	290	NA	207	NA	732	NA	878	NA	<50[1]	**4,330**	**9,960**	**4,500**	**15,800**	NA
	11/15/2006	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	5/15/2007	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/19/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL

TABLE 3

GROUNDWATER LABORATORY ANALYTICAL RESULTS

PETROLEUM HYDROCARBONS AND VOLATILE ORGANIC COMPOUNDS in µg/L

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
MW-10S (dry) *Well Abandoned*	11/25/2003	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
	11/15/2006	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
	8/28/2008	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
MW-10D	11/25/2003	NA	**37**	NA	1.5	NA	57	NA	2.8	NA	<20[1]	381	**783**	**637**	**1,400**	NA
	11/16/2006	**13**	**16**	0.79 J	<2.0[1]	9.1	11	1.1	2.1	<1.0	<5.0[1]	349	631	246	**1,130**	<1.0
	5/16/2007	2.9	2.3	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	3.9	4.3	<20	23	17 J	31	2.1
	8/28/2008	**12**	**14**	0.67 J	<2.5[1]	190	186	3.3	4.1	<1.0	<5.0[1]	677	**895**	**639**	**1,920**	<2.0[1]
	3/19/2009	**8.2**	**9.4**	0.52	1.4	24	26	<1.0	1.8	<1.0	<5.0[1]	321	631	348	**1,100**	<2.0[1]
	11/28/2011	**3.4**	**3.6**	0.32	<4.0 D	2.3	2.8	1.6	1.6	<1.0	<1.0	264	593	286	921	<1.0
MW-11	11/25/2003	NA	**6.1**	NA	3.4	NA	4.3	NA	6.2	NA	<1.0	20	21	37	75	NA
	11/16/2006	**32**	**29**	1.4	1.3	30	27	19	19	<1.0	<10[1]	207	**1,040**	320	**1,120**	**18**
	5/17/2007	**31**	**47**	1.3	2.3	9.1	42	22	36	<1.0	<15[1]	385	**1,990**	413	**2,220**	**13**
	8/29/2008	**7.7**	**8**	<2.0	<0.50	7.9	7.1	8.6	12	<2.0	<2.0[1]	261	576	344	**1,080**	**6.6**
	3/19/2009	**34**	**37**	1.2	2.4	26	32	26	44	<1.0	<5.0[1]	700	**2,100**	**1,170**	**3,590**	**18**
	11/28/2011	**28**	**28**	2.2	5	48	47	38	34	<1.0	<1.0	545	**1,570**	**785**	**2,510**	**17**
MW-12	11/25/2003	NA	**10**	NA	5.6	NA	1.3	NA	6.7	NA	<1.0	<20	108	24	114	NA
	11/16/2006	**504**	**564**	712	686	207	225	730	729	<1.0	<20[1]	**1,010**	**5,570**	**773**	**7,990**	<1.0
	5/17/2007	**448**	**339**	420	287	239	245	611	628	<1.0	<20[1]	**1,350**	**3,500**	**1,170**	**5,510**	**25**
	8/29/2008	**250**	**248**	38	25	123	129	162	145	<2.0	<10[1]	487	**2,400**	**529**	**3,970**	**27**
	3/19/2009	**400**	**374**	266	225	195	215	417	399	<1.0	<20[1]	806	**3,470**	**1,110**	**5,480**	**42**
	11/29/2011	**398**	**235**	266	132	163	57	316	124	<1.0	<10 D	260	**891**	**502**	**1,720**	<1.0
MW-14	11/25/2003	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<1.0	<20	<20	<20	<20	NA
	11/15/2006	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	5/15/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	8/28/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/19/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-15	11/25/2003	NA	**9,550**	NA	**1,390**	NA	**2,500**	NA	4,500	NA	<20[1]	**5,700**	**26,700**	**4,950**	**40,100**	NA
	11/17/2006	**3,460**	**4,020**	76	82	**1,350**	**1,510**	527	609	<1.0	<25	**2,490**	**9,960**	**1,560**	**18,000**	<1.0
	5/16/2007	**1,600**	**2,410**	133	154	**1,220**	**1,300**	290	327	<1.0	<20[1]	**2,800**	**4,630**	**1630 J**	**9,710**	<1.0
	8/29/2008	**3,560**	**3,760**	580	425	**1,830**	**1,740**	1,350	1,380	<10	<50[1]	**3,240**	**11,400**	**2,780**	**20,100**	<10
	3/20/2009	**3,100**	**3,040**	338	369	**1,640**	**1,780**	864	957	<10	<50[1]	**2,990**	**4,880**	**2,690**	**13,800**	<10
	11/29/2011	**2,930**	**2,100**	460	384	**1,270**	**1,090**	883	758	<5.0	<20 D	**1,960**	**7,440**	**3,060**	**13,100**	<5.0
MW-16-06	11/20/2006	**532**	**676**	12	15	520	592	196	199	<1.0	<10[1]	**2,060**	**3,070**	**1,320**	**6,860**	<1.0
	5/17/2007	**1,710**	**2,200**	134	166	**1,100**	**1,260**	2,210	2720	<1.0	<100[1]	**6,240**	**8,450**	**3,770**	**18,100**	**19**
	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/18/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL

TABLE 3

GROUNDWATER LABORATORY ANALYTICAL RESULTS

PETROLEUM HYDROCARBONS AND VOLATILE ORGANIC COMPOUNDS in µg/L

MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
MW-17-06	11/20/2006	**9.6**	**7.9**	2.4	2	8	7	2.6	3	<1.0	<2.0	43	382	53	500	<1.0
	5/17/2007	**7.6**	**8.3**	1.2	1.4	6.2	8.1	0.84 J	4	<1.0	<5.0[1]	55	425	59	424	<1.0
	8/28/2008	4.5	**5.6**	<1.0	<1.0[1]	4.1	4.6	0.59 J	1	<1.0	<1.0	37	270	54	344	<1.0
	3/19/2009	4.7	**6.1**	0.48 J	1	3.2	5	0.84 J	3	<1.0	<1.0	37	278	55	330	<1.0
	11/28/2011	9.1	**8.5**	1.4	2.1	2.4	2.5	1.2	2	<1.0	<1.0	19 J	165	22	190	<1.0
MW-18-06	11/20/2006	**210**	**243**	76	79	6	8	23	27	<1.0	<10[1]	36	**2,070**	34	**2,340**	<1.0
	5/17/2007	**159**	**170**	18	26	4	5	10	14	2.8	<10[1]	<100[1]	**1,220**	<100[1]	**1,110**	**17**
	8/29/2008	**640**	**700**	374	394	392	394	1,630	1,630	<1.0	<10[1]	**1,810**	**3,900**	**1,690**	**8,330**	<1.0
	3/20/2009	**248**	**222**	25	25	174	180	351	343	<10	<20[1]	**1,230**	**3,010**	**1,530**	**5,520**	**56**
	11/28/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-19-06	11/20/2006	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	5/17/2007	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	8/28/2008	<1.0	<0.50	0.52 J	0.61	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/20/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	0.12 J	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-20-08	8/29/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-21-08	8/29/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-22-08	8/29/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-23-08	9/2/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/19/2009	0.81 J	0.89	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	30	28	44	132	<1.0
	11/22/2011	<1.0	<0.50	0.68	0.56	1	0.83	4.9	4.3	<1.0	<1.0	<20	<20	<20	<20	<1.0
MW-24-08	9/2/2008	**7.5**	**9.9**	11	14	20	29	3.9	85	<1.0	<1.0	188	171	66	470	0.81 J
	3/19/2009	<1.0	0.89	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	30	28	44	132	<1.0
	11/28/2011	**58**	**53**	5.7	6.1	10	9.6	37	37	<1.0	<1.0	44	166	64	287	<1.0
MW-25-08	8/29/2008	**366**	**475**	21	30	211	256	300	376	<1.0	<10[1]	**1,400**	**5,540**	**1,270**	**7,850**	**100**
	3/20/2009	**2,030**	**1,810**	70	67	468	486	817	760	<2.0[1]	<20[1]	**1,500**	**7,510**	**1,590**	**11,600**	**252**
	11/29/2011	**5,560**	**3,700**	332	279	**5,240**	**1,070**	**11,800**	2,320	<50	<100 D	**27,500**	**24,400**	**24,300**	**66,300**	<50
MW-26-08	9/4/2008	0.47 J	<0.50	0.72 J	0.51	0.43 J	<0.50	0.48 J	0.42 J	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	1.2	<1.0	<1.0	<20	<20	<20	<20	<1.0

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MAGER WELL - LUST TRUST SITE

HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
Mager Irrigation	4/7/1999	**52**	NA	<1.0	NA	1.6	NA	<1.0	NA	4.8	NA	NA	NA	NA	231	NA
	5/12/1999	**52**	NA	<0.5	NA	0.89	NA	<0.5	NA	8.9	NA	NA	NA	NA	NA	**4.6**
	8/23/1999	**449**	NA	3	NA	6.8	NA	4.1	NA	6.1	NA	NA	NA	NA	NA	**4.9**
	5/16/2000	**20 D**	NA	0.16 J	NA	<0.50	NA	<0.50	NA	4.7	NA	NA	NA	NA	NA	2.5
	6/27/2000	**19**	NA	<0.50	NA	0.20 J	NA	**0.40 J**	NA	3.5	NA	NA	NA	NA	NA	2.7
	7/16/2003	**1430**	NA	91	NA	138	NA	156	NA	<5.0	NA	NA	NA	NA	NA	**9.0**[2]
	11/25/2003	**1620**	**907**	10	8.7	123	111	32	39	1.6	<10[1]	207	**2,670**	214	**2,530**	**6.6**
Well Abandoned	9/11/2006	**131**	**126**	0.56	0.71	0.91	1.1	0.76	0.98	0.28 J	<1.0	<20	134	25	256	0.55
Thompson Supply	5/15/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.26 J
	6/14/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.21 J
	7/16/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	11/25/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	0.21 J
	11/15/2006	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	5/15/2007	<1.0	NA	0.60 J	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	9/4/2008	0.96 J	0.71	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	10/30/2008	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	3/20/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/30/2011	0.57 J	0.42 J	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
Jaw Bone Creek G.C.	7/17/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	5/15/2007	0.58 J	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	7/1/2007	0.41 J	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	7/2/2007	2	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	7/3/2007	3.8	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	9/4/2008	1.5	1.3	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	9/4/2008	3.4	3	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
Fastway Conoco	5/16/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	6/27/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	7/17/2003	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	11/11/2003	<0.50	<0.50	<0.50	0.46 J	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	140	<20	71	166	<0.50
	11/15/2006	<1.0	NA	<1.0	NA	<1.0	NA	0.52 J	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	5/16/2007	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	8/28/2008	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	3/18/2009	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0
Fastway Conoco Duplicate	11/22/2011	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	0.26	<0.50	<1.0	<1.0	<20	<20	<20	<20	<1.0

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HARLOWTON, MT

Location	Sample Date	Benzene (VOC)	Benzene (VPH)	Toluene (VOC)	Toluene (VPH)	Ethyl-benzene (VOC)	Ethyl-benzene (VPH)	Xylenes (VOC)	Xylenes (VPH)	MTBE (VOC)	MTBE (VPH)	C9 to C10 Aromatics	C5 to C8 Aliphatics	C9 to C12 Aliphatics	TPH	1,2-DCA
Two J's Market	5/11/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	6/28/2000	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	<0.50	NA	NA	NA	NA	NA	<0.50
	11/17/2006	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
	5/16/2007	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	<1.0	NA	NA	NA	NA	NA	<1.0
Courthouse Well	10/31/2006	NA	**76 H**	NA	1.7 H	NA	33 H	NA	11 H	NA	<2.0[1]H	694 H	592 H	492 H	**1620 H**	NA
Well Abandoned	11/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RBSL Ceiling		-	**5**	-	**1,000**	-	**700**	-	**10,000**	-	**30**	**1,000**	**700**	**1,000**	**1,000**	**4**
DEQ-7 HHS		**5**	-	**1,000**	-	**700**	-	**10,000**	-	**30**	-	-	-	-	-	-

Results in micrograms per liter (µg/L), equivalent to parts per billion (ppb)

Notes:

[1]The reporting limit was increased due to sample matrix interference.

[2]1,2-Dichloroethane was found in the sample; however, the reported concentration should be considered an estimate due to the interference from the large amount of benzene present.

Acronyms/Abbreviations

1,2-DCA - 1,2-Dichloroethane

D - RL increased due to sample matrix

DEQ-7 - Circular DEQ-7 Montana Numerical Quality Standards

EPH - extractable petroleum hydrocarbons

HHS - human health standard

H - Analysis performed past recommended holding time.

J - Estimated Value. The analyte was present but less than the reporting limit.

LNAPL - light non-aqueous phase liquid was detected in the monitor well, so no groundwater sample was collected for laboratory analysis

MTBE - methyl tert-butyl ether

NA - not analyzed

N.S. - not sampled

RBSL - MDEQ Table 3 Tier 1 Groundwater Risk-Based Screening Level and Standards, September 2009

TEH - total extractable hydrocarbons

TPH - total purgeable hydrocarbons

µg/L - micrograms per liter

VOC - volatile organic compounds

VPH - volatile petroleum hydrocarbons

TABLE 4
GROUNDWATER LABORATORY ANALYTICAL RESULTS
EXTRACTABLE PETROLEUM HYDROCARBONS in µg/L
MAGER WELL - LUST TRUST SITE
HARLOWTON, MONTANA

Location	Sample Date	EPH Screen[1]	C9 to C18 Aliphatics	C19 to C36 Aliphatics	C11 to C22 Aromatics	TEH
MW-2	8/28/2008	893	NA	NA	NA	NA
	3/19/2009	<300	NA	NA	NA	NA
	11/22/2011	554	NA	NA	NA	NA
MW-3	8/29/2008	<312	NA	NA	NA	NA
	3/18/2009	<306	NA	NA	NA	NA
MW-4	8/28/2008	<303	NA	NA	NA	NA
	3/18/2009	<326	NA	NA	NA	NA
	11/22/2011	<300	NA	NA	NA	NA
MW-5	8/28/2008	<333	NA	NA	NA	NA
	3/19/2009	<306	NA	NA	NA	NA
	11/22/2011	<306	NA	NA	NA	NA
MW-6	8/28/2008	<330	NA	NA	NA	NA
	3/18/2009	<319	NA	NA	NA	NA
	11/22/2011	<300	NA	NA	NA	NA
MW-7S	8/29/2008	**22,300**	**6,820**	990	**3,820**	**156,002**
	3/19/2009	**9,260**	**1,280**	<333	888	**5,350**
	11/29/2011	**5,530**	**1,250**	<316	631	**3,660**
MW-7D	8/28/2008	586	NA	NA	NA	NA
	3/19/2009	**1,790**	<312	<312	<312	<312
	11/22/2011	<300	NA	NA	NA	NA
MW-8S	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/18/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-8D	8/28/2008	<319	NA	NA	NA	NA
	3/19/2009	<316	NA	NA	NA	NA
	11/22/2011	<309	NA	NA	NA	NA
MW-9	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/18/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-10D	8/28/2008	**2,630**	<326	<326	<326	6,132
	3/19/2009	898	NA	NA	NA	NA
	11/28/2011	661	NA	NA	NA	NA
MW-11	8/29/2008	**2,650**	**693**	<333	349	**13,202**
	3/19/2009	**137,000**	**60,700**	**2,540**	**14,300**	**79,400**
	11/28/2011	**23,200**	**11,900**	**572**	**3,130**	**16,600**

TABLE 4
GROUNDWATER LABORATORY ANALYTICAL RESULTS
EXTRACTABLE PETROLEUM HYDROCARBONS in µg/L
MAGER WELL - LUST TRUST SITE
HARLOWTON, MONTANA

Location	Sample Date	EPH Screen[1]	C9 to C18 Aliphatics	C19 to C36 Aliphatics	C11 to C22 Aromatics	TEH
MW-12	8/29/2008	**1,610**	<326	<326	<326	4,552
	3/19/2009	**2,810**	<326	<326	<326	957
	11/29/2011	**2,720**	<316	<316	<316	753
MW-14	8/28/2008	<303	NA	NA	NA	NA
	3/19/2009	<333	NA	NA	NA	NA
MW-15	8/29/2008	**10,100**	371	<326	532	**38,502**
	3/20/2009	**6,940**	<309	<309	240 J	**1,680**
	11/29/2011	**6,400**	<309	<309	339	**2,180**
MW-16-06	8/28/2008	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	3/18/2009	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-17-06	8/28/2008	<319	NA	NA	NA	NA
	3/19/2009	<326	NA	NA	NA	NA
	11/28/2011	<309	NA	NA	NA	NA
MW-18-06	8/29/2008	**9,820**	**938**	387	537	**37,002**
	3/20/2009	**21,700**	**6,350**	**1,370**	**1,500**	**10,100**
	11/21/2011	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
MW-19-06	8/28/2008	<333	NA	NA	NA	NA
	3/20/2009	<309	NA	NA	NA	NA
	11/22/2011	<309	NA	NA	NA	NA
MW-20-08	8/29/2008	<326	NA	NA	NA	NA
	3/18/2009	<333	NA	NA	NA	NA
	11/22/2011	<306	NA	NA	NA	NA
MW-21-08	8/29/2008	<312	NA	NA	NA	NA
	3/18/2009	<326	NA	NA	NA	NA
	11/22/2011	<306	NA	NA	NA	NA
MW-22-08	8/29/2008	<306	NA	NA	NA	NA
	3/18/2009	<303	NA	NA	NA	NA
	11/22/2011	<300	NA	NA	NA	NA
MW-23-08	9/2/2008	<300	NA	NA	NA	NA
	3/19/2009	409	NA	NA	NA	NA
	11/22/2011	<300	NA	NA	NA	NA
MW-24-08	9/2/2008	633	NA	NA	NA	NA
	3/19/2009	<333	NA	NA	NA	NA
	11/28/2011	681	NA	NA	NA	NA
MW-25-08	8/29/2008	**5,280**	405 J	<435	315 J	**16,502**
	3/20/2009	**10,700**	275 J	<309	<309	**1,470**
	11/29/2011	**3,150,000**	1,860,000	130,000	485,000	**2,760,000**

TABLE 4 *GROUNDWATER LABORATORY ANALYTICAL RESULTS* EXTRACTABLE PETROLEUM HYDROCARBONS in µg/L MAGER WELL - LUST TRUST SITE HARLOWTON, MONTANA						
Location	**Sample Date**	**EPH Screen[1]**	**C9 to C18 Aliphatics**	**C19 to C36 Aliphatics**	**C11 to C22 Aromatics**	**TEH**
MW-26-08	9/4/2008	<303	NA	NA	NA	NA
	3/18/2009	<312	NA	NA	NA	NA
	11/22/2011	**1,950**	<300	<300	<300	<300
Thompson	9/4/2008	<312	NA	NA	NA	NA
	3/20/2009	<300	NA	NA	NA	NA
	11/30/2011	<309	NA	NA	NA	NA
Jaw Bone	9/4/2008	<306	NA	NA	NA	NA
Creek G.C.	9/4/2008	<312	NA	NA	NA	NA
Fastway Conoco	8/28/2008	<326	NA	NA	NA	NA
	3/18/2009	<319	NA	NA	NA	NA
	11/22/2011	<309	NA	NA	NA	NA
Fastway Conoco Duplicate	11/22/2011	NA	NA	NA	NA	NA
RBSL/Ceiling		**1,000**	**1,000**	**1,000**	**1,000**	**1,000**

Bold numbers indicate levels above Ceiling Concentration or Risk-Based Screening Level (Montana Tier 1 Risk-Based Results in micrograms per liter (µg/L), equivalent to parts per billion (ppb)

Notes:

[1]TEH concentration values obtained through the EPH Screen analysis are typically higher than those obtained through the EPH analysis. As such, these values should be used on a qualitative, not quantitative basis.

[2]The hydrocarbons in the sample consisted almost entirely of gasoline range organics.

Acronyms/Abbreviations

EPH - extractable petroleum hydrocarbons

NA - not analyzed

RBSL - MDEQ Table 3 Tier 1 Groundwater Risk-Based Screening Level and Standards, September 2009

TEH - total extractable hydrocarbons

µg/L - micrograms per liter

NAPL - non aqueous phase liquid

LNAPL - light non-aqueous phase liquid was detected in the monitor well, so no groundwater sample was collected for laboratory analysis

APPENDIX L

Water Rights Summary

DNRC Water Right Query System

Water Right	A	WR Type	Status	Purpose	Priority Date yyyymmdd (hhmm)	Src	Src Name	Means of Diversion	Owner	Flow Rate	Volume	Acres	Doc Image	Div Count & map	Use Count & map	Irr Count & map	Res Count & map	Issue Remarks
40A 110247 00	A	STATEMENT OF CLAIM	ACTV	MUNICIPAL	19480628	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	716.00 GPM	1157.88		View	1	3			
40A 112931 00	A	STATEMENT OF CLAIM	ACTV	MUNICIPAL	19610813	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	1200.00 GPM	1935.00		View	1	3			
40A 112932 00	A	STATEMENT OF CLAIM	ACTV	MUNICIPAL	19550519	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	280.00 GPM	452.00		View	1	3			
40A 17873 00	A	PROVISIONAL PERMIT	ACTV	AGRICULTURAL SPRAYING	197803071115	S	JAWBONE CREEK	PUMP	HARLOWTON COUNTRY CLUB INC	1000.00 GPM	50.00		View	1	1		1	
40A 204218 00	A	STATEMENT OF CLAIM	ACTV	COMMERCIAL	19361226	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	50.00 GPM	40.43		View	1	1			
40A 204219 00	A	STATEMENT OF CLAIM	ACTV	COMMERCIAL	19300324	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	120.00 GPM	97.03		View	1	1			
40A 204223 00	A	STATEMENT OF CLAIM	ACTV	COMMERCIAL	19221031	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	25.00 GPM	20.21		View	1	1			
40A 61323 00	A	PROVISIONAL PERMIT	ACTV	IRRIGATION	198511051036	G	GROUNDWATER	WELL	HARLOWTON, CITY OF	450.00 GPM	51.12	42	View	1	2	2		

Form No. 76-O N10/79

RECEIVED
OCT 30 1981
MONTANA D.N.R.C.
LEWISTOWN FIELD OFFICE

112932 -40A

WH-L
06-056-01-01
$40.00

STATEMENT OF CLAIM FOR EXISTING WATER RIGHTS

OTHER USES

For the Water Courts of the State of Montana

1. **Owner of Water Right** CITY OF HARLOWTON, / WHEATLAND COUNTY, MONTANA
(Last / First / Middle Initial)

Co-Owner or Other Interest Owner _____ / _____ / _____
(Last / First / Middle Initial)

Address _____

City Harlowton State Montana Zip Code 59036

Home Phone No. _____ Business Phone No. _____

2. **Person completing form** Mitchell / Robert / M.
(Last / First / Middle Initial)

Address City Attorney, P. O. Box 653

City Harlowton State Montana Zip Code 59036

Home Phone No. 406-632-5743 Business Phone No. 406-632-4380

3. **Use:**
- ☐ Fish Raceways
- ☐ Fish & Wildlife
- ☐ Commercial
- ☐ Industrial
- ☒ Municipal
- ☐ Geothermal
- ☐ Navigation
- ☐ Fire Protection
- ☐ Agricultural Spraying
- ☐ Oil Well Flooding
- ☐ Mining
- ☐ Power Generation
- ☐ Recreation
- ☐ Other

Explain _____

4. **Source of Water:**
- ☐ Stream — Name _____ Tributary of _____
- ☐ Spring
- ☒ Well
- ☐ Lake — Name _____ Stream _____ Tributary of _____
- ☐ Reservoir — Name _____ Stream _____ Tributary of _____

5. **Point of Diversion:** County(ies) Wheatland

NE ¼ SE ¼ SW ¼, Section 22, T 8 N/S, R 15 E/W

¼ ¼ ¼, Section _____, T _____ N/S, R _____ E/W

Lot _____, Block _____, Subdivision _____

6. **Means of Diversion:**
- ☒ Well
- ☒ Pump Capacity 280 gpm
- ☐ Headgate with ditch or pipeline
- ☐ Instream use
- ☐ Other Explain _____

7. **Means of Conveyance:**
- ☐ Ditch
- ☒ Pipeline
- ☐ Instream
- ☒ Other: underground water mains

DNRC

* 8. Place of Use: County(ies) WHEATLAND

DNRC

☐ Instream ☒ City or Town ☐ Other: Explain

¼	¼	¼,	Section	22	, T	8	N/S,	R	15 E/W
¼	¼	SE ¼,	Section	21	, T	8	N/S,	R	15 E/W
¼	NE ¼	SW ¼,	Section	21	, T	8	N/S,	R	15 E/W
¼	¼	¼,	Section		, T		N/S,	R	E/W
¼	¼	¼,	Section		, T		N/S,	R	E/W

Lot _____, Block _____, Subdivision _____

All property within the Harlowton city limits as identified on the attached city map within Sections 21, 22 and 23, T8N, R15E.

9. Flow rate claimed: 280 ☐ cubic feet per second ☒ gallons per minute ☐ miner's inches

10. Volume claimed: 452 acre-feet

DNRC

11. Period(s) of use: Continuous, 24 hours per day, 365 days per year.

1/1 to 12/31

* DNRC

12. Check one:
- ☐ Decreed Water Right
- ☒ Filed Appropriation Right
- ☐ Use Water Right

May, 1955

13. Attach copies of the Decree, Record of Filing or Proof of Use Right.

14. Attach copies of aerial photographs, U.S. Geological Survey maps or such other documents necessary to show point of diversion, place of use, place of storage, and conveyance facilities.

15. Notarized Statement signed by claimant.

STATE OF MONTANA)
)ss.
County of Wheatland)

I, TERRILL R RIOUX, having been first duly sworn, depose(s) and say(s) that (he) (she) (they), being of legal age and being the claimant(s) of the foregoing claim of Existing Water Right, and the person(s) whose name(s) is (are) subscribed thereto as the claimant(s), that (he) (she) (they) know(s) the contents of said foregoing claim and that the matters and things therein are true and correct.

Terrill R Rioux
City Clerk

Subscribed and sworn before me, this 27 day of October 1981.

Robert M Pritchell
Notary Public for the State of Montana

Residing at Harlowton Mt

My Commission expires July 2, 1984

THURBER'S HELENA

A

STATE OF MONTANA
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
48 NORTH LAST CHANCE GULCH P.O.BOX 201601 HELENA, MONTANA 59620-1601

CHANGE AUTHORIZATION 'GENERAL ABSTRACT'

Application From: HARLOWTON, CITY OF
PO BOX 292
HARLOWTON, MT 59036

Water Right Number(s) Changed:	Wr #	Ext	Type
	40A 112932	00	STATEMENT OF CLAIM

Change Description:
REPLACEMENT WELL

CONDITIONAL APPROVAL
THIS AUTHORIZATION IS LIMITED TO THE AMOUNT OF THE HISTORIC USE RECOGNIZED BY THE DEPARTMENT IN THIS PROCEEDING AS SUBJECT TO CHANGE, AND WILL THEREAFTER NOT EXCEED THAT AMOUNT. IF THE HISTORIC USE IS REDUCED UNDER ADJUDICATION PROCEEDINGS PURSUANT TO TITLE 85, CHAPTER 2, PART 2, MCA, THIS AUTHORIZATION WILL BE LIMITED TO A LESSER AMOUNT.

FAILURE TO COMPLY WITH ANY OF THESE TERMS AND CONDITIONS MAY RESULT IN THE LOSS OF THIS CHANGE AUTHORIZATION.

THE INFORMATION SHOWN BELOW REFLECTS THE ENTIRE WATER RIGHT.
AN ASTERISK (*) HAS BEEN PLACED NEXT TO EACH ITEM ALTERED BY THIS CHANGE AUTHORIZATION.

Water Right Number: 40A 112932-00 STATEMENT OF CLAIM
Version: 2 -- CHANGE AUTHORIZATION
Status: ACTIVE

Owners: HARLOWTON, CITY OF
PO BOX 292
HARLOWTON, MT 59036

Priority Date: MAY 19, 1955

Purpose (use): MUNICIPAL

Maximum Flow Rate: 280.00 GPM

Maximum Volume: 452.00 AC-FT

Source Name: GROUNDWATER

***Point of Diversion and Means of Diversion:**

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NESESW	22	8N	15E	WHEATLAND

Diversion Means: WELL

Period of Diversion: JANUARY 1 to DECEMBER 31

Purpose (Use): MUNICIPAL
Volume: 452.00 AC-FT
Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1				22	8N	15E	WHEATLAND
2			SE	21	8N	15E	WHEATLAND
3			NESW	21	8N	15E	WHEATLAND

REPLACEMENT WELL INFORMATION
THE NEW WELL IS LOCATED 250 FEET SOUTHWEST FROM THE OLD WELL.

DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
WATER RIGHTS BUREAU
WATER RIGHT INFORMATION

WATER RIGHT NUMBER: 40A 6112932-00

OWNER DATA:

CURRENT OWNER: C HARLOWTON, CITY OF
PO BOX 292

HARLOWTON MT 59036

WATER RIGHT DATA:

LIMITS FOR WATER RIGHT		OPERATING DATES		MISCELLANEOUS DATA	
SURFACE/GROUND WATER	G	APPLICATION RECEIVED.	10/30/81	INITIAL ID.	6
TOTAL RATE	280.00 GPM	PRIORITY DATE	05/19/1955	PUBLIC NOTICE WAIVED. . . .	Y
TOTAL VOLUME (AF). .	452.00	PROCESSING STATUS	W-6-LE-04/30/90	SUBDIVISION NAME.	
		PERMIT/AUTHORIZATION ISSUED .	01/05/76		
		NOTICE OF COMPLETION RECEIVED	04/13/81		
			N		

WELL DATA:

NUMBER: 01
LOCATION: NESESW SEC 22 TWP 08N RGE 15E WHEATLAND CO

DETAILS OF WELL	
YIELD RATE	280
CASING DIAMETER. .	.12
RATE	280.00 GPM
DEPTH.	921

USE:

TYPE OF USE: (MC) MUNICIPAL

LIMITS OF USE	
PERIOD OF USE. . .	JAN 01-DEC 31
RATE	280.00 GPM
VOLUME	452.00

PLACE OF USE:

NUMBER	ACRES	LOT	BLOCK	QTR SEC	SEC	TWP	RGE	COUNTY
MC01-001					22	08N	15E	WHEATLAND CO
MC01-002				SE	21	08N	15E	WHEATLAND CO
MC01-003				NESW	21	08N	15E	WHEATLAND CO

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06-056-01-01
$40.00

STATEMENT OF CLAIM FOR EXISTING WATER RIGHTS

OTHER USES

For the Water Courts of the State of Montana

1. **Owner of Water Right** CITY OF HARLOWTON, (Last) / WHEATLAND COUNTY, MONTANA (First) (Middle Initial)

   Co-Owner or Other Interest Owner _____ (Last) / _____ (First) / _____ (Middle Initial)

   Address _____

   City Harlowton **State** Montana **Zip Code** 59036

   Home Phone No. _____ **Business Phone No.** _____

2. **Person completing form** Mitchell (Last) / Robert (First) / M. (Middle Initial)

   Address City Attorney, Box 653

   City Harlowton **State** Montana **Zip Code** 59036

   Home Phone No. 406-632-5743 **Business Phone No.** 406-632-4380

3. **Use:**
   - ☐ Fish Raceways
   - ☐ Fish & Wildlife
   - ☐ Commercial
   - ☐ Industrial
   - ☒ Municipal
   - ☐ Geothermal
   - ☐ Navigation
   - ☐ Fire Protection
   - ☐ Agricultural Spraying
   - ☐ Oil Well Flooding
   - ☐ Mining
   - ☐ Power Generation
   - ☐ Recreation
   - ☐ Other — Explain _____

4. **Source of Water:**
   - ☐ Stream — Name _____ Tributary of _____
   - ☐ Spring
   - ☒ Well
   - ☐ Lake — Name _____ Stream _____ Tributary of _____
   - ☐ Reservoir — Name _____ Stream _____ Tributary of _____

5. **Point of Diversion:** County(ies) Wheatland

   ____ ¼ ____ ¼ ____ ¼, Section 21, T 8 N/S, R 15 E/W

   ____ ¼ ____ ¼ ____ ¼, Section ____, T ____ N/S, R ____ E/W

   Lot 6, Block 5, Subdivision Tucker Second Addition, City of Harlowton

6. **Means of Diversion:**
   - ☒ Well
   - ☒ Pump — Capacity 1200 gpm
   - ☐ Headgate with ditch or pipeline
   - ☐ Instream use
   - ☐ Other — Explain _____

7. **Means of Conveyance:** DNRC
   - ☐ Ditch
   - ☒ Pipeline
   - ☐ Instream
   - ☒ Other: underground water mains

8. **Place of Use:** County(ies) Wheatland

DNRC ☐ Instream ☒ City or Town ☐ Other: Explain _____

¼ ¼ ¼, Section 22, T 8 N/S, R 15 E/W

¼ SE ¼ ¼, Section 21, T 8 N/S, R 15 E/W

¼ NE ¼ SW ¼, Section 21, T 8 N/S, R 15 E/W

¼ ¼ ¼, Section _____, T _____ N/S, R _____ E/W

¼ ¼ ¼, Section _____, T _____ N/S, R _____ E/W

Lot _____, Block _____, Subdivision _____

All property within the Harlowton city limits as identified on the attached map within Sections 21, 22 and 23, T8N, R15E

9. **Flow rate claimed:** 1,200
   - ☐ cubic feet per second
   - ☒ gallons per minute
   - ☐ miner's inches

10. **Volume claimed:** 1,935 acre-feet

DNRC 11. **Period(s) of use:** Continuous, 24 hours per day, 365 days per year.
1/1 to 12/31

DNRC 12. **Check one:**
- ☐ Decreed Water Right
- ☒ Filed Appropriation Right — 8-13-1961
- ☐ Use Water Right

13. **Attach** copies of the Decree, Record of Filing or Proof of Use Right.

14. **Attach** copies of aerial photographs, U.S. Geological Survey maps or such other documents necessary to show point of diversion, place of use, place of storage, and conveyance facilities.

15. **Notarized Statement signed by claimant.**

STATE OF MONTANA)
)ss.
County of Wheatland)

I, TERRILL R ROWE, having been first duly sworn, depose(s) and say(s) that (he) (she) (they), being of legal age and being the claimant(s) of the foregoing claim of Existing Water Right, and the person(s) whose name(s) is (are) subscribed thereto as the claimant(s), that (he) (she) (they) know(s) the contents of said foregoing claim and that the matters and things therein are true and correct.

Terrill R Rowe
City Clerk

Subscribed and sworn before me, this 27 day of October 19 87.

Robert M Mitchell
Notary Public for the State of Montana

Residing at Harlowton Mt

My Commission expires July 2, 1988

THURBER S HELENA

Form No. 76-O N10/79

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OCT 30 1981
MONTANA D.N.R.C.
LEWISTOWN FIELD OFFICE

110247 -40A

WH-L
06-056-01-01
$40.00

STATEMENT OF CLAIM FOR EXISTING WATER RIGHTS

OTHER USES

For the Water Courts of the State of Montana

1. **Owner of Water Right** CITY OF HARLOWTON (Last) / WHEATLAND COUNTY, MONTANA (First) / (Middle Initial)

   Co-Owner or Other Interest Owner _____ (Last) / _____ (First) / _____ (Middle Initial)

   Address Harlowton

   City Harlowton State Montana Zip Code 59036

   Home Phone No. _____ Business Phone No. _____

2. **Person completing form** Mitchell (Last) / Robert (First) / M. (Middle Initial)

   Address City Attorney, P. O. Box 653

   City Harlowton State Montana Zip Code 59036

   Home Phone No. 406-632-5743 Business Phone No. 406-632-4380

3. **Use:**
   - ☐ Fish Raceways
   - ☐ Fish & Wildlife
   - ☐ Commercial
   - ☐ Industrial
   - ☒ Municipal
   - ☐ Geothermal
   - ☐ Navigation
   - ☐ Fire Protection
   - ☐ Agricultural Spraying
   - ☐ Oil Well Flooding
   - ☐ Mining
   - ☐ Power Generation
   - ☐ Recreation
   - ☐ Other

   Explain _____

4. **Source of Water:**
   - ☐ Stream — Name _____ Tributary of _____
   - ☐ Spring
   - ☒ Well
   - ☐ Lake — Name _____ Stream _____ Tributary of _____
   - ☐ Reservoir — Name _____ Stream _____ Tributary of _____

5. **Point of Diversion:** County(ies) Wheatland

   ____ ¼ ____ ¼ ____ ¼, Section 22, T 8 N/S, R 15 E/W

   ____ ¼ ____ ¼ ____ ¼, Section ____, T ____ N/S, R ____ E/W

   Lot 5, Block 13, Subdivision Graves Third Addition, City of Harlowton

6. **Means of Diversion:**
   - ☒ Well
   - ☒ Pump Capacity 716 gpm
   - ☐ Headgate with ditch or pipeline
   - ☐ Instream use
   - ☐ Other Explain _____

DNRC

7. **Means of Conveyance:**
   - ☒ Ditch
   - ☒ Pipeline
   - ☐ Instream
   - ☒ Other: underground water mains

8. **Place of Use:** County(ies) Wheatland

DNRC ☐ Instream ☒ City or Town ☐ Other: Explain _____

¼ ¼ ¼, Section 22, T 8 (N)/S, R 15 (E)/W

¼ ¼ SE ¼, Section 21, T 8 (N)/S, R 15 (E)/W

¼ NE ¼ SW ¼, Section 21, T 8 (N)/S, R 15 (E)/W

¼ ¼ ¼, Section _____, T _____ N/S, R _____ E/W

¼ ¼ ¼, Section _____, T _____ N/S, R _____ E/W

Lot _____, Block _____, Subdivision _____

All property within the Harlowton city limits as identified on the attached map within Sections 21, 22 and 23, T8N, R15E.

9. **Flow rate claimed:** 716
☐ cubic feet per second
☒ gallons per minute
☐ miner's inches

10. **Volume claimed:** 1,160 acre-feet

DNRC 11. **Period(s) of use:** Continuous, 24 hours per day, 365 days per year.

DNRC 1/1 to 12/31

12. **Check one:**
☐ Decreed Water Right
☒ Filed Appropriation Right
☐ Use Water Right

6-28-1948

13. **Attach** copies of the Decree, Record of Filing or Proof of Use Right.

14. **Attach** copies of aerial photographs, U.S. Geological Survey maps or such other documents necessary to show point of diversion, place of use, place of storage, and conveyance facilities.

15. **Notarized Statement signed by claimant.**

STATE OF MONTANA)
)ss.
County of Wheatland)

I, TERRILL R. RIOUX, having been first duly sworn, depose(s) and say(s) that (he) (she) (they), being of legal age and being the claimant(s) of the foregoing claim of Existing Water Right, and the person(s) whose name(s) is (are) subscribed thereto as the claimant(s), that (he) (she) (they) know(s) the contents of said foregoing claim and that the matters and things therein are true and correct.

Terrill R Rioux
City Clerk

Subscribed and sworn before me, this 27 day of October 1981.

Robert M Mitchell
Notary Public for the State of Montana

Residing at Harlowton MT

My Commission expires July 2, 1984

THURBER S HELENA

APPENDIX M

Harlowton Fire Department Letter

5-19-2011

Mr. Rob Ashton
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

RE: Harlowton Montana, Water System Improvements – Fire Service

Dear Mr. Ashton,

The City of Harlowton Fire Department has reviewed the proposed water improvement plans and has had discussions with the design engineer, and understands that a new 590,000 gallon water storage tank, booster station and transmission pipe is proposed for the City.

Given that the City's existing well supply pumps do not currently have backup power generators, the Fire Department will accept a fire flow rate of 2,500 gpm for 2 hours, which will be supplied from the proposed water storage tank. The Department understands that available fire flows and pressures will be greatly improved with the increased tank height and pipe system upgrades. Additionally, the proposed new fire hydrant locations, which include two fire hydrant replacements at the same location are acceptable to the Department.

Please call me at (406) 366-0110 if you have any questions.

Sincerely,

Harlowton Fire Department

Dean R. Thompson
Fire Chief

APPENDIX N

Three-Year Well Pump Records

Pump Usages 2017

Thompson Well			South Well		Prichard Well		Month Totals	
Month	Start	Total	Start	Total	Start	Total		
January Start	61319151		93941300		70074559			
January	65256951	3937800	95971000	2029700	70074559	0	**5967500**	
February	68484363	3227412	98012800	2041800	70074559	0	**5269212**	
March	71694660	3210297	40000	2027200	70727639	653080	**5890577**	
April	74784198	3089538	1973300	1933300	72737791	2010152	**7032990**	
May	78180050	3395852	5822300	3849000	75162148	2424357	**9669209**	
June	84603776	6423726	9920800	4098500	78881153	3719005	**14241231**	
July	91648900	7045124	14387000	4466200	79854471	973318	**12484642**	
August	98180470	6531570	18791400	4404400	79872597	18126	**10954096**	
September	102200090	4019620	21329400	2538000	79872669	72	**6557692**	Prichard Meter Failed
October	104327505	2127415	22820300	1490900	0	2	**3618317**	New Meter Installed
November	106470477	2142972	24068200	1247900	1167028	1167028	**4557900**	
December	108273918	1803441	25222700	1154500	2413444	1246416	**4204357**	
Yearly Totals		***46,954,767.00***		***31,281,400.00***		***12,211,556.00***	***90,447,723.00***	

Pump Usages 2018

Thompson Well			South Well		Prichard Well		Month Totals
Month	Start	Total	Start	Total	Start	Total	
January Start	108365137		25279100		2476569		
January	110565511	2200374	26651600	1372500	3923681	1447112	**5019986**
February	113062217	2496706	28167200	1515600	5575477	1651796	**5664102**
March	116236719	3174502	30166500	1999300	6557698	982221	**6156023**
April	118958000	2721281	31858700	1692200	8346684	1788986	**6202467**
May	122119311	3161311	33803600	1944900	9839803	1493119	**6599330**
June	126154748	4035437	36371000	2567400	10405909	566106	**7168943**
July	131643531	5488783	39764200	3393200	13626087	3220178	**12102161**
August	136635446	4991915	43068100	3303900	17222969	3596882	**11892697**
September	139908371	3272925	45138800	2070700	19512987	2290018	**7633643**
October	142616020	2707649	46834900	1696100	21382349	1869362	**6273111**
November	145260760	2644740	48505600	1670700	23173830	1791481	**6106921**
December	148186533	2925773	50338800	1833200	25161295	1987465	**6746438**
Yearly Totals		***39,821,396.00***		***25,059,700.00***		***22,684,726.00***	***87,565,822.00***

Pump Usages 2019

Thompson Well

Month	Start	Total
January Start	148186533	
January	151188010	3001477
February	154187873	2999863
March	158190640	4002767
April	161745256	3554616
May	165038108	3292852
June	169017400	3979292
July	173452748	4435348
August	177822957	4370209
September	181005538	3182581
October	184579440	3573902
November	187609274	3029834
December	190316356	2707082
Yearly Totals		***42,129,823.00***

South Well

Start	Total
50338800	
52216700	1877900
54317200	2100500
56534400	2217200
58679600	2145200
60749500	2069900
63203700	2454200
65940400	2736700
68778800	2838400
70878800	2100000
73065900	2187100
74936900	1871000
76593800	1656900
26,255,000.00	

Prichard Well

Start	Total
25161295	
27179139	2017844
29452211	2273072
32113759	2661548
34147323	2033564
36219653	2072330
38892756	2673103
41255058	2362302
44370076	3115018
46633478	2263402
47095143	461665
48387135	1291992
50177058	1789923
25,015,763.00	

Month Totals

6897221
7373435
8881515
7733380
7435082
9106595
9534350
10323627
7545983
6222667
6192826
6153905
93,400,586.00

APPENDIX O

Distribution System Model

FOURTH ST NW
THIRD ST NW
SECOND ST NE
THIRD ST NE
STATE HIGHWAY US 12
MILL ST
KLOCK AVE
E LOGAN ST

E SEVENTH ST
E LOGAN ST
SHAMUT AVE
MILL ST
FOURTH ST
HAWKEYE ROAD
DUNN AVE
KLOCK AVE
MILWAUKEE AVE
THIRD ST
STATE HIWAY US 12
THIRD ST SE
SE LOGAN ST
SECOND ST SE
SE GORDON ST
FIRST ST SE
E AVE SE
CENTRAL AVE
E DIVISION ST
THIRD ST NE
SECOND ST NE
FOURTH ST NE
FIFTH ST NE
SIXTH ST NE
D AVE NE
C AVE NE
B AVE NE
A AVE NE
FIRST ST NW
SECOND ST NW
THIRD ST NW
FOURTH ST NW
FIFTH ST NW
SIXTH ST NW
H AVE NW
E AVE NW
NW PRICHARD ST
STATE HIGHWAY US 12

PHASE 3 IMPROVEMENTS W/ 2034 PEAK DAY FF

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-1	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-2	500.00	1,702.33	503.86	1,706.19	20.0	25.0	20.0	20.0	J-35	20.0	J-35
J-4	500.00	1,810.34	503.86	1,814.20	20.0	28.3	20.0	20.0	J-35	20.0	J-35
J-6	500.00	1,848.64	503.86	1,852.50	20.0	20.0	20.0	22.4	J-12	22.4	J-12
J-7	500.00	1,453.00	503.86	1,456.86	20.0	20.4	20.0	20.0	J-12	20.0	J-12
J-11	500.00	1,720.66	503.86	1,724.52	20.0	25.7	20.0	20.0	J-35	20.0	J-35
J-12	500.00	659.22	503.86	663.08	20.0	20.1	20.0	33.1	J-68	33.1	J-68
J-13	500.00	2,187.30	503.86	2,191.16	20.0	20.0	20.0	24.3	J-33	24.3	J-33
J-14	500.00	2,352.36	503.86	2,356.22	20.0	26.7	20.0	20.0	J-153	20.0	J-153
J-15	500.00	1,831.48	503.86	1,835.34	20.0	31.5	20.0	20.0	J-153	20.0	J-153
J-16	500.00	2,070.69	503.86	2,074.55	20.0	36.5	20.0	20.0	J-153	20.0	J-153
J-17	500.00	2,571.49	503.86	2,575.35	20.0	40.9	20.0	20.0	J-153	20.0	J-153
J-18	500.00	2,873.69	503.86	2,877.55	20.0	34.0	20.0	20.0	J-153	20.0	J-153
J-19	500.00	2,669.03	503.86	2,672.89	20.0	20.0	20.0	21.0	J-20	21.0	J-20
J-20	500.00	2,600.65	503.86	2,604.51	20.0	20.0	20.0	21.3	J-83	21.3	J-83
J-21	500.00	2,264.42	503.86	2,268.28	20.0	20.0	20.0	23.2	J-22	23.2	J-22
J-22	500.00	2,103.07	503.86	2,106.93	20.0	20.0	20.0	25.6	J-23	25.6	J-23
J-23	500.00	2,063.80	503.86	2,067.66	20.0	20.0	20.0	26.2	J-153	26.2	J-153
J-24	500.00	2,080.87	503.86	2,084.73	20.0	20.0	20.0	25.6	J-153	25.6	J-153
J-25	500.00	2,175.30	503.86	2,179.16	20.0	20.0	20.0	24.0	J-153	24.0	J-153
J-26	500.00	2,277.88	503.86	2,281.74	20.0	20.0	20.0	21.8	J-25	21.8	J-25
J-27	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-28	500.00	1,510.66	503.86	1,514.52	20.0	20.0	20.0	21.9	J-29	21.9	J-29
J-29	500.00	1,545.80	503.86	1,549.66	20.0	20.0	20.0	20.1	J-28	20.1	J-28
J-30	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-31	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-32	500.00	1,821.67	503.86	1,825.53	20.0	23.9	20.0	20.0	J-33	20.0	J-33

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-33	500.00	1,675.36	503.86	1,679.22	20.0	20.0	20.0	25.7	J-37	25.7	J-37
J-34	500.00	1,781.63	503.86	1,785.49	20.0	23.0	20.0	20.0	J-35	20.0	J-35
J-35	500.00	1,587.51	503.86	1,591.37	20.0	20.0	20.0	29.0	J-164	29.0	J-164
J-36	500.00	1,681.84	503.86	1,685.70	20.0	23.8	20.0	20.0	J-35	20.0	J-35
J-37	500.00	1,423.46	503.86	1,427.32	20.0	20.0	20.0	22.9	J-38	22.9	J-38
J-38	500.00	1,504.87	503.86	1,508.73	20.0	20.0	20.0	21.4	J-37	21.4	J-37
J-39	500.00	1,608.18	503.86	1,612.04	20.0	20.0	20.0	21.5	J-38	21.5	J-38
J-40	500.00	1,311.76	503.86	1,315.62	20.0	20.0	20.0	20.6	J-41	20.6	J-41
J-41	500.00	1,271.43	503.86	1,275.29	20.0	20.0	20.0	21.0	J-40	21.0	J-40
J-42	500.00	977.90	503.86	981.76	20.0	20.0	20.0	27.6	J-40	27.6	J-40
J-43	500.00	1,068.14	503.86	1,072.00	20.0	20.0	20.0	28.4	J-39	28.4	J-39
J-44	500.00	3,000.00	503.86	3,003.86	20.0	22.0	20.0	22.5	J-39	22.5	J-39
J-45	500.00	3,000.00	503.86	3,003.86	20.0	33.8	20.0	31.5	J-68	31.5	J-68
J-47	500.00	3,000.00	503.86	3,003.86	20.0	32.3	20.0	30.7	J-68	30.7	J-68
J-48	500.00	990.73	503.86	994.59	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-49	500.00	652.08	503.86	655.94	20.0	20.0	20.0	20.0	J-50	20.0	J-50
J-50	500.00	644.52	503.86	648.38	20.0	20.0	20.0	20.4	J-49	20.4	J-49
J-51	500.00	616.74	503.86	620.60	20.0	20.0	20.0	21.7	J-53	21.7	J-53
J-53	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-54	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-55	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-56	500.00	3,000.00	503.86	3,003.86	20.0	33.2	20.0	30.4	J-68	30.4	J-68
J-57	500.00	3,000.00	503.86	3,003.86	20.0	39.6	20.0	31.4	J-68	31.4	J-68
J-58	500.00	3,000.00	503.86	3,003.86	20.0	52.6	20.0	31.4	J-68	31.4	J-68
J-59	500.00	3,000.00	503.86	3,003.86	20.0	64.5	20.0	31.4	J-68	31.4	J-68
J-60	500.00	3,000.00	503.86	3,003.86	20.0	35.7	20.0	29.2	J-153	29.2	J-153
J-61	500.00	1,570.07	503.86	1,573.93	20.0	20.0	20.0	26.8	J-153	26.8	J-153
J-62	500.00	3,000.00	503.86	3,003.86	20.0	34.0	20.0	31.4	J-68	31.4	J-68

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-63	500.00	3,000.00	503.86	3,003.86	20.0	34.7	20.0	31.4	J-68	31.4	J-68
J-64	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-65	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-66	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-67	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-68	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-69	500.00	3,000.00	503.86	3,003.86	20.0	32.8	20.0	31.4	J-68	31.4	J-68
J-70	500.00	2,868.22	503.86	2,872.08	20.0	22.3	20.0	20.0	J-95	20.0	J-95
J-71	500.00	3,000.00	503.86	3,003.86	20.0	31.6	20.0	27.4	J-123	27.4	J-123
J-72	500.00	3,000.00	503.86	3,003.86	20.0	29.8	20.0	31.4	J-68	31.4	J-68
J-73	500.00	3,000.00	503.86	3,003.86	20.0	41.5	20.0	31.4	J-68	31.4	J-68
J-74	500.00	3,000.00	503.86	3,003.86	20.0	63.3	20.0	31.4	J-68	31.4	J-68
J-75	500.00	2,447.93	503.86	2,451.79	20.0	28.4	20.0	20.0	J-136	20.0	J-136
J-76	500.00	2,442.85	503.86	2,446.71	20.0	23.0	20.0	20.0	J-77	20.0	J-77
J-77	500.00	2,051.03	503.86	2,054.89	20.0	20.0	20.0	32.4	J-68	32.4	J-68
J-78	500.00	1,513.23	503.86	1,517.09	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-80	500.00	1,864.46	503.86	1,868.32	20.0	20.1	20.0	20.0	J-160	20.0	J-160
J-81	500.00	2,383.83	503.86	2,387.69	20.0	29.7	20.0	20.0	J-136	20.0	J-136
J-82	500.00	1,304.98	503.86	1,308.84	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-83	500.00	2,430.39	503.86	2,434.25	20.0	20.0	20.0	21.0	J-161	21.0	J-161
J-84	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-85	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-86	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-87	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-88	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-89	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-90	500.00	437.27	503.86	441.13	20.0	20.0	20.0	33.3	J-68	33.3	J-68
J-92	500.00	632.95	503.86	636.81	20.0	29.4	20.0	20.0	J-90	20.0	J-90

High Pt

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-93	500.00	692.88	503.86	696.74	20.0	29.9	20.0	20.0	J-90	20.0	J-90
J-94	500.00	3,000.00	503.86	3,003.86	20.0	48.8	20.0	31.4	J-68	31.4	J-68
J-95	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-96	500.00	2,808.64	503.86	2,812.50	20.0	32.3	20.0	20.0	J-123	20.0	J-123
J-97	500.00	2,572.96	503.86	2,576.82	20.0	33.1	20.0	20.0	J-123	20.0	J-123
J-98	500.00	1,583.12	503.86	1,586.98	20.0	22.9	20.0	20.0	J-100	20.0	J-100
J-99	500.00	1,442.07	503.86	1,445.93	20.0	21.1	20.0	20.0	J-100	20.0	J-100
J-100	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-101	500.00	1,408.39	503.86	1,412.25	20.0	23.2	20.0	20.0	J-178	20.0	J-178
J-102	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-103	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-104	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-105	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-106	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-107	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-108	500.00	2,020.42	503.86	2,024.28	20.0	41.9	20.0	20.0	J-113	20.0	J-113
J-109	500.00	2,413.55	503.86	2,417.41	20.0	21.4	20.0	20.0	J-110	20.0	J-110
J-110	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-111	500.00	2,494.51	503.86	2,498.37	20.0	30.7	20.0	20.0	J-110	20.0	J-110
J-112	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-113	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-114	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-115	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-116	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-117	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-119	500.00	2,498.26	503.86	2,502.12	20.0	31.3	20.0	20.0	J-110	20.0	J-110
J-120	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-121	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-122	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-123	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-124	500.00	2,028.31	503.86	2,032.17	20.0	25.8	20.0	20.0	J-136	20.0	J-136
J-126	500.00	1,657.96	503.86	1,661.82	20.0	27.8	20.0	20.0	J-131	20.0	J-131
J-194	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-127	500.00	1,657.79	503.86	1,661.65	20.0	22.9	20.0	20.0	J-131	20.0	J-131
J-128	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-129	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-130	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-131	500.00	1,578.04	503.86	1,581.90	20.0	20.0	20.0	21.0	J-132	21.0	J-132
J-132	500.00	1,483.71	503.86	1,487.57	20.0	20.0	20.0	28.9	J-131	28.9	J-131
J-133	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-134	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-135	500.00	1,198.67	503.86	1,202.53	20.0	20.1	20.0	32.7	J-68	32.7	J-68
J-136	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-137	500.00	1,813.26	503.86	1,817.12	20.0	26.4	20.0	20.0	J-136	20.0	J-136
J-138	500.00	1,534.48	503.86	1,538.34	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-139	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-140	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-141	500.00	1,423.60	503.86	1,427.46	20.0	20.0	20.0	20.8	J-142	20.8	J-142
J-142	500.00	1,419.26	503.86	1,423.12	20.0	20.0	20.0	20.2	J-141	20.2	J-141
J-143	500.00	1,419.29	503.86	1,423.15	20.0	20.6	20.0	20.0	J-142	20.0	J-142
J-144	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-145	500.00	1,310.12	503.86	1,313.98	20.0	31.2	20.0	20.0	J-150	20.0	J-150
J-146	500.00	1,298.33	503.86	1,302.19	20.0	31.1	20.0	20.0	J-150	20.0	J-150
J-147	500.00	1,127.00	503.86	1,130.86	20.0	37.4	20.0	20.0	J-150	20.0	J-150
J-148	500.00	483.99	503.86	487.85	20.0	20.0	20.0	33.3	J-68	33.3	J-68
J-149	500.00	1,062.05	503.86	1,065.91	20.0	22.1	20.0	20.0	J-150	20.0	J-150

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-150	500.00	1,045.59	503.86	1,049.45	20.0	20.0	20.0	23.4	J-149	23.4	J-149
J-151	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-152	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-153	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-154	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-155	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-156	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-157	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-158	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-159	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-160	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-161	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-163	500.00	677.27	503.86	681.13	20.0	24.8	20.0	20.0	J-120	20.0	J-120
J-164	500.00	1,598.00	503.86	1,601.86	20.0	20.0	20.0	28.8	J-33	28.8	J-33
J-165	500.00	1,627.23	503.86	1,631.09	20.0	20.0	20.0	26.1	J-164	26.1	J-164
J-166	500.00	1,913.01	503.86	1,916.87	20.0	26.3	20.0	20.0	J-153	20.0	J-153
J-167	500.00	1,857.79	503.86	1,861.65	20.0	26.7	20.0	20.0	J-153	20.0	J-153
J-168	500.00	3,000.00	503.86	3,003.86	20.0	55.2	20.0	31.4	J-68	31.4	J-68
J-169	500.00	3,000.00	503.86	3,003.86	20.0	55.1	20.0	31.4	J-68	31.4	J-68
J-170	500.00	3,000.00	503.86	3,003.86	20.0	58.4	20.0	31.4	J-68	31.4	J-68
J-171	500.00	3,000.00	503.86	3,003.86	20.0	63.2	20.0	31.4	J-68	31.4	J-68
J-172	500.00	3,000.00	503.86	3,003.86	20.0	65.2	20.0	31.4	J-68	31.4	J-68
J-173	500.00	3,000.00	503.86	3,003.86	20.0	65.0	20.0	31.4	J-68	31.4	J-68
J-174	500.00	3,000.00	503.86	3,003.86	20.0	20.9	20.0	22.7	J-153	22.7	J-153
J-175	500.00	1,657.63	503.86	1,661.49	20.0	20.5	20.0	20.0	J-131	20.0	J-131
J-176	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-177	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-178	500.00	1,399.90	503.86	1,403.76	20.0	20.0	20.0	22.0	J-100	22.0	J-100

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-182	500.00	1,797.69	503.86	1,801.55	20.0	24.3	20.0	20.0	J-33	20.0	J-33
J-183	500.00	3,000.00	503.86	3,003.86	20.0	38.9	20.0	31.3	J-68	31.3	J-68
J-184	500.00	3,000.00	503.86	3,003.86	20.0	41.7	20.0	31.4	J-68	31.4	J-68
J-188	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-189	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-190	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-191	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)

Existing System w/ Future Peak Day - FF

max 3000
min 500 gpm

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-1	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-2	500.00	1,670.47	503.86	1,674.33	20.0	25.1	20.0	20.0	J-35	20.0	J-35
J-4	500.00	1,770.49	503.86	1,774.35	20.0	28.4	20.0	20.0	J-35	20.0	J-35
J-6	500.00	1,808.88	503.86	1,812.74	20.0	20.0	20.0	22.4	J-12	22.4	J-12
J-7	500.00	1,436.72	503.86	1,440.58	20.0	20.4	20.0	20.0	J-12	20.0	J-12
J-11	500.00	1,687.64	503.86	1,691.50	20.0	25.8	20.0	20.0	J-35	20.0	J-35
J-12	500.00	658.90	503.86	662.76	20.0	20.1	20.0	33.1	J-68	33.1	J-68
J-13	500.00	2,093.14	503.86	2,097.00	20.0	20.0	20.0	21.8	J-153	21.8	J-153
J-14	500.00	1,896.18	503.86	1,900.04	20.0	33.1	20.0	20.0	J-153	20.0	J-153
J-15	500.00	1,446.94	503.86	1,450.80	20.0	31.5	20.0	20.0	J-153	20.0	J-153
J-16	500.00	2,023.06	503.86	2,026.92	20.0	32.9	20.0	20.0	J-153	20.0	J-153
J-17	500.00	2,418.12	503.86	2,421.98	20.0	39.0	20.0	20.0	J-153	20.0	J-153
J-18	500.00	2,473.86	503.86	2,477.72	20.0	32.0	20.0	20.0	J-153	20.0	J-153
J-19	500.00	2,410.14	503.86	2,414.00	20.0	21.0	20.0	20.0	J-153	20.0	J-153
J-20	500.00	2,390.10	503.86	2,393.96	20.0	20.0	20.0	20.1	J-153	20.1	J-153
J-21	500.00	2,136.30	503.86	2,140.16	20.0	20.0	20.0	22.8	J-153	22.8	J-153
J-22	500.00	2,003.99	503.86	2,007.85	20.0	20.0	20.0	23.8	J-153	23.8	J-153
J-23	500.00	1,973.07	503.86	1,976.93	20.0	20.0	20.0	23.4	J-153	23.4	J-153
J-24	500.00	1,987.12	503.86	1,990.98	20.0	20.0	20.0	22.4	J-153	22.4	J-153
J-25	500.00	2,064.34	503.86	2,068.20	20.0	20.0	20.0	20.1	J-153	20.1	J-153
J-26	500.00	2,026.38	503.86	2,030.24	20.0	24.5	20.0	20.0	J-153	20.0	J-153
J-27	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-28	500.00	1,484.45	503.86	1,488.31	20.0	20.0	20.0	21.8	J-29	21.8	J-29
J-29	500.00	1,517.40	503.86	1,521.26	20.0	20.0	20.0	20.1	J-28	20.1	J-28
J-30	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-31	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-32	500.00	1,785.28	503.86	1,789.14	20.0	23.9	20.0	20.0	J-33	20.0	J-33

N/A - Junction removed

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-33	500.00	1,651.79	503.86	1,655.65	20.0	20.0	20.0	25.7	J-37	25.7	J-37
J-34	500.00	1,744.42	503.86	1,748.28	20.0	23.0	20.0	20.0	J-35	20.0	J-35
J-35	500.00	1,562.27	503.86	1,566.13	20.0	20.0	20.0	28.8	J-164	28.8	J-164
J-36	500.00	1,651.25	503.86	1,655.11	20.0	23.9	20.0	20.0	J-35	20.0	J-35
J-37	500.00	1,422.81	503.86	1,426.67	20.0	20.0	20.0	22.9	J-38	22.9	J-38
J-38	500.00	1,504.98	503.86	1,508.84	20.0	20.0	20.0	21.4	J-37	21.4	J-37
J-39	500.00	1,609.02	503.86	1,612.88	20.0	20.0	20.0	21.5	J-38	21.5	J-38
J-40	500.00	1,313.74	503.86	1,317.60	20.0	20.0	20.0	20.6	J-41	20.6	J-41
J-41	500.00	1,273.52	503.86	1,277.38	20.0	20.0	20.0	21.0	J-40	21.0	J-40
J-42	500.00	980.64	503.86	984.50	20.0	20.0	20.0	27.6	J-40	27.6	J-40
J-43	500.00	1,070.66	503.86	1,074.52	20.0	20.0	20.0	28.5	J-39	28.5	J-39
J-44	500.00	3,000.00	503.86	3,003.86	20.0	22.0	20.0	22.5	J-39	22.5	J-39
J-45	500.00	3,000.00	503.86	3,003.86	20.0	33.9	20.0	31.5	J-68	31.5	J-68
J-47	500.00	3,000.00	503.86	3,003.86	20.0	32.3	20.0	30.7	J-68	30.7	J-68
J-48	500.00	990.68	503.86	994.54	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-49	500.00	652.74	503.86	656.60	20.0	20.0	20.0	20.0	J-50	20.0	J-50
J-50	500.00	645.18	503.86	649.04	20.0	20.0	20.0	20.4	J-49	20.4	J-49
J-51	500.00	617.33	503.86	621.19	20.0	20.0	20.0	21.7	J-53	21.7	J-53
J-53	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-54	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-55	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-56	500.00	3,000.00	503.86	3,003.86	20.0	33.2	20.0	30.4	J-68	30.4	J-68
J-57	500.00	3,000.00	503.86	3,003.86	20.0	39.6	20.0	31.4	J-68	31.4	J-68
J-58	500.00	3,000.00	503.86	3,003.86	20.0	50.7	20.0	31.4	J-68	31.4	J-68
J-59	500.00	3,000.00	503.86	3,003.86	20.0	61.0	20.0	31.4	J-68	31.4	J-68
J-60	500.00	2,684.60	503.86	2,688.46	20.0	20.0	20.0	31.8	J-68	31.8	J-68
J-61	500.00	1,483.42	503.86	1,487.28	20.0	20.0	20.0	27.8	J-153	27.8	J-153
J-62	500.00	3,000.00	503.86	3,003.86	20.0	33.8	20.0	31.4	J-68	31.4	J-68

High Pt.

High Pt

2nd line →

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-63	500.00	3,000.00	503.86	3,003.86	20.0	34.7	20.0	31.4	J-68	31.4	J-68
J-64	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-65	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-66	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-67	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-68	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-69	500.00	3,000.00	503.86	3,003.86	20.0	32.4	20.0	31.4	J-68	31.4	J-68
J-70	500.00	2,734.74	503.86	2,738.60	20.0	22.3	20.0	20.0	J-95	20.0	J-95
J-71	500.00	3,000.00	503.86	3,003.86	20.0	26.5	20.0	29.4	J-123	29.4	J-123
J-72	500.00	3,000.00	503.86	3,003.86	20.0	26.9	20.0	31.4	J-68	31.4	J-68
J-73	500.00	3,000.00	503.86	3,003.86	20.0	38.8	20.0	31.4	J-68	31.4	J-68
J-74	500.00	3,000.00	503.86	3,003.86	20.0	58.7	20.0	31.4	J-68	31.4	J-68
J-75	500.00	2,261.92	503.86	2,265.78	20.0	30.1	20.0	20.0	J-136	20.0	J-136
J-76	500.00	2,261.97	503.86	2,265.83	20.0	25.2	20.0	20.0	J-136	20.0	J-136
J-77	500.00	1,967.78	503.86	1,971.64	20.0	20.0	20.0	31.5	J-136	31.5	J-136
J-78	500.00	1,480.88	503.86	1,484.74	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-80	500.00	1,807.12	503.86	1,810.98	20.0	20.1	20.0	20.0	J-160	20.0	J-160
J-81	500.00	2,204.93	503.86	2,208.79	20.0	31.1	20.0	20.0	J-136	20.0	J-136
J-82	500.00	1,209.89	503.86	1,213.75	20.0	20.0	20.0	32.7	J-68	32.7	J-68
J-83	500.00	2,263.03	503.86	2,266.89	20.0	20.0	20.0	21.0	J-161	21.0	J-161
J-84	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-85	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-86	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-87	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-88	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-89	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-90	500.00	437.23	503.86	441.09	20.0	20.0	20.0	33.3	J-68	33.3	J-68
J-92	500.00	632.81	503.86	636.67	20.0	29.4	20.0	20.0	J-90	20.0	J-90

High Pt. ↓

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-93	500.00	692.71	503.86	696.57	20.0	29.9	20.0	20.0	J-90	20.0	J-90
J-94	500.00	3,000.00	503.86	3,003.86	20.0	48.7	20.0	31.4	J-68	31.4	J-68
J-95	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-96	500.00	2,376.42	503.86	2,380.28	20.0	27.6	20.0	20.0	J-123	20.0	J-123
J-97	500.00	2,049.60	503.86	2,053.46	20.0	33.4	20.0	20.0	J-123	20.0	J-123
J-98	500.00	1,318.27	503.86	1,322.13	20.0	24.4	20.0	20.0	J-100	20.0	J-100
J-99	500.00	1,153.09	503.86	1,156.95	20.0	22.0	20.0	20.0	J-100	20.0	J-100
J-100	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-101	500.00	999.95	503.86	1,003.81	20.0	20.0	20.0	21.8	J-178	21.8	J-178
J-102	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-103	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-104	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-105	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-106	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-107	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-108	500.00	1,969.08	503.86	1,972.94	20.0	41.9	20.0	20.0	J-113	20.0	J-113
J-109	500.00	1,995.10	503.86	1,998.96	20.0	21.4	20.0	20.0	J-110	20.0	J-110
J-110	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-111	500.00	2,035.14	503.86	2,039.00	20.0	30.7	20.0	20.0	J-110	20.0	J-110
J-112	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-113	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-114	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-115	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-116	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-117	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-119	500.00	2,037.05	503.86	2,040.91	20.0	31.3	20.0	20.0	J-110	20.0	J-110
J-120	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-121	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-122	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-123	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-124	500.00	1,879.24	503.86	1,883.10	20.0	26.4	20.0	20.0	J-136	20.0	J-136
J-126	500.00	1,499.26	503.86	1,503.12	20.0	28.7	20.0	20.0	J-132	20.0	J-132
J-194	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-127	500.00	1,499.26	503.86	1,503.12	20.0	25.7	20.0	20.0	J-132	20.0	J-132
J-128	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-129	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-130	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-131	500.00	1,428.65	503.86	1,432.51	20.0	20.2	20.0	20.0	J-132	20.0	J-132
J-132	500.00	1,331.16	503.86	1,335.02	20.0	20.0	20.0	28.9	J-131	28.9	J-131
J-133	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-134	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-135	500.00	1,143.41	503.86	1,147.27	20.0	20.1	20.0	32.7	J-68	32.7	J-68
J-136	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-137	500.00	1,680.51	503.86	1,684.37	20.0	26.4	20.0	20.0	J-136	20.0	J-136
J-138	500.00	1,419.21	503.86	1,423.07	20.0	20.0	20.0	32.6	J-68	32.6	J-68
J-139	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-140	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-141	500.00	1,153.10	503.86	1,156.96	20.0	21.1	20.0	20.0	J-100	20.0	J-100
J-142	500.00	1,153.10	503.86	1,156.96	20.0	21.2	20.0	20.0	J-100	20.0	J-100
J-143	500.00	1,153.09	503.86	1,156.95	20.0	22.5	20.0	20.0	J-100	20.0	J-100
J-144	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-145	500.00	1,116.10	503.86	1,119.97	20.0	31.2	20.0	20.0	J-150	20.0	J-150
J-146	500.00	1,108.50	503.86	1,112.36	20.0	31.1	20.0	20.0	J-150	20.0	J-150
J-147	500.00	992.69	503.86	996.55	20.0	37.4	20.0	20.0	J-150	20.0	J-150
J-148	500.00	469.37	503.86	473.23	20.0	20.0	20.0	33.3	J-68	33.3	J-68
J-149	500.00	946.14	503.86	950.00	20.0	22.1	20.0	20.0	J-150	20.0	J-150

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Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-150	500.00	934.10	503.86	937.96	20.0	20.0	20.0	23.2	J-149	23.2	J-149
J-151	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-152	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-153	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-154	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-155	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-156	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-157	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-158	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-159	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-160	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-161	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-163	500.00	666.40	503.86	670.26	20.0	24.8	20.0	20.0	J-120	20.0	J-120
J-164	500.00	1,573.85	503.86	1,577.71	20.0	20.0	20.0	28.5	J-33	28.5	J-33
J-165	500.00	1,603.86	503.86	1,607.72	20.0	20.0	20.0	25.8	J-164	25.8	J-164
J-166	500.00	1,410.53	503.86	1,414.39	20.0	20.0	20.0	24.0	J-153	24.0	J-153
J-167	500.00	1,511.30	503.86	1,515.16	20.0	20.4	20.0	20.0	J-153	20.0	J-153
J-168	500.00	3,000.00	503.86	3,003.86	20.0	51.4	20.0	31.4	J-68	31.4	J-68
J-169	500.00	3,000.00	503.86	3,003.86	20.0	50.7	20.0	31.4	J-68	31.4	J-68
J-170	500.00	3,000.00	503.86	3,003.86	20.0	53.3	20.0	31.4	J-68	31.4	J-68
J-171	500.00	3,000.00	503.86	3,003.86	20.0	58.0	20.0	31.4	J-68	31.4	J-68
J-172	500.00	3,000.00	503.86	3,003.86	20.0	60.2	20.0	31.4	J-68	31.4	J-68
J-173	500.00	3,000.00	503.86	3,003.86	20.0	60.6	20.0	31.4	J-68	31.4	J-68
J-174	500.00	2,178.81	503.86	2,182.67	20.0	20.0	20.0	25.4	J-153	25.4	J-153
J-175	500.00	1,499.68	503.86	1,503.54	20.0	23.3	20.0	20.0	J-132	20.0	J-132
J-176	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-177	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-178	500.00	799.26	503.86	803.12	20.0	20.0	20.0	33.0	J-68	33.0	J-68

Fire Flow Node FlexTable: Fire Flow Report (10111-Phase 3 Water Model for 2014 PER.wtg)

Current Time: 0.000 hours

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-182	500.00	1,763.67	503.86	1,767.53	20.0	24.3	20.0	20.0	J-33	20.0	J-33
J-183	500.00	3,000.00	503.86	3,003.86	20.0	38.8	20.0	31.3	J-68	31.3	J-68
J-184	500.00	3,000.00	503.86	3,003.86	20.0	41.6	20.0	31.4	J-68	31.4	J-68
J-188	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-189	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-190	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)
J-191	500.00	(N/A)	(N/A)	(N/A)	20.0	(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)

APPENDIX P

Three-Year Detailed Income and Expense Reports

Combined Funds

Account	Object	Description	Current Month	Current YTD	Budget	Variance	%
		Revenue					
	331010	Community Development Block Grant		441,000.00	450,000.00	-9,000.00	98
	331095	WRDA Grant		217,535.66	240,000.00	-22,464.34	91
	334120	Treasure State Endowment Program		712,930.34	750,000.00	-37,069.66	95
	334121	DNRC Grants		386,446.00	392,500.00	-6,054.00	98
	334123	State Revolving Fund/Loan 1		12,449.39		12,449.39	
	336020	On Behalf Payments	1,616.00	1,616.00		1,616.00	
	343022	Water Sales	27,611.05	297,478.83	301,000.00	-3,521.17	99
	343023	Bulk Water Sales		225.00	350.00	-125.00	64
	343024	Sale of Supplies	67.89	483.51		483.51	
	343026	Re-Hook-Up Fees	880.59	2,880.39	800.00	2,080.39	360
							97
		Total Revenue	30,175.53	2,073,045.12	2,134,650.00	-61,604.88	97
		Expenses					
430510		WATER/ADMINISTRATION					
	110	Salaries & Wages	21,906.54	120,719.07	99,300.00	-21,419.07	122
	210	Office Supplies	74.12	1,931.39	2,690.00	758.61	72
	350	Professional Services	690.27	4,232.24	4,275.00	42.76	99
	510	Insurance		837.29	1,911.00	1,073.71	44
		Total Account	22,670.93	127,719.99	108,176.00	-19,543.99	118
430530		WATER SOURCE OF SUPPLY AND PUMPING					
	210	Office Supplies	67.32	107.67		-107.67	
	230	Repair and Maintenance Supplies	7,283.15	47,268.14	45,000.00	-2,268.14	105
	238	Repair Parts for Water, Sewer, Meters Etc	240.00	558.47	7,500.00	6,941.53	7
	241	Minor Equipment/Consumable Tools		1,922.94		-1,922.94	
	330	Publicity, Subscriptions & Dues		1,610.00	1,600.00	-10.00	101
	340	Utilities	2,599.02	24,554.47	28,000.00	3,445.53	88
	360	Repair and Maintenance Services	446.06	5,750.55	8,500.00	2,749.45	68
	361	Testing	80.00	1,371.03	1,200.00	-171.03	114
	380	Training and Other Services		2,017.03	800.00	-1,217.03	252
	830	Depreciation-Closed to Retained Earnings	13,627.00	13,627.00		-13,627.00	
	940	Capital Outlay/Equipment			20,975.00	20,975.00	
		Total Account	24,342.55	98,787.30	113,575.00	14,787.70	87
430593		Water Utilities-Other Activities-Phased Water Projects					
	620	Interest		538.42		-538.42	
	931	Capital Outlay/Engineering	-3,518.09		265,532.00	265,532.00	
	933	Capital Outlay/Profesional Services (Salaries)	-375.50		47,540.00	47,540.00	
	934	Capital Outlay/Legal Services	-10,000.00		352.00	352.00	
	935	Capital Outlay/Audit			8,000.00	8,000.00	
	936	Capital Outlay/Training & Travel			460.00	460.00	
	937	Capital Outlay/Office Supplies	-2,168.15		690.00	690.00	
	950	Construction	-1,531,761.21		1,362,852.70	1,362,852.70	

Combined Funds

Account	Object	Description	Current Month	Current YTD	Budget	Variance	%
			---------- Current Year ----------				
		Total Account	-1,547,822.95	538.42	1,685,426.70	1,684,888.28	
430690		Other Sewer Activities: Notes, Loans, Contracts etc.					
	610	Principal	-5,172.94		5,170.00	5,170.00	
	620	Interest	496.32	552.28	155.00	-397.28	356
		Total Account	-4,676.62	552.28	5,325.00	4,772.72	10
430692		Water Upgrade Loan					
	610	Principal	-23,000.00		45,000.00	45,000.00	
	620	Interest	10,113.35	19,333.16	21,880.00	2,546.84	88
	630	Paying Agent Fees	3,076.67	6,079.14	6,394.00	314.86	95
	640	Loan Loss Reserve	1,264.16	2,416.63	2,732.00	315.37	88
		Total Account	-8,545.82	27,828.93	76,006.00	48,177.07	37
		Total Expenses	-1,514,031.91	255,426.92	1,988,508.70	1,733,081.78	13
		Net Income from Operations	1,544,207.44	1,817,618.20			
Other Revenue							
	381010	SRF [redacted] - Phase III Water	-167,920.00	0.21	259,574.00	-259,573.79	
		Total Other Revenue	-167,920.00	0.21	259,574.00	-259,573.79	
		Net Income	1,376,287.44	1,817,618.41			

Combined Funds

Account	Object	Description	Current Month	Current YTD	Budget	Variance	%
			---------- Current Year ----------				
Revenue							
	331010	Community Development Block Grant		9,000.00		9,000.00	
	331095	WRDA Grant		22,464.34		22,464.34	
	334120	Treasure State Endowment Program		37,069.66		37,069.66	
	334121	DNRC Grants		6,054.00		6,054.00	
	334136	SRF BAN	-95,561.00				
	336020	On Behalf Payments	1,271.00	1,271.00		1,271.00	
	343022	Water Sales	25,071.72	309,466.83	302,700.00	6,766.83	102
	343023	Bulk Water Sales	826.00	886.00	250.00	636.00	354
	343024	Sale of Supplies		365.36		365.36	
	343026	Re-Hook-Up Fees	850.00	1,768.64	1,000.00	768.64	177
							128
		Total Revenue	-67,542.28	388,345.83	303,950.00	84,395.83	128
Expenses							
430510		WATER/ADMINISTRATION					
	110	Salaries & Wages	-7,909.07	63,449.33	111,500.00	48,050.67	57
	210	Office Supplies	132.46	1,635.46	2,000.00	364.54	82
	330	Publicity, Subscriptions & Dues		1,483.53	1,600.00	116.47	93
	350	Professional Services	4,105.29	4,798.99	4,250.00	-548.99	113
	380	Training and Other Services		544.56	800.00	255.44	68
	510	Insurance		2,490.08	2,490.00	-0.08	100
		Total Account	-3,671.32	74,401.95	122,640.00	48,238.05	61
430530		WATER SOURCE OF SUPPLY AND PUMPING					
	210	Office Supplies		70.28		-70.28	
	230	Repair and Maintenance Supplies	6,005.60	63,733.19	45,000.00	-18,733.19	142
	241	Minor Equipment/Consumable Tools	139.99	139.99	2,000.00	1,860.01	7
	340	Utilities	1,855.43	25,217.76	26,000.00	782.24	97
	360	Repair and Maintenance Services	29.04	5,698.10	6,000.00	301.90	95
	361	Testing	52.05	3,656.11	1,350.00	-2,306.11	271
	830	Depreciation-Closed to Retained Earnings	61,413.00	61,413.00	61,413.00		100
		Total Account	69,495.11	159,928.43	141,763.00	-18,165.43	113
430593		Water Utilities-Other Activities-Phased Water Projects					
	931	Capital Outlay/Engineering	-47,678.12				
	933	Capital Outlay/Profesional Services (Salaries)	-9,097.84				
	934	Capital Outlay/Legal Services	-5,000.00				
	937	Capital Outlay/Office Supplies	-71.17				
		Total Account	-61,847.13				
430692		Water Upgrade Loan					
	610	Principal	-23,000.00		54,000.00	54,000.00	
	620	Interest	10,369.50	20,858.60	23,000.00	2,141.40	91
	630	Paying Agent Fees	3,036.19	6,124.83	6,500.00	375.17	94

Combined Funds

Account Object	Description	Current Year Current Month	Current YTD	Budget	Variance	%
640	Loan Loss Reserve	1,296.19	2,607.32	3,000.00	392.68	87
	Total Account	-8,298.12	29,590.75	86,500.00	56,909.25	34
	Total Expenses	-4,321.46	263,921.13	350,903.00	86,981.87	75
	Net Income from Operations	-63,220.82	124,424.70			
Other Revenue						
381010	SRF B - Phase III Water	-64,104.00				
	Total Other Revenue	-64,104.00	0.00	0.00	0.00	
	Net Income	-127,324.82	124,424.70			

Combined Funds

Account	Object	Description	Current Month	Current YTD	Budget	Variance	%
			---------- Current Year ----------				
Revenue							
	331095	WRDA Grant	17,502.25	19,352.65		19,352.65	
	334136	SRF BAN	-2,964.00				
	336020	On Behalf Payments	1,428.01	1,428.01		1,428.01	
	343022	Water Sales	26,464.04	316,952.21	318,000.00	-1,047.79	100
	343023	Bulk Water Sales		3,514.00	1,600.00	1,914.00	220
	343024	Sale of Supplies	1,208.55	2,481.50		2,481.50	
	343026	Re-Hook-Up Fees		3,170.04	1,600.00	1,570.04	198
							108
		Total Revenue	43,638.85	346,898.41	321,200.00	25,698.41	108
Expenses							
430510		WATER/ADMINISTRATION					
	110	Salaries & Wages	6,610.52	89,482.56	83,675.00	-5,807.56	107
	195	Other Non-Cash Personnel - Pension/OPEB	-2,025.24	-2,025.24		2,025.24	
	210	Office Supplies	69.47	2,091.48	1,800.00	-291.48	116
	330	Publicity, Subscriptions & Dues		1,509.20	1,600.00	90.80	94
	350	Professional Services	850.12	4,846.22	5,000.00	153.78	97
	380	Training and Other Services	27.11	743.18	800.00	56.82	93
	510	Insurance		2,665.94	2,670.00	4.06	100
		Total Account	5,531.98	99,313.34	95,545.00	-3,768.34	104
430530		WATER SOURCE OF SUPPLY AND PUMPING					
	230	Repair and Maintenance Supplies	8,063.34	72,262.96	38,000.00	-34,262.96	190
	241	Minor Equipment/Consumable Tools		302.24		-302.24	
	340	Utilities	2,127.43	25,093.29	26,000.00	906.71	97
	360	Repair and Maintenance Services	4.71	11,704.52	6,000.00	-5,704.52	195
	361	Testing	49.84	2,090.12	1,500.00	-590.12	139
	610	Principal	-192.85				
	620	Interest	20.78	27.93		-27.93	
	830	Depreciation-Closed to Retained Earnings	63,481.00	63,481.00	63,481.00		100
	940	Capital Outlay/Equipment	-6,080.00		12,000.00	12,000.00	
		Total Account	67,474.25	174,962.06	146,981.00	-27,981.06	119
430593		Water Utilities-Other Activities-Phased Water Projects					
	931	Capital Outlay/Engineering	-6,232.75				
	933	Capital Outlay/Profesional Services (Salaries)	-7,298.50				
	937	Capital Outlay/Office Supplies	-27.11				
	950	Construction	-28,732.50				
		Total Account	-42,290.86				
430692		Water Upgrade Loan					
	610	Principal	-23,000.00		46,000.00	46,000.00	
	620	Interest	10,185.00	20,365.83	17,455.00	-2,910.83	117
	630	Paying Agent Fees	2,938.13	5,913.23	5,550.00	-363.23	107

Combined Funds

Account Object	Description	Current Month	Current YTD	Budget	Variance	%
		---------- Current Year ----------				
640	Loan Loss Reserve	1,273.12	2,545.72	2,200.00	-345.72	116
	Total Account	-8,603.75	28,824.78	71,205.00	42,380.22	40
	Total Expenses	22,111.62	303,100.18	313,731.00	10,630.82	97
	Net Income from Operations	21,527.23	43,798.23			
Other Revenue						
381010	SRF B - Phase III Water	-27,550.00				
	Total Other Revenue	-27,550.00	0.00	0.00	0.00	
	Net Income	-6,022.77	43,798.23			

Combined Funds

Account	Object	Description	Current Year Current Month	Current Year Current YTD	Current Year Budget	Current Year Variance	%
Revenue							
	331095	WRDA Grant	11,063.17	52,904.34		52,904.34	
	334120	Treasure State Endowment Program		231,779.05		231,779.05	
	343022	Water Sales	25,594.63	237,617.74	322,000.00	-84,382.26	74
	343023	Bulk Water Sales	1.70	196.70	800.00	-603.30	25
	343024	Sale of Supplies		341.38		341.38	
	343026	Re-Hook-Up Fees		800.00	800.00		100
							162
		Total Revenue	36,659.50	523,639.21	323,600.00	200,039.21	162
Expenses							
430510		WATER/ADMINISTRATION					
	110	Salaries & Wages	8,000.82	64,339.89	95,000.00	30,660.11	68
	210	Office Supplies	105.80	1,847.12	2,100.00	252.88	88
	330	Publicity, Subscriptions & Dues	39.96	2,151.74	1,510.00	-641.74	142
	350	Professional Services	199.62	3,795.46	4,850.00	1,054.54	78
	380	Training and Other Services		100.44	800.00	699.56	13
	510	Insurance		3,760.93	3,760.00	-0.93	100
		Total Account	8,346.20	75,995.58	108,020.00	32,024.42	70
430530		WATER SOURCE OF SUPPLY AND PUMPING					
	230	Repair and Maintenance Supplies	6,313.74	32,701.44	65,410.00	32,708.56	50
	241	Minor Equipment/Consumable Tools			3,000.00	3,000.00	
	340	Utilities	2,103.83	18,908.26	25,845.00	6,936.74	73
	360	Repair and Maintenance Services	19.42	12,820.76	11,700.00	-1,120.76	110
	361	Testing	40.00	2,654.19	6,000.00	3,345.81	44
	610	Principal	187.29	1,654.55	2,215.00	560.45	75
	620	Interest	12.71	145.45	190.00	44.55	77
	940	Capital Outlay/Equipment	100.00	5,300.00	6,080.00	780.00	87
		Total Account	8,776.99	74,184.65	120,440.00	46,255.35	62
430593		Water Utilities-Other Activities-Phased Water Projects					
	931	Capital Outlay/Engineering		41,940.64		-41,940.64	
	933	Capital Outlay/Profesional Services (Salaries)		10,581.70		-10,581.70	
	937	Capital Outlay/Office Supplies	102.00	556.00		-556.00	
	950	Construction		231,779.05		-231,779.05	
		Total Account	102.00	284,857.39		-284,857.39	
430692		Water Upgrade Loan					
	610	Principal		23,000.00	46,000.00	23,000.00	50
	620	Interest		9,955.00	19,680.00	9,725.00	51
	630	Paying Agent Fees		2,871.87	5,680.00	2,808.13	51
	640	Loan Loss Reserve		1,244.38	2,460.00	1,215.62	51
		Total Account		37,071.25	73,820.00	36,748.75	50

Combined Funds

Account Object	Description	Current Year Current Month	Current Year Current YTD	Current Year Budget	Current Year Variance	Current Year %
	Total Expenses	17,225.19	472,108.87	302,280.00	-169,828.87	156
	Net Income from Operations	19,434.31	51,530.34			
	Net Income	19,434.31	51,530.34			

APPENDIX Q

EPA Chapter 2 Cross-Connection Control Manual

Public Health Significance of Cross-Connections

Public health officials have long been aware of the impact that cross-connections play as a threat to the public health. Because plumbing defects are so frequent and the opportunity for contaminants to invade the public drinking water through cross-connections are so general, enteric illnesses caused by drinking water may occur at most any location and at any time.

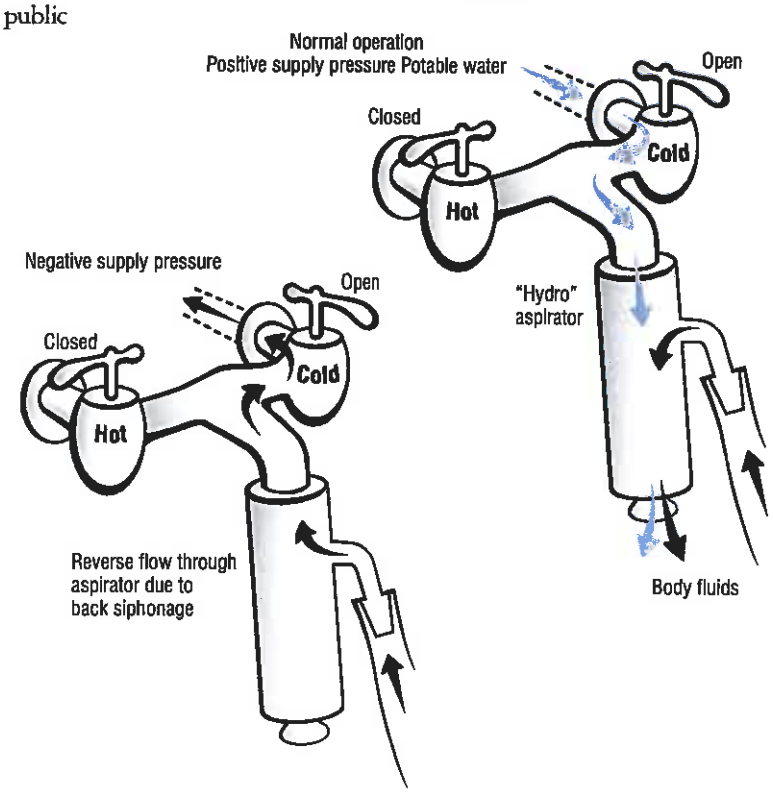
The following documented cases of cross-connection problems illustrate and emphasize how actual cross-connections have compromised the water quality and the public health.

Human Blood in the Water System

Health Department officials cut off the water supply to a funeral home located in a large southern city, after it was determined that human blood had contaminated the fresh water supply. City water and plumbing officials said that they did not think that the blood contamination had spread beyond the building, however, inspectors were sent into the neighborhood to check for possible contamination. The chief plumbing inspector had received a telephone call advising that blood was coming from drinking fountains within the building. Plumbing and county health department inspectors went to the scene and found evidence that the blood had been circulating in the water system within the building. They immediately ordered the building cut off from the water system at the meter.

Investigation revealed that the funeral home had been using a hydraulic aspirator to drain fluids from the bodies of human "remains" as part of the embalming process. The aspirator directly connected to the water supply system at a faucet outlet located on a sink in the "preparation" (embalming) room. Water flow through the aspirator created suction that was utilized to draw body fluids through a hose and needle attached to the suction side of the aspirator.

The contamination of the funeral home potable water supply was caused by a combination of low water pressure in conjunction with the simultaneous use of the aspirator. Instead of the body fluids flowing into the sanitary drain, they were drawn in the opposite direction—into the potable water supply of the funeral home!



Burned in the Shower

A resident of a small town in Alabama, jumped in the shower at 5 a.m. one morning in October, 1986, and when he got out his body was covered with tiny blisters. "The more I rubbed it, the worse it got," the 60 year old resident said. "It looked like someone took a blow torch and singed me."

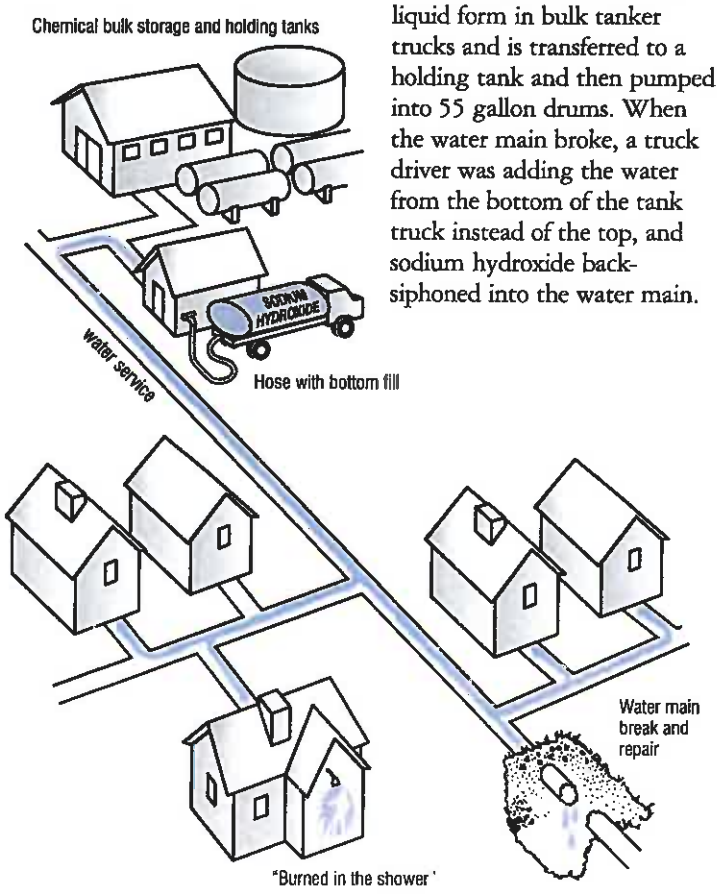
He and several other residents received medical treatment at the emergency room of the local hospital after the water system was contaminated with sodium hydroxide, a strong caustic solution.

Other residents claimed that, "It (the water) bubbled up and looked like Alka Seltzer. I stuck my hand under the faucet and some blisters came up."

One neighbor's head was covered with blisters after she washed her hair and others complained of burned throats or mouths after drinking the water.

The incident began after an 8-inch water main, that fed the town, broke and was repaired. While repairing the water main, one workman suffered leg burns from a chemical in the water and required medical treatment. Measurements of the ph of the water were as high as 13 in some sections of the pipe.

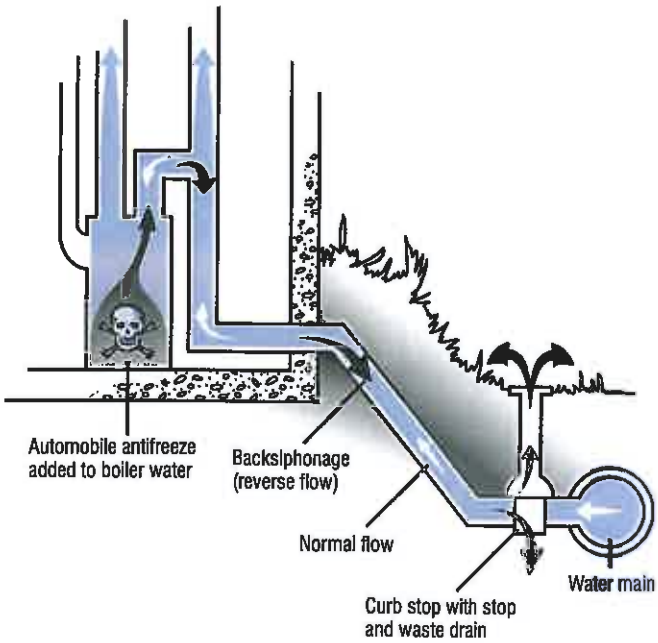
Investigation into the cause of the problem led to a possible source of the contamination from a nearby chemical company that distributes chemicals such as sodium hydroxide. The sodium hydroxide is brought to the plant in liquid form in bulk tanker trucks and is transferred to a holding tank and then pumped into 55 gallon drums. When the water main broke, a truck driver was adding the water from the bottom of the tank truck instead of the top, and sodium hydroxide back-siphoned into the water main.



"Burned in the shower"

Heating System Anti-Freeze into Potable Water

Bangor Maine Water Department employees discovered poisonous antifreeze in a homeowner's heating system and water supply in November, 1981. The incident occurred when they shut off the service line to the home to make repairs. With the flow of water to the house cut off, pressure in the lines in the house dropped and the anti-freeze, placed in the heating system to prevent freeze-up of an unused hot water heating system, drained out of the heating system into house water lines, and flowed out to the street. If it had not been noticed, it would have entered the homeowner's drinking water when the water pressure was restored.

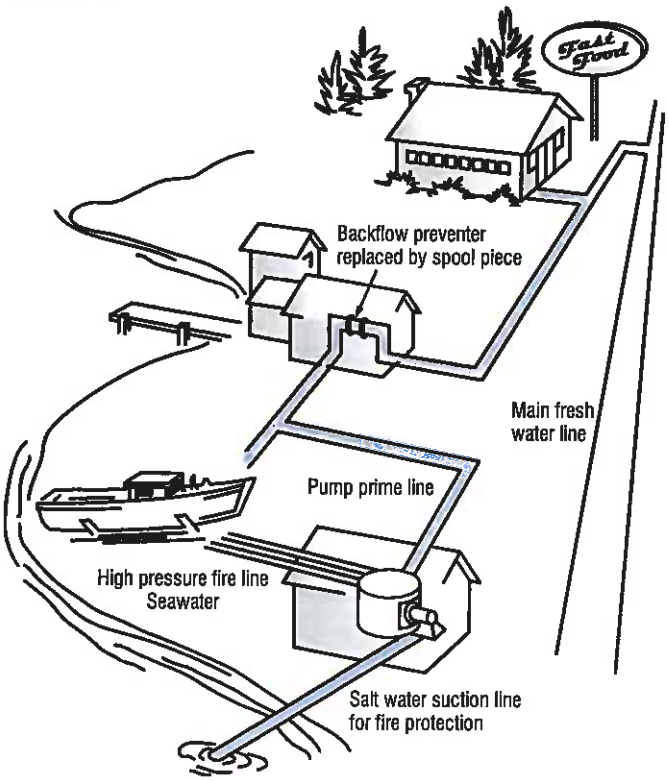


Salty Drinks

In January, 1981, a nationally known fast food restaurant located in southeastern United States, complained to the water department that all their soft drinks were being rejected by their customers as tasting "salty." This included soda fountain beverages, coffee, orange juice, etc. An investigation revealed that an adjacent water customer complained of salty water occurring simultaneously with the restaurant incident. This second complaint came from a water front ship repair facility that was also being served by the same water main lateral. The (investigation centered on the ship repair facility and revealed the following:

- A backflow preventer that had been installed on the service line to the shipyard had frozen and had been replaced with a spool piece sleeve.
- The shipyard fire protection system utilized sea water that was pumped by both electric and diesel driven pumps.
- The pumps were primed by potable city water.

With the potable priming line left open and the pumps maintaining pressure in the fire lines, raw salt water was pumped through the priming lines, through the spool sleeve piece, to the ship repair facility and the restaurant.



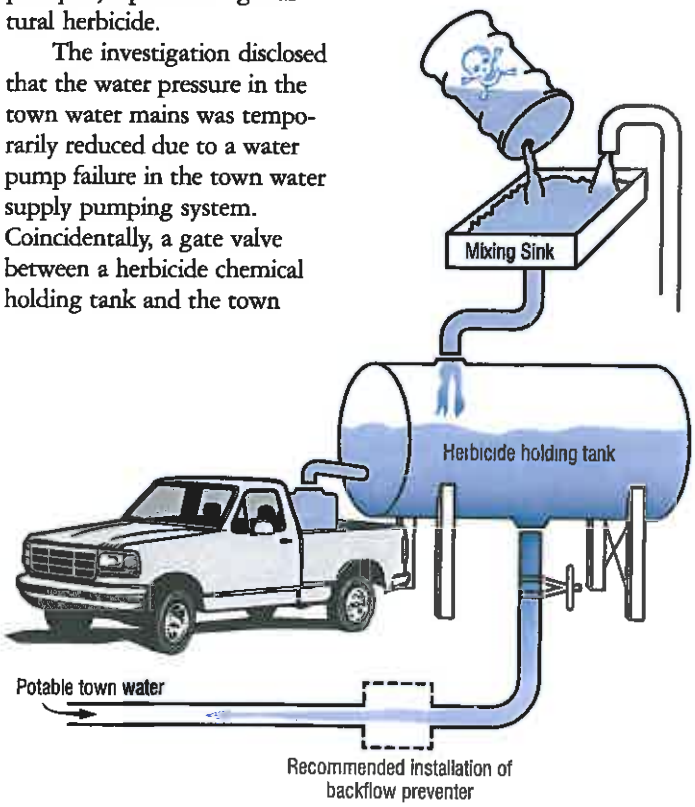
Paraquat in the Water System

"Yellow gushy stuff" poured from some of the faucets in a small town in Maryland, and the State of Maryland placed a ban on drinking the water supply. Residents were warned not to use the water for cooking, bathing, drinking or any other purpose except for flushing toilets.

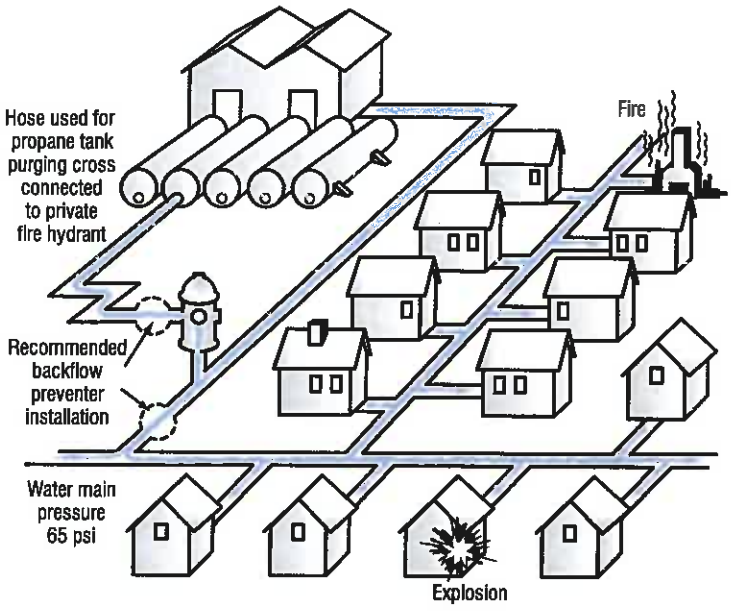
The incident drew widespread attention and made the local newspapers. In addition to being the lead story on the ABC news affiliate in Washington, D.C. and virtually all the Washington/Baltimore newspapers that evening. The news media contended that lethal pesticides may have contaminated the water supply and among the contaminants was paraquat, a powerful agricultural herbicide.

The investigation disclosed that the water pressure in the town water mains was temporarily reduced due to a water pump failure in the town water supply pumping system. Coincidentally, a gate valve between a herbicide chemical holding tank and the town water supply piping had been left open. A lethal cross-connection had been created that permitted the herbicide to flow into the potable water supply system. Upon restoration of water pressure, the herbicides flowed into the many faucets and outlets on the town water distribution system.

This cross-connection created a needless and costly event that fortunately did not result in serious illness or loss of life. Door-to-door public notification, extensive flushing, water sample analysis, emergency arrangements to provide temporary potable water from tanker trucks, all contributed to an expensive and unnecessary town burden.



Propane Gas in the Water Mains



Hundreds of people were evacuated from their homes and businesses on an August afternoon in a town in Connecticut in 1982 as a result of propane entering the city water supply system. Fires were reported in two homes and the town water supply was contaminated. One five-room residence was gutted by a blaze resulting from propane gas "bubbling and hissing" from a bathroom toilet and in another home a washing machine explosion blew a woman against a wall. Residents throughout the area reported hissing, bubbling noises, coming from washing machines, sinks and toilets. Faucets sputtered out small streams of water mixed with gas and residents in the area were asked to evacuate their homes.

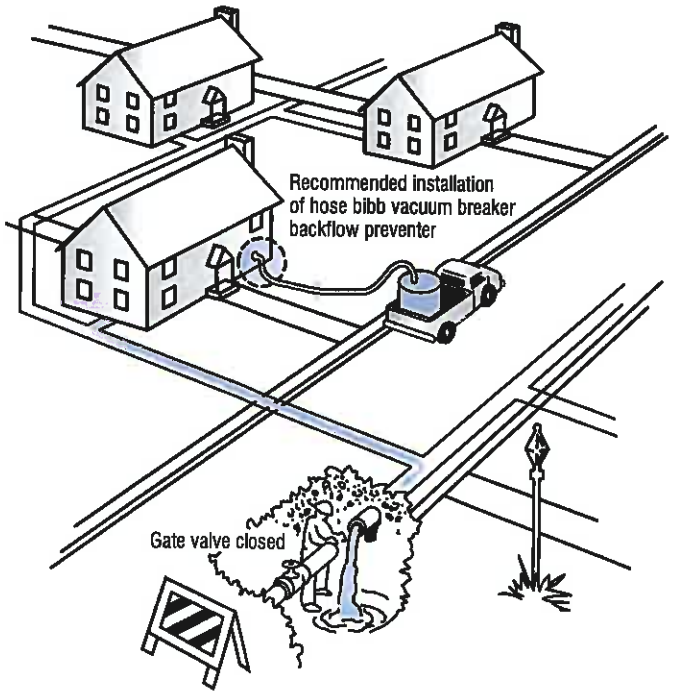
This near-disaster occurred in one, 30,000 gallon capacity liquid propane tank when the gas company initiated immediate repair procedures. To start the repair, the tank was "purged" of residual propane by using water from one of two private fire hydrants located on the property. Water purging is the preferred method of purging over the use of carbon dioxide since it is more positive and will float out any sludge as well as any gas vapors. The "purging" consisted of hooking up a hose to one of the private fire hydrants located on the property and initiating flushing procedures.

Since the vapor pressure of the propane residual in the tank was 85 to 90 psi., and the water pressure was only 65 to 70 psi., propane gas backpressure backflowed into the water main. It was estimated that the gas flowed into the water mains for about 20 minutes and that about 2,000 cubic feet of gas was involved. This was approximately enough gas to fill one mile of an 8-inch water main.

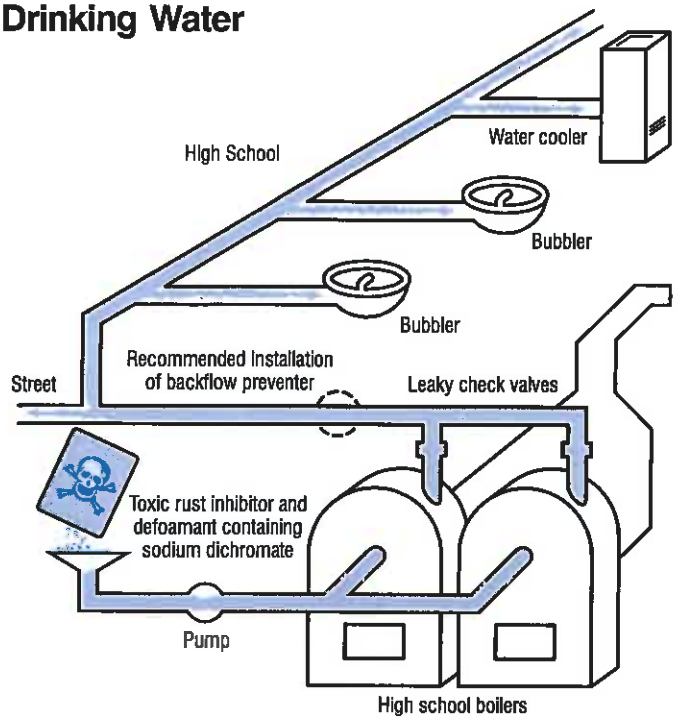
Chlordane and Heptachlor at the Housing Authority

The services to seventy five apartments housing approximately three hundred people were contaminated with chlordane and heptachlor in a city in Pennsylvania, in December, 1980. The insecticides entered the water supply system while an exterminating company was applying them as a preventative measure against termites. While the pesticide contractor was mixing the chemicals in a tank truck with water from a garden hose coming from one of the apartments, a workman was cutting into a 6-inch main line to install a gate valve. The end of the garden hose was submerged in the tank containing the pesticides, and at the same time, the water to the area was shut off and the lines being drained prior to the installation of the gate valve. When the workman cut the 6-inch line, water started to drain out of the cut, thereby setting up a backsiphonage condition. As a result, the chemicals were siphoned out of the truck, through the garden hose, and into the system, contaminating the seventy five apartments.

Repeated efforts to clean and flush the lines were not satisfactory and it was finally decided to replace the water line and all the plumbing that was affected. There were no reports of illness, but residents of the housing authority were told not to use any tap water for any purpose and they were given water that was trucked into the area by volunteer fire department personnel. They were without their normal water supply for 27 days.



Boiler Water Enters High School Drinking Water



A high school in New Mexico, was closed for several days in June 1984 when a home economics teacher noticed the water in the potable system was yellow. City chemists determined that samples taken contained levels of chromium as high as 700 parts per million, "astronomically higher than the accepted levels of .05 parts per million." The head chemist said that it was miraculous that no one was seriously injured or killed by the high levels of chromium. The chemical was identified as sodium dichromate, a toxic form of chromium used in heating system boilers to inhibit corrosion of the metal parts.

No students or faculty were known to have consumed any of the water; however, area physicians and hospitals advised that if anyone had consumed those high levels of chromium, the symptoms would be nausea, diarrhea, and burning of the mouth and throat. Fortunately, the home economics teacher, who first saw the discolored water before school started, immediately covered all water fountains with towels so that no one would drink the water.

Investigation disclosed that chromium used in the heating system boilers to inhibit corrosion of metal parts entered the potable water supply system as a result of backflow through leaking check valves on the boiler feed lines.

Pesticide in Drinking Water

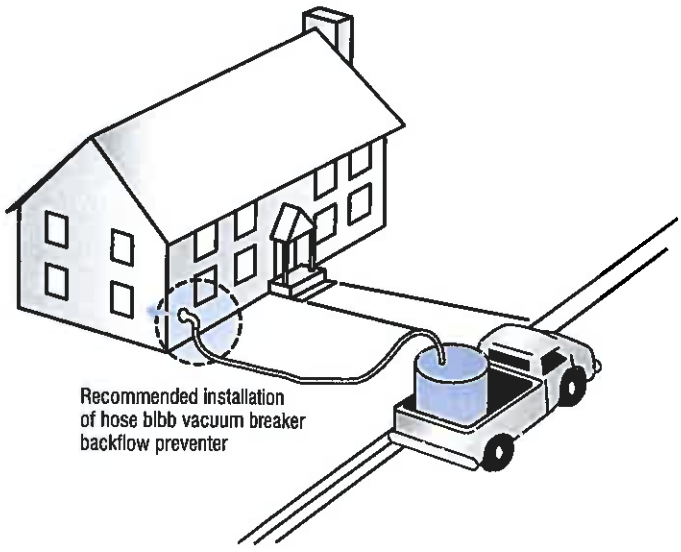
A pesticide contaminated a North Carolina water system in April, 1986, prompting the town to warn residents of 23 households not to drink the water. The residents in the affected area were supplied drinking water from a tank truck parked in the parking lot of a downtown office building until the condition could be cleared up. Residents complained of foul smelling water but there were no reports of illness from ingesting the water that had been contaminated with a pesticide containing chlordane and heptachlor.

Authorities stated that the problem occurred when a water main broke at the same time that a pest control service was filling a pesticide truck with water. The reduction in pressure caused the pesticide from inside the tank to be sucked into the building's water main. The pesticide contaminated the potable water supply of the office building and neighborhood area.

Car Wash Water in the Water Main Street

This car wash cross-connection and back-pressure incident, which occurred in February, 1979, in the state of Washington, resulted in backflow chemical contamination of approximately 100 square blocks of water mains. Prompt response by the water department prevented a potentially hazardous water quality degradation problem without a recorded case of illness.

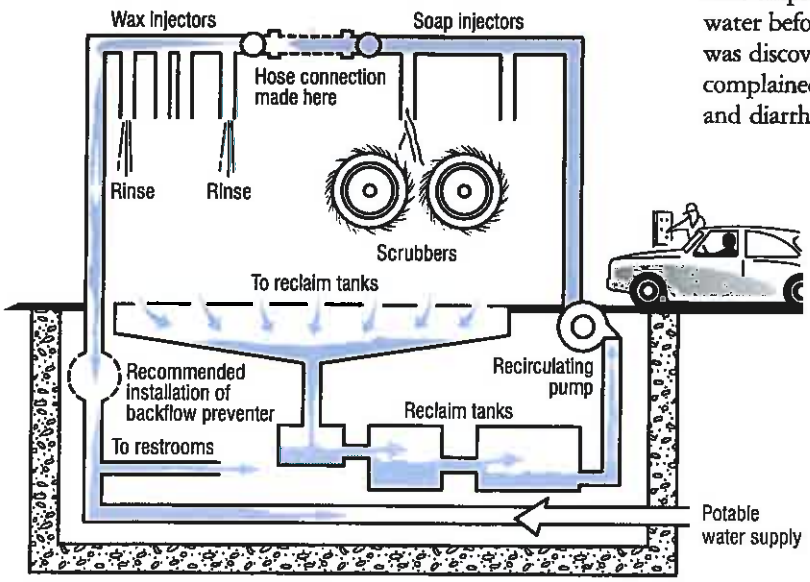
Numerous complaints of grey-green and "slippery" water were received by the water department coming from the same general area of town. A sample brought to the water department by a customer confirmed the reported problem and preliminary analysis indicated contamination with what appeared to be a detergent solution. While emergency crews initiated flushing operations, further investigation within the contaminated area signaled the problem was probably caused by a car wash,



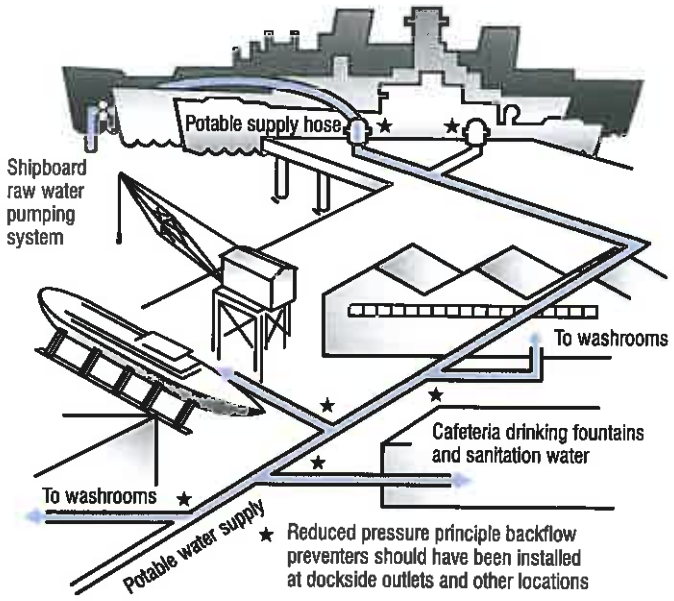
or laundry, based upon the soapy nature of the contaminant. The source was quickly narrowed down to a car wash and the proprietor was extremely cooperative in admitting to the problem and explaining how it had occurred. The circumstances leading up to the incident were as follows:

- On Saturday, February 10, 1979, a high pressure pump broke down at the car wash. This pump recycled reclaimed wash and rinse water and pumped it to the initial scrubbers of the car wash. No potable plumbing connection is normally made to the car wash's scrubber system.
- After the pump broke down, the car wash owner was able to continue operation by connecting a 2-inch hose section temporarily between the potable supply within the car wash, and the scrubber cycle piping.
- On Monday, February 12, 1979, the owner repaired the high pressure pump and resumed normal car wash operations. The 2-inch hose connection (cross-connection) was not removed!
- Because of the cross-connection, the newly repaired high pressure pump promptly pumped a large quantity of the reclaimed wash/rinse water out of the car wash and into a 12-inch water main in the street. This in turn was delivered to the many residences and commercial establishments connected to the water main.

Within 24 hours of the incident, the owner of the car wash had installed a 2-inch reduced pressure principle backflow preventer on his water service and all car wash establishments in Seattle that used a wash water reclaim system were notified of the state requirement for backflow prevention.



Shipyard Backflow Contamination



Water fountains at an East Coast Shipyard were posted "No Drinking" as workers flushed the water lines to eliminate raw river water that had entered the shipyard following contamination from incorrectly connected water lines between ships at the pier and the shipyard. Some third shift employees drank the water before the pollution was discovered and later complained of stomach cramps and diarrhea.

The cause of the problem was a direct cross-connection between the on-board salt water fire protection water system and the fresh water connected to one of the ships at the dock. While the shipyard had been aware of the need for backflow protection at the dockside tie up area, the device had not been delivered and installed prior to the time of the incident. As a result, the salt water on-board fire protection system, being at a greater pressure than the potable supply, forced the salt water, through backpressure, into the shipyard potable supply.

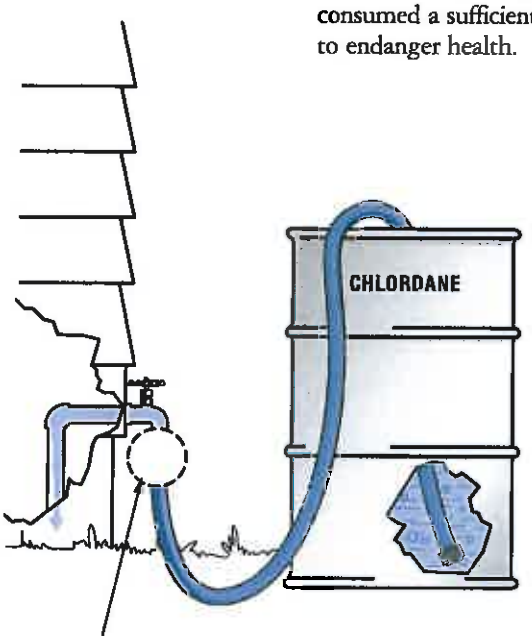
Fortunately, a small demand for potable water at the time of the incident prevented widespread pollution in the shipyard and the surrounding areas.

Chlordane in the Water Main

In October, 1979, approximately three gallons of chlordane, a highly toxic insecticide, was sucked back (back-siphoned) into the water system of a residential area of a good sized eastern city. Residents complained that the water "looked milky, felt greasy, foamed and smelled," and as one woman put it, "It was similar to a combination of kerosene and Black Flag pesticide."

The problem developed while water department personnel were repairing a water main. A professional exterminator, meanwhile, was treating a nearby home with chlordane for termite elimination. The workman for the exterminator company left one end of a garden hose that was connected to an outside hose bibb tap in a barrel of diluted pesticide. During the water service interruption, the chlordane solution was back-siphoned from the barrel through the house and into the water mains.

Following numerous complaints, the water department undertook an extensive program of flushing of the water mains and hand delivered letters telling residents to flush their lines for four hours before using the water. Until the water lines were clear of the contaminant, water was hand-hauled into homes, and people went out of their homes for showers, meals and every other activity involving potable water. Fortunately, due to the obvious bad taste, odor and color of the contaminated water, no one consumed a sufficient quantity to endanger health.



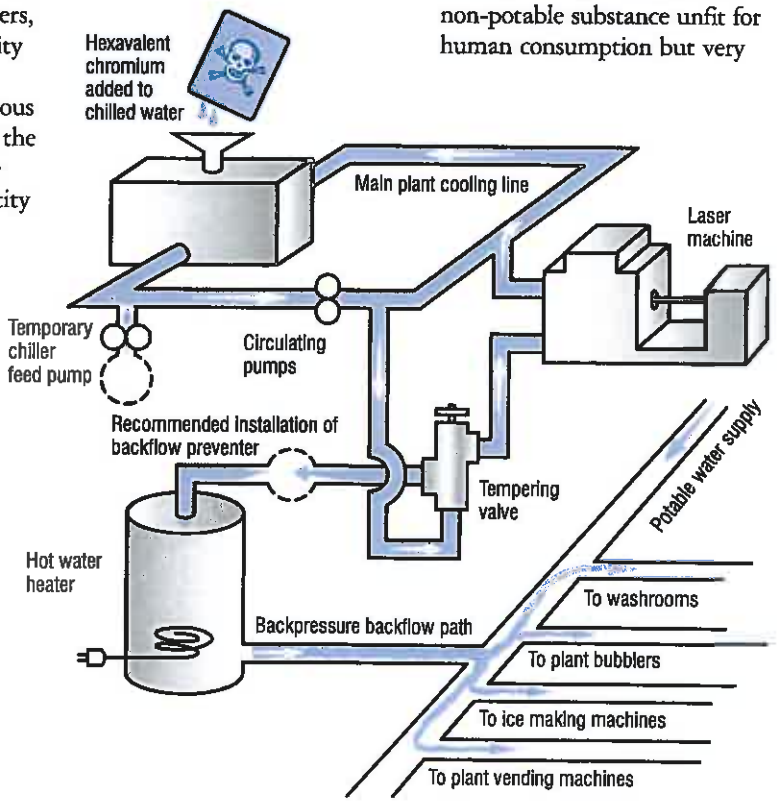
Recommended installation of hose bibb vacuum breaker backflow preventer

Hexavalent Chromium in Drinking Water

In July, 1982, a well meaning maintenance mechanic, in attempting to correct a fogging lens in an overcooled laser machine, installed a tempering valve in the laser cooling line, and inadvertently set the stage for a backpressure backflow incident that resulted in hexavalent chromium contaminating the potable water of a large electronic manufacturing company in Massachusetts employing 9,000 people. Quantities of 50 parts per million hexavalent chromium were found in the drinking water which is sufficient to cause severe vomiting, diarrhea, and intestinal sickness. Maintenance crews working during the plant shutdown were able to eliminate the cross-connection and thoroughly flush the potable water system, thereby preventing a serious health hazard from occurring.

The incident occurred as follows:

- Laser machine lenses were kept cool by circulating chilled water that came from a large refrigeration chiller. The water used in the chiller was treated with hexavalent chromium, a chemical additive used as an anticorrosive agent and an algicide. As a result, the chilled water presented a toxic, non-potable substance unfit for human consumption but very



acceptable for industrial process water. No health hazard was present as long as the piping was identified, kept separate from potable drinking water lines, and not cross-connected to the potable water supply.

• A maintenance mechanic correctly reasoned that by adding a tempering valve to the chilled water line, he could heat up the water a bit and eliminate fogging of the laser lenses resulting from the chilled water being too cold. The problem with the installation of the tempering valve was that a direct cross-connection had been inadvertently made between the toxic chilled water and the potable drinking water line!

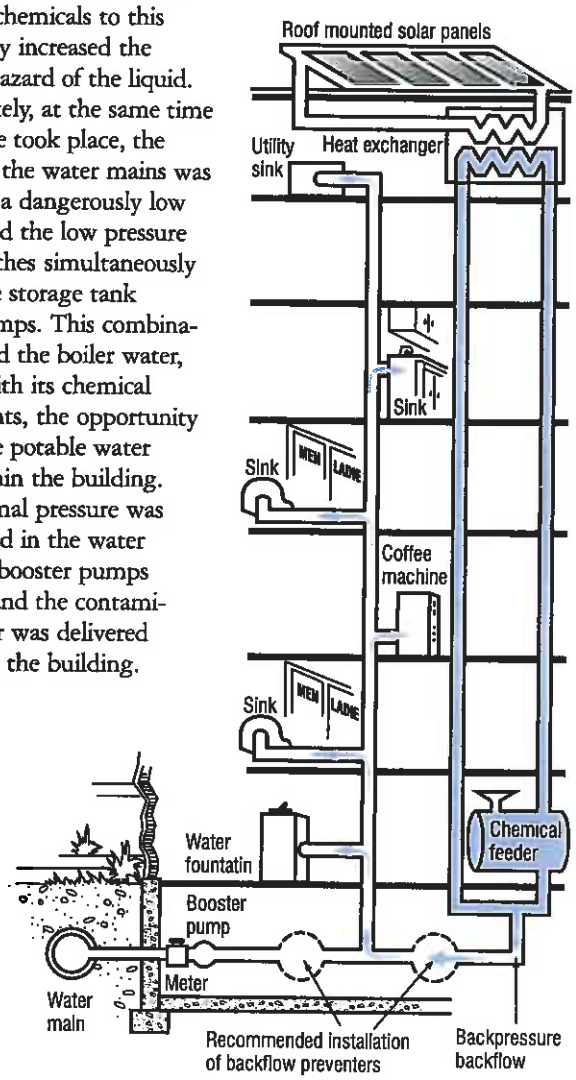
• Periodic maintenance to the chiller system was performed in the summer, requiring that an alternate chiller feed pump be temporarily installed. This replacement pump had an outlet pressure of 150 psi, and promptly established an imbalance of pressure at the tempering valve, thereby overpressurizing the 60 psi, potable supply. Backpressure backflow resulted and pushed the toxic chilled water from the water heater and then into the plant's potable drinking water supply. Yellowish green water started pouring out of the drinking fountains, the washroom, and all potable outlets.

Employee Health Problems due to Cross-Connection

A cross-connection incident occurring in a modern seven-story office building located in a large city in New Hampshire, in March, 1980, resulted in numerous cases of nausea, diarrhea, loss of time and employee complaints as to the poor quality of the water.

On Saturday, March 1, 1980, a large fire occurred two blocks away from a seven-story office building in this large New Hampshire city. On Sunday, March 2, 1980, the maintenance crew of the office building arrived to perform the weekly cleaning, and after drinking the water from the drinking fountains, and sampling the coffee from the coffee machines, noticed that the water smelled rubbery and had a strong bitter taste. Upon notifying the Manchester Water Company, water samples were taken and preliminary analysis disclosed that the contaminants found were not the typical contaminants associated with fire line disturbances. Investigating teams suspected that either the nearby fire could have siphoned contaminants from adjacent buildings into the water mains, or the contamination could have been caused by a plumbing deficiency occurring within the seven story building itself.

Water ph levels of the building water indicated that an injection of chemicals had probably taken place within the seven-story building. Tracing of the water lines within the building pinpointed a 10,000 gallon hot-water storage tank that was used for heat storage in the solar heating system. It did not have any backflow protection on the make-up supply line! As the storage tank pressure increased above the supply pressure, as a result of thermal expansion, the potential for backpressure backflow was present. Normally, this would not occur because a boost pump in the supply line would keep the supply pressure to the storage tank always greater than the highest tank pressure. The addition of rust inhibiting chemicals to this tank greatly increased the degree of hazard of the liquid. Unfortunately, at the same time that the fire took place, the pressure in the water mains was reduced to a dangerously low pressure and the low pressure cutoff switches simultaneously shut off the storage tank booster pumps. This combination allowed the boiler water, together with its chemical contaminants, the opportunity to enter the potable water supply within the building. When normal pressure was reestablished in the water mains, the booster pumps kicked in, and the contaminated water was delivered throughout the building.



Dialysis Machine Contamination

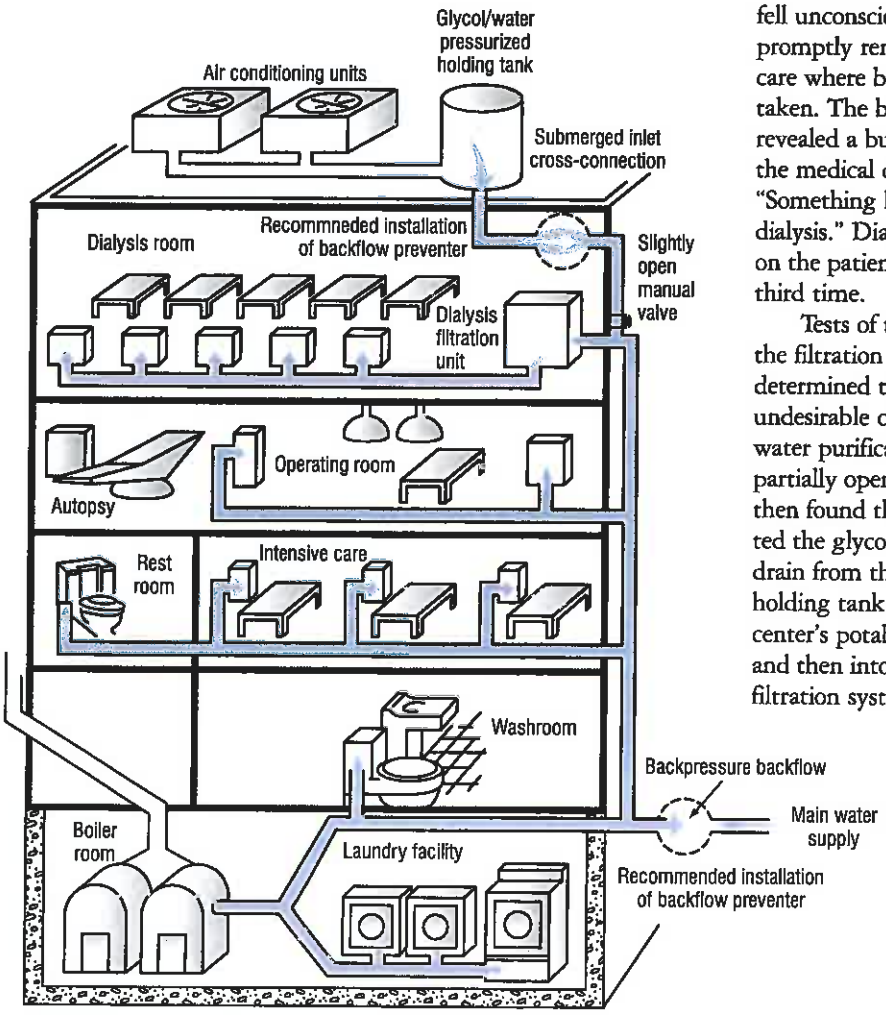
Ethylene glycol, an anti-freeze additive to air conditioning cooling tower water, inadvertently entered the potable water supply system in a medical center in Illinois in September, 1982, and two of six dialysis patients succumbed as a direct or indirect result of the contamination.

The glycol was added to the air conditioning water, and the glycol/water mix was stored in a holding tank that was an integral part of the medical center's air conditioning cooling system. Pressurized make-up water to the holding tank was supplied by a medical center potable supply line and fed through a manually operated control valve. With this valve open, or partially open, potable make-up water flowed slowly into the glycol/water mixture in the holding tank until it filled to the point where the pressure in the closed tank equaled the pressure in the potable water supply feed line. As long as the potable feed line pressure was at least equal to, or greater than, the holding tank pressure, no backflow could occur. The stage was set for disaster, however.

It was theorized that someone in the medical center flushed a toilet or turned on a faucet, which in turn dropped the pressure in the potable supply line to the air conditioning holding tank. Since the manually operated fill valve was partially open, this allowed the glycol/water mixture to enter the medical center potable pipelines and flow into the dialysis equipment. The dialysis filtration system takes out trace chemicals such as those used in the city water treatment plant, but the system could not handle the heavy load of chemicals that it was suddenly subjected to.

The effect upon the dialysis patients was dramatic: patients became drowsy, confused and fell unconscious, and were promptly removed to intensive care where blood samples were taken. The blood samples revealed a build-up of acid and the medical director stated that, "Something has happened in dialysis." Dialysis was repeated on the patients a second and third time.

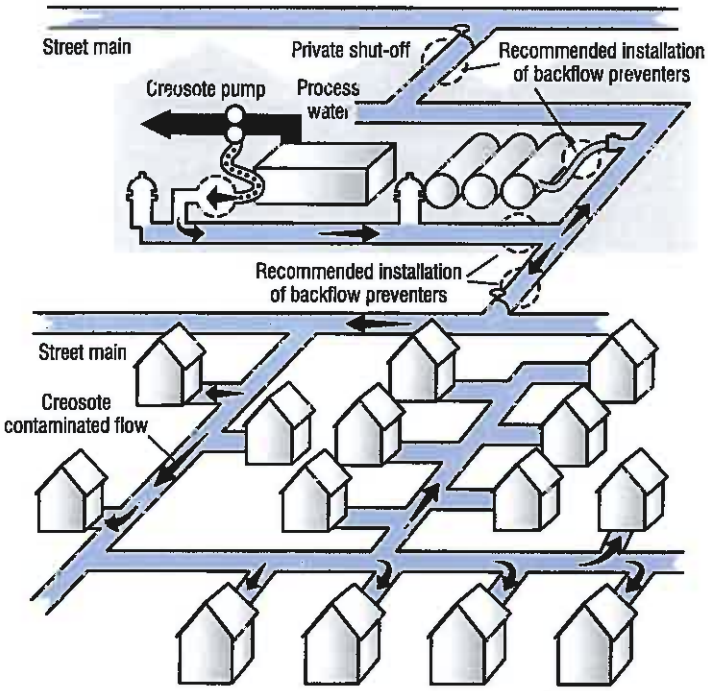
Tests of the water supply to the filtration system quickly determined the presence of "an undesirable chemical in the water purification system." The partially open fill valve was then found that it had permitted the glycol water mix to drain from the air conditioning holding tank into the medical center's potable supply lines and then into the dialysis filtration system equipment.



Creosote in the Water Mains

Creosote entered the water distribution system of a southeastern county water authority in Georgia, in November, 1984, as a result of cross-connection between a ¾-inch hose that was being used as a priming line between a fire service connection and the suction side of a creosote pump. The hose continually supplied water to the pump to ensure the pump was primed at all times. However, while repairs were being made to a private fire hydrant, the creosote back-siphoned into the water mains and contaminated a section of the water distribution system.

Detailed investigation of the cause of the incident disclosed that the wood preservative company, as part of their operation, pumped creosote from collective pits to other parts of their operation. The creosote pump would automatically shut off when the creosote in the pit was lowered to a predetermined level. After the creosote returned to a higher level, the pump would restart. This pump would lose its prime quite often prior to the pit refilling, and to prevent the loss of prime, the wood preservative company would connect a hose from a ¾-inch hose bibb, located on the fire service line, to the suction side of the pump. The hose bibb remained open at all times in an effort to continuously keep the pump primed.



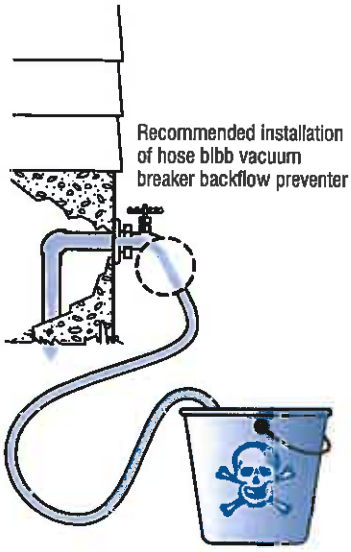
Repairs were necessary to one of the private fire hydrants on the wood preservative company property, necessitating the shutting down of one of two service lines and removal of the damaged fire hydrant for repair. Since the hydrant was at a significantly lower level than the creosote pit, the creosote back-siphoned through a ¾-inch pump priming hose connecting the creosote pit to the fire service line.

After the repairs were made to the hydrant, and the water service restored, the creosote, now in the fire lines, was forced into the main water distribution system.

Kool-Aid Laced With Chlordane

In August, 1978, a professional exterminator was treating a church located in a small town in South Carolina, for termite and pest control. The highly toxic insecticide chlordane was being mixed with water in small buckets, and garden hoses were left submerged in the buckets while the mixing was being accomplished. At the same time, water department personnel came by to disconnect the parsonage's water line from the church to install a separate water meter for the parsonage. In the process, the water was shut off in the area of the church building. Since the church was located on a steep hill, and as the remaining water in the lines was used by residents in the area, the church was among the first places to experience a negative pressure.

The chlordane was quickly siphoned into the water lines within the church and became mixed with the Kool-Aid being prepared by women for the vacation bible school. Approximately a dozen children and three adults experienced dizziness and nausea. Fortunately, none required hospitalization or medical attention.



APPENDIX R

Water Rate Schedule

	2015	2016	2017	2018	2019
Water	28.00	34.50	35.54	36.61	37.71
Sewer	33.09	31.09	31.09	31.09	31.09
Solid Waste	2.23	2.23	2.23	2.23	2.23
Base Rate 5/8 3/4	63.32	67.82	68.86	69.93	71.03
Water	50.12	61.76	63.61	65.52	67.49
Sewer	59.23	55.65	55.65	55.65	55.65
Solid Waste	2.23	2.23	2.23	2.23	2.23
Base Rate 1"	111.58	119.64	121.49	123.40	125.37
Water	112.00	138.00	142.14	146.40	150.79
Sewer	132.36	124.36	124.36	124.36	124.36
Solid Waste	2.23	2.23	2.23	2.23	2.23
Base Rate 1 1/2"	246.59	264.59	268.73	272.99	277.38
Water	199.92	246.33	253.72	261.33	269.17
Sewer	236.26	221.98	221.98	221.98	221.98
Solid Waste	2.23	2.23	2.23	2.23	2.23
Base Rate 2"	438.41	470.54	477.93	485.54	493.38
Water			568.56	585.62	603.19
Sewer			497.44	497.44	497.44
Solid Waste	2.23	2.23	2.23	2.23	2.23
Base Rate 3"	2.23	2.23	1,068.23	1,085.29	1,102.86

Water
$1 / 1000

Sewer
$1.75 / 2000

Sewer average ~~from~~ FROM
Oct - Apr used on
May - Sept bills

APPENDIX S

Metered Water Usage

Month	Residential Accounts	Residential Usage	Business Accounts	Business Usage	Total Accounts	Total Usage	
3/2020	503	1555240	67	340210	570	1895450	
2/2020	503	1299820	67	340720	570	1640540	
1/2020	503	1727780	68	461010	571	2188790	5724780
12/2019	503	1486490	68	373760	571	1860250	
11/2019	503	1392630	68	392790	571	1785420	
10/2019	504	1615220	69	442740	573	2057960	
9/2019	505	2945930	69	473940	574	3419870	
8/2019	506	4600020	69	775870	575	5375890	
7/2019	508	4396480	69	662410	577	5058890	
6/2019	506	2677650	69	566480	575	3244130	
5/2019	506	1714350	69	496140	575	2210490	
4/2019	507	1719310	69	517080	576	2236390	
3/2019	506	1242310	69	441450	575	1683760	
2/2019	507	1874560	69	582390	576	2456950	
1/2019	507	1590610	69	705500	576	2296110	33686110
12/2018	509	1600460	69	453590	578	2054050	
11/2018	510	1501120	69	462190	579	1963310	
10/2018	509	1967934	70	1017857	579	2985791	
9/2018	507	2987183	70	719756	577	3706939	
8/2018	507	6683833	70	1102736	577	7786569	
7/2018	505	5286065	71	934974	576	6221039	
6/2018	508	2115048	71	389387	579	2504435	
5/2018	509	2018953	71	586841	580	2605794	
4/2018	509	1554310	71	442270	580	1996580	
3/2018	507	1418307	71	464040	578	1882347	
2/2018	507	1458120	70	372740	577	1830860	
1/2018	506	1583508	70	433590	576	2017098	37554812
12/2017	507	1813492	70	536830	577	2350322	
11/2017	507	1233340	70	332270	577	1565610	
10/2017	507	1590136	70	378490	577	1968626	
9/2017	507	4371726	70	726050	577	5097776	
8/2017	507	7470362	70	1061310	577	8531672	
7/2017	508	6747941	69	754600	577	7502541	
6/2017	508	5190807	69	782320	577	5973127	
5/2017	506	2502286	69	544240	575	3046526	
4/2017	506	1527225	69	382090	575	1909315	
3/2017	506	1610707	69	370390	575	1981097	
2/2017	506	1520172	69	358730	575	1878902	
1/2017	506	1565495	69	494050	575	2059545	43865059
12/2016	506	1823877	69	551720	575	2375597	
11/2016	506	1778339	69	539390	575	2317729	
10/2016	507	1596441	69	508310	576	2104751	
9/2016	507	3204611	69	798120	576	4002731	
8/2016	506	6363142	70	1110800	576	7473942	
7/2016	506	6424147	70	1161350	576	7585497	25860247

APPENDIX T

Public Outreach and Community Engagement

Due to the restrictions of COVID-19 on public meetings, the City was unable to effectively meet with the public to discuss this PER and proposed improvements prior to the publication of the document. The City of Harlowton will continue to work with Great West Engineering on a plan for in-person public meetings as restrictions allow. The City of Harlowton is confident that public meetings will occur prior to August 1, 2020.

APPENDIX U

Resolutions

Due to the restrictions of COVID-19 on public meetings, the City was unable to effectively meet with the public to discuss this PER and proposed improvements prior to the publication of the document. The City of Harlowton will continue to work with Great West Engineering on a plan for in-person public meetings as restrictions allow. The City of Harlowton is confident that public meetings will occur prior to August 1, 2020 and resolutions will be passed following the public meetings.