



CITY OF BATTLE CREEK

WELLHEAD PROTECTION PLAN

FOR THE VERONA AND COLUMBIA WELL FIELDS

(Update Version 2)

Original Plan – August 2000

Update Version 1 – September 2006

Update Version 2 – June 2012

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INTRODUCTION

The City of Battle Creek obtains all of its drinking water from groundwater. The groundwater is derived from the Marshall Formation, which is a prolific sandstone aquifer that is present at the Verona Well Field (VWF). The VWF is located in the northeast portion of the City and is the City's primary well field.

Following is the second update to the Wellhead Protection Plan (WHPP) for the City of Battle Creek (City), Michigan, Verona Well Field (VWF) and a supplemental well field, the Columbia Well Field (CWF). The goal of the WHPP is to protect the City's groundwater supplies from contamination. The WHPP reflects the City's commitment to protection of its community resources, the public health of its citizens, and the natural environment. The City submitted a WHPP for the VWF in August 2000, which was later approved by the Michigan Department of Environmental Quality (MDEQ). This WHPP serves to update the August 2000 and September 2006 WHPP and incorporate strategies for protecting the CWF.

This WHPP was prepared in accordance with guidance documents available from the MDEQ-Resource Management Division. Funding for the WHPP was provided by the City and the State of Michigan through the Wellhead Protection Grant program.

This WHPP is intended to be a working document. In order for the WHPP to achieve its goal, this document needs to be used frequently and updated when necessary. One must remember that the City intends to use its water supply for an indefinite period of time. As long as groundwater is used by the City, this WHPP will have to be maintained.

Updated copies of this WHPP will always be available at the City's Public Works Department and the Willard Public Library. These copies will be updated periodically by the Public Works Department (see Table 2 for contact information).

The WHPP provides background information about the City's water supply system, a summary of each of seven elements of the WHPP, recommended procedures for maintaining the WHPP, an implementation schedule, and a guide to resources that can be used as the WHPP is implemented. Supporting information is provided in associated tables and appendices.

This document would not have been possible without the participation of a dedicated group of people who volunteered their time on the local Wellhead Protection Team (Team). Their efforts and contributions will continue long into the future, and their legacy is contained herein.

BACKGROUND INFORMATION

LOCATION OF CITY DEMOGRAPHICS

The City is located in southwestern Michigan, in Calhoun County (please see Figure 1). The VWF is located in the northeast corner of the City. The main portion of the well field lies along the east bank of the Battle Creek River. Three additional wells in the Bailey Park area are on the west bank of the river. The VWF is bordered by Pennfield and Emmet Townships.

The CWF is located in the southwest portion of the City, north of Columbia Avenue, west of Helmer Road, and south of the W. K. Kellogg Regional Airport.

According to the U.S. Census Bureau, in the year 2010, the City's population was approximately 52,347 persons. According to the Battle Creek Area Transit Study, the Michigan Department of Management and Budget, and the U.S. Census Bureau, it is projected that the City's population will reach between 55,944 and 65,812 persons in the year 2020.

HISTORY OF THE VWF

In 1903, the City began a test-drilling program in search of additional water supplies. Favorable testing resulted in the purchase of the VWF. The VWF was not used until 1915, when several wells were put in service to supplement the Goguac Lake water supply. During the period of 1940 to 1950, the VWF became the major source of the City's water supply.

There have been two incidents of contamination of the VWF. The first incident involved the discovery of biological contamination in a well. This contamination appeared to be limited and related to surface dumping of waste materials. In the early 1980s, volatile organic compounds (VOCs) were discovered at the VWF. This discovery eventually led to the listing of the VWF as a U.S. Environmental Protection Agency (EPA) National Priority List (Superfund) site. Since that time, there have been extensive investigations into the nature and extent of contamination and the initiation of remedial efforts. Currently, a series of blocking wells are being used to pump groundwater in order to minimize the spread of the VOCs and to reduce the mass of the compounds. Groundwater purged from the aquifer is then discharged into the Battle Creek River. As a result of the blocking wells, the full capacity of the well field cannot be accessed. Groundwater remediation activities associated with the cleanup of the Thomas Solvent site has been successful in reducing contamination and allowing continued use of well field. More information about this cleanup can be obtained at the following EPA website: <http://www.epa.gov/R5Super/npl/michigan/MID980793806.html>

HISTORY OF THE CWF

The CWF was farm land before being used as a well field. The land was initially purchased in the early 1960s (1964 to 1965) by Battle Creek Township for use as a well field. The initial two production wells were installed in the early 1960s, and production at the well field began in 1965. In 1983, Battle Creek Township merged with the City. A third production well was installed in April 1993 and completed in July 1995. The third well was installed to raise production at the well field when the Richfield Well Field was abandoned. The CWF continued in operation until 1991 when production was shifted to the VWF. The CWF has not been used since that time, but is kept as a potential supplemental supply. The City has no plans to use this well field in the near future.

DESCRIPTION OF SUPPLY/DISTRIBUTION SYSTEM

The City is a groundwater-based public water supply. The City relies entirely on groundwater for its residential, commercial, and industrial water supply needs. The City's water system provides water to the City, City of Springfield, portions of Bedford, Emmett, Pennfield and Leroy Townships. The City currently maintains approximately 360 miles of various-sized water distribution piping, as well as five elevated storage tanks, one underground storage tank, and five booster pump stations. The entire system is fed from the VWF.

A tabulation of the water system demand projections is indicated in the following Table 1.

Table 1 • Projected Water System Demands

| Description | City and Adjacent Areas | | | | |
|--|-------------------------|----------------|----------------|----------------|----------------|
| | FY 2004-2005 | Projected 2010 | Projected 2015 | Projected 2020 | Projected 2025 |
| Residential Water Sales | | | | | |
| City of Battle Creek Population | 53,399 | 55,860 | 58,320 | 60,781 | 63,241 |
| Total Population Served | 92,843 | 97,275 | 101,708 | 106,140 | 110,572 |
| Per Capita usage (gpcd)* | 52 | 52 | 52 | 52 | 52 |
| Total Residential Sales (MGD) | 2.78 | 2.90 | 3.03 | 3.16 | 3.29 |
| Commercial & Industrial Water Sales | | | | | |
| Total Comm. & Ind. Sales (MGD) | 6.09 | 6.37 | 6.64 | 6.92 | 7.20 |
| Municipal Water Sales | | | | | |
| Total Municipal Sales (MGD)** | 0.68 | 0.72 | 0.75 | 0.79 | 0.82 |
| Total Water Sales (MGD) | 9.55 | 9.99 | 10.43 | 10.87 | 11.30 |
| Total Water Sales (MGY) | 3,486 | 3,648 | 3,806 | 3,968 | 4,125 |
| Unmetered Water Usage | | | | | |
| 15% of Water Pumpage (MGD) | 1.43 | 1.50 | 1.56 | 1.63 | 1.70 |
| Total Annual Pumpage (MGY) | 4,009 | 4,195 | 4,377 | 4,563 | 4,744 |
| Average Day Demand (MGD) | 10.98 | 11.49 | 11.99 | 12.50 | 13.00 |
| Maximum Day Demand (MGD) | 19.77 | 20.69 | 21.59 | 22.50 | 23.39 |
| Maximum Hour Demand (gpm) | 22,882 | 23,944 | 24,983 | 26,046 | 27,077 |
| Per Capita Pumpage (gpcd) | 118 | 118 | 118 | 118 | 118 |

Notes: * Per Capita Usage is Residential Sales per population for the City, from FY 04-05.

** Assume Municipal sales increase an average of 1% per year.

Source – Battle Creek Reliability Study, CTE/AECOM, March 2006

The City monitors the water quality of its water supply in accordance with state and federal regulations.

Water quality data indicate the water system quality meets all applicable criteria for safe water.

WELLHEAD PROTECTION ACTIVITIES

The City initiated wellhead protection activities in 1989, making the City one of the pioneers in wellhead protection efforts in the State of Michigan. The City worked with Black & Veatch, Inc. to complete various elements of their program for the three well fields Verona, Columbia, and Richfield (now abandoned/plugged). A report summarizing the delineation activities was prepared by Black & Veatch, Inc. in September 1991. Although Wellhead Protection Area (WHPA) delineations were prepared as a result of this work, the delineations were not approved by the State of Michigan, nor were other elements of the program.

In October 1999, the City retained FTC&H to complete the remaining elements of the WHPP. The City also submitted a grant application to the State of Michigan for program funding. In November 2000, the City retained FTC&H to assist the City in developing a WHPP for the CWF. The 2001 WHPP was approved by the MDEQ in September.

In 2004, the City received national recognition for its groundwater protection efforts. The City was awarded the American Water Works Association/U.S. Environmental Protection Agency (EPA) wellhead protection award for medium-size communities.

In 2006, the Wellhead Protection Plan for the Verona and Columbia Well Fields was updated.

For over two decades, the City has implemented activities identified in its WHPPs, along with numerous other groundwater and surface water protection activities. Since applying for its first wellhead protection grant in 1999, the City has continued to pursue grant funding from the State to help support its groundwater protection efforts.

ELEMENTS OF THE WELLHEAD PROTECTION PLAN

The State of Michigan has identified seven elements to be included in a WHPP. These elements are:

1. Element 1 - Roles and Responsibilities
2. Element 2 - WHPA Delineation
3. Element 3 - Contaminant Source Inventory
4. Element 4 - Development of Management Strategies
5. Element 5 - Contingency Planning
6. Element 6 - Siting New Wells
7. Element 7 - Education and Participation

Each element of the WHPP is discussed in the following sections.

ELEMENT 1 - ROLES AND RESPONSIBILITIES

This element is intended to identify individuals responsible for development and implementation of the WHPP. This process started with the establishment of the City's Team. Continued success and implementation of the WHPP will rely on the efforts of the Team; representatives from neighboring townships (Emmett, Pennfield, and Leroy); the Calhoun County Health Department; Citizens at large, business and industry, the MDEQ; and other agencies, such as the Michigan Agriculture Environmental Assurance Program (MAEP). These groups are aware of their roles and responsibilities and several are represented on the Team. Contact details for the Team members are provided in Table 2.

WELLHEAD PROTECTION TEAM

The City's wellhead protection team members generally include representation from the following organizations:

Calhoun Conservation District
Leroy Township
City of Battle Creek Planning
Calhoun County Health Department
City of Battle Creek, Public Works
Pennfield Township
City of Battle Creek, Fire Marshal
City of Battle Creek, Verona Pumping Station Representative
Battle Creek Schools
Canadian National

Various roles are discussed below:

CITY

The Team has had responsibility for preparing the WHPP. The Team shall have continued responsibility for assuring the WHPP is implemented and updated.

City Manager: The City Manager will be responsible for providing support and guidance as the WHPP is implemented. The City Manager will work with others to insure there is accountability with the WHPP. The City Manager should promote the importance of the WHPP to the administrative staff, who, in turn, can promote the program to the community at large.

Utilities Director: The Utilities Director will have the primary responsibility for insuring the WHPP is both implemented and updated. The Utilities Director will serve as the liaison with all others having a role and/or responsibility. The Environmental Services Administrator will be responsible for maintaining any budgets associated with wellhead protection activities.

Water Superintendent: The Superintendent will assist the Environmental Programs Coordinator in implementing the WHPP.

Environmental Programs Coordinator: The Environmental Programs Coordinator will have the primary responsibility for implementing, coordinating, and updating the WHPP. The Environmental Programs Coordinator will also coordinate wellhead protection activities with other similar programs.

Fire Marshal: The Fire Marshal has the responsibility of ensuring that appropriate public safety staff are familiar with the City's WHPP. Additionally, the Fire Marshal is responsible for assuring there is a linkage between wellhead protection and public safety issues such as hazardous waste storage, handling, and chemical spills.

Planner: The Planning Supervisor or designee will assist with the development of land-use regulations related to groundwater protection. The Director of Planning will assist in the enforcement of any regulations related to wellhead protection.

TOWNSHIP REPRESENTATION

Emmett Township: The Emmett Township representative will serve as liaison between the Township and the City. This person will be responsible for communicating to the Township regarding wellhead protection efforts being undertaken by the City. Examples of such activities may include any regulatory, education, and outreach programs.

Pennfield Township: The Pennfield Township representative will serve as liaison between the City and the Township. This person will be responsible for communicating to the Township regarding wellhead protection efforts being undertaken by the City. Examples of such activities may include education, and outreach programs. This person will also be responsible for communicating wellhead protection efforts by the Township to the City.

Leroy Township: The Leroy Township representative will serve as liaison between the City and the Township. This person will be responsible for communicating to the Township regarding wellhead protection efforts being undertaken by the City. Examples of such activities may include education and outreach programs.

OTHER AGENCIES

Other agencies that will provide support for this WHPP include (refer to Table 2 for contact information):

MDEQ-Resource Management Division, Community Water Supply: The District Engineer is familiar with the goals and objectives of the WHPP and can provide guidance during the WHPP's implementation. The District Engineer should be kept informed of progress in implementing the WHPP.

MDEQ-Resource Management Division, Wellhead Protection Unit: (see Appendix 1 for a listing of state resources).

Calhoun County Health Department: The health department provides information regarding existing environmental regulations and historical environmental concerns from the area. Input incorporates public health protection parameters and can promote awareness of the sensitivity of the WHPA through departmental contacts with the area population.

Michigan Agriculture Environmental Assurance Program (MAEP): The MAEP is an excellent resource for the City. The program focuses on addressing risks to groundwater associated with pesticide and nitrogen fertilizer use. However, it has a wide scope and addresses the many uses of these materials including agricultural, turf grass, and household uses. Funds for educational materials come from industry-supported pesticide and fertilizer registration fees on specialty and agricultural products.

Battle Creek Area Math and Science Center: The Battle Creek Area Math and Science Center will provide a resource for education and outreach to the student population through their involvement in activities, especially the Children's Water Festival and Global Citizens River Conservation Day.

ELEMENT 2 - WELLHEAD PROTECTION AREA DELINEATION

The State of Michigan defines a WHPA as “the surface and subsurface areas surrounding water well, or well field, which supplies a public water system, and through which contaminants are reasonably likely to move toward and reach the water well, or well field within a 10 year time-of-travel.” The 10-year time-of-travel (TOT) is the area within which water would take less than 10 years to arrive at an operating well.

The WHPA for the VWF was delineated by Fishbeck, Thompson, Carr & Huber (FTC&H). A report titled *Wellhead Protection Area Delineation for the Verona Well Field, Battle Creek, Michigan*, was prepared by FTC&H in May 2000 and submitted to the MDEQ. This report is not included as an appendix to this WHPP due to its size. The report is available at the City’s Department of Public Works office. The WHPA was approved by the MDEQ in July 2000. The approved WHPA is shown on Figure 2.

It is important to note that the WHPA for the VWF includes portions of the City, Emmett Township, and Pennfield Township. The relationship of the WHPA to these areas is shown on Figure 2. Land use in the VWF is mixed and includes: residential, commercial, industrial, and agricultural

The WHPA for the CWF was delineated by FTC&H. A report titled *Wellhead Protection Area Delineation for the Columbia Well Field, Battle Creek, Michigan*, was prepared by FTC&H in April 2001 and submitted to the MDEQ. The report is not included as an appendix to this WHPP due to its size. The report is available at the City’s Department of Public Works. The WHPA was approved by the MDEQ in July 2001. The approved CWF WHPA is shown on Figure 3. Land use in the CWF area is mixed.

ELEMENT 3 - CONTAMINANT SOURCE INVENTORY (CSI)

CSIs have been completed for both the VWF and the CWF. The purpose of the CSIs is to identify existing and potential threats to well fields. The CSI for the VWF WHPA was initially completed in August 2000. The inventory was later approved by the MDEQ.

The CSI for the CWF WHPA was completed in August 2001 and submitted to the MDEQ. This inventory was approved by the MDEQ in August 2001. The CSI for the CWF is provided in Appendix 2.

The CSI for the VWF was updated in September 2006. The 2006 VWF CSI is provided in Appendix 3.

ELEMENT 4 - MANAGEMENT STRATEGIES INTRODUCTION

Local management strategies help form the basis for programs that identify, incorporate, and utilize systematic approaches in wellhead protection. Well-prepared management strategies are fundamental in the natural resource preservation and protection efforts of a community. Management strategies should encourage and facilitate desirable uses of the environment, plus regulate and limit undesirable land uses and development practices. The following management practices can be administered through the site plan review requirements of the zoning ordinance and other local ordinances. Management strategies and their various related functions should be considered a high priority.

Management strategies are unique to each community's situation and are specific to:

- The CSI.
- Hydrogeology of the delineated WHPA.
- Land use.
- Current and proposed zoning.
- Enforcement capability.
- Intangibles such as public interest and support.
- Financial resources.

Because the City's VWF WHPA extends into neighboring Pennfield and Emmett Townships, management strategies need to meet each of these municipalities' particular situations. Only about 7% (663 acres) of the WHPA is actually within the City. Approximately 72% (6,154 acres) of the entire WHPA lies within Pennfield Township. Pennfield Township has a WHP program in place. Pennfield Township's WHPA is adjacent to and actually overlaps the City's WHPA. A portion of Pennfield's residents use City water. Emmett Township, of which 1,764 acres (21%) is within the WHPA, utilizes City water. All three municipalities have current master plans and zoning ordinances.

The CWF WHPA lies entirely within the City and does not involve any other political jurisdictions.

INTERGOVERNMENTAL RELATIONS

It is the intention of the local Team that all three political entities (the City, Pennfield Township, and Emmett Township), along with other neighboring communities, share in their determination to preserve the quality of the public water supply. Optimum protection may require the agreement of the townships to implement similar regulatory and nonregulatory strategies. Certainly, regulatory ordinances cannot be imposed on one community by another without mutual consent. It is the hope of the Team in compiling this document that the plans and recommendations will be received as credible and with integrity, since they are based on empirical evidence.

An example of intergovernmental cooperation between the City, Pennfield and Emmett Townships has been the effort to develop groundwater ordinances to protect the VWF. As a result of this effort, Pennfield implement an ordinance that not only protects its own WHPA, but also helps protect the VWF WHPA. Emmett Township continues to cooperate with the City in working toward safeguards for the VWF.

MANAGEMENT STRATEGIES OVERVIEW

Management strategies do not necessarily need to be limited to the WHPA defined by the 10-year TOT. Some communities in Michigan have chosen community-wide groundwater protection efforts. This strategy results in the protection of the public water supply beyond the 10-year TOT, protecting resources that may never be essential to the public water supply. This strategy protects private water wells, in addition to those on the public water supply.

In preparation of the VWF and CWF WHPPs, the Team systematically reviewed two types of management strategies: nonregulatory and regulatory. The Team has identified the following nonregulatory and regulatory strategies for implementation.

NONREGULATORY MANAGEMENT STRATEGIES

INCLUDING WELLHEAD PROTECTION IN COMMUNITY LAND-USE PLANNING

It is recommended that the City, Pennfield Township, Emmett Township, and other townships neighboring the City incorporate appropriate documentation on groundwater protection policy and management issues into their respective master plans.

One component of establishing effective management strategies involves the identification of wellhead protection as a community planning issue. This can be accomplished by incorporating the basic groundwater protection concepts into the master plans of each community within the WHPA. Maps identifying the WHPAs should also be included in these documents as they are developed or updated.

PARTICIPATION IN THE GROUNDWATER GUARDIAN PROGRAM

The City should maintain involvement in the Groundwater Guardian program.

The City has been a designated Groundwater Guardian Community since 2001. Groundwater Guardian encourages communities to begin groundwater awareness and protection activities, supports the communities in their efforts, and then recognizes their achievements. This international program began in 1994 with eight test-year communities and has grown substantially. Communities can represent a number of diverse settings including rural areas, large incorporated cities, Indian reservations, and water basins in the United States and Canada.

As part of the Groundwater Guardian designation, the City must submit and accomplish various Result Oriented Activities (ROAs).

These ROAs are available online at <http://www.groundwater.org/active/community.asp?id=194>.

HAZARDOUS WASTE COLLECTION

Residents, businesses, or other land users within the WHPA should be strongly encouraged to participate in the hazardous waste collections.

Hazardous waste collection programs are excellent ways to keep hazardous materials from being improperly disposed and becoming threats to the groundwater.

There are two programs currently available to Calhoun County residents: Clean Sweep and the Calhoun County Household Hazardous Waste Collection program. For more information on these programs, please contact the following:

Calhoun County Clean Sweep –This program is operated periodically and is a free, nonregulatory program to help any Michigan homeowner, farm, greenhouse, nursery, golf course, or other end user of pesticides to properly dispose of unwanted pesticides.

Calhoun County Household Hazardous Waste Collection (269) 373-5211. Examples of acceptable items are old gas/kerosene, antifreeze, floor polish, furniture polish, drain cleaner, oven cleaner, toilet bowl cleaner, bleach, oil-based paints, lead-based paints, paint thinners, wood preservatives, and weed killers.

Solid Waste – More information on solid waste disposal/recycling is available from Calhoun County by contacting Calhoun County Road Commission.

USE OF CONSERVATION EASEMENTS

Land owners in the WHPA should be encouraged to participate in the Conservation Reserve Program.

Conservation buffers are described as strips or other areas of land in permanent vegetation that help control pollutants and manage other environmental concerns. Under the Conservation Reserve Program, landowners can sign up at a local U. S. Department of Agriculture (USDA) service center (Farm Service Agency and the Natural Resources Conservation Service) and receive financial incentives to protect resources such as WHPAs. Currently, contracts for these programs have 10 to 15 year durations. In Calhoun County, the local USDA/Natural Resources Conservation Services is the contact for determining whether a site is qualified to participate in this valuable program.

WASTE REDUCTION

Waste reduction lessens the potential for waste by-products to enter the water resources and should be encouraged.

The Team identified waste reduction as a nonregulatory strategy. Waste reduction is a very positive step in the protection of water resources. By reducing waste, either by reduction in the consumption of resources or more efficient use of resources, less waste by-products enter the water resources.

The City does provide curbside recycling to its residents.

SEPTIC SYSTEM MANAGEMENT

It is important that landowners using septic systems in the WHPA be encouraged to manage their systems properly.

Septic systems are used for waste management in areas not serviced by municipal sanitary sewers. Septic systems are used in both of the WHPAs. These septic systems are regulated by the Calhoun County Health Department. The Team identified failing septic systems as a potential concern to the WHPA. Signs of a failing septic system include:

- Odors, surfacing sewage, wet spots, or lush vegetation in the drain field area.
- Plumbing or septic tank backups.
- Slow-draining fixture, not due to local clogging.
- Gurgling sounds in the plumbing system. Failing septic systems may result in:
- Property damage.
- Surface and possibly groundwater pollution.
- Disease potential.
- Costly repairs or replacement.

Information regarding management of septic systems is available from a variety of local sources, including the Calhoun County Health Department. A document titled *Managing Your Septic System*, prepared by the Michigan State University Extension Office, serves as an excellent guideline for homeowners and others using septic systems. This document is available through the Michigan Association of Realtors at the following link:

<http://www.mirealtors.com/content/MARSepticSystemBrochures.htm>

PLUG ABANDONED WELLS

Abandoned wells pose a threat to the groundwater resources and should be plugged.

The Groundwater Quality Control Action, Part 127, 1978 PA 368, defines an abandoned water well as a well which:

- Has its use permanently discontinued.
- Is in such disrepair that its continued use for obtaining groundwater is impractical.
- Has been left incomplete.
- Is a threat to groundwater resources.
- Is, or may be, a health or safety hazard.

There are many reasons for properly plugging unused wells. The most important of these include:

- Abandoned wells can act as conduits for contaminants to move from the surface into deeper aquifers.
- Abandoned wells are a safety hazard and an unnecessary liability for property owners.
- Deteriorated well casings or open, uncased, boreholes allow movement of water between previously separated aquifers.
- Abandoned wells have been used for illegal waste disposal. Following are examples of abandoned wells that should be plugged:
 - Wells that are not operational.
 - Wells disconnected and taken out of service at the time connection is made to a municipal water system.
 - Any inoperable or abandoned well that is not properly sealed, which can be a safety or environmental hazard.

In Michigan, the plugging of water wells is regulated under the authority of Part 127, Act 368 PA 1978 (Act). The Act authorizes promulgation of the rules contained within the Michigan Water Well Construction and Pump Installation Code.

The City has been actively working toward plugging abandoned wells. In 2006, the City received grant funding through the MDEQ to find and plug wells. Work completed during the grant included the identification of areas where there is a high-likelihood of finding wells, neighborhood canvassing to find wells, placing door hangers on homes/businesses in areas where abandoned wells might be present, hanging flyers and posters in the community, and media announcements of abandoned well programs. These efforts resulted in the plugging of numerous wells.

The City plans to continue these efforts while grant funding is available. When there is no longer grant funding, the City will continue to work toward addressing abandoned wells.

PROGRAM COMPONENTS

The City Well Abandonment Program consists of three components:

1. Well location and identification.
2. Prioritization of wells for abandonment.
3. Plugging assistance.

WELL LOCATION AND IDENTIFICATION

Using grant-funded efforts, the City has identified where there are likely to be abandoned wells. Specific locations for wells continue to require field inspections.

PRIORITIZATION OF WELLS FOR ABANDONMENT

The City encourages proper well plugging despite the well's location. Given limited resources, specific wells have to be prioritized. The following priority scheme has been developed by the City for plugging abandoned wells:

Priority Wells in the Following Areas:

High—Commercial or industrial properties within the WHPA. Medium—Residential properties within the WHPA. Low—Wells outside the WHPA.

PLUGGING ASSISTANCE

The City cannot plug abandoned wells it does not own. The City recognizes that owners of abandoned wells are often uninformed about their responsibility regarding the wells or may be unable to pay for proper plugging of their wells. As such, the City will strive to make both educational and financial resources available for well owners to properly plug their wells. The City will work with organizations such as the MDEQ, the Calhoun County Health Department, and the Calhoun County Conservation District by contributing to the following goals:

- Increasing public awareness to the problem of abandoned wells.
- Providing educational materials to the public.
- Helping enforce well plugging regulations.
- Following up on well plugging at replacement well sites.
- Helping to secure funding such as grant monies that can offset the cost of well plugging.

GEOGRAPHIC INFORMATION SYSTEM (GIS)

In conjunction with ongoing utility upgrades and management philosophy, the City has a complete GIS program that includes land use and utility information. The GIS system will be used to integrate wellhead protection information and will be compatible with other information in the system. In turn, the GIS program can be used as a management tool for policy decisions within the WHPA.

FIRE WATER CONTAINMENT

Water used to suppress fires is inherently toxic. The City would like to develop strategies to control water from fires in the WHPA. As time and resources allow, the City will continue to work toward developing these protocols.

COORDINATION WITH OTHER REGIONAL WATER PROTECTION EFFORTS

The City will continue to work with other groups dedicated to improving water quality in the City and surrounding communities.

REGULATORY STRATEGIES

The City has been in the process of developing a wellhead protection ordinance for the VWF. Initial work on the ordinance began in 2007. The City worked with representatives from Emmett and Pennfield Townships. Eventually, Pennfield Township implemented an ordinance. This ordinance includes both Pennfield's WHPA and the portion of the VWF WHPA that is within Pennfield Township.

The City has continued working toward developing an ordinance for the VWF. This ordinance that is being considered is modeled after an ordinance originally developed by the City of Kalamazoo. This ordinance is expected to be implemented in June of 2012.

ELEMENT 5 - CONTINGENCY PLAN INTRODUCTION

The Contingency Plan portion of the WHPP is an important part of the overall program to protect the quality of drinking water for the City. The Contingency Plan was developed to document what must be done if an environmental incident causes a problem that could impact the City's wells. The Contingency Plan should be shared with the public/media when complete, rather than waiting for an incident to occur.

CONTINGENCY SITUATIONS

Two different contingency situations were evaluated as part of this WHPP. Potential emergency situations that could arise are:

1. Routine monitoring discloses unexpected contamination in the well field.
2. An accident causes a chemical spill in the WHPA.

The following sections identify general procedures to follow in such emergencies. In reality, there are numerous variables that will determine how a given emergency situation will develop and be handled. The ultimate response to an emergency situation must be evaluated on a case-by-case basis, given the severity of the emergency and the potential risks. As such, deviations from the following procedures may be appropriate.

The following actions are recommended to mitigate these two water supply emergencies.

1. Routine monitoring discloses unexpected contamination in the well field. If contamination is discovered in groundwater samples from one or more of the City supply wells, the following general procedure will be followed:
 - a. Shut down the well, unless it is impossible to maintain adequate service without the well in question.
 - b. If the well must be maintained in service, minimize its use.
 - Consider pumping the well as surface waste to protect the remaining wells.
 - Make a decision regarding the best short-term solution to protect the well field.
 - Make a decision on blending with clean wells to dilute contaminant.
 - Determine if existing blocking wells and treatment systems can handle the problem.
 - c. Notify the MDEQ. The source must be identified and the contaminant remediated as soon as possible.

Water Bureau – Community Water Supply Program:

| | |
|------------------|----------------|
| Mr. Fred Sellers | (269) 567-3500 |
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|----------------------|----------------|
| Mr. Wood Chooi, P.E. | (269) 567-3500 |
|----------------------|----------------|

Remediation Division (RD):

| | |
|--------------------------------------|----------------|
| Ms. Beth O'Brien-Mead, RRD Superfund | (517) 335-3098 |
|--------------------------------------|----------------|

| | |
|---------------------|----------------|
| Mr. Frank Ballo, RD | (269) 567-3500 |
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| | |
|----------------------|----------------|
| 24-hour PEAS Hotline | (800) 292-4706 |
|----------------------|----------------|

- d. Review the situation with the Calhoun County Health Department and local medical community regarding the seriousness of the contaminant(s).
 - e. Notify the public of the situation and any necessary precautions.
 - f. Initiate an investigation into the source of the contamination.
 - g. Determine whether or not the problem can be corrected or controlled in the near term, or is correction expected to be long term? Can a well at the upgradient end of the well field be pumped to surface waste to protect the remaining wells?
 - h. Determine a strategy to get the well back online; replace with new well or treat the water from the contaminated well.
 - i. Decide if rationing of water will be necessary and determine priorities.
2. An accident causes a chemical spill in the vicinity of the WHPA. The City has an emergency response plan for hazardous material spills that should be followed in the case of chemical release. In addition to the procedures noted in this plan, the following should be considered:
- a. Contact an environmental consultant to get advice regarding the potential impacts of the release.
 - b. If at all possible, do not wash (hose) contaminants into the aquifer.
 - c. Notify the MDEQ and advocate for immediate response activities.

Resource Management Division – Community Water Supply Program:

| | |
|------------------|----------------|
| Mr. Fred Sellers | (269) 567-3500 |
|------------------|----------------|

| | |
|----------------------|----------------|
| Mr. Wood Chooi, P.E. | (269) 567-3500 |
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Remediation Division (RD):

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|-------------------------------------|----------------|
| Ms. Beth O'Brien-Mead, RD Superfund | (517) 335-3098 |
|-------------------------------------|----------------|

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|----------------------|----------------|
| Mr. Frank Ballo, RRD | (269) 567-3500 |
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| 24-hour PEAS Hotline | (800) 292-4706 |
|----------------------|----------------|

- d. As appropriate, review the situation with the Calhoun County Health Department and the local medical community to determine the seriousness of the contaminant(s) to public health.
- e. If there is a likelihood that the release will impact the well field, notify the public of the situation. Include the status of the well(s), cleanup of the spill, and the potential seriousness of the contaminant(s) relative to the safety of the drinking water.
- f. Officially notify the MDEQ of the need for remediation of the release.
- g. Continually determine the status of the problem.
- h. Keep the public informed of the status of the situation and final solution as appropriate.

OTHER ACTIVITIES

Other activities should be considered for any of the above problems. Among these are:

1. Well field management: Use unaffected wells as sources or pump contaminated well(s) to waste to intercept contamination and to protect remaining wells.
2. Determine whether or not there are monitoring wells or private wells that could be monitored between the incident site and the potentially impacted well(s). If not, determine if a monitoring well could be installed quickly. Locate private wells in the area as the contingency plan is being developed.
3. Notify the public of any need to reduce water use if some of the source is lost.
4. Assess the possibilities of treatment for the various contaminants that might be released in a WHPA.
5. Cooperate with the MDEQ and the responsible party or parties to make certain the contamination is removed from the WHPA as soon as possible.
6. Keep the public informed of the status until the problem is resolved.

PERSONNEL TO CONTACT IN THE EVENT OF AN EMERGENCY SITUATION

- A. Operators to turn on/turn off wells:

Names of Operators

Verona Pump Station Operators

Telephone Numbers

(269) 966-3493 (Office)

(269) 966-3494 (Office)

B. Managers of the City water or emergency services:

| <u>Names of Managers</u> | <u>Telephone Numbers</u> |
|----------------------------------|--------------------------|
| Perry Hart, Water Superintendent | (269) 966-3481 |
| Ken Kohs, Utilities Director | (269) 966-3480 |
| Ken Tsuchiyama, City Manager | (269) 966-3378 |
| Mike Mikenzie, Emergency Manager | |

C. MDEQ:

Resource Management Division - Community Water Supply Program:

| | |
|----------------------|----------------|
| Mr. Fred Sellers | (269) 567-3500 |
| Mr. Wood Chooi, P.E. | (269) 567-3500 |

Remediation Division (RD):

| | |
|--------------------------------------|----------------|
| Ms. Beth O'Brien-Mead, RRD Superfund | (517) 335-3098 |
| Mr. Frank Ballo, RD | (269) 567-3500 |
| 24-hour PEAS Hotline | (800) 292-4706 |

D. Local emergency response personnel:

| <u>Names</u> | <u>Telephone Numbers</u> |
|--|--------------------------|
| Battle Creek Police | 911 |
| Battle Creek Fire & HAZMAT | 911 |
| Calhoun County Sheriff | 911 |
| Michigan State Police | (269) 968-6115 |
| Poison Control Center | (800) 764-7661 |
| City of Battle Creek Emergency Service | (269) 966-3550 |

E. Local Health Department/Medical:

| <u>Position</u> | <u>Telephone Numbers</u> |
|---|--------------------------|
| Calhoun County Health Department Environmental Health | (269) 966-1489 |

F. Media: Follow press release protocol of the Water Division

| | |
|-----------------------------------|----------------------------------|
| <u>Name</u> | <u>Telephone Numbers</u> |
| WBCK (radio) | (269) 963-5555 or (269) 963-6397 |
| Battle Creek Enquirer (newspaper) | (269) 964-7161 or (269) 964-3668 |

ASSESSMENT OF EXISTING WELL SUPPLY AND DISTRIBUTION FACILITIES

VWF

| Capacity of each well | | Operation Order | | | | |
|-----------------------|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Well No. | Gallons per minute (gpm) | 1 st on | 2 nd on | 3 rd on | 4 th on | 5 th on |
| 14 | 936 | | | X | | |
| 15 | 1,011 | | | X | | |
| 17 | 1,096 | | | X | | |
| 36 | 1,001 | | | | | X |
| 37 | 1,202 | | | | | X |
| 38 | 1,202 | | | | | X |
| 39 | 1,315 | | X | | | |
| 40 | 936 | | | | X | |
| 41 | 1,026 | | | | X | |
| 42 | 1,050 | | | | X | |
| 43 | 1,324 | | | | X | |
| 44 | 1,300 | | X | | | |
| 45 | 1,266 | X | | | | |
| 46 | 1,253 | X | | | | |
| 47 | 1,041 | X | | | | |
| 48 | 1,305 | X | | | | |
| 49 | 1,236 | X | | | | |
| 50 | 1,313 | X | | | | |
| 51 | 1,225 | X | | | | |
| 52 | 1,265 | X | | | | |
| 53 | 1,264 | X | | | | |
| 54 | 1,286 | X | | | | |

CWF

| Well No. | Gallons per minute (gpm) |
|----------|--------------------------|
| 1 | 1,041 |
| 2 | 1,041 |
| 3 | 1,041 |

The ADD for the City is approximately 10.0 mgd. As can be seen from the above pumpage rates, this demand can be met by the first series of wells to be used. At the present time, the MDD is nearly 21.8 mgd. When use of the second series of wells is initiated, an additional 4.1 mgd is available, which brings the total capacity in use to 18 mgd. The third series of wells to be used adds another 3.7 mgd, which brings the total pumpage available to 21.7 mgd. This is approximately equal to the MDD. The fourth

series of wells to be used brings the total pumpage available to 26.2 mgd, which is more than equal to the maximum hour pumpage experienced by the City in the last 10 years. At this point, the City still has 7 wells in reserve with a total capacity of approximately 10 mgd.

The City's schedule of placing these wells in service takes into account its concern with the contaminants in the ground southeast of the VWF. These contaminants are regularly being monitored, as are the City's production wells. The interceptor wells and purge system have, to date, been successful in maintaining the City's wells in safe condition. City staff is continuously monitoring the situation to make sure the City's water system is maintained clear of the VOC contaminants.

The City has, in the past, attempted to replace some of their well capacity with new wells north of the existing VWF. This effort was not successful, as the Marshall Sandstone was much different and not conducive to installation of large capacity production wells for a municipal water system. The City may wish to give some thought to where they might develop additional wells, should a problem develop with the VWF. The following work should be part of the new well field development:

1. Prepare a preliminary WHPA delineation based on existing information.
2. Perform a CSI for the preliminary WHPA.
3. Obtain property or access to property.
4. Modify zoning in the well field area, as necessary, to protect future well sites.
5. Update the wellhead protection plan to include the new well(s).

At this point, it is critical that the City make certain all precautions are taken by those operating the purge system to protect the wells in the VWF. It is probable that a well field could be located where the Marshall Sandstone is available and where it is not threatened by chemical contaminants, but the development of a new source and transmission mains, etc., to transport the well water to the treatment plant would be very expensive.

INTERCONNECTION TO ADJACENT WATER SYSTEMS/ALTERNATIVE WATER SUPPLIES

The City has a connection to the Pennfield Township water supply. Pennfield Township can provide limited water to the City in an emergency situation. This line is being flushed annually as required by MDEQ.

The CWF can produce approximately 4.5 mgd and could potentially be used to supply water in emergency situations. It would take approximately one to two weeks to put this system in operation.

ELEMENT 6 - NEW WELLS

In the event that any new wells are installed, the City will incorporate all new wells into the WHPP. This will involve updating the WHPA delineation, as necessary, to reflect the new wells; updating the CSI, as necessary, to include the revised WHPA; and updating other elements in the WHPP to include the new wells.

The VWF is unique in its ability to provide a significant quantity of water from one centralized geographic area. If the capacity available from the VWF needed to be replaced, it would likely require the development of several well fields. Some preliminary work has been done to identify well field sites and none have been identified.

ELEMENT 7 - EDUCATION AND PARTICIPATION

Successful implementation of the City's WHPP will require public education and community outreach. This process is important in both the development and implementation of the WHPP. This WHPP outlines a public outreach and education program that focuses on several groups: City employees, the general public, businesses, agriculture, and students. The basic theme of the WHPP is to better inform the groups on the following topics:

- What is groundwater?
- How is groundwater in the City pumped and distributed?
- How can our groundwater become contaminated?
- What measures can and have been taken to ensure that our water supply is safe?
- What can you (as an individual, company, group, etc.) do to prevent groundwater contamination?

There were several key educational audiences initially identified by the Team. These were: the general public, City employees, township representatives, business/industry, agriculture, and schools. In addition to the audiences, the Team identified education objectives and education approaches. Supplemental details are provided below:

GENERAL PUBLIC

Methods the Team identified for educating the general public about the WHPP and associated community wellhead protection activities included:

Handout/Brochure. A handout has been prepared that describes basic information about the WHPP and methods to protect water quality. The handout is available at a variety of locations.

Wall Calendar. The City has produced thousands of calendars that promote water quality awareness. These calendars have been distributed to the community through various means.

Water Bill Inserts. The City has provided water quality information by including them to water users.

Local Newspapers, Radio Stations, and Access Vision (Local Cable). The City has used, and will continue to use, local media to present information on City wellhead protection efforts. As appropriate, the local media will be used to distribute and promote wellhead protection activities.

Local Events. There are occasional opportunities to promote the City's WHPP. Examples of such events include: parades and festivals, Global Citizens River Conservation Day, and Super Soils Test Saturday. As appropriate, information regarding wellhead protection will be distributed at these activities.

Water Festivals. Water festivals are education programs that focus on the importance of water and water quality protection. The City has held several water festivals and plans to continue these festivals as state funding and interest remains.

Letters to the Editor. The City routinely provides water awareness messages for distribution by the local paper.

Local Community Service Groups. As resources allow, several community service organizations (local environmental organizations, the Boy/Girl Scouts, churches, and the League of Woman Voters) and other business and professional organizations (Chamber of Commerce, etc.) will be informed about the City's WHPP and asked to promote the goals of the WHPP in their community efforts.

Consumer Confidence Report (CCR). The CCR is an annual report provided to water customers that outlines specific information about the City's water system and water quality. The City includes information regarding wellhead protection efforts in the CCR. This tool will continue to be used as a means to distribute information to the community regarding wellhead protection efforts.

Museum/Library Displays. The City has worked with the Kingman museum to develop a large groundwater model. This model is currently on display at the museum

Static Displays. The City will continue to work with local venues to establish displays promoting groundwater protection.

The City Web Page and other Social Media. The City, in cooperation with other clean water Partners maintains an active website for water quality issues. The URL for the site is www.bcwater.org. The Battle Creek Area Clean Water Partners also has a Facebook page.

CITY EMPLOYEES

The City has developed an educational program for City employees and has conducted two rounds of training with City employees. The training schedule is one time every five years in conjunction with stormwater training, with an option for online training. The Team has recommended that City employees be knowledgeable of various aspects of the WHPP. Some employees will only need an introduction to the program, where others need to be familiar with more detailed program aspects. The following employees were identified by the Team as being important to the implementation of the WHPP:

receptionists, meter readers, industrial pretreatment/wastewater workers, planning staff, environmental services staff, and fire department staff.

TOWNSHIP REPRESENTATIVES

It is important that township representatives be informed of the WHPP and the implications of the WHPP to the surrounding communities. Emmett and Pennfield Townships have representatives on the City's Team. Continued communication and cooperation with the townships is essential for the successful implementation of the WHPP.

INDUSTRY/BUSINESS

Local business and industry should play a vital role in protecting groundwater. Often, these groups use significant amounts of groundwater for manufacturing and other purposes. Protection of their water source can be an important component in the economic vitality of their operations.

The City has developed two programs to help the small-business community protect groundwater: the Facility Risk Evaluation Program (FREP) and a spill plan preparation program. These programs have been offered to various businesses within the City's WHPAs. With these programs, businesses can sign up with a City-approved consulting firm and select one or both of these programs. The programs are free to the business, and the results of the programs are confidential. These programs will be used as the primary outreach to the business community. It is the City's intent to continue these programs as long as there continues to be an interest in the business community and grant funding is available for the program. The City will also continue with general outreach activities with the business community.

It is also recommended that local well drillers and septic system installers are notified of groundwater protection activities. This will help ensure those conducting activities directly related to groundwater and water quality are aware of the vulnerability of the groundwater resources.

AGRICULTURE

Agricultural lands occupy a large portion of the VWF WHPA and a limited amount of the CWF WHPA. Organizations such as the Calhoun Conservation District, through the Michigan Agriculture Environmental Assurance Program (MAEAP), provide educational assistance to Michigan's residents to identify and reduce contamination risks to water and other natural resources. The program encourages individuals to take voluntary proactive steps to protect Michigan's water quality. MAEAP staff work with the agriculture community about environmental protection. This process is comprehensive, covering aspects of groundwater protection that relate to a farm. It is anticipated such programs will continue to promote groundwater protection in agricultural areas. The City will continue to work with such agencies to assure the wellhead protection efforts of the City are communicated to the agricultural community.

STUDENTS

The City recognizes the need to educate students regarding their water supply system and how to protect it. The City is able to provide a limited amount of support to the school system. There are four school districts within the WHPA: Harper Creek, Lakeview , Battle Creek, and Pennfield. There are also several private schools in this region. The City considers outreach and education of student-age community members extremely important to the long-term success of the WHPP. The plan for student outreach and education will involve the following strategies:

1. Work with schools and teacher organizations to integrate groundwater-related issues into the curriculum. For reference, curriculum coordinators for the school systems are provided below.
2. Provide demonstrations and materials to students relative to groundwater and groundwater protection.
3. Encourage students and teachers to embark upon individual or class projects concerning groundwater protection.
4. Hold children's water festivals.
5. Promote teacher education as it relates to groundwater protection.

SIGNIFICANT ACCOMPLISHMENTS OF THE CITY'S WHPP

There have been many accomplishments of the City's WHPP. Some of these accomplishments are listed below (in no specific order).

- Handouts regarding the WHPP have been prepared and are available at multiple locations.
- The City created a full-time position of Environmental Programs Coordinator.
- The City and other Team representatives have been on cable access to discuss groundwater protection efforts.
- The City participated in the formation of a county/watershed wide water protection program.
- The City updated its Consumer Confidence Report to provide additional information regarding the wellhead protection program to its water customers.
- The City has prepared and distributed thousands of wall calendars that promote water and environmental awareness.
- The City has held Groundwater Teachers Training Camps.
- The City has held Children's Water Festivals, with thousands of students participating at these events.
- A newspaper release was prepared about the WHPP.
- Developed a logo and slogan to be used for both groundwater and surface water protection initiatives.
- Slogan: Clean Water. You Make the Difference.
- The City purchased several groundwater simulators.
- The City participated in multiple community events.
- Several presentations were given to local service groups and classrooms.
- Since 2001, the City has annually participated in the Groundwater Guardian Program.
- The City won a national wellhead protection award from the American Water Works Association/EPA.
- The City has plugged numerous abandoned wells in the VWF WHPA.
- The City developed two programs to help small-businesses protect groundwater: the FREP program and the spill plan preparation program.
- The City has shown pre-movie advertisements pertaining to groundwater protection.
- The City airs groundwater protection messages on local radio stations.
- The City developed an extensive display for the Kingman Museum (groundwater model).
- The City has developed a Facebook page that posts water protection messages.
- The City has developed an ordinance and associated performance standards and has worked with both Pennfield and Emmett Townships to develop strategies to protect groundwater.
- Pennfield has developed a groundwater ordinance that includes both its own WHPA and the VWF WHPA.
- The City has developed a website (bcwater.org) that provides information about water protection, including videos.

CONTINUING WELLHEAD PROTECTION ACTIVITIES

The City expects to continue indefinitely with the following activities:

- Review WHPP and update as necessary.
- Updates to the City's web page.
- Participate in the Groundwater Guardian program.
- Make presentations to schools and service groups.
- Consider the need to provide employee trainings (based on staff changes).
- Update the CSI on a five-year frequency.
- Search and plug abandoned wells.
- Add groundwater protection information to the City's Consumer Confidence Report.
- Update social media.
- Prepare letters to the editor regarding water protection efforts.
- Prepare and distribute Wall Calendars promoting Water and Environmental Awareness.

The following activities will be continued as grant funding is made available and there is a need:

- Hold the annual Children's Water Festival.
- Assist small-businesses with the FREP program and the spill plan preparation program.
- Develop wall calendars with water protection as a theme.

PLAN MAINTENANCE

As indicated, the WHPP is a working document. As such, it needs to be maintained periodically. It is recommended that the plan be reviewed and updated on an as needed basis. The checklist for plan maintenance (below) will be reviewed annually. The checklist can be used to steer the user toward portions of the WHPP most likely to require updates. It is recommended that any proposed changes to the plan be recorded and filed with the WHPP by the Environmental Services Director. At an appropriate time, the plan should be revised to reflect the updates.

CHECKLIST FOR PLAN MAINTENANCE

Element 1 - Roles and Responsibilities

- Have there been any Team member changes?
- Should someone be added to the list of those having roles or responsibilities?
- Have there been any changes in City representation?
- Have there been any changes in Emmett, Leroy, or Pennfield Township representation?

Element 2 - Check Potential for Delineation Area Changes

- Has there been any new geological data made available that should be incorporated into the delineation?
- Have the flow rates of the water supply system significantly changed from those used in the delineation? If so, the WHPA delineation may need to be updated.

Element 3 - Update Contaminant Source Inventory

- Has there been any data developed regarding potential source of contamination?
- Has it been five years since the last contaminant source inventory was prepared? If so, the inventory must be updated.

Element 4 - Management Strategy Updates

- All management strategies in the WHPP should be reviewed.
- Are there updates to the CSI that have resulted from the management strategies?

Element 5 - Update Contingency Plan

- Have there been any changes in the contacts listed in the Contingency Plan?
- Have there been any changes in response procedures?
- Are new staff familiar with the response procedures?
- Have there been any water supply emergencies since the last update? If so, what was learned that may be important to put into the Contingency Plan?

Element 6 - Review Status of New Wells

- Are there any new wells being planned?
- Has there been any change in the proposed location of new wells?
- If a new well was installed, has the WHPP been updated to include the new well?

Element 7 - Update WHPP Regarding Any New Education Strategies

- Do new educational supplies need to be obtained?
- What educational accomplishments have occurred during this review period?
- Are there new educational tools or resources that need to be added to the resource list?