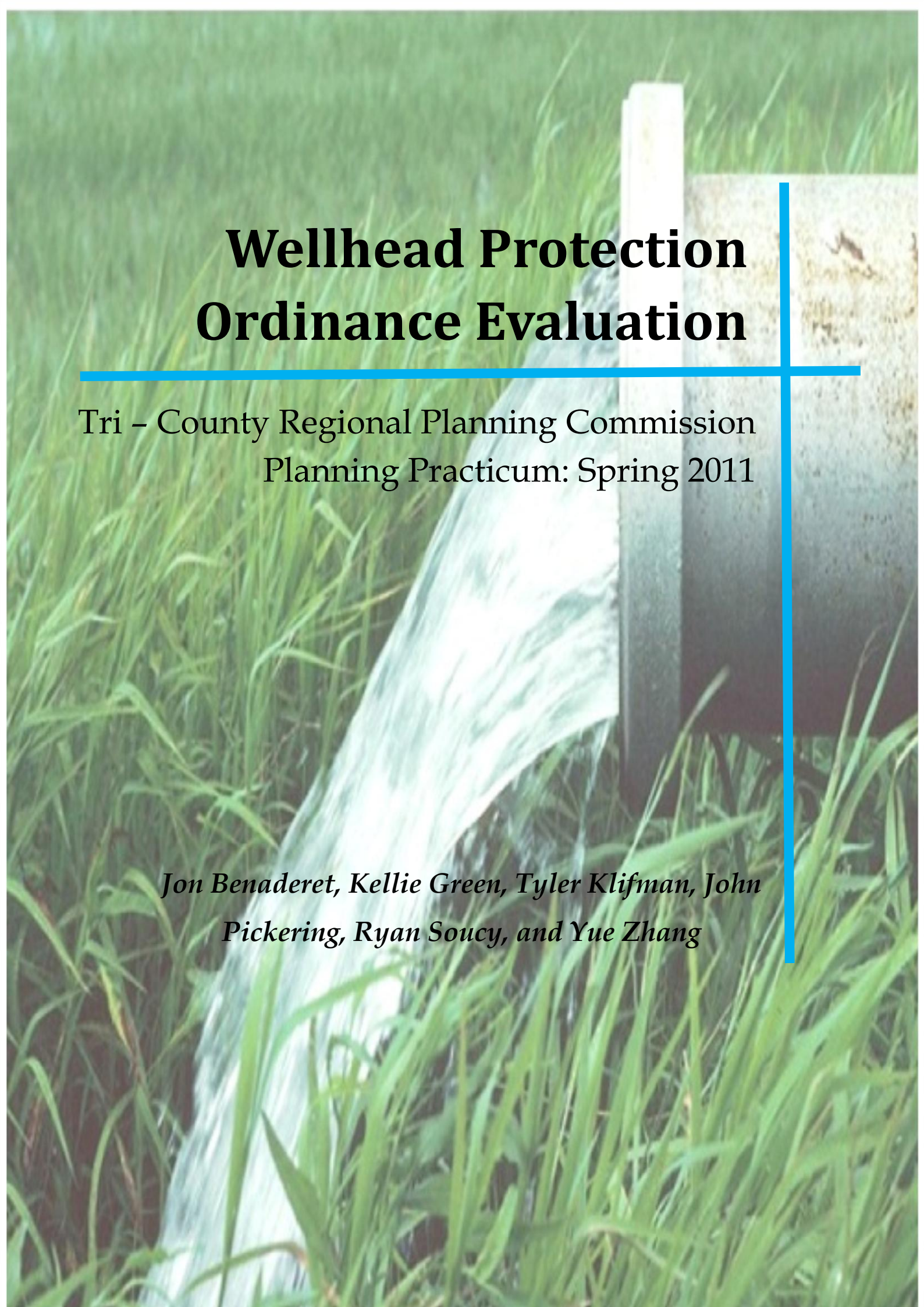

Wellhead Protection Ordinance Evaluation

Tri – County Regional Planning Commission
Planning Practicum: Spring 2011

Jon Benaderet, Kellie Green, Tyler Klifman, John Pickering, Ryan Soucy, and Yue Zhang

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Erin Campbell, Environmental Planning Technician, *Tri-County Regional Planning Commission*

Dana DeBruyn, Regional Environmental Health Technician, *Barry-Eaton District Health Department*

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William Rieske, AICP, Assistant Planning Manager, *City of Lansing*

Christine Spitzley, Environmental Programs Planner, *Tri-County Regional Planning Commission*

Timothy Schmitt, AICP, Community Development Analyst, *City of East Lansing*

Mark Wyckoff, FAICP, *Planning & Zoning Center at Michigan State University*

EXECUTIVE SUMMARY

The Wellhead Protection Ordinance Evaluation Team, as a part of Michigan State University's Urban and Regional Planning Practicum, has compiled an analysis of wellhead protection planning for the major municipalities in the Tri-County area of mid-Michigan. The project includes the analysis of six target communities; the Charter Townships of Delhi, Delta, Lansing, and Meridian and the Cities of Lansing and East Lansing.

These six municipalities were chosen for review by the Tri-County Regional Planning Commission; selection of communities was based on a previous analysis of wellhead protection efforts, completed by the Planning and Zoning Center in 2000. An analysis of each target area's relevant community documents (master plans, zoning ordinances, site plan review processes, and supplementary documents) were reviewed with specific recommendations for improving wellhead protection plans and regulations.

The goal of this project was to review and re-evaluate the relevant community documents within the six Tri-County target communities to assess the effectiveness and implementation of their wellhead protection programs (WHPPs) to date. Analyzing the evolution of these documents allowed the MSU Wellhead Protection Ordinance Evaluation Team to assess the initial development of wellhead protection programs, their current state, and to develop the framework for providing of recommendations for future implementation.

The primary objective of this project was to obtain all of the most current community documents that pertained to wellhead and groundwater protection. From here, an evaluation tool was developed to assess these relevant documents and compare and contrast them in a uniform method. This assessment tool was modeled after several other audit tools for planning and zoning as well as watershed protection in order to ensure that the most effective and comprehensive instrument was created.

The tool that was produced (referred in the report as the Wellhead and Groundwater Protection Audit Tool) was been developed to assess these six specific communities (townships of Delhi, Delta, Lansing, and Meridian, and the cities of Lansing and East Lansing) within the Tri-County area for their application of contemporary regulations and standards as they apply to wellhead and groundwater protection. This audit tool can also be applied to other communities throughout the nation who are looking to evaluate their wellhead and groundwater protection strategies. These communities were evaluated in four aspects important to the wellhead protection planning process; the identification of goals and objectives for improving or maintaining groundwater quality, the identification of specific strategies that will allow the community to meet their stated goals and objectives, an examination of ordinances pertaining to groundwater protection, and an analysis of strengths, weaknesses, opportunities, and threats (SWOT analysis) to aid in the identification of barriers and to gauge potential room for improvement.

This report provides a comprehensive analysis for the implementation of WHPPs in the target communities within the Tri-County region. This includes an evaluation of official documents and interviews with local administrators, as well as a comparative case study of similar region in Michigan. For the client, recommendations were developed in order to update existing wellhead protection efforts in each municipality, create a uniform standard and promote best management techniques.

Findings:

There are various specific recommendations used to enhance wellhead protection planning in the six target communities. These recommendations are based off findings from the audit tool as well as further expert interviews and research. These recommendations include improvements for deficiencies in relevant community documents (master plans, zoning ordinances, site plan review processes, and supplementary documents) as well as improvements for the procedures, enforcement, outreach, education, and regional efforts necessary for comprehensive wellhead protection planning.

After reviewing and evaluating each of the six communities' approaches to groundwater and wellhead protection efforts, general recommendations were made for improvement. Each community had specific strengths and weaknesses, but all failed to meet certain criteria. With the adoption of the following, general recommendations, communities will be able to develop more comprehensive, uniform standards for groundwater and wellhead protection.

Update Contingency Plans:

Emergency response is imperative for the prevention of serious contamination. Without adequate plans to deal with these situations, there can be detrimental effects to ground water and wellhead protection areas. Also, clean up efforts can become increasingly expensive as time goes on. Also, fire response must have knowledge of locations with hazardous material in order to handle emergencies correctly. Inadequate emergency response control can cause contamination to runoff into groundwater and potentially pollute drinking water.

Maintain Current GIS Data on Groundwater:

Current and regularly updated groundwater information is important in the maintenance of the community's water quality. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues. Examples of data pertinent to wellhead protection planning includes: locations of all wells including unplugged wells, aquifer models, and locations of wellhead protection areas.

Encourage Best Management Practices:

Best management practices are important for the everyday protection of groundwater resources. These practices can be encouraged through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

INTRODUCTION

The Client

The client for the Wellhead Protection Evaluation Project was the Mid-Michigan's Tri-County Regional Planning Commission (TCRPC) based in Lansing, Michigan, which serves Clinton, Eaton, and Ingham Counties. TCRPC strives to support local professional planning by providing technical and collaborative assistance. Specific to this project, the TCRPC is involved with various environmental planning initiatives including regional wellhead and groundwater management efforts.

> "*The mission of the Tri-County Regional Planning Commission is to provide professional planning, coordinating and advisory services to local governments, state and federal agencies and the public in order to preserve and enhance quality of life in Mid-Michigan."*

Goal

The main goal of this practicum project is to review the relevant community documents for the Charter Townships of Delhi, Delta, Lansing, and Meridian and the Cities of Lansing and East Lansing to assess the effectiveness and implementation of wellhead protection programs (WHPPs). Analyzing these documents allowed the Team to assess the initial development of WHPPs, their current state, and provided a basis for developing individual recommendations for future implementation.

Methods of Analysis

A variety of research methods were employed in order to attempt an accurate and comprehensive overview of wellhead protection planning.

Qualitative research approach:

In order to deal with the multiple social and environmental factors that are inherent in locally based environmental protection initiatives such as WHP planning, a qualitative research approach was used for this study. Qualitative research allows the investigator to focus on the research topic as a holistic entity, with an emphasis on the interactions of each component of the topic being studied. Rather than relying on empirical formulas, qualitative researchers strive to identify the individual's perspective through observation and detailed examination (Denzin and Lincoln, 2000).

Qualitative research provides an opportunity for the investigator to study and understand complex social issues and interactions. However, because qualitative research is by its very nature interpretative research, the researcher's biases, values and judgment may influence the study conclusions (Creswell, 1994). While it may be difficult to establish the reliability of the qualitative research results, it is argued that qualitative research should judged as credible and confirmable with appropriate and reliable research (Merriam, 1998). Although challenges with generalizing exist with this mode of research, the benefits associated with qualitative research validate its use.

Research strategies in qualitative research often involve examining case studies and observing participants in the field, while data collection methods include interviewing and observing

individuals and analyzing documents and records related to the issue being examined. All of these strategies are utilized in the completion of this project.

Case study research:
A comparative case study approach was utilized for this project, including the six noted communities (Delhi Charter Township, Delta Charter Township, the City of East Lansing, the City of Lansing, Lansing Charter Township and Meridian Charter Township). An integral component of qualitative research includes the expansion of knowledge on each cases background, physical setting, and contextual issues. By employing a case study method, researchers are able to provide insight into an issue and to develop generalizations about the study topic (Stake, 2000). Because case studies emphasize the context around which the issue is framed, the researcher is able to develop valuable analysis of the case being studied.

Disadvantages to case study research also exist. Because case studies rely on personal interpretation of the research findings, the researcher may introduce subjectivity into the research report. In addition, it may be difficult to test the validity of the results. However, with evidence and analysis, case study research can provide valuable insight.

Procedures used in this investigation:

1. *Face-to-face interviews:*
   Interviews were used as the primary data collection strategy for this study. The principal advantage of interviews is that they allow the researcher to focus directly on the case study topic, and provide depth to the research findings. However, bias can be introduced via poorly designed questions, and inaccuracies may result due to poor recall or reference by the researcher. Structured interviews utilize a series of pre-established questions with a limited set of response categories, while the unstructured interview is designed to provide a greater depth and breadth of understanding (Fontana and Frey, 2000). Structured interviews were conducted for this study, whereby a series of questions were developed that allowed for some categorization of answers as well as open-ended responses. These interviews were then used to compare and provide analysis for further recommendations.

   Planners from each of the selected six communities were interviewed. These individuals are designated in handling wellhead protection issues for their communities in collaboration with the TCRPC. In addition, environmental planners and consultants, Lansing Board of Water and Light representatives, health department representatives, and a wellhead protection representative from the City of Battle Creek were interviewed in order to conduct a complete and comprehensive analysis.

   There are difficulties in this procedure as well as with any other research method. Some of the inconsistencies may result from time constraints, unavailability of interviewees and interviewers, slow response to follow-up, as well as question misinterpretation.

2. *Review of archival documentation:*
   Reviewing documentation to augment information obtained through the interview process has several advantages. The process is unobtrusive, and allows the researcher to work at his own pace to collect and analyze the information. The stability of the information allows it to be repeatedly viewed, and a broad array of information can be tapped. Disadvantages of this data collection method include the possibility that bias

may be introduced through selectivity, and access to particular records may be deliberately blocked.

For this project, the zoning ordinances, master plan and other adopted plans, as well as site plan review documents for each of the six selected communities were reviewed and evaluated. These documents are public and accessible. In order to create a standard for reviewing these documents an audit tool was developed. The Wellhead and Groundwater Protection Audit Tool helped group members to evaluate each of the community's relevant documents on a standard basis. The audit tool provided evaluation questions which were then referenced using the designated documents.

3. Methods utilized to ensure validity of the data:
   The process of triangulation was employed in this study to help ensure the validity of the research results. This process relies on multiple modes of data collection in order to overcome any inherent biases in the data sources, with the investigator or research method (Creswell, 1994). Data collection and analysis methods used in this study included interviews with individuals from the WHP communities, discussions with state, regional and WHP experts, personal observation within the communities, review of archival documentation, and peer consultation. The findings as a result of these methods were then reviewed by professional colleagues to ensure the validity of the research results.

   This cross examination was necessary for an inclusive analysis and proper utilization of the audit tool. The questions in the audit tool help to clarify and provide a basis for wellhead protection planning. Therefore, all of the questions could not be answered successfully by simply relying on interviews with professionals or by review of relevant documents. A combination of both helps to ensure the collection of up to date and accurate data. This triangulation provides a kind of check and balance system on both kinds of data sources.

Deliverables

This report provides a comprehensive and specific analysis for the implementation of wellhead protection planning in the designated communities within the Tri-County region. This includes an evaluation of official documents and interviews with local administrators, as well as comparative case studies of similar regions in Michigan. Furthermore, a Wellhead and Groundwater Protection Audit Tool was developed for generally evaluating WHPP. For Tri-County, recommendations were developed to update existing wellhead protection efforts in each specific municipality.

Wellhead Protection Overview
It is imperative to understand the process of the water cycle in order to appreciate the importance of wellhead protection planning.

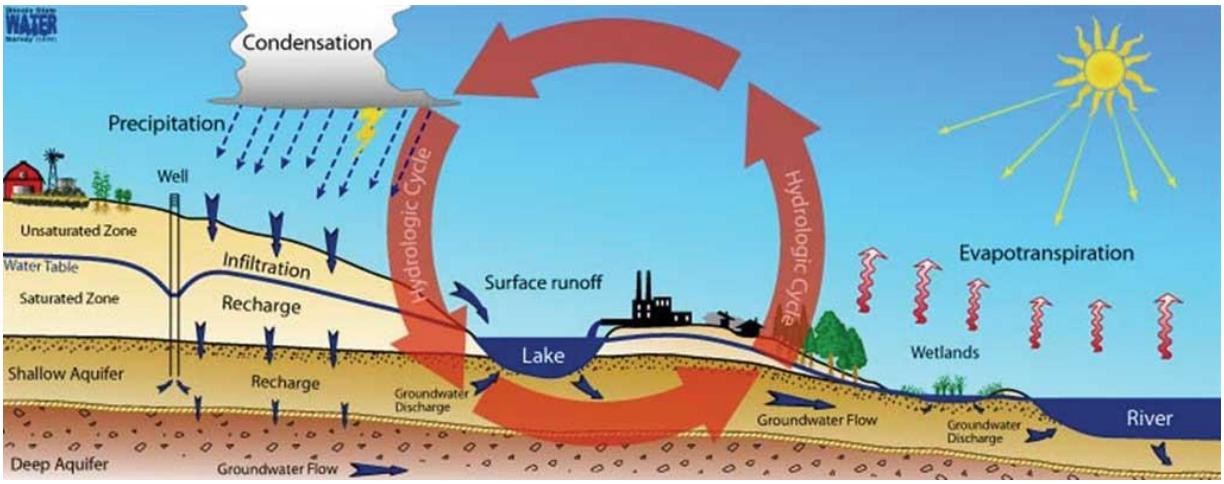


Figure 1. The Hydrological Cycle. *Source:* http://www.esri.com/news/arcuser/0408/graphics/groundwater_1_lg.jpg.

The continuous movement of water from solid to liquid throughout the natural environment is called the water cycle. Any type of pollutant introduced into the environment could potentially enter into the groundwater. Once a contaminant has entered the groundwater, it will remain there, but could take months, years or even decades to resurface again. Because of this prolonged process, it becomes difficult to determine the amount the contaminants present in the water supply. It is for these reasons that it is extremely important carefully monitor and protect a community's groundwater supply.

Groundwater is always subject to contamination; therefore it is clear to see why wellhead protection planning, as a proactive approach, is necessary for managing quality drinking water. Most communities engage in wellhead protection programs at the local level in order to promote healthy living and environmental stability. Protecting wellheads helps to ensure adequate sanitation, quality drinking water, and a reduction in costly contamination clean-up efforts. Wellhead protection involves the management of land surrounding areas containing both private and public wells in order to control and prevent pollution.

Most communities engage in wellhead protection programs at the local level in order to promote healthy living and environmental stability. Protecting wellheads helps to ensure adequate sanitation, quality drinking water, and a reduction in costly contamination clean-up efforts. Wellhead protection involves the management of land surrounding areas containing both private and public wells in order to control and prevent pollution.

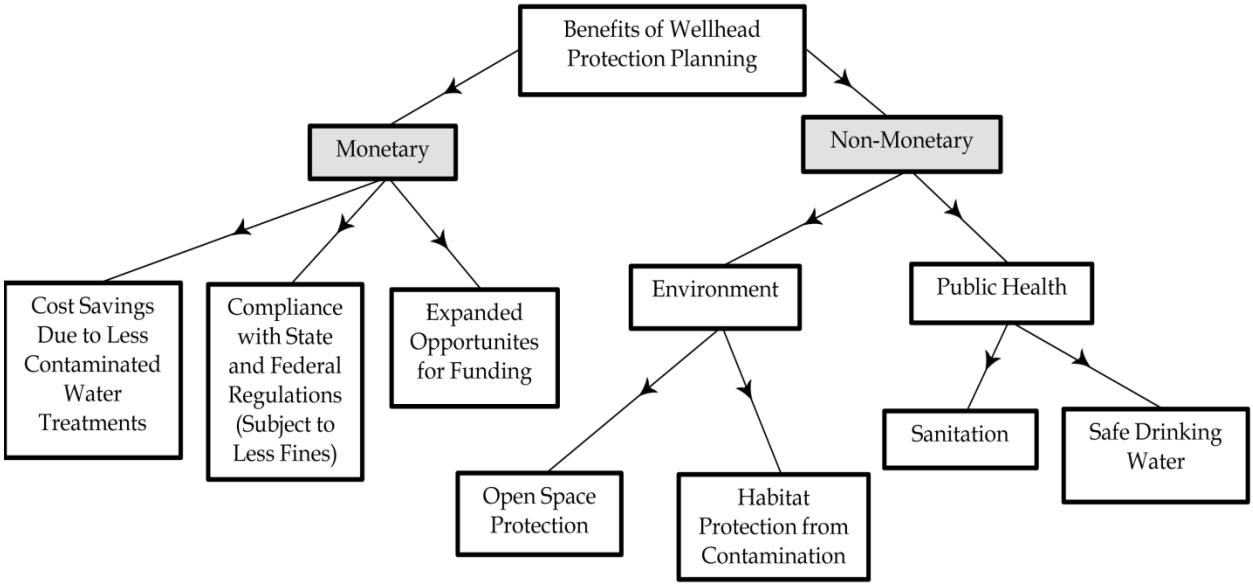


Figure 2. Benefits of WHPP. *Source:* Wellhead Protection Ordinance Evaluation Practicum Group 2011.

In the Tri-County area, wellhead protection is administered under federal, state, regional, and local governing bodies. Wellhead protection efforts typically involve these seven steps according to the Michigan Wellhead Protection Program guidelines: ("Teaming Up for Quality Drinking Water: The Michigan Wellhead Protection Program Guide". *Michigan Department of Environmental Quality Drinking Water & Environmental Health Section.)*

1. Roles and duties for program development
2. Delineation of the wellhead protection area
3. Identification of potential and known contaminant sources
4. Management strategies
5. Contingency plans for the wellhead protection area
6. Development and implementation of a wellhead protection program for a new well or well field
7. Public participation

Federal and State Regulations

There are a variety of federal and state regulations that assist with the enforcement of protecting and managing groundwater. These regulations set standards on managing practices for local and regional governments. These uniform standards are necessary at the state and federal levels since groundwater is in continuous motion and contamination will likely affect a wide range of surrounding communities.

There are a number of regulations that affect groundwater protection and quality; however there are some more specific ones pertinent to wellhead protection planning. The Clean Water Act (CWA) of 1972 is the primary federal law governing water pollution and was the first to set quality standards for all bodies of surface water. While it does not specifically address groundwater, it does set limits on the amount of toxic waste that can be discharged into rivers, lakes and streams. By the interconnectedness of water systems, groundwater resources benefit from this regulation because surface water seeps through the soil to feed the aquifer. Through the CWA's Title VI, federal funds are allocated to states to capitalize on their revolving funds, which are used to provide financial loans or grants to local governments. This assistance is used for wastewater treatment, nonpoint source pollution control and estuary protection.

1974's Safe Drinking Water Act (SDWA) was implemented to ensure public access to quality drinking water and applies to every public water system in the United States. It requires the Environmental Protection Agency (EPA) to set standards for drinking water quality and provide oversight for states, localities and water suppliers, ensuring that standards are met. The Michigan Safe Drinking Water Act of 1976 granted the Michigan Department of Environmental Quality (MDEQ) regulatory authority for the public drinking water program within the state and drinking water well drilling. While the federal SDWA does not regulate private wells, it does regulate liquid waste contamination into the ground as well as monitoring and reporting requirements for drinking water. Over time, it has been updated to monitor for specific substance concentrations, provide the EPA with more enforcement powers, and in 1986, amendments to the SDWA established the concept of Wellhead Protection Programs (WHPPs) to serve as a pollution prevention and management initiative. The power to regulate Wellhead Protection Programs is delegated to state governments, and Michigan's is managed through the MDEQ. The MDEQ has an expressed mission to, "…assist local communities utilizing groundwater for their municipal drinking water supply systems in protecting their water source. A WHPP minimizes the potential for contamination by identifying and protecting the area that contributes water to municipal water supply wells and avoids costly groundwater clean-ups." WHPPs are voluntary, and implementation powers are left to the local or regional governing body.

Nationally, the Resource Conservation and Recovery Act (RCRA) of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), provide further regulations regarding the management of hazardous waste, and include provisions that protect groundwater. The RCRA regulates the generation, storage, transport, treatment and storage of hazardous wastes and gives the EPA power to protect all groundwater sources from hazardous waste. The CERCLA, more commonly referred to as Superfund, cleans up existing hazardous waste sites that pose a threat to surface water, groundwater, or other sources.

As of August 31st, 2003, a Pollution Incident Prevention Plan (PIPP) was updated pursuant to Part 31 of the Natural Resources and Environmental Protection Act of 1994. The PIPP applies to any owner or operator of any on-land facility that receives uses, processes, manufactures, stores or ships polluting materials in excess of the applicable threshold management quantity

(TMQ). These requirements should prevent ground water and surface water from contamination from polluting materials. This 2005 version requires facilities to manage any polluting material, submit PIPPs and report spills of polluting material. However, there are some specific exemptions for many different types of facilities that are subject to other similar state or federal regulations or are otherwise not felt to represent significant environmental threats. TMQs, under the new ruling, are significantly larger than the previous threshold. Also, they distinguish between indoor and outdoor management of polluting materials and create an incentive to encourage indoor storage and handling of polluting materials. The final portion of the plan ruled that any on-land facility that has any outdoor storage areas, used to store liquid polluting materials in excess of the TMQ, shall provide secondary containment structures for those outdoor storage areas.

While these are not a comprehensive collection of federal groundwater laws, they provide the most direct regulation and are principal governing documents for water quality standards. More information for these regulations is available through the MDEQ.

Regional and Local Regulations

Local communities have authority for protecting groundwater resources through zoning and site plan review processes. There are also other regulations set in place within regions and localities which provide oversight for managing groundwater and wellhead protection areas. The enforceability associated with these regulations usually result in fines or a lack of funding if violations occur.

Eaton, Clinton, and Ingham Counties use an environmental permits checklist as part of the site plan review process for development. Therefore, local governments gain regulatory control by requiring a developer to fill out this checklist. This checklist provides a basis for developers to use for management of their project. This checklist provides specific stipulations about current regulations that will affect the development process. Many of the questions relate to groundwater and contamination by attempting to protect this natural resource. Moreover, there are specific questions pertaining to the construction of new wells and the acknowledgement of abandoned ones. It is important for developers to take into account the effects of new or redevelopment on the surrounding environment and specifically on the water supply. The permit checklists are attached for further reference (Appendix VII).

Michigan's Fire Fighter Right to Know Act (FFRTK) provides the local fire chief the right to request and receive a list of chemicals and MSDSs used at a specified location. Under the law, if the fire chief requests it, the following information must be provided within ten working days of the query:

- A listing of all hazardous chemicals at the location
- MSDSs for all hazardous chemicals at the location
- Information pertaining to the quantity and location of the chemicals

In addition, an employer must provide the fire chief with a written update "when there is a significant change relating to fire hazards and the quantity, location or presence of hazardous chemicals in the workplace." The ORCBS has this information on electronic database and will provide for this contingency when required.

The Ingham County Board of Commissioners adopted a Point of Sale (POS) regulation required for the inspection of residential on-site water and sewage disposal. A household is required to

complete an inspection for all private septic systems and wells located on the residential property before selling the property. This regulation helps account for private wells and requires proper plugging for individual properties not in compliance with current inspection and evaluation criteria. The Ingham County Health Department assists with inspections and evaluates reports. This is a fairly new regulation enacted in 2006.

The Barry-Eaton District Health Department adopted a Time of Sale or Transfer (TOST) that places requirements on a parcel containing an on-site sewage system and/or on-site water supply system. Until the following criteria is met, there will no sale or transfer. The first of which requires documentation of a transfer evaluation by a registered evaluator to the Health Department. During this transfer evaluation, the Health Department determines that the condition and operation of the system is not in a state of failure or that any necessary system maintenance or remediation has been completed or assured and approved. Once this is completed, the Health Department issues the final step and provides a transfer authorization for sale or transfer of the parcel. This final step completes the requirements for the Barry-Eaton TOST.

Meanwhile, the Mid Michigan District Health Department, serving Clinton County, has not officially adopted a POS or TOST ordinance thus far. However, since none of our six case study communities are located within or fall under the jurisdiction of Clinton County, Clinton County's regulations relating to groundwater and wellhead protection were not fully examined.

CURRENT WELLHEAD AND GROUNDWATER TRENDS

Statewide

Groundwater is a very valuable resource for all communities. Without quality water, a municipality could incur catastrophic problems including: agricultural failures, water-borne infections, disease and even death. Groundwater in Michigan is used for industry, irrigation, as well as public water supply. It is a very important natural resource to Michigan as an entirety due to overwhelming public and private reliance.
Pertinent state statistics on groundwater:
("Ground Water Statistics", *Michigan Department of Environmental Quality*)

- About half of Michigan's population depends on groundwater for drinking water;
- Michigan has more households (1.25 million) served by private wells than any other state in the nation;
- Michigan's private household wells withdraw 194 million gallons of groundwater each day, while total groundwater use in Michigan equals about 700 million gallons each day.

The Pennsylvanian Saginaw Aquifer is the main water supplier for most communities in the Tri-County area. It is considered a confined bedrock aquifer with a sandstone layer reaching depths from 100 to 400 feet depending on the specific topography located above.

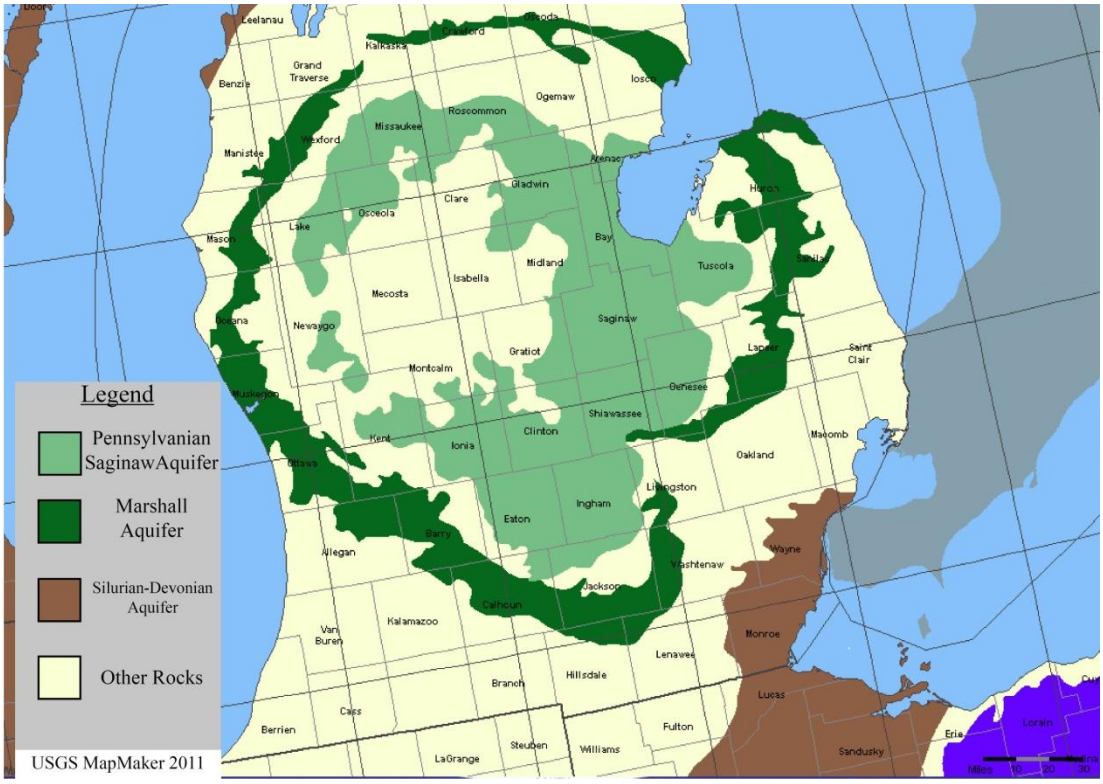


Figure 3. Saginaw Aquifer. *Source:* USGS MapMaker 2011

Most of Mid-Michigan and the Tri-County area depend on groundwater resources from the Pennsylvanian Saginaw Aquifer which is delineated in light green in Figure 3. Most of the public and private wells located within these counties probably depend on this aquifer for water. This aquifer also serves other communities, which is why regional groundwater protection efforts are necessary.

Tri-County

All of the six Tri-County communities receive municipal water from the Lansing Board of Water and Light (LBWL), while parts of Delta Township, the City of Lansing, and the west side of Lansing Township also receive water from West Side Water. West Side Water however is in contract with the LBWL, as the LBWL is accountable for all filtration services. West Side Water is responsible for the operation and maintenance of all storage and pumping facilities in several areas of Lansing Township.

There are a number of wells that have been drilled, dug, and driven over the years as this region expanded. The table below indicates the numbers of wells for each community, that are accounted for and managed, separated by type of well. It is important to keep in mind that there are still a number of abandoned wells that have not been accounted for or managed in this area.

Number of Wells in Tri-County Region							
	Public*	Private*	Irrigation*	Test*	Industrial*	Monitoring*	Plugged*
Delhi Charter Township	30	1188	16	1	2	37	50
Delta Charter Township	23	398	7	0	3	6	40
City of East Lansing	18	45	8	1	0	2	14
City of Lansing	135	73	10	3	2	11	30
Lansing Charter Township	11	27	3	0	0	2	11
Meridian Charter Township	49	1134	23	25	0	23	34

Figure 4. Number of Wells in Tri-County Region. *Source:* Tri-County InfoGeographics Wellhead Protection Viewer 2011 & Wellogic, Michigan Department of Environmental Quality 2011. https://secure1.state.mi.us/wellogic/Login.aspx

*See Page 17 of this report for definitions of well types.

Abandoned Wells

Abandoned wells pose a significant threat to groundwater; a well left unprotected is a direct conduit for pollution to the aquifer. While plumes of pollution within contaminated soils may take weeks, months, or even years to creep into the aquifer, a contamination event involving an abandoned well is immediate, irreversible, and poses a threat to the entire community's and even region's water supply.

Typically, abandoned wells are found in rural areas without municipal drinking water infrastructure, where private household wells are common. However, many still exist in urban places as a remnant of times before the growth of municipal water services. Whether urban or rural, abandoned wells are a danger and should be plugged to prevent the contamination of groundwater used by active surrounding wells.

Plugging of abandoned wells in the Tri-County area is required at the time of sale of the property through district health department ordinances (Barry-Eaton District Health Department's Time of Sale Transfer and Ingham County Health Department's Point of Sale ordinance; see Appendix VIII). All communities involved in this study require abandoned wells to be plugged when there is a change of use, though not all provide financial assistance for the costs of plugging. Of the six Tri-County communities, only Delta Township provides financial assistance for plugging wells. The average total cost of plugging a well in this region ranges from $800-$2,000; Delta Township provides half the cost of plugging, up to $600.

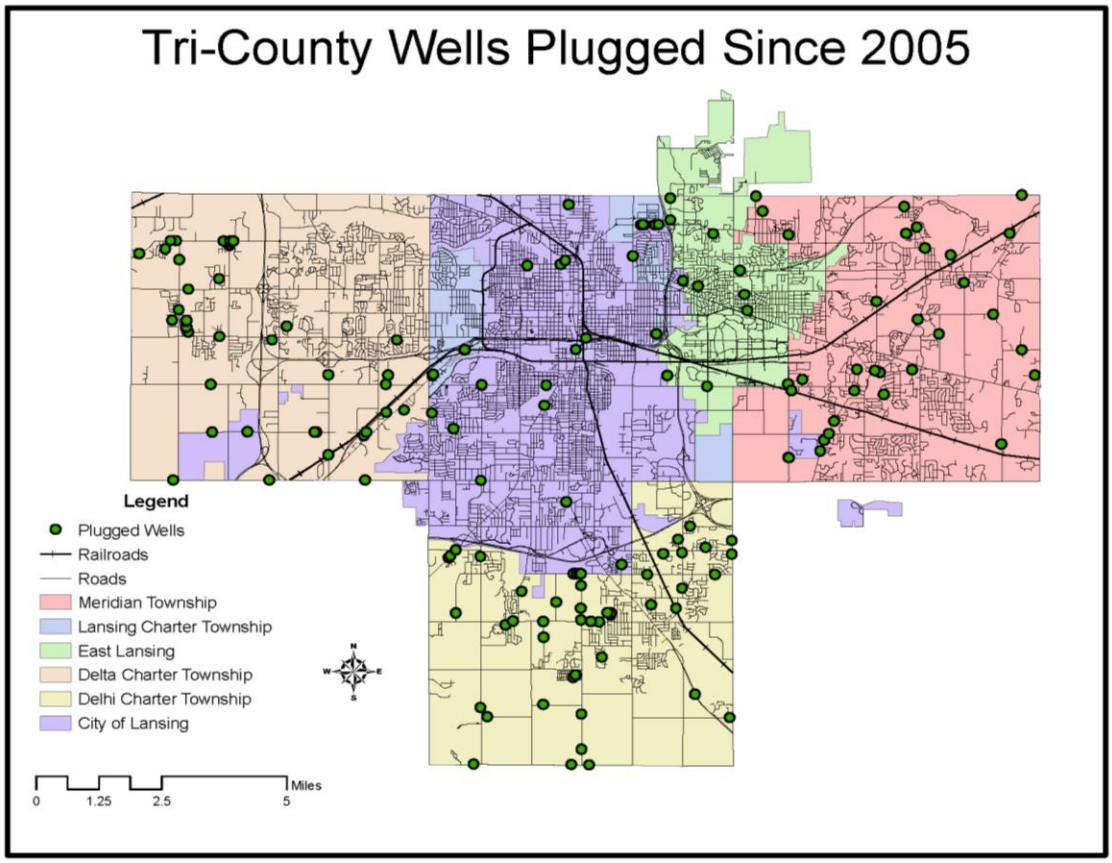


Figure 5. *Source*: Wellogic, Michigan Department of Environmental Quality 2011 (https://secure1.state.mi.us/wellogic/Login.aspx)

Well Plugging Assessment:
Extrapolating information from the “Tri-County Wells Plugged Since 2005” map, it is apparent that Delhi and Delta Township have the highest frequency of plugged wells, followed closely by Meridian Township. This pattern of well plugging is perhaps due to two factors; the presence of well plugging assistance and the concentration of abandoned wells. More urbanized communities, like Lansing Township and the Cities of Lansing and East Lansing, have operated on municipal water for decades and their roots as rural communities are more distant.

Abandoned wells will continue to pose a safety, environmental, and health threat to citizens, ecosystems, and groundwater resources if left unidentified. Without any available records, identifying these wells proves difficult. So, it is important to encourage property owners to look for evidence of aged abandoned wells. The MDEQ suggests land assessment as the best way to locate threatening wells (“Plugged Abandoned Water Wells, *MDEQ).* Furthermore, they suggest “looking for pipes sticking above ground, pipes sticking through wall or floor in the basement, electrical switch boxes out in the yard, cement pits in or under sheds, windmills, old crock, brick, or stone structures, and old hand pumps”. Similarly, they suggest scanning for buried wells by relying on metal detectors for finding buried steel well casings as well as relying on information from neighbors and the elderly. While these techniques are not enforceable, they should be encouraged by local and regional governing bodies. These voluntary investigations will only support and increase life quality.

INDIVIDUAL COMMUNITY REPORTS

Overview

Wellhead and Groundwater Protection Audit Tool

Introduction

The Groundwater Protection Audit Tool has been developed to assess six specific communities (Charter Townships of Delhi, Delta, Lansing, and Meridian, and the Cities of Lansing and East Lansing) within the Tri-County area for their application of contemporary standards as they apply to groundwater and wellhead protection. The tool seeks to identify strengths, weaknesses, opportunities and threats related to groundwater resources in the community, and to provide a framework for individual community recommendations.

This Groundwater Protection Audit Tool has been adapted from various planning, zoning, and water quality-related audit tools including:

- Kurt Schindler's *Community Planning and Zoning Audit*
  http://web5.msue.msu.edu/lu/pamphlet/Baudit/PlnASystCPZApart8.pdf
- Planning & Zoning Center at MSU's *Saginaw Bay Watershed Audit Tool*
  Not yet published
- Maryland DNR's *Tool 14: Watershed Protection Program Audit*
  http://www.dnr.state.md.us/watersheds/pubs/planninguserguide/tools/Tool14EightToolsAudit.pdf

Organization and Content

The content of this tool is organized to fit within a survey-style question-and-answer form; the complexity of answers varies by question and quotes and citations to community documents should be provided when applicable.

These communities will be evaluated based on three categories:

- The identification of elements (particularly goals, objectives, and strategies) in the master plan that relate to groundwater and wellhead protection
- An assessment of rules and regulations that relate to groundwater in the zoning ordinance or other pertinent ordinances
- An interview of a wellhead protection specialist (typically a planner or engineer) in the community focusing in the categories of **procedures and enforcement**, **education and outreach**, and **information sharing and data management**

Based on the answers provided from the question-and-answer portion of the audit; an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been populated for the

community. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

A comprehensive final analysis is provided for the community which will give a critique for each category and address specific questions from the audit. This final analysis will eventually serve as the framework for personalized individual community recommendations.

Geographic Information Systems Data

First, a map of the Tri-County region will delineate the six communities and show the area's outlined WHPAs (pg. 17). For each community's report, there are 2 maps to provide a visual representation of data pertinent to wellhead protection. The first delineates the various wellheads across the communities. These are useful in determining area of WHP's versus non-WHP's as well as giving a good reference for the protection plans. It includes multiple types of wells and their locations.

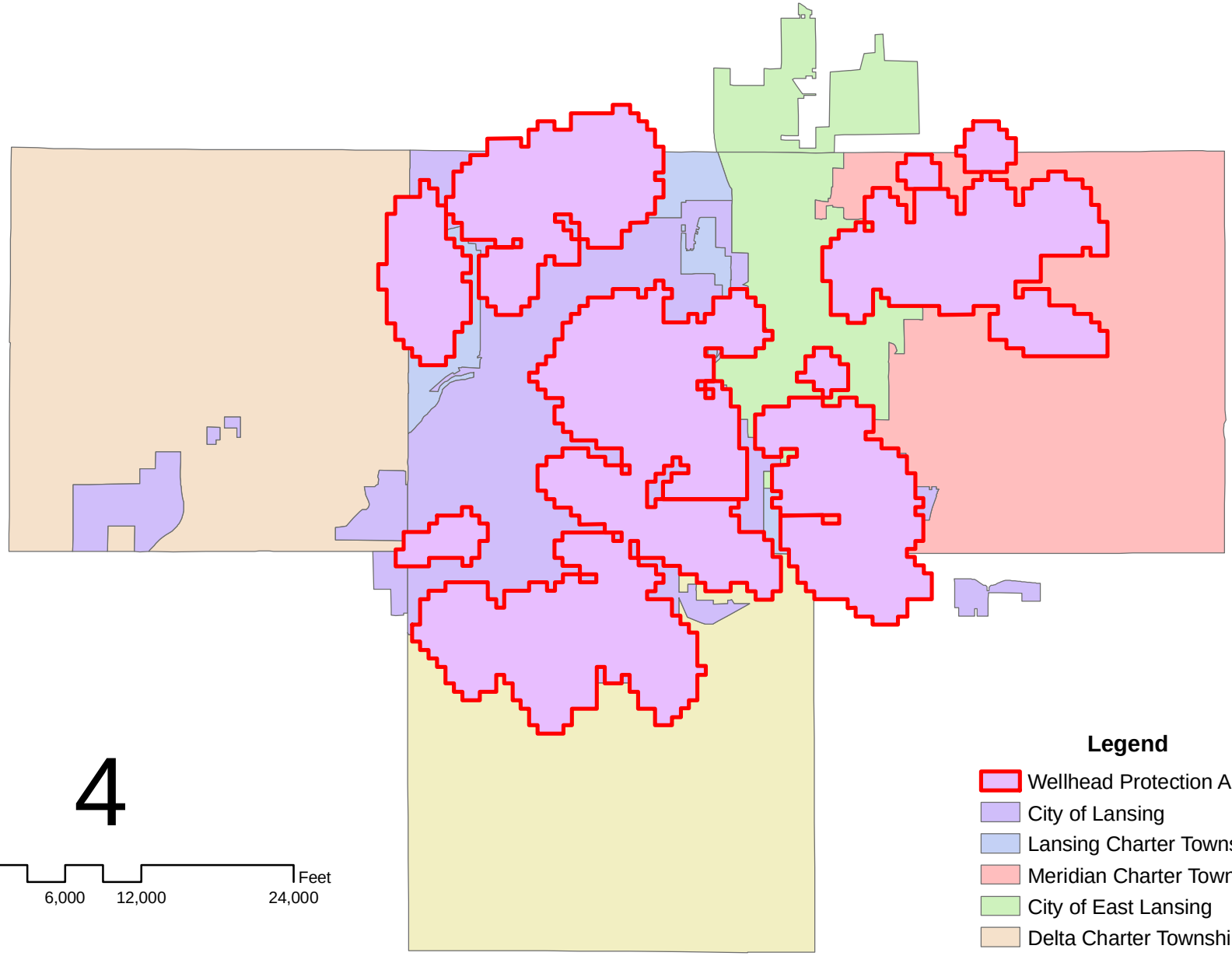
These types (defined by the MDEQ) are:

- Irrigation wells which are used to provide water for livestock, plants and other agricultural needs. Examples of these can include agricultural and golf course irrigation/
- Industrial Wells which provide for the water needs at industrial sites. Fire protection and other high use industrial processes are common necessities
- Test wells are obtained for a number of reasons. Essentially, these wells identify water levels and quality, as well as, aquifer type, level, and other characteristics. This data is used for the purpose of designing and operating water wells.
- Public wells can be broken up into three different types
    - Type 1 – Community Public – These wells provide year round water supply to no less than 25 residents or 15 living units. They are often seen supplying apartment complexes, and mobile home parks.
    - Type 2 – Non-transient Non-community Public Water Supply- Type 2 non-transient wells serve at least 25 of the same residents for at least 6 months a year. These commonly include schools and places of employment.
    - Type 2 – Transient Non-community Public Water Supply- Type 2 transient wells serve at least 25 people or connections for at minimum 60 days year. Hotels, restaurants and camp grounds utilize these wells frequently.
- Type 3- Public Water Supply- Public water wells serve the majority of the population. Any well not type 1 or 2; serves less than 25 people or 15 connections, or operates for less than 60 days per year can classify as public wells. Predominant uses for public wells serve apartment complexes, condos and town houses.

- Monitoring wells are used to view the wells hydraulic head or sample the groundwater for chemical compositions. This helps to assimilate contamination and is often used in conjunction with wellhead protection areas.
- Plugged wells are often no longer in service or abandoned. Plugging these wells helps to prevent contamination and accurately assess water usage

The third map delineates the plugged wells in each community. The plugged well map gives a view of the work the city has been able to do at plugging wells. The data used is from the DEQ and was geocoded into a GIS shapefile using the Tri-County address locator. This data is the most complete source available at this time and shows the plugging of wells since 2005.

Tri-County Target Community's WHPAs



Wellhead and Groundwater Protection
Audit Assessment

Master Plan	Delhi Township	Delta Township	City of East Lansing	City of Lansing	Lansing Township	Meridian Township
Year last updated	2007	2004	2006	1958	2009	2005
1.) Are wellhead protection areas (WHPA) included in the plan?	X				X	
2.) Are WHPAs defined?	X*				X*	X*
3.) Does the community utilize overlay zones for wellhead protection areas?†						
4.) Is there reference to designated Brownfield sites located within WHPAs?			X*		X	
5.) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	X	X			X	X
6.) If yes, is the community's strategy for protection noted?	X	X			X	X
7.) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	X	X		X*		X*
8.) Does the plan acknowledge the need for a regional effort for groundwater protection?	X	X			X	X
9.) Are specific sites with existing or perceived sources of contamination identified in the plan?	X		X		X	

X-Yes, X*-implied, but not explicitly stated; † question not factored into findings - irrelevant beyond identification

Zoning Ordinance	Delhi Township	Delta Township	City of East Lansing	City of Lansing	Lansing Township	Meridian Township
10.) Are WHPAs free of any districts zoned for medium or heavy industrial uses?†	X		X			X
11.) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department?†	X	X*	X	X	X*	X
12.) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?						X*
13.) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	X	X	X	X	X	X
14.) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality?	X	X*	X	X	X	X
15.) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality?	X	X*	X	X	X	X
16.) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements?	X	X*	X	X	X	X
17.) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?						
18.) Are there any provisions in the zoning ordinance for the demolition of buildings that include the magement of wells as a standard?			X*	X	X	
19.) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies?			X	X	X	X
20.) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?†	X	X	X		X	X

X-Yes, X*-implied, but not explicitly stated; † question not factored into findings - irrelevant beyond identification

Zoning Ordinance: Site Plan Review	Delhi Township	Delta Township	City of East Lansing	City of Lansing	Lansing Township	Meridian Township
21.) Please indicate which of the following conditions/requirements are present for approval of site plans:						
Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	X	X	X	X	X	X
The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	X	X	X	X	X	X
Location for on-site wastewater treatment and disposal systems.	X*	X	X	X	X	X
Location for existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	X	X	X	X	X	X
Description and location for any existing or proposed above ground and below ground storage facilities.	X	X	X	X	X	X
If floor drains are permitted: The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	X	X*	X	X*	X	X
If floor drains are permitted: Is it a requirement that they be connected to subsurface wastewater disposal systems?	X*			X*		X
Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	X	X	X	X	X	X
Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	X	X	X	X	X	X
Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	X	X	X	X	X	X
Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?		X	X		X	X
If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?		X				

X-Yes, X*-implied, but not explicitly stated; † question not factored into findings - irrelevant beyond identification

Interview Questions*	Delhi Township	Delta Township	City of East Lansing	City of Lansing	Lansing Township	Meridian Township
22.) Does the community require onsite inspections of new land uses in WHPAs?	X	X	X	X*	X	X*
23.) Is a Phase I Environmental Assessment required before starting development in WHPA?			X*	X*		X*
24.) Have no new variances been issued in the past three years that affect groundwater regulations?	X	X	X	X	X	X
25.) Does the community require potentially contaminating land uses to submit contingency plans for emergency response?	X	X	X	X	X	X
26.) If yes, do these plans ensure protection from discharges and spills to groundwater?	X	X	X	X	X	X
27.) Does the community provide incentives in reporting and plugging private abandoned wells?		X				
28.) Does the community have signs to build awareness about WHPAs?					X	
29.) When a community delineates a new WHPA, is the information shared with other communities within the 10-year time of travel?	X*		X	X	X	X
30.) Have any new public wells been drilled in the community since 2005? †						
31.) Are local groundwater regulations reviewed by a regional authority prior to implementation?	X	X	X	X	X*	X
32.) Does your community maintain basic groundwater-based GIS data layers?	X			X	X	X

***Some of the interview questions from the wellhead and groundwater protection audit tool are not included on this matrix due to complexity of answers. (Question numbering may not coincide with audit tool numbering)**

X-Yes, X*-implied, but not explicitly stated; † question not factored into findings - irrelevant beyond identification

REGIONAL FINDINGS

All six communities have met the following standards that help to strengthen groundwater and wellhead protection
The Zoning Ordinance for each community:

- Regulates that abandoned water wells, abandoned monitoring wells and cisterns be plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department
- Includes the definitions of materials deemed to be 'hazardous substances'
- States that above ground storage tanks be certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality
- States that underground storage tanks be registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality
- States that local regulations be present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements

The Site Plan Review's requirements for site approval include:

- Existing topographic elevations at two (2) foot contour intervals and indicate direction of drainage flow.
- The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.
- Location for on-site wastewater treatment and disposal systems.
- Location for existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.
- Description and location for any existing or proposed above ground and below ground storage facilities.
- The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan. (If floor drains are permitted)
- An inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).
- Descriptions of the types of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.
- Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.

From interviews with the professional planners, the 6 communities:

- Require potentially contaminating land uses to submit contingency plans for emergency response

- Ensure protection from discharges and spills to groundwater through contingency their plans
- Share information with other communities within the 10-year time of travel when a community delineates a new wellhead protection areas
- Ensure that new regulations concerning wellhead and groundwater issues are thoroughly reviewed by the regional planning authority.

Findings and Recommendations for

DELHI CHARTER TOWNSHIP

Master Plan
Findings for Delhi Township indicate **6 of 8** outcomes have been met. For further improvement, the community can:

- Define WHPAs using local, state, or federal definitions
- Cite the location of existing and perceived sources of contamination as well as designated Brownfield sites located within the WHPAs

Zoning Ordinance
Findings for Delhi Township indicate **5 of 8** outcomes have been met. For further improvement, the community can:

- Amend zoning ordinance to set limits for volumes of on-site storage of fuel and other potential contaminants
- Create ordinance provisions for the demolition of buildings that ensure the safeguarding of wells
- Create zoning provisions that explicitly state that “no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies”

Site Plan Review
Findings for Delhi Township indicate **8 of 12** outcomes have been met. For further improvement, the community can:

- If floor drains are permitted, require that they be connected to subsurface wastewater disposal systems
- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains”

General Recommendations
Findings from an interview with Tracy Miller indicate **7 of 11** satisfactory responses. For further improvement, the community can:

- Set standards for when a Phase I Environmental Site Assessments are required; make these a requirement for any new development in WHPAs
- Develop assistance programs (financial and/or technical) for locating and plugging abandoned wells
- Develop an awareness program for WHPAs that includes signage
- Gather and maintain basic GIS data on wells and WHPAs
- Update Contingency Plans

  Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have

knowledge of locations with hazardous material in order to handle the emergency correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.

- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community's water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: Delhi Charter Township

Master Plan

This section is to be completed by relying on the community's master plan document (Delhi Charter Township Master Plan 2007) as well as any supplementary adopted plans. This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPAs) included in the plan?	Yes, pg. 62: "Delhi Township is one of twelve dues paying members of the Groundwater Management Board (GMB.) which was created in 1983 as an ongoing forum for groundwater protection issues, and has helped GMB communities to delineate wellhead protection areas for their municipal water wells."
2) Are WHPAs defined?	Not explicitly, (pg.62)."Some Wellhead Protection Areas cross municipal lines into the City of Lansing and Alaiedon Township…".
3) Does the community utilize overlay zones for WHPAs?	No
4) Is there reference to designated Brownfield sites located within WHPAs?	No

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	Yes, pg. 67: "Goal 2, Protect the groundwater, surface waters, and shorelines".
6) *Follow-up:* If yes, is the community's strategy for protection noted?	Yes, pg. 62: "To pursue groundwater protection at the Township level, Delhi can pursue several different planning initiatives. Developed site plan amendments within the zoning ordinance regarding wellheads ensure the protection of these areas from development. A workbook has been developed by the GMB. with a "fill in the blank" approach to help with the development of management plans. Classes are offered periodically and staff from the GMB is available to provide assistance."
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	Yes, pg. 62: "Delhi Township can work cooperatively with the Lansing Board of Water and Light so that areas already selected for future municipal wells are taken into consideration when making land use decisions".
8) Does the plan acknowledge the need for a regional effort for groundwater protection?	Yes, pg.62: "To pursue groundwater protection at the Township level, Delhi can pursue several different planning initiatives. Developed site plan amendments within the zoning ordinance regarding wellheads ensure the protection of these areas from development. A workbook has been developed by the G.M.B. with a "fill in the blank" approach to help with the development of management plans. Classes are offered periodically and staff from the GMB is available to provide assistance."pg. 63 "Remembering that groundwater contamination does not stop at municipal lines, it is clear that great care must be taken through sound planning practices to assure that Township residents continue to enjoy a plentiful, quality water supply".

9) Are specific sites with existing or perceived sources of contamination identified in the plan?	Yes, pg. 63" Ingham County Health Department keeps track of sites where contamination is known or likely to exist in order to prevent new wells from being located on or near the site. Although some listings may also be considered 201 or LUST site listings, the Health Department lists fifteen sites within Delhi Township and sixty-four throughout the County"; pg. 67: "There are areas of pollution within Delhi Township on record at both the State and County levels. The Environmental Response Division of the Department of Environmental Quality (DEQ) regulates sites defined as "contaminated" by State Statute (Part 201 of P.A. 451 of 1994). Known as "201 Sites", the State currently reports four within Delhi Township including the Gunn Road Landfill. The Underground Storage Tank Division of the DEQ is responsible for keeping track of Leaking Underground Storage Tanks (LUST sites) which are not included as 201 sites."

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Code of Ordinances: Charter Township of Delhi, Michigan. Codified through Ordinance No.118, adopted May 18, 2010. (Supplement No. 14)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	Yes, based on a comparison of zoning maps and WHPA maps, it is apparent that the Industrial Warehouse District which allows for the storage of fuels, chemicals, and hazardous waste resides within a WHPA.
11) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department?	Yes, section 3.3.6: "Abandoned water wells (wells that are no longer in use or are in disrepair), abandoned monitoring wells, and cisterns shall be plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality and the Ingham County Health Department."
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	No
13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, section 6.75: "Hazardous substance/waste, as defined by section 101(14) of the United States Comprehensive Environmental Response Compensation and Liability Act (CERCLA) means a substance designated pursuant to section 311 (B)(2))(A) of the Federal Water Pollution Control Act; any element, compound, mixture, solution or substance designated pursuant to section 102 of CERCLA; any hazardous waste having characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (not including waste regulations suspended by act of Congress); any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act; any hazardous air pollutant listed under section 102 of the Clean Air Act; and any hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to section 7 of the Toxic

	Substance Control Act."
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 3.3: "Above ground storage tanks shall be certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."
15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 3.3: "Underground storage tanks shall be registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 3.3: "Built storage facilities for pesticides and fertilizers shall be in compliance with requirements of the Michigan Department of Agriculture."
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	No

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	No

20) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	Yes, section 5.15.9: "It is the further intent of this district (Industrial Warehouse District) to only allow uses that are compatible with and not potentially injurious to those areas of the township that are groundwater recharge areas."

Site Plan Review Assessment

Question	Response
21) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, section 3.3: "With (two-foot contour intervals) off-site elevations within approximately one hundred (100) feet of the property. Include finish floor elevations, drainage and typical cross sections. Drainage plan shall address natural drainage, storm sewer systems, subdrainage, and soil sedimentation and erosion control."
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	Yes, section 3.3: "The location and elevations of existing watercourses and waterbodies, including county drains and manmade surface drainage ways, floodplains and wetlands."
➢ Location for on-site wastewater treatment and disposal systems.	Yes, but not explicitly, section 3.3: "Location and outline of all existing development and natural features on the site and adjacent sites within two hundred (200) feet of the property line, such as buildings, drives, parking areas, wells, septic tanks, drain fields, utilities, poles, ditches, underground storage tanks, above ground storage areas, woods, streams, marshes, wetlands, fence rows, individual trees of six (6) inches or larger caliper when not located in a woods, 100-year flood hazard area depicted in plan view. Utilities plan - showing on-site utility locations, including sanitary sewer sanitary sewer service, waterlines, gas, electrical, telephone, cable television and other pertinent utility information".
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, section 3.3: "Location of existing and proposed public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes."
➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, section 3.3: "Description and location for any existing or proposed above ground and below ground storage facilities."
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Yes, section 3.3: "The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drain and pipes shall be specified on the site plan."
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	Yes, not explicitly stated, section 3.3: "General purpose floor drains shall be connected to a public sewer system or an on-site holding tank (not a septic system) in accordance with state, county and municipal requirements, unless a groundwater discharge permit has been obtained from the Michigan Department of Environmental Quality. General purpose floor drains which discharge to groundwater are generally prohibited."
➢ Inventory of hazardous substances to be	Yes, section 3.3: "Inventory of hazardous substances to be stored, used or

stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	generated on-site, presented in a format acceptable to the township fire chief (include CAS numbers)."
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	Yes, section 3.3: " Descriptions of type of operations proposed for the project and drawings showing size, location and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes and/or polluting materials."
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, section 3.3: "Completion of the environmental permits checklist on the form provided by the director of community development."
➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	No
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?	N/A

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *Tracy Miller (Director of Community Development, Delhi Township)*

Date/Time: *3/16/2011*

Location: *E-mail Correspondence*

Procedural & Enforcement

Wellhead Protection

Question	Response
22) Does the community require onsite inspections of new land uses in WHPAs?	All new land uses require some form of on-site inspection such as a zoning compliance inspection, building inspection, etc., but the Delhi Township does not require a specific inspection that is aimed only at WHP goals.
23) How often are plugged wells inspected?	This is done by the Ingham County Health Department.
24) Is a Phase I Environmental	No, not by the Township. Phase I's are typically required by lenders and are usually

Assessment required before starting development in a WHPA?	done when a new entity acquires a property, but again this is not a specific requirement relative to WHP.
25) How often are new WHPAs assessed and integrated into maps and plans?	The interview subject is not sure about this question and refers to the Tri-County Regional Planning Commission and the Lansing Board of Water and Light (LBWL).

Groundwater Protection

Question	Response
26) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	No
27) Within the past three years, have any variances been given that affect groundwater regulations?	No
28) Does the community require potentially contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	Yes. A "basic monitoring report" is submitted for each new project. In addition, companies that are potentially contaminating are typically required to file a PIPP (Pollution Incident Prevention Plan) and a FFRTK (Fire Fighter Right-to-Know) report. These detail the potential contaminate sources such as specific chemicals to be stored as well as containment and spill prevention/cleanup procedures.
29) In what instances does the municipality require groundwater monitoring?	The Delhi Township does not specifically require this. Typically this is a state requirement when a site has been identified through the environmental assessment process as being contaminated. The state works with the property owner to develop a cleanup and mitigation plan that would include specifics about groundwater monitoring (frequency, etc.) if necessary.
30) Do you have and use an environmental assessment checklist? How often is this updated?	Yes, the interview subject does not think that it's been updated within the past 5 years. Delhi Township uses the standard Ingham County Environmental Permits Checklist.

Education & Outreach

Wellhead Protection

Question	Response
31) Does the community provide incentives in reporting and plugging private abandoned wells?	Not currently. Delhi Township used to participate in the well capping program via the Tri-County Regional Planning Commission (TCRPC), but that program is no longer funded. They do not provide incentives; however, they require that wells are properly plugged when a property owner seeks connection to the public water supply.
32) Does the community have signs to build awareness about WHPAs?	No, but they have watershed prosecution area signs. They also use signs in the parks and on their manhole covers to alert residents about dumping things in drains and allowing animal waste to accumulate on the ground. They also have several rain gardens that are marked with signage which explains how they work to filter storm water and recharge the aquifers.

Groundwater Protection

Question	Response
33) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	Yes, Delhi Township participated with TCRPC and the "Cap Wells" promotions. They also consistently educate residents via their storm water program about the interconnectivity between surface water, storm water, groundwater, wetlands, and drinking water. Examples include the annual "Publicly Owned Treatment Works

	(POTW) Open House" where people are invited to the sewage treatment plant and they specifically talk/educate about this relationship.
34) Is the community actively involved in the Children's Water Festival?	Not noted

Information Sharing & Data Management

Wellhead Protection

Question	Response
35) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	Delhi Township does not delineate the wellhead protection areas. The LBWL provides public drinking water system and the wellhead areas are defined by them.
36) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	The interview subject stated 'no' to this question, but she referred this to LBWL.

Groundwater Protection

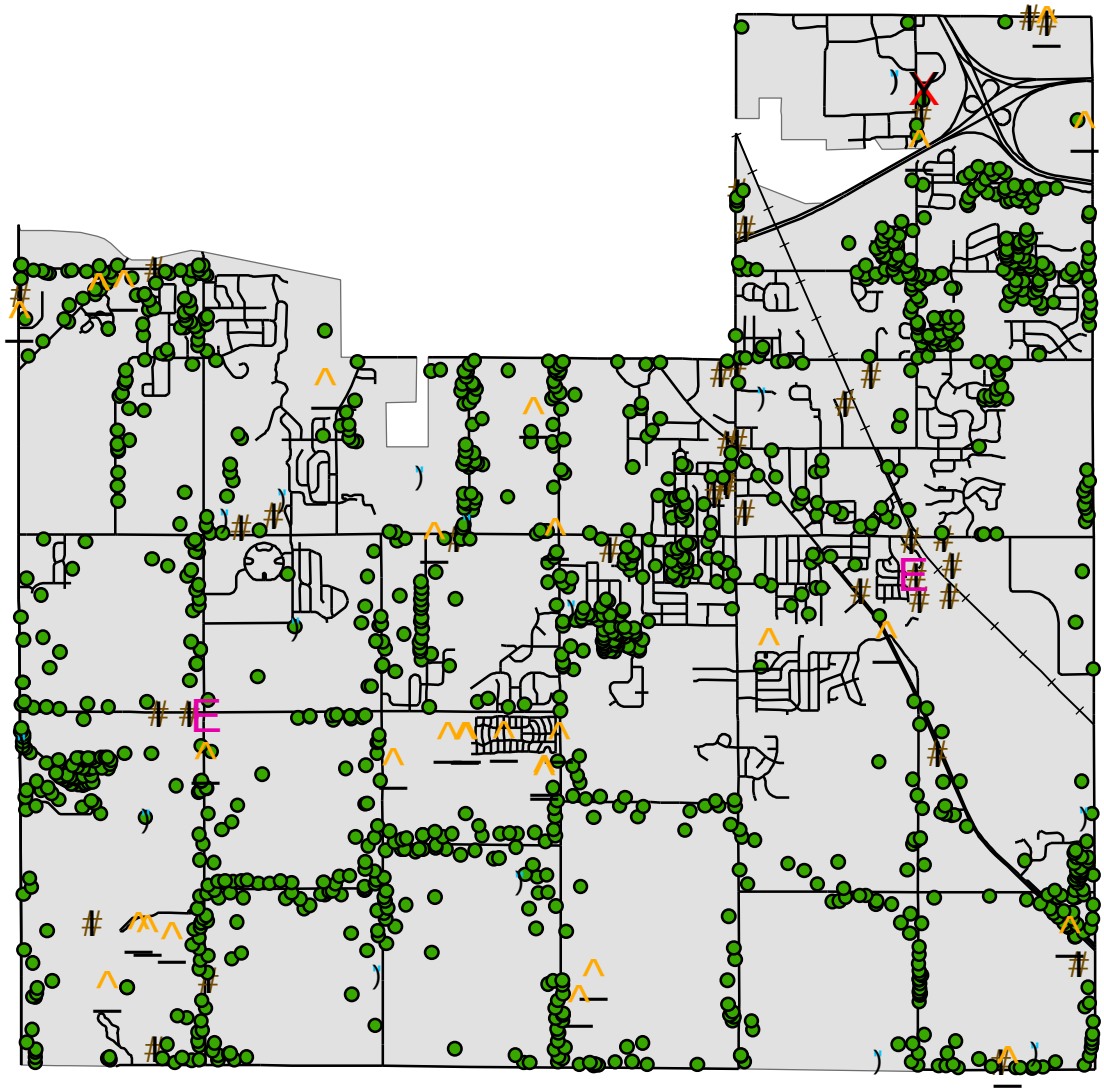
Question	Response
37) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	They participate with the Tri-County Regional Planning Commission on regulations.
38) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	Tri-County Regional Planning Commission
39) How is your community represented on the Groundwater Management Board?	They are participating members and staff regularly attends the meetings.
40) Does your community maintain basic GIS data on wells and WHPA's?	Yes, they are the same layers that are provided by the state.
41) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	GIS was, until very recently, housed in our Community Development Department. The GIS responsibilities have been moved to the IT Department due to the expansion of use and implementation of this resource. The GIS professionals in the region regularly work together to ensure data sharing and consistency.

SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

Strengths	Weaknesses
• Information shared across agencies and communities • All new land uses require some form of on-site inspection such as a zoning compliance inspection, building inspection, etc. • Engagement in a media campaign that promotes groundwater quality	• No zoning provision for the demolition of structures that include the protection of wells as a standard • Lack of data of private and abandoned wells • Does not provide plugging assistance for abandoned wells
Opportunities	**Threats**
• Expand standard environmental checklist regularly to be more specific to the community • Fulfill wellhead protection strategy outlined in master plan	• Reduced state and federal funding threatens local wellhead protection efforts • No explicit provisions of location for on-site wastewater treatment and disposal systems

Delhi Charter Township Wells



Legend

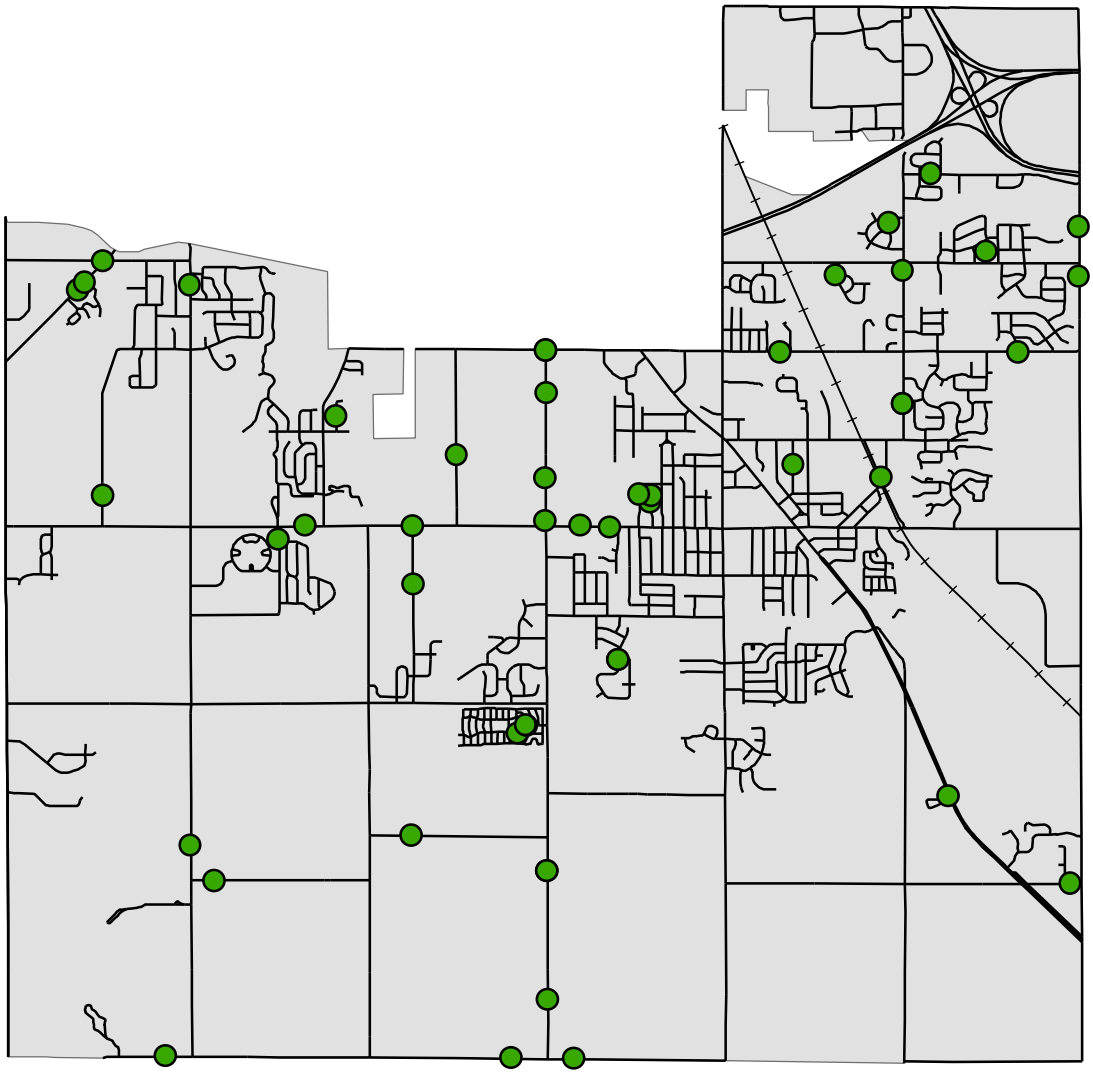
- Industrial Wells
- Public Wells
- Test Wells
- Irrigation Wells
- Private Wells
- Monitoring Wells
- Road
- Railroads
- Delhi Township

4

0 3,000 6,000 12,000 Feet

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Delhi Charter Township Plugged Wells Since 2005



4

0 3,000 6,000 12,000 Feet

Legend

- Plugged Wells since 2005
- Road
- Railroads
- Delhi Township

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Findings and Recommendations for

DELTA CHARTER TOWNSHIP

Master Plan
Findings for Delta Township indicate **4 of 8** outcomes have been met. For further improvement, the community can:

- Define WHPAs and reference where to find the most current WHP data and delineations.
- Define WHPAs using local, state, or federal definitions.
- Cite the location of existing and perceived sources of contamination as well as designated Brownfield sites located within the WHPAs.

Zoning Ordinance
Findings for Delta Township indicate **4 of 8** outcomes have been met. For further improvement, the community can:

- Amend zoning ordinance to set limits for volumes of on-site storage of fuel and other potential contaminants.
- Create ordinance provisions for the demolition of buildings that ensure the safeguarding of wells.
- Create zoning provisions that explicitly state that “no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies”.

Site Plan Review
Findings for Delta Township indicate **11 of 12** outcomes have been met. For further improvement, the community can:

- If floor drains are permitted, require that they be connected to subsurface wastewater disposal systems.

General Recommendations
Findings from an interview with Gary Bozek indicate **6 of 11** satisfactory responses. For further improvement, the community can:

- Set standards for when Phase I Environmental Site Assessments are required; make these a requirement for any new development in WHPAs.
- Develop assistance programs (financial and/or technical) for locating and plugging abandoned wells.
- Develop an awareness program for WHPAs that includes signage.
- Gather and maintain basic GIS data on wells and WHPAs.
- Update Contingency Plans

Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have knowledge of locations with hazardous material in order to handle the emergency correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.

- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community's water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: Delta Charter Township

Master Plan

This section is to be completed by relying on the community's master plan document (Delta Charter Township Comprehensive Plan 2004) as well as any supplementary adopted plans. This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPAs) included in the plan?	No
2) Are WHPAs defined?	No
3) Does the community utilize overlay zones for WHPAs?	No
4) Is there reference to designated Brownfield sites located within WHPAs?	No

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	Yes, p.94: "Goal Statement #8: …Protect and enhance groundwater aquifers, natural recharge areas and surface water resources from contamination."
6) *Follow-up:* If yes, is the community's strategy for protection noted?	Yes, p.94: "1) Inventory Delta Township's water resources including wetlands, streams, ponds, etc. via the GIS System, 2) Adopt the TCRPC Well Head Management Plan and Ordinance Amendments, 3) Consider adoption of zoning ordinance amendments that would limit the amount of impervious surfaces in commercial developments. Consider a limit on the maximum number of parking spaces above the minimum that can be provided on a site, 4) Consider a stream buffer ordinance to reduce pollution from run-off and erosion, 5) Consider the adoption of a Township Wetlands Protection Ordinance, 6) Recommend Township financing of a well capping program for abandoned private wells, 7) Participate in phase II of the Federal Stormwater Management Program in an effort to improve the quality of stormwater runoff, 8) Support the Eaton County Drain Commissioner in the enforcement of Compiled Rules."
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	Yes, pg. 51: "The appearance of West Saginaw and traffic volumes in residential areas were identified as moderate problems. The protection of groundwater was listed as a possible problem. The amount of wetlands and the availability of sidewalks were identified as "not a problem.
8) Does the plan acknowledge the need for a regional effort for groundwater protection?	Yes, pg. 94: "Adopt the TCRPC Well Head Management Plan and Ordinance Amendments"

9) Are specific sites with existing or perceived sources of contamination identified in the plan?	No

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Code of Ordinances: Charter Township of Delta, Michigan. Codified through Ordinance No. 10-50, enacted April 19, 2010. (Supplement No. 16)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	Yes, based on a comparison of zoning maps and WHPA maps.
11) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Implied but not explicitly stated. (source: Interview)
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	No
13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, pg. 18-49: "defined as a chemical or other material which is or may become injurious to the public health, safety, or welfare or to the environment."
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Implied but not explicitly stated, pg. 18-49: "Material storage and use areas shall be constructed such that no liquid polluting material can escape via gravity through building sewers, drains, or otherwise directly or indirectly into any sewer system or the surface of ground waters… Secondary containment for aboveground areas where hazardous substances are stored or used shall be provided. Secondary containment shall be sufficient to store the substance for the maximum anticipated period of time necessary, for the recovery of any released substance."

15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Implied but not explicitly stated, pg. 18-49: "Material storage and use areas shall be constructed such that no liquid polluting material can escape via gravity through building sewers, drains, or otherwise directly or indirectly into any sewer system or the surface of ground waters… The use and storage of a Hazardous Substance, defined as a chemical or other material which is or may become injurious to the public health, safety, or welfare or to the environment, shall be identified.
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Implied but not explicitly stated, pg. 6-1: "Land and/or buildings may be utilized for the following uses by Special Land Use approval, subject to the applicable general and specific requirements and standards of Chapter 18… (F) Bulk feed, seed and fertilizer outlets and distribution centers." 18-14: "(1) Parking areas shall be subject to a required front yard setback of thirty-five (35) feet. (2) Parking lots, the nearest edge of which is fifty (50) feet or nearer to a residential district or use, shall be effectively screened by a buffer strip, wall or fence at least three (3) feet above the highest point of the parking lot which it screens. It shall be designed so as not to present a safety hazard for vehicles entering or leaving the site. (3) Exterior storage of equipment or accessory items, display of materials, goods, or supplies shall not take place within thirty-five (35) feet of the front lot line or in any side or rear yard area."
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	No

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	No
20) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	Yes, pg. 19-2 (Site Plan Review Process): The clearing, grading, and balancing of land may commence absent site plan review if all necessary permits have been obtained from the appropriate State or local agencies. The property owner(s) or developer(s) proceed at their own risk despite having a Soil Erosion Permit, due to the fact that subsequent reviews may necessitate modifications to the grades. If deemed necessary, a Soil Erosion and Sedimentation Permit shall be obtained from the Eaton County Drain Commissioner. If regulated floodplains and/or wetlands are located on the property, the applicable permits shall be obtained from the Michigan Department of Natural Resources.

Site Plan Review Assessment

Question	Response
21) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, pg. 19-2: “Application Requirements: … contours at two foot intervals...” & 19-3: “Proposed grades and site drainage patterns, including existing and proposed drainage structures. Where applicable, indicate the location and elevation(s) of the 100 year floodplain.”
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	Yes, pg. 19-2: “Application Requirements: … Legal description of site, dimensions of site boundary lines, total site area, water courses and water bodies, and locations of all buildings, driveways, parking areas; and other structures on adjacent properties within one hundred (100) feet of the property, including those located across the street from the property.”
➢ Location for on-site wastewater treatment and disposal systems.	Yes, pg. 19-3: “(g) Existing and proposed water supply and wastewater systems locations, including wells.”
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, pg. 19-3: “(g) Existing and proposed water supply and wastewater systems locations, including wells.”
➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, pg. 19-3: “(q) Description and location of existing and proposed above and below ground storage facilities for hazardous substances.”
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Implied but not explicitly stated, pg. 18-49: “Material storage and use areas shall be constructed such that no liquid polluting material can escape via gravity through building sewers, drains, or otherwise directly or indirectly into any sewer system or the surface of ground waters.”
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	No
➢ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	Yes, pg. 19-3: “(o) Chemical Substances Survey as provided by the Fire Department and an Environmental Checklist as provided by the Planning Department.”
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	Yes, pg. 19-3: “(p) Description of the type of operations proposed for the project and plans showing the size, location, and description of any proposed areas for storing, use, loading/unloading of hazardous substances and hazardous wastes.“
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, pg. 19-3: “(o) Chemical Substances Survey as provided by the Fire Department and an Environmental Checklist as provided by the Planning Department.”

➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	Yes, pg. 18-49: "(1) The site shall be served by public water and sanitary sewer service. (2) On-site treatment of waste, sludge, or effluent may be required by the Delta Township Utilities Director prior to the placement of such liquids into public sanitary sewers. (3) Material storage and use areas shall be constructed such that no liquid polluting material canescape via gravity through building sewers, drains, or otherwise directly or indirectly into any sewer system or the surface of ground waters. (4) The use and storage of flammable and combustible liquids shall be identified and provided to the Fire Chief. (5) The use and storage of a Hazardous Substance, defined as a chemical or other material which is or may become injurious to the public health, safety, or welfare or to the environment, shall be identified. Secondary containment for aboveground areas where hazardous substances are stored or used shall be provided. Secondary containment shall be sufficient to store the substance for the maximum anticipated period of time necessary, for the recovery of any released substance."
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?	Yes, pg. 18-49: "Material storage and use areas shall be constructed such that no liquid polluting material can escape via gravity through building sewers, drains, or otherwise directly or indirectly into any sewer system or the surface of ground waters."

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *Gary Bozek, Senior Planner for Delta Charter Township*

Date/Time: *March 4th, 2011 10:00AM*

Location: *Delta Township Hall*

Procedural & Enforcement

Wellhead Protection

Question	Response
22) Does the community require onsite inspections of new land uses in WHPAs?	Yes, they are held to the same standards as any development site.
23) How often are plugged wells inspected?	Not often, TCRPC is responsible for this.
24) Is a Phase I Environmental Assessment required before starting	No, but it is required by the project's financial lender.

development in a WHPA?	
25) How often are new WHPAs assessed and integrated into maps and plans?	Not often, TCRPC is responsible for this.

Groundwater Protection

Question	Response
26) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	No
27) Within the past three years, have any variances been given that affect groundwater regulations?	No
28) Does the community require potentially contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	Yes, it is required by the fire department.
29) In what instances does the municipality require groundwater monitoring?	None specifically, as the state is primarily responsible for this.
30) Do you have and use an environmental assessment checklist? How often is this updated?	Yes, it is managed through Eaton County.

Education & Outreach

Wellhead Protection

Question	Response
31) Does the community provide incentives in reporting and plugging private abandoned wells?	Yes, in paying half of the cost, up to $600.
32) Does the community have signs to build awareness about WHPAs?	No

Groundwater Protection

Question	Response
33) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	No, TCRPC is responsible this.
34) Is the community actively involved in	No, but the Greener Delta event was similar, although recently suspended.

the Children's Water Festival?	

Information Sharing & Data Management

Wellhead Protection

Question	Response
35) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	No, TCRPC is responsible this.
36) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	Unknown, the Health Department is responsible for this.

Groundwater Protection

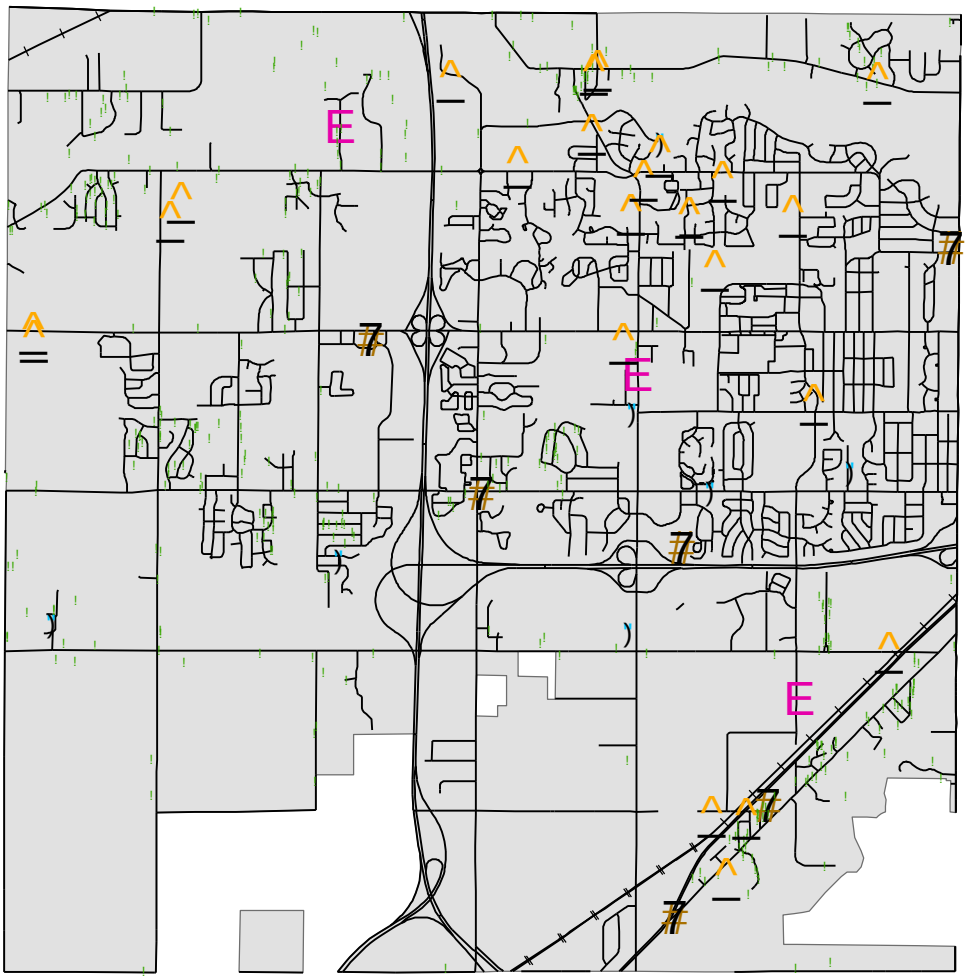
Question	Response
37) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	Yes, by TCRPC
38) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	TCRPC
39) How is your community represented on the Groundwater Management Board?	Gary Bozek serves on the board.
40) Does your community maintain basic data GIS data on wells and WHPA's?	No, but new software is being installed that could make this possible in the future.
41) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	Engineering and IT departments share this if requested.

SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

Strengths	Weaknesses
• Incentives and assistance is available for plugging wells • All new land uses require some form of on-site inspection • Information is shared across agencies and communities	• Does not maintain an updated environmental checklist • Regulations are not specifically in line with MDEQ standards • No zoning provisions for the demolition of a structure that include the protection of wells as a standard • No locally focused wellhead protection media campaign that promotes education and awareness • Lack of data on private abandoned wells
Opportunities	**Threats**
• Expand the standard environmental permits checklist regularly to be made specific to the community • Fulfill the wellhead protection strategy outlined in the master plan	• Contamination and Brownfield sites are not closely monitored in regards to groundwater safety. • Reduced state and federal funding threatens local wellhead protection efforts • Insufficient regulations for floor drains allow for discharge of potentially hazardous materials • Lacking regulation of discharges in surface water and groundwater • Medium and heavy industrial zoning districts located within WHPAs

Delta Charter Township Wells



4

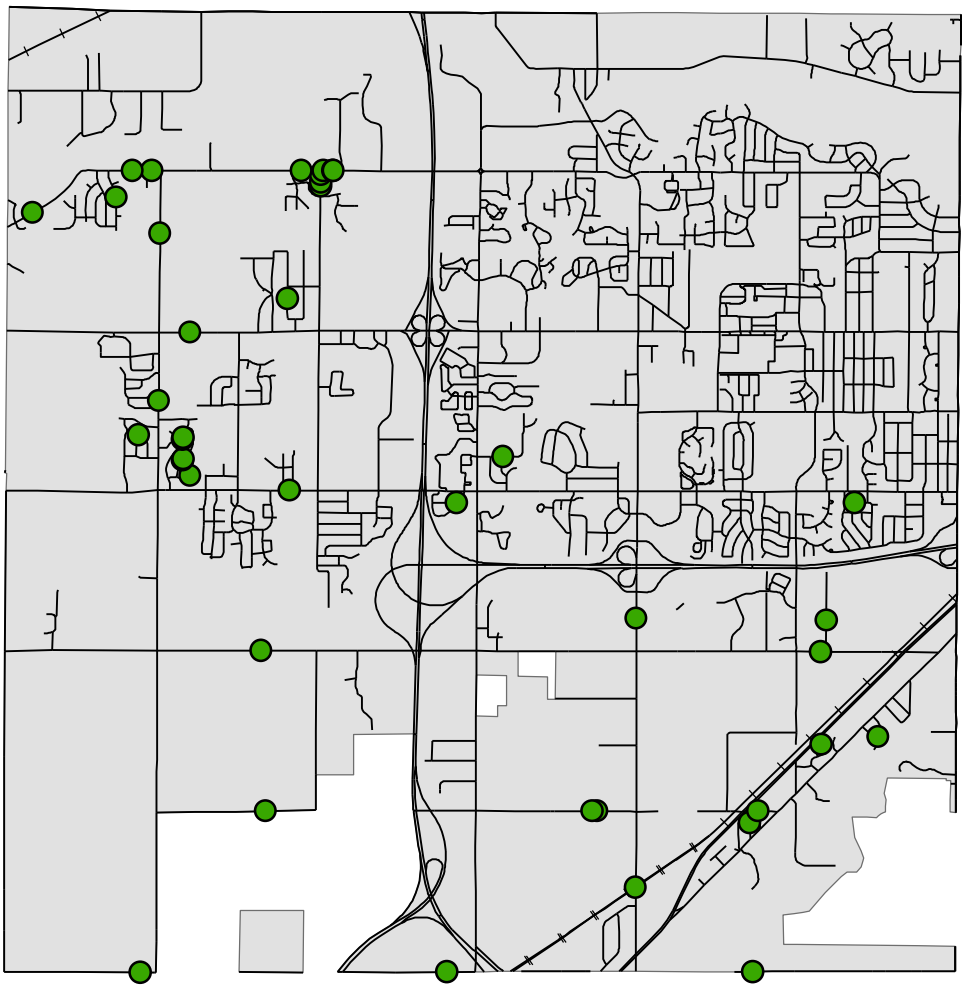
0 3,500 7,000 14,000 Feet

Legend

- Public Wells
- Private Wells
- Monitoring Wells
- Irrigation Wells
- Industrial Wells
- Allroads
- Railroads
- Delta Charter Township

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Delta Charter Township Plugged Wells Since 2005



4

0 3,550 7,100 14,200 Feet

Legend

- Plugged Wells
- Allroads
- Railroads
- Delta Charter Township

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Findings and Recommendations for

THE CITY OF EAST LANSING

Master Plan

Findings for the City of East Lansing indicate **2 of 8** outcomes have been met. For further improvement, the community can:

- Define WHPAs and reference where to find the most current WHP data and delineations
- Define WHPAs using local, state, or federal definitions
- Cite the location of existing and perceived sources of contamination as well as designated Brownfield sites located within the WHPAs
- Create goals and objectives that acknowledge and safeguard groundwater resources, as well as outlined strategies to achieve them
- Acknowledge the relationship between future land use change and groundwater
- Acknowledge the need for a regional effort for groundwater and wellhead protection

Zoning Ordinance

Findings for City of East Lansing indicate **6 of 8** outcomes have been met. For further improvement, the community can:

- Create ordinance provisions for the demolition of buildings that ensure the safeguarding of wells
- Create zoning provisions that explicitly state that “no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies”

Site Plan Review

Findings for City of East Lansing indicate **8 of 12** outcomes have been met. For further improvement, the community can:

- If floor drains are permitted, require that they be connected to subsurface wastewater disposal systems
- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains”

General Recommendations

Findings from an interview with Timothy Schmitt indicate **7 of 11** satisfactory responses. For further improvement, the community can:

- Set standards for when a Phase I Environmental Site Assessments are required; make these a requirement for any new development in WHPAs.

- If floor drains are permitted, require that they be connected to subsurface wastewater disposal systems
- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains”
- Require comprehensive on site inspections of new land uses within WHPAs that include the identification of potential threats to groundwater contamination, such as unplugged abandoned wells
- Develop assistance (financial or technical) program for locating and plugging abandoned wells
- Develop an awareness program for WHPAs that includes signage
- Gather and maintain basic GIS data on wells and WHPAs
- Update Contingency Plans

  Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have knowledge of locations with hazardous material in order to handle the emergency correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.
- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community’s water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: City of East Lansing

Master Plan

This section is to be completed by relying on the community's master plan document (City of East Lansing: Comprehensive Plan for our Future 2006) as well as any supplementary adopted plans. This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPAs) included in the plan?	No
2) Are WHPAs defined?	No
3) Does the community utilize overlay zones for WHPAs?	No
4) Is there reference to designated Brownfield sites located within WHPAs?	No

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	No
6) *Follow-up:* If yes, is the community's strategy for protection noted?	N/A
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	No
8) Does the plan acknowledge the need for a regional effort for groundwater protection?	No
9) Are specific sites with existing or perceived sources of contamination identified in the plan?	Yes, pg. 64

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Code of Ordinances: City of East Lansing, Michigan. Codified through Ordinance No. 1242, enacted May 5, 2010. (Supplement No. 9)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	No
11) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department?	Yes, section 50-38 part 5 I; "Abandoned water wells (wells that are no longer in use or are in disrepair), abandoned monitoring wells, and cisterns shall be plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality."
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	No
13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, section 36-142; "*Hazardous material* means a substance or combination of substances which, because of its quantity, concentration, or physical, chemical, or infectious characteristics may either cause, or significantly contribute to, an increase in serious reversible and irreversible, or incapacitating illness or pose a substantial present or potential hazard to humans or the environment. "
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 50-38 part 5 G; "Aboveground storage tanks shall be certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."
15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations,*	Yes, section 50-38 part 5 F; "Underground storage tanks shall be registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."

2000)	
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 50-38 part 5 H; "Bulk storage facilities for pesticides and fertilizers shall be in compliance with requirements of the Michigan Department of Agriculture."
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	Yes, section 20-66; "The provisions in this code shall not be construed to abolish or impair existing remedies of the jurisdiction or its officers or agencies relating to the removal or demolition of any structure which is dangerous, unsafe and insanitary. "

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? 20) *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 46-87; "No person shall discharge, or cause to be discharged, into any storm sewer or natural or artificial watercourse, waters or wastes other than stormwater or uncontaminated industrial wastes as heretofore defined."
21) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	Yes, section 49-14; "The site provides protection of subsurface water resources and provision of valuable watersheds and recharging groundwater supplies."

Site Plan Review Assessment

Question	Response
22) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, section 50-37 part 2 C; "Existing ground contours at two-foot intervals or less, indicating the direction of surface drainage flow, and the type of surface soils present"
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade	Yes, section 50-37 part 2 F & G; "Where wetland of any size may be present, as indicated on the city's wetland inventory map, a report prepared by a qualified wetland consultant which verifies

surface drainageways, floodplains, and wetlands.	the presence of any wetland."
➢ Location for on-site wastewater treatment and disposal systems.	Yes, section 50-37 part 4 J; "Location of any on-site wastewater collection, treatment and disposal system."
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, section 50-73 part 4 K; "Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes."
➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, section 50-37 part 4 N; "Description and location for any existing or proposed aboveground and belowground storage facilities."
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Yes, section 30-73 part 4 I; "Location and status of any floor drains in existing or proposed structures on the site, indicating the point of discharge for all drains and pipes."
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	No
➢ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	Yes, section 50-37 part 4 L; "Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include CAS numbers)."
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	Yes, section 50-73 part 4 M; "Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials."
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, section 50-73 part 4 O; "Completed environmental permits checklist on the form provided by the planning and zoning official."
➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	Yes, section 36-146; "The fire chief shall cause to be delivered a copy of this division and a hazardous material disclosure form for completion to any person who, as a result of an inspection by the city, or based on the nature of the enterprise, may be handling, storing, using, processing, or disposing of hazardous materials."
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains.	No

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *Timothy R. Schmitt, AICP (Associate Planner at City of East Lansing)*

Date/Time: *March 23rd, 2011 10:00AM*

Location: *East Lansing City Hall*

Procedural & Enforcement

Wellhead Protection

Question	Response
23) Does the community require onsite inspections of new land uses in WHPAs?	Yes. The city is onsite almost daily on any new construction.
24) How often are plugged wells inspected?	They are not.
25) Is a Phase I Environmental Assessment required before starting development in a WHPA?	Yes. For any project the city is involved in a Phase I is required. If it is out of their jurisdiction, it is not necessary but is usually completed regardless.
26) How often are new WHPAs assessed and integrated into maps and plans?	No new WHPAs have been created since the last update to the comprehensive plan. If there were to be any, they would be included when the comprehensive plan was updated.

Groundwater Protection

Question	Response
27) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	No.
28) Within the past three years, have any variances been given that affect groundwater regulations?	No.
29) Does the community require potentially	Yes. It begins with a written description of the use and then details are submitted to

contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	the fire department and a PIPP is drafted.
30) In what instances does the municipality require groundwater monitoring?	There are few uses that would require this besides gas stations. East Lansing has little industrial use and therefore this is not necessary an issue. If anything came up, it would be implemented.
31) Do you have and use an environmental assessment checklist? How often is this updated?	Yes. Part of the Building Permits checklist. It needs to be updated

Education & Outreach

Wellhead Protection

Question	Response
32) Does the community provide incentives in reporting and plugging private abandoned wells?	No.
33) Does the community have signs to build awareness about WHPAs?	Yes. WHPAs, riversheds and parks.

Groundwater Protection

Question	Response
34) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	Yes. Published articles in the Curbside Journal, Dialog and on the City website.
35) Is the community actively involved in the Children's Water Festival?	Yes. The public schools participate.

Information Sharing & Data Management

Wellhead Protection

Question	Response
36) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	Yes. Mainly with Meridian because they have a joint water plan.
37) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	No.

Groundwater Protection

Question	Response
38) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	Yes. Multiple groups review this.
39) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	Begins with the in-house engineers. They usually have the answer for any question.
40) How is your community represented on the Groundwater Management Board?	By the in-house engineers and by myself.
41) Does your community maintain basic data GIS data on wells and WHPA's?	Not sure.
42) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	Public Works. Yes, but it must be requested.

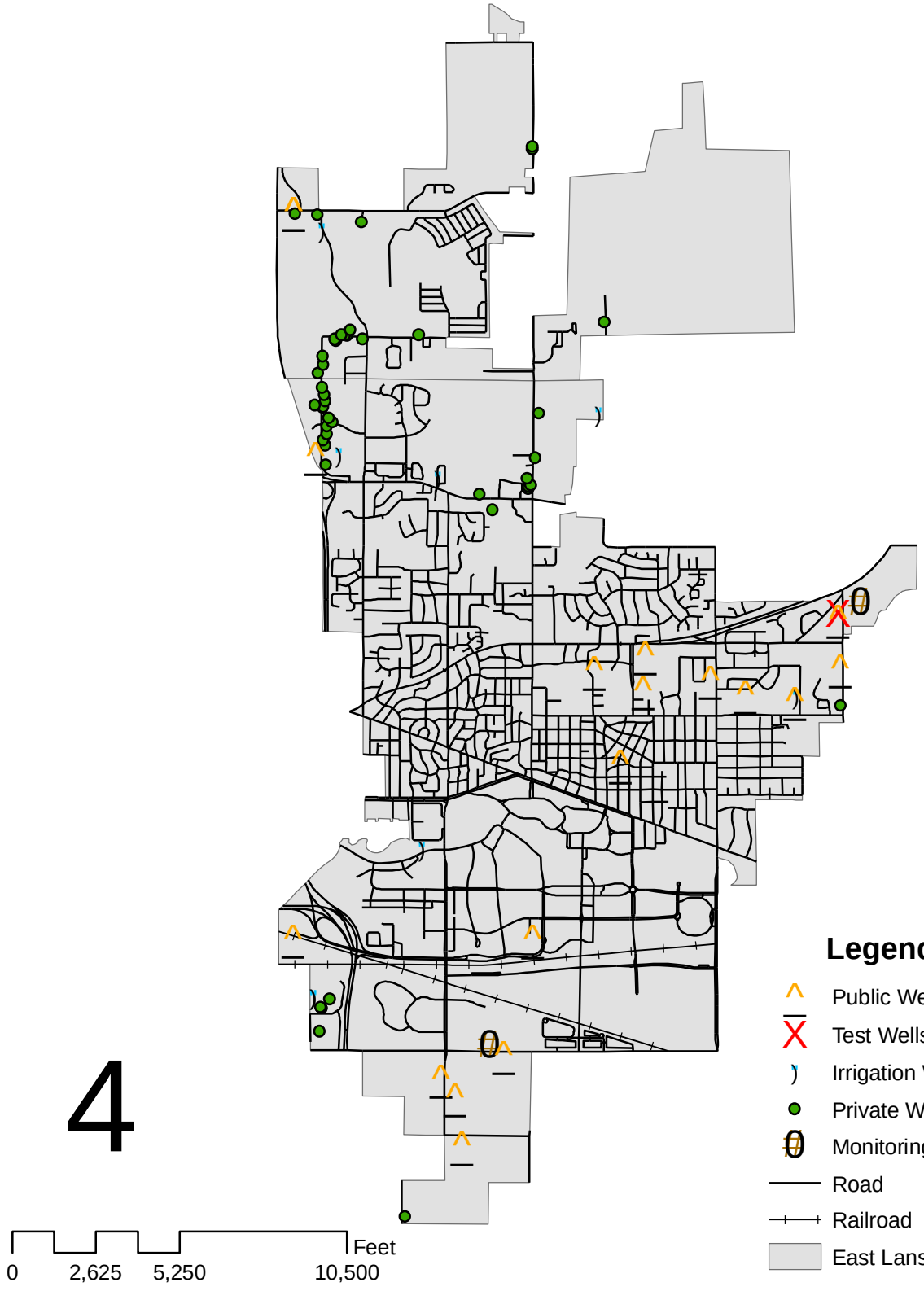
SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

Strengths	Weaknesses
• Actively promotes education and awareness to all citizens regarding WHPAs through many different media campaigns • Zoning ordinance has strong environmental protection restrictions • The city has used public water for a prolonged period of time and therefore has few abandoned or private wells within their city limits • Information is shared across agencies and communities • All new land uses require some form of on-site inspection such as a zoning compliance inspection, building inspection, etc.	• Master Plan has no reference to groundwater protection and WHPAs or their definitions • No goals or objectives to protect groundwater through WHPAs • Does not provide plugging assistance for abandoned wells • Lack of data on private and abandoned wells • No zoning provision for the demolition of structures that include the protection of wells as a standard
Opportunities	**Threats**
• Expand standard environmental permits checklist regularly to be more specific to the community	• Contamination and Brownfield sites are not closely monitored in regard to groundwater safety • Reduced state and federal funding threatens local

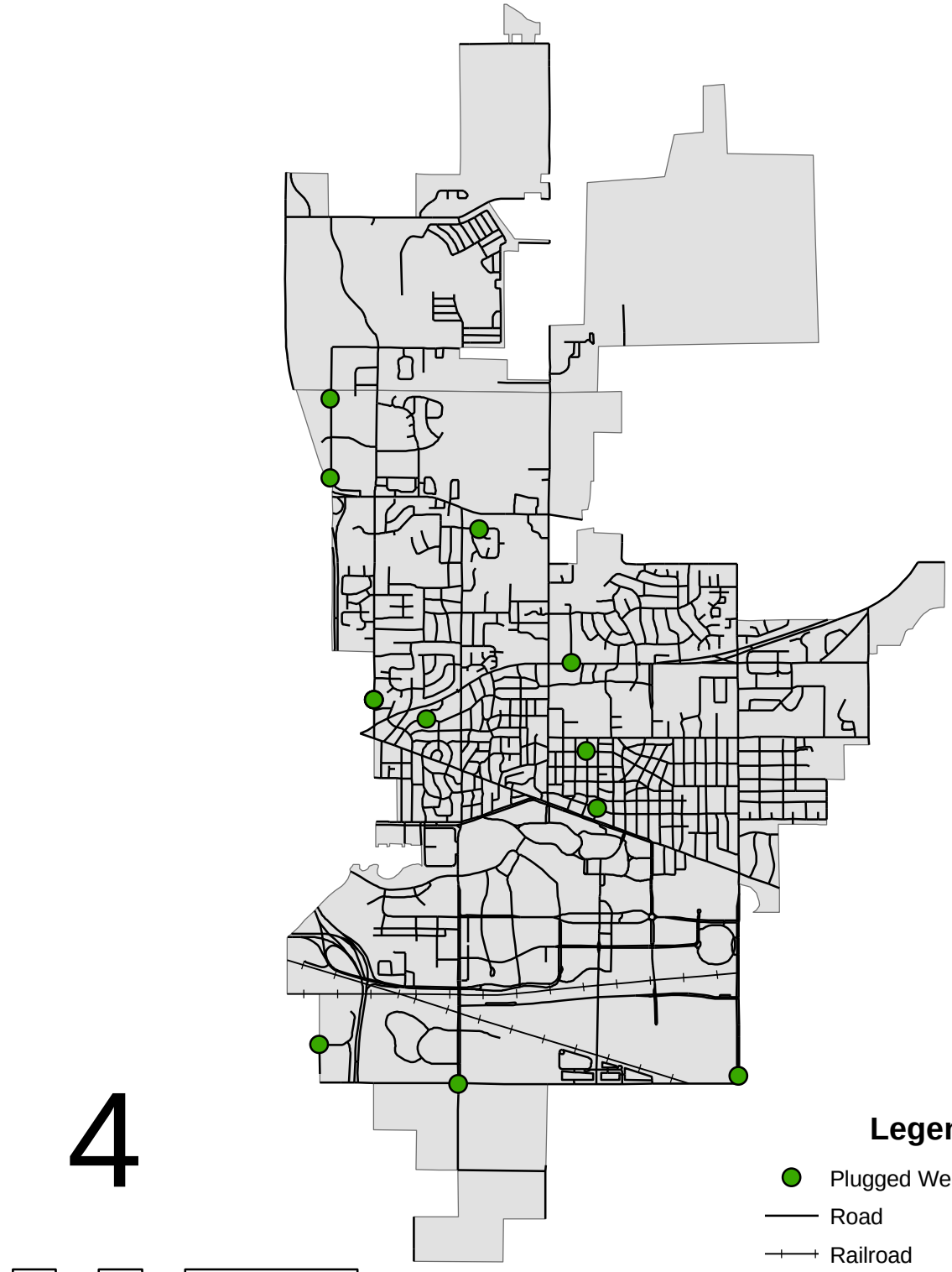
	wellhead protection efforts • Insufficient regulations for floor drains allow for discharge of potentially hazardous materials

East Lansing Wells



Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

East Lansing Plugged Wells Since 2005



4

0 2,625 5,250 10,500 Feet

Legend

- Plugged Wells since 2005
- Road
- Railroad
- East Lansing

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Findings and Recommendations for

THE CITY OF LANSING

Master Plan
Findings for Lansing indicate **1of 8** outcomes have been met. For further improvement, the community can:

- Define WHPAs and reference where to find the most current WHP data and delineations
- Cite the location of existing and perceived sources of contamination as well as designated Brownfield sites located within the WHPAs
- Acknowledge the general location of public and large scale irrigation wells are managed and monitored.
- Acknowledge the relationship between future land use change and groundwater.
- Create goals and objectives that acknowledge and safeguard groundwater resources, as well as outlined strategies to achieve them.

Zoning Ordinance
Findings for Lansing indicate **6 of 8** outcomes have been met. For further improvement, the community can:

- If the WHPA encompasses medium or heavy industrial zoning districts, begin to phase out these districts in favor of those with less potential for contamination
- Amend zoning ordinance to set limits for volumes of on-site storage of fuel and other potential contaminants.

Site Plan Review
Findings for Lansing indicate **10 of 12** outcomes have been met. For further improvement, the community can:

- Include provisions for the on-site handling, storage, use, and manufacture of chemicals
- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains.

General Recommendations
Findings from an interview with Bill Rieskie indicate **8 of 11** satisfactory responses. For further improvement, the community can:

- Require comprehensive on site inspections of new land uses within WHPAs that include the identification of potential threats to groundwater contamination, such as unplugged abandoned wells
- Set standard for when a Phase I ESA is required; make these a requirement for any new development in WHPAs.
- Develop assistance (financial or technical) program for locating and plugging abandoned wells.
- Develop awareness program for WHPAs that includes signage.

- Update Contingency Plans

  Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have knowledge of locations with hazardous material in order to handle the emergency correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.

- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community's water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: City of Lansing

Master Plan

This section is to be completed by relying on the community's master plan document (City of Lansing: Comprehensive Master Plan 1958) as well as any supplementary adopted plans. This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPAs) included in the plan?	No
2) Are WHPAs defined?	N/A
3) Does the community utilize overlay zones for WHPAs?	No
4) Is there reference to designated Brownfield sites located within WHPAs?	No

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	No
6) *Follow-up:* If yes, is the community's strategy for protection noted?	N/A
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	Partially, pg. 41 "Public Utilities - No great difficulty is anticipated in Lansing in extending the water system to accommodate expected future growth. Residential development should be permitted only where it can readily be serviced with such facilities as sewer and water. Developing Areas - In these areas the principal residential growth of the future is expected. Adequate public facilities, such as paved streets, water and sewers, recreation areas, and schools should be provided."
8) Does the plan acknowledge the need for a regional effort for groundwater protection?	No
9) Are specific sites with existing or perceived sources of contamination identified in the plan?	No

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Code of Ordinances: Lansing, Michigan. Codified through Ordinance No. 1158, enacted August 30, 2010. (Supplement No. 31)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	Yes, based on a comparison on Lansing's WHPA map and zoning map, many heavy industrial zones reside within the WHPA
11) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 1242.07 (v), "Abandoned water wells (wells that are no longer in use or are in disrepair), abandoned monitoring wells, and cisterns shall be immediately repaired or "formally abandoned" in accordance with regulations and procedures of the Michigan Department of Environmental Quality and the Ingham County Health Department. The level of repair for irrigation wells shall meet the same standards as the rules and procedures required by the Michigan Department of Environmental Quality for potable water, except as to depth."
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	No
13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, section 1612.02, ""Hazardous material" means explosive, pyrotechnics, compressed gas, flammable liquid, flammable solid, combustible liquid, oxidizing material, poisonous gas, poisonous liquid, poisonous solid, irritating material, etiological material, radioactive material, corrosive material or liquefied petroleum gas and also including, but not limited to, any of the following: 1. Any material, listed in the list of toxic pollutants found in 40 CFR 401.15, as amended, or in any other federal law or regulation; 2. Any material regulated as an hazardous material by the United States Department of Transportation through regulations found in 49 CFR 171.1 et seq.; 3. Any material designated as hazardous material by state or federal law or regulation, or City Ordinance; or, 4. Any otherwise nonhazardous material released is a hazardous material for purposes of this ordinance if its presence causes a potential hazard to vehicular or pedestrian traffic."
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations,*	Yes, section 1242.07 (t), " Above ground storage tanks shall be certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."

2000)	
15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 1242.07 (s), "Underground storage tanks shall be registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality."
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 1242.07 (u), "Bulk storage facilities for pesticides and fertilizers shall be in compliance with requirements of the Michigan Department of Agriculture."
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	Yes, section 1242.04 (11) ,"Demolition of any structure that is listed as a Michigan 201 Site and/or has old wells or septic systems."

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, section 1242.07 (q) "Sites at which hazardous substances, hazardous wastes, or potentially polluting materials are stored, used, or generated shall be designed in such a manner as to prevent spills and discharges of such materials to the air, surface of the ground, groundwater, lakes, streams, rivers or wetlands. Such facilities shall not have general purpose floor drains."
20) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	No

Site Plan Review Assessment

Question	Response
21) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, section 1242.05 (9), "Existing and proposed land elevations and/or contours to appropriately illustrate topography and to indicate direction of drainage flow; and location map."
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	Yes, section 1242.05 (11) "The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands."
➢ Location for on-site wastewater treatment and disposal systems.	Yes, section 1242.05 (14), "Location of any on-site wastewater treatment and disposal systems."
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, section 1242.05 (15), "Location of existing and proposed electric services, fire hydrants, public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes."
➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, section 1242.05 (18) ,"Description and location for any existing or proposed above ground and below ground storage facilities."
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Yes*, section 1242.07 "(p) General purpose floor drains shall be connected to a public sanitary/combined sewer system or an on-site holding tank (not a septic system) in accordance with state, county and municipal requirements, unless a groundwater discharge permit has been obtained from the Michigan Department of Environmental Quality. General purpose floor drains which discharge to groundwater are generally prohibited. (q) Sites at which hazardous substances, hazardous wastes, or potentially polluting materials are stored, used, or generated shall be designed in such a manner as to prevent spills and discharges of such materials to the air, surface of the ground, groundwater, lakes, streams, rivers or wetlands. Such facilities shall not have general purpose floor drains."
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	Yes, section 1242.07 (q), "General purpose floor drains shall be connected to a public sanitary/combined sewer system or an on-site holding tank (not a septic system) in accordance with state, county and municipal requirements, unless a groundwater discharge permit has been obtained from the Michigan Department of Environmental Quality. General purpose floor drains which discharge to groundwater are generally prohibited."
➢ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	Yes, section 1242.05 (16), "Inventory of hazardous substances in quantities greater than what is typically kept for general cleaning, to be stored, used or generated on-site, presented in a format acceptable to the city fire marshal (include CAS numbers)"
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or	Yes, section 1242.05 (17), "Description of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, polluting materials and/or flammable and combustible materials."

unloading of hazardous substances, hazardous wastes, and/or polluting materials.	
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, section 1242.05 (20), "Completion of the environmental permits checklist on the form provided by the Zoning Administrator."
➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	No
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?	N/A

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *William Rieske AICP (Assistant Planning Manager at City of Lansing)*

Date/Time: *March 2nd, 2011 10:00AM*

Location: *Lansing Planning Office*

Procedural & Enforcement

Wellhead Protection

Question	Response
22) Does the community require onsite inspections of new land uses in WHPAs?	Yes, Building safety dept and public service at certain times, not just Wellhead Protection Areas
23) How often are plugged wells inspected?	Managed by Lansing Board of Water and Light
24) Is a Phase I Environmental Assessment required before starting development in a WHPA?	They are required at property acquisitions, but not by the city.
25) How often are new WHPAs assessed and integrated into maps and plans	Yearly, by the Groundwater Management Board

Groundwater Protection

Question	Response
26) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	No
27) Within the past three years, have any variances been given that affect groundwater regulations?	No
28) Does the community require potentially contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	The Fire Department manages contingency plans for emergency response.
29) In what instances does the municipality require groundwater monitoring?	Lansing Board of Water and Light
30) Do you have and use an environmental assessment checklist? How often is this updated?	Lansing uses the standard Ingham County Environmental Permits Checklist

Education & Outreach

Wellhead Protection

Question	Response
31) Does the community provide incentives in reporting and plugging private abandoned wells?	No, this is done by the Health Department
32) Does the community have signs to build awareness about WHPAs?	No

Groundwater Protection

Question	Response
33) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	Yes, Water fest, PSA's before movies, Groundwater model at impression 5 science museum
34) Is the community actively involved in the Children's Water Festival?	Yes

Information Sharing & Data Management

Wellhead Protection

Question	Response
35) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	Yes
36) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	Not to his knowledge

Groundwater Protection

Question	Response
37) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	Yes, they are reviewed by the Lansing Board of Water and Light as well as the Tri-County Regional Planning Board
38) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	Staff at BWL and Tri-County
39) How is your community represented on the Groundwater Management Board?	Mr Rieski as well as BWL representatives appear on the board
40) Does your community maintain basic data GIS data on wells and WHPA's?	Yes
41) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	Info tech office from finance dept. WHP is done by USGS

SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

Strengths

- Relationship with LBWL helps to alleviate responsibilities for WHP planning
- Maintains current GIS department coordination with regional authorities
- Strong regulations for the storage of hazardous materials
- The city has used public water for a prolonged period of time and therefore has few abandoned or private wells within the city
- All new property acquisitions require on-site building and public service inspections
- Community has engaged in an education program to promote wellhead protection

Weaknesses

- Total reliance on LBWL for water needs and regulations
- There is no reference to wellhead and groundwater protection in the current master plan
- Does not maintain a regularly updated environmental checklist
- Does not have a locally focused Wellhead Protection media strategy promoting education and awareness
- Does not provide plugging assistance for abandoned wells
- Zoning ordinance is lacking provisions specific to wellhead protection plans
- Lack of data on private abandoned wells
- Lack of plugging assistance and regulations
- Low level of collaboration between the City of Lansing and Lansing Township

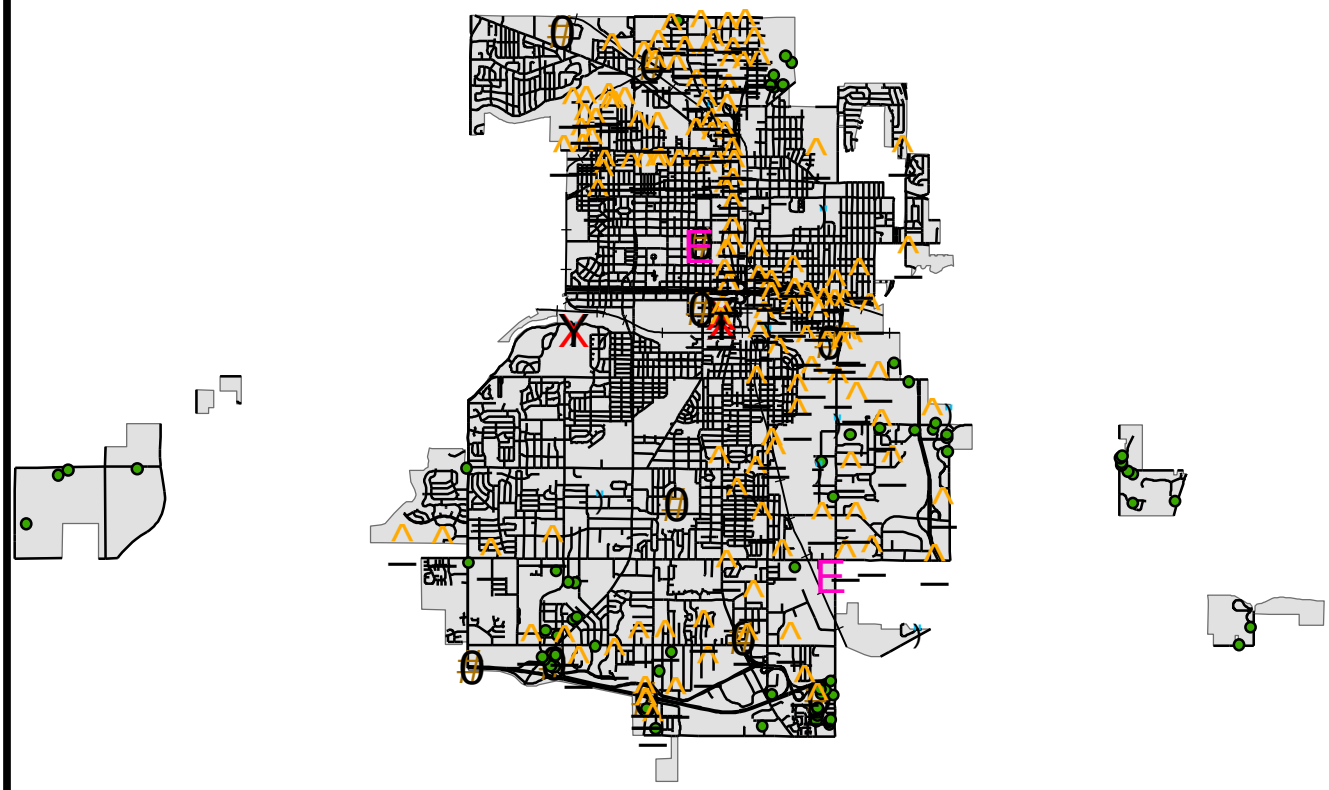
Opportunities

- Expansion for wellhead and groundwater protection concepts in upcoming master plan update
- Expansion of education and community outreach programs
- Expand standard County environmental assessments checklist regularly to be more specific to the community

Threats

- Contamination issues do not have proper municipal regulations for a prompt and thorough response
- Lack of plugging regulations
- Reduced state and federal funding threatens local wellhead protection efforts
- Contamination and brownfield sites are not closely monitored in regards to groundwater safety
- Medium and heavy industrial zoning districts are located within WHPAs

City of Lansing Wells



Legend

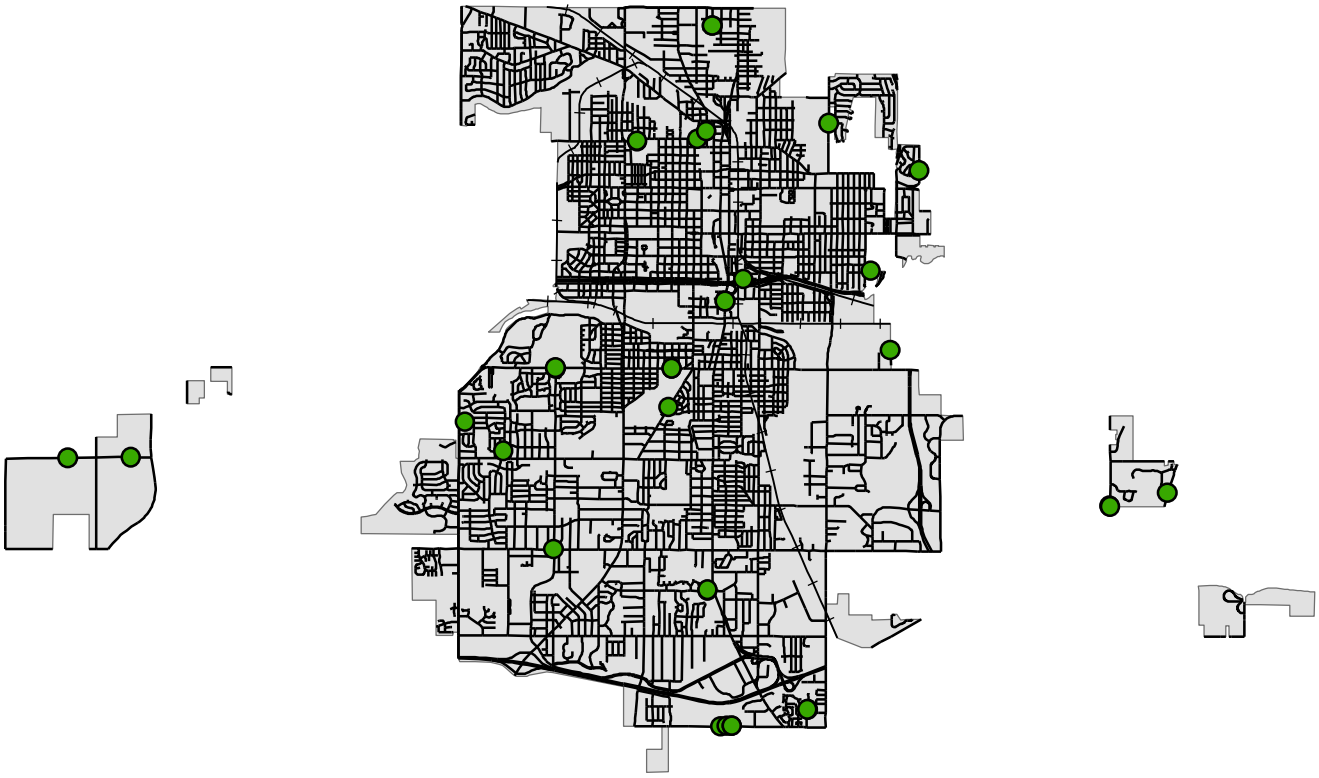
- Industrial Wells
- Public Wells
- Test Wells
- Irrigation Wells
- Private Wells
- Monitoring Wells
- Roads
- Rail Roads
- City of Lansing

4

0 7,000 14,000 28,000 Feet

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

City of Lansing Plugged Wells Since 2005



4

0 7,000 14,000 28,000 Feet

Legend

- Plugged Wells since 2005
- Roads
- Rail Roads
- City of Lansing

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Findings and Recommendations for

LANSING CHARTER TOWNSHIP

Master Plan
Findings for Lansing Township indicate **6 of 9** outcomes have been met. For further improvement, the community can:

- Define WHPAs using local, state, or federal definitions
- Acknowledge the relationship between future land use change and groundwater

Zoning Ordinance
Findings for Lansing Township indicate **6 of 8** outcomes have been met. For further improvement, the community can:

- Amend zoning ordinance to set limits for volumes of on-site storage of fuel and other potential contaminants

Site Plan Review
Findings for Lansing Township indicate **10 of 12** outcomes have been met. For further improvement, the community can:

- If floor drains are permitted, require that they be connected to subsurface wastewater disposal systems
- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains”

General Recommendations
Findings from an interview with Matt Brinkley indicate **8 of 11** satisfactory responses. For further improvement, the community can:

- Set standards for when a Phase I Environmental Site Assessments are required; make these a requirement for any new development in WHPAs.
- Develop assistance programs (financial and/or technical) for locating and plugging abandoned wells
- Ensure that new regulations concerning wellhead and groundwater issues are thoroughly reviewed by the regional planning authority

- Update Contingency Plans

  Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have knowledge of locations with hazardous material in order to handle the emergency

correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.

- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community's water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: Lansing Charter Township

Master Plan

This section is to be completed by relying on the community's master plan document (Charter Township of Lansing: Master Plan 2009-2039) as well as any supplementary adopted plans. This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPAs) included in the plan?	Yes, pg. 59: Map 13: Lansing Township Contaminated Sites
2) Are WHPAs defined?	Not explicitly, pg. 56: "Wellhead protection areas have been established to protect groundwater resources from pollution".
3) Does the community utilize overlay zones for WHPAs?	No
4) Is there reference to designated Brownfield sites located within WHPAs?	Yes, pg. 56: Other Brownfields, "Of particular concern are contaminated sites located within wellhead protection area."

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	Yes, pg.13: Goal: Environmental Stewardship, Objective: 3.) "Continue to participate in and support regional efforts to improve ground and surface water quality". Also, in another section (not goals and objectives) titled Natural Resources and Environment: p. 56-57, "As a community which depends on groundwater for almost all of its drinking water, protecting this vital resource is very important".
6) *Follow-up:* If yes, is the community's strategy for protection noted?	Yes, pg.13: "Continue to participate in and support regional efforts to improve ground and surface water quality".
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	No, only "surface bodies of water".
8) Does the plan acknowledge the need for a regional effort for groundwater protection?	Yes, pg.13: Goal, Environmental Stewardship, Objective: 3.) "Continue to participate in and support regional efforts to improve ground and surface water quality"; p, 58, Conclusions, Water Resource Management, "Lansing Township has been very active in regional water quality protection efforts. Long range plans should be developed that reflect this commitment and directly address stormwater management and wellhead protection through the formulation of policy and continued collaboration with other communities and regional partners." Also, p. 81, Implementation, Policy Response: "Continue to actively participate in regional environmental initiatives including the Greater Lansing Regional Committee (GLRC) and Groundwater Management, 3-5 Years".
9) Are specific sites with existing or perceived sources of contamination identified in the plan?	Yes, pg. 59: Map 13: Lansing Township Contaminated Sites: Leaking Underground Storage Tanks, and Leaking Underground Storage Tank in WHPAs are delineated. Also, pg. 56: GM site and Fly-ash Sites are discussed as contamination areas.

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Charter Township of Lansing, Michigan. Codified through Ordinance No. 71.1, adopted September 14, 2010. (Supplement No. 11)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	Yes, based on a comparison of zoning maps and WHPA maps.
11) Are abandoned water wells, abandoned monitoring wells and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department?	Yes, not explicitly from the MDEQ, but implied chapter 85-10.4: 23.)"Abandoned water wells (wells that are no longer in use or are in disrepair), abandoned monitoring wells, and cisterns shall be plugged in accordance with regulations and procedures of appropriate local, state, and federal agencies".
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	No
13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, chapter 24-1: (1) "Hazardous substance/waste includes one or more of the following: a. Hazardous substance as defined by the United States Comprehensive Environmental Response Compensation and Liability Act (CERCLA); b. Any substance designated pursuant to section 311(B)(2)(A) of the Federal Water Pollution Control Act; c. Any element, compound, mixture, solution, or substance designated pursuant to section 102 of CERCLA; d. Any hazardous waste having characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (not including waste regulations suspended by act of Congress); e. Any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act; f. Any hazardous air pollutant listed under section 112 of the Clean Air Act; g. Any hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to section 7 of the Toxic Substance Control Act; h. Petroleum as described in part 213 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (MCL 324.11101, et seq.) ("NREPA"); i. Any substance that the Michigan Department of Environmental Quality or a successor agency of the state demonstrates, on a case-by-case basis, poses an unacceptable risk to the public health, safety, or welfare, or the environment, considering the fate of the material, dose-response, toxicity, or adverse impact on natural resources; and/or j. Hazardous waste as defined in part 111 of NREPA".
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, chapter 85-10-4: 21.)"Above-ground storage tanks shall be certified, installed, operated, maintained, closed or removed in accordance with regulations of appropriate local, state, and federal agencies".

15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, chapter 85-10-4: 20.)"Underground storage tanks shall be registered, installed, operated, maintained, closed or removed in accordance with regulations of appropriate local, state, and federal agencies".
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, chapter 85-10.4: 22.) "Bulk storage facilities for pesticides and fertilizers shall be in compliance with requirements of appropriate local, state, and federal agencies".
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	Yes, chapter 109 -6: “Demolition plan for class 1 demolition projects. (G) The location of functional and/or abandoned public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells, or wells used for industrial purposes”, “(6) Plans for the removal of underground drains, water lines and/or mains, sewer lines, pipes, and wells”; chapter 109-7: ”3.) A site plan or other acceptable diagram of the entire property and adjacent properties that clearly depicts: (H) The location of functional and/or abandoned public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells, or wells used for industrial purposes”, “(K) The location of the property with respect to a wellhead protection area, if applicable”; chapter 109-7 “(13) Plans for the removal of underground drains, water lines and/or mains, sewer lines, pipes, and wells. chapter 109-10 “Standards for demolition permit approval for class 1 demolition projects.; A Demolition Permit shall be approved and granted by Township Staff for a Class 1 Demolition Project if the Demolition Permit Application and Demolition Plan are determined to comply with the following standards: (5) The demolition plan provides adequate plans for the removal, if necessary, of all underground drains, water lines and/or mains, sewer lines, pipes, and wells related to buildings and structures that are subject to demolition activities”; chapter 109-11 “Standards for demolition permit approval for class 2 demolition projects and class 3 demolition projects (4) The demolition plan provides for the removal of all underground drains, water lines and/or mains, sewer lines, pipes, and wells related to buildings and structures that are subject to demolition activities”.

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, chapter 85-10.4: 24). "State and federal requirements for storage, spill prevention, recordkeeping, emergency response, transport and disposal of hazardous substances, hazardous wastes, liquid industrial waste or potentially polluting materials shall be met. No discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies".
20) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	Yes, chapter 85-10: "2.) *Administrative review.* A site plan may be reviewed and approved by the zoning administrator, without further review by the planning commission and approval from the township board, if the following requirements are satisfied: (g.) Any earth change activity, including construction of new buildings and structures and additions to existing buildings and structures, does not directly affect a surface body of water, wetland, or other natural water feature regulated by part 301 or 303 of P.A. 451 of 1994 the Natural Resources and Environmental Protection Act"; chapter 85-10.4: "16.) The project and related improvements shall be designed to protect land and water resources from pollution, including pollution of soils, groundwater, rivers, streams, lakes, ponds, and wetlands"; chapter 85-10.4 "18.) Sites at which hazardous substances, hazardous wastes, or potentially polluting materials are stored, used, or generated shall be designed to prevent spills and discharges of such materials to the air, surface of the ground, groundwater, lakes, streams, rivers or wetlands"; chapter 109-6. "Demolition plan for class 1 demolition projects. Each demolition permit application for a class 1 demolition project shall be accompanied by a demolition plan that contains the following information, data and documentation:(H) The location on the property of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands"; chapter 109-7. "Demolition plan for class 2 demolition projects and class 3 demolition projects. (3) A site plan or other acceptable diagram of the entire property and adjacent properties that clearly depicts: (H) The location of functional and/or abandoned public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells, or wells used for industrial purposes. (I) The location on the property, and adjacent property within 500 feet of the property, of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands".

Site Plan Review Assessment

Question	Response
21) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, chapter 85-11.5: 3.) j. "Existing and proposed topographical contours at a minimum of two foot intervals".
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	Yes, chapter 85-10.1: 11.) "Location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands."

➢ Location for on-site wastewater treatment and disposal systems.	Yes, chapter 85-10.1: 9.) “Proposed utilities and services and tentative locations, including dumpsters, and the locations for on-site wastewater treatment and disposal systems”.
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, chapter 85-10.1: 10.) “Location of existing and proposed public water mains, public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes”.
➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, chapter 85-10.4: 19.) "Secondary containment facilities shall be provided for above-ground storage of hazardous substances, hazardous wastes, or potentially polluting materials in accordance with state and federal requirements. Above-ground secondary containment facilities shall be designed and constructed so that the potentially polluting material cannot escape from the unit by gravity through sewers, drains, or other means, directly or indirectly into a sewer system, or to the waters of the state (including groundwater) 20.) Underground storage tanks shall be registered, installed, operated, maintained, closed or removed in accordance with regulations of appropriate local, state, and federal agencies. 21.) Above-ground storage tanks shall be certified, installed, operated, maintained, closed or removed in accordance with regulations of appropriate local, state, and federal agencies."
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Yes, chapter 85-10.1: 20.) “Location and status of any floor drains in existing or proposed structures on the site. Further, the point of discharge for all drains and pipes shall be specified on the site plan”.
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	No
➢ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	Yes, chapter 85-10.1: 22.) c. “Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the township fire marshal (include CAS numbers)."
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	Yes, chapter 85-10.1: 22.) d. "Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structure for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials."
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, chapter 85-10.1: 22.) e. "Completed environmental permits checklist on the form provided by the Zoning- Administrator".
➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	Yes, chapter 85-8: 3.) a. Bulk storage of flammable liquids, liquid petroleum, gases and explosives; provided, all tanks shall be below ground and located not less than 100 feet from property lines, and the storage and handling shall comply with state rules and regulations.
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?	No

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *Matthew Brinkley, AICP (Senior Planner at Lansing Township)*

Date/Time: *March 15th, 2011, 11:00AM*

Location: *Union Building, Michigan State University*

Procedural & Enforcement

Wellhead Protection

Question	Response
22) Does the community require onsite inspections of new land uses in WHPAs?	Yes, however these inspections are required whether or not the use is located in a WHPA.
23) How often are plugged wells inspected?	Ingham County Community Health Department is responsible for this, but inspections for capped wells are rarely completed.
24) Is a Phase I Environmental Assessment required before starting development in a WHPA?	No
25) How often are new WHPAs assessed and integrated into maps and plans?	No new ones have been delineated, so rarely.

Groundwater Protection

Question	Response
26) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	Yes, mainly administratively. "There is not a strong enough process to follow; there is a lack of qualified experts". A coordinated effort is needed. In Lansing Township there is no public works department or engineering department. There is too much reliance on third parties.
27) Within the past three years, have any variances been given that affect groundwater regulations?	No
28) Does the community require potentially contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	Yes, this is a requirement from the state and federal entities (PIPP's submitted to EPA and MDEQ).

29) In what instances does the municipality require groundwater monitoring?	Not done by Township, Westside Water and Lansing Board of Water and Light. Lansing Board of Water and Light publishes annual water quality reports.
30) Do you have and use an environmental assessment checklist? How often is this updated?	Yes, Lansing Township utilizes the standard Ingham County Environmental Permits Checklist.

Education & Outreach

Wellhead Protection

Question	Response
31) Does the community provide incentives in reporting and plugging private abandoned wells?	No however, they require that wells are properly plugged when a property owner seeks connection to the public water supply.
32) Does the community have signs to build awareness about WHPAs?	Yes, the township has wellhead protection areas, watershed, and Greater Lansing Regional Committee for Stormwater Management (GLRC) surface water signs.

Groundwater Protection

Question	Response
33) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	Not specifically, however the township has engaged in regional campaigns.
34) Is the community actively involved in the Children's Water Festival?	Yes

Information Sharing & Data Management

Wellhead Protection

Question	Response
35) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	No new ones have been delineated (not since USGS delineations of 2005). However, if they were or when they are, it will be shared.
36) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	No

Groundwater Protection

Question	Response
37) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	No new standards, but the township works closely with the Groundwater Management Board and Greater Lansing Regional Committee (for Stormwater Management) (GLRC) for regulations.

38) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	Tri-County Regional Planning Commission
39) How is your community represented on the Groundwater Management Board?	The Director of Westside Water sits on the board.
40) Does your community maintain basic data GIS data on wells and WHPA's?	Yes, the wellhead protection area layer.
41) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	Planning department, information is shared as updates become available.

SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

<u>Strengths</u>

- Information shared across agencies and communities
- Strong zoning provisions on demolition effects of groundwater and wellhead; Ch. 109: "Demolition of Buildings and Structures" is considered one of the most stringent demolition ordinances in the state
- Awareness signs about WHPAs
- Master Plan 2009 Map 13: Lansing Township Contaminated Sites
- The township has used public water for a prolonged period of time and therefore has few abandoned or private wells within township limits
- All new land uses require some form of on-site inspection such as a zoning compliance inspection, building inspection, etc.
- Relationship with Westside Water on groundwater protection

<u>Weaknesses</u>

- Does not provide plugging assistance for abandoned wells
- Low level of collaboration between Lansing Township and the City of Lansing
- Lack of locally focused WHP media strategy promoting education and awareness
- Lack of data on private abandoned wells

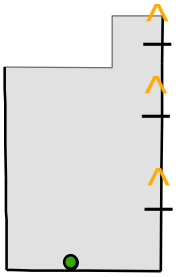
<u>Opportunities</u>

- Expand standard Environmental Permits Checklist regularly to be more specific to the community
- Fulfill wellhead protection strategy outlined in master plan

<u>Threats</u>

- Numerous contaminated and Superfund sites
- Industrial history
- Reduced state and federal funding threatens local wellhead protection efforts
- Insufficient regulations for floor drains allow for discharge of potentially hazardous materials
- Medium and heavy industrial zoning districts located within WHPAs

Lansing Charter Township Wells



4

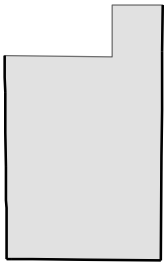
0 2,650 5,300 10,600 Feet

Legend

- Public Wells
- Irrigation Wells
- Private Wells
- Monitoring Wells
- Railroads
- Roads
- Lansing Township

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Lansing Charter Township Plugged Wells Since 2005



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Legend

- Plugged Wells 2005
- Railroads
- Roads
- Lansing Township

0 2,650 5,300 10,600 Feet

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Findings and Recommendations for
MERIDIAN CHARTER TOWNSHIP

Master Plan
Findings for Meridian Township indicate **5 of 8** outcomes have been met. For further improvement, the community can:

- Define WHPAs and reference where to find the most current WHP data and delineations
- Cite the location of existing and perceived sources of contamination as well as designated Brownfield sites located within the WHPAs

Zoning Ordinance
Findings for Meridian Township indicate **6 of 8** outcomes have been met. For further improvement, the community can:

- Amend zoning ordinance to set limits for volumes of on-site storage of fuel and other potential contaminants
- Create ordinance provisions for the demolition of buildings that ensure the safeguarding of wells

Site Plan Review
Findings for Meridian Township indicate **11 of 12** outcomes have been met. For further improvement, the community can:

- Include specific provisions for the on-site handling, storage, use, and manufacture of chemicals that explicitly states that “the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains”.

General Recommendations
Findings from an interview with Rick Brown indicate **8 of 11** satisfactory responses. For further improvement, the community can:

- Develop assistance programs (financial and/or technical) for locating and plugging abandoned wells
- Develop an awareness program for WHPAs that includes signage
- Set standards for when a Phase I Environmental Site Assessments is required; make these a requirement for any new development in WHPAs
- Update Contingency Plans

  Emergency response is imperative for the prevention of serious contamination issues. Without adequate plans to deal with these situations, detrimental effects can come to ground water and wellhead protection areas. Also, clean up can become increasingly more expensive as time goes on. Fire response must have knowledge of locations with hazardous material in order to handle the emergency correctly. Improper fire control can cause contamination to runoff into groundwater and potentially pollute drinking water. Furthermore, outside

externalities, such as a railway spill, must be cleaned promptly and efficiently to ensure the wellbeing of groundwater and wellhead protection areas.

- Maintain Current Data on Groundwater

  Current and regularly updated groundwater information is important in the maintenance of the community's water quality and usage. Without regular ground water monitoring, issues can arise that would have a much greater impact than if acknowledged early on. Low water levels require a particular response, and without proactive knowledge of this, a well could dry up unnoticed. Furthermore, contamination that is found early will greatly decrease the impact it has on surrounding areas. It is important to maintain these practices of regular upkeep of groundwater data to be knowledgeable of arising issues.

- Encourage Best Management Practices

  This can be done through media campaigns, public awareness and education programs, as well as by word of mouth. Best management practices are important for mitigation and prevention of potentially hazardous and costly environmental risks. In this case drinking water is at risk of contamination. Local officials can encourage best management practices to assist with preventative wellhead protection planning.

Wellhead and Groundwater Protection Audit Tool: Meridian Charter Township

Master Plan

This section is to be completed by relying on the community's master plan document (Meridian Charter Township Master Plan 2005) as well as any supplementary adopted plans (Meridian Charter Township Greenspace Plan 2004). This section is broken into two parts with specific questions for: wellhead protection and groundwater protection. This is done in order to make direct wellhead protection planning clear. The groundwater specific part includes additional questions related to protecting groundwater resources which have an effect on wellheads. These two categories complement each other and help create a more comprehensive overview. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
1) Are the wellhead protection areas (WHPA) included in the plan?	No; however, WHPAs are present in the Meridian Township Greenspace Plan: Appendix, Final Report (pg. 9)
2) Are WHPAs defined?	Yes, The wellhead protection area is defined by the State of Michigan as "the surface and subsurface areas surrounding a 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."
3) Does the community utilize overlay zones for WHPAs?	No overlay zones are present for WHPAs; however, at one time Meridian attempted to use overlay zoning for groundwater recharge areas. chapter 2, pg. 14
4) Is there reference to designated Brownfield sites located within WHPAs?	No

Groundwater Protection

Question	Response
5) In the goals and objectives section of the master plan, is the protection of groundwater an issue of importance for the community?	Yes, chapter 2, pg.14: "Objective D: Protect groundwater recharge areas in the Township."
6) *Follow-up:* If yes, is the community's strategy for protection noted?	Yes, chapter 2, pg. 14: "Strategies: 1. Conduct a study to identify all important groundwater recharge areas. 2. Encourage the development of programs to educate citizens about the importance of protecting groundwater recharge areas. 3. Develop a set of public policies to protect the important groundwater recharge areas through zoning and other appropriate land management techniques."
7) Does the plan evaluate and take into account impacts of future land use changes on groundwater?	Not explicitly stated, but implied

8) Does the plan acknowledge the need for a regional effort for groundwater protection?	Yes, chapter 7, pg. 101: "Meridian Township is a member of the Groundwater Management Board (GMB) which is made up of 12 communities and Michigan State University. The purpose of the GMB is to protect the region's drinking water resources. Potential sources of groundwater contamination are often identified during site plan review conducted by Township departments including Community Planning, Engineering and Fire. Following approval of the East Lansing/Meridian Wellhead Protection Plan, groundwater protection regulations were incorporated into the site plan review section of the zoning ordinance."
9) Are specific sites with existing or perceived sources of contamination identified in the plan?	No

Zoning Ordinance

This section is to be completed by relying on the community's zoning ordinance and site plan review documents (Code of Ordinances: Charter Township of Meridian, Michigan. Codified through Ordinance No. 2009-10, effective November 22, 2009. (Supplement No. 8, Rev. 2)). This section is broken into two parts: general zoning ordinance questions and site plan review assessment. The site plan review is usually located within the zoning ordinance, which is why they are organized accordingly. The general zoning ordinance section is further broken down into questions pertaining to wellhead protection and groundwater protection separately. This is again done in order to make a distinction between wellhead protection planning and the topic of overall groundwater protection planning. The site plan review assessment contains questions specific to new development procedures or land use changes. Each question is to be answered with citations as to where the information is found in the legal documents to ensure quick access for reference.

Wellhead Protection

Question	Response
10) Does the WHPA encompass any districts zoned for medium or heavy industrial uses?	No
11) Are abandoned water wells, abandoned monitoring wells, and cisterns plugged in accordance with regulations and procedures of the Michigan Department of Environmental Quality as well as the county health department? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, pg. 78-63 (c); 86-156 (2) (b) (viii): "At such time as use of private water system, including wells, storage tanks, and similar private facilities, shall be abandoned for water supply purposes, suitable steps shall be taken to ensure that injury to persons shall not result from such abandoned, private system." "State and federal requirements for storage, spill prevention, record keeping, emergency response, and transport and disposal of hazardous substances, hazardous wastes, liquid industrial waste, or potentially polluting materials shall be met. No discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies."
12) Do any of the community's ordinances contain regulations on the withdrawal of groundwater (volumes or rates) from industrial/commercial wells?	Only as much as needed, pg. 78-92: "Rates sufficient to provide for the payment of the expenses of administration and operation of the water system and such expenses for the maintenance thereof as may be necessary to preserve the same in good repair and working order; to provide for the payment of the interest upon and principal of all bonds payable there from, as and when the same shall become due and payable, and for the creation of a reserve for the payment of principal and interest required in township Ordinance No. 34; The methodology of adjusting the commodity charges shall be in accordance with the water and wastewater rate study prepared by the township's consultant. Such revisions shall be by resolution of the township board and formal amendment of township Ordinance No. 34 setting rates for water consumption shall not be necessary. All rate changes shall be published at least twice in a newspaper of general circulation within the township."

13) Does the zoning ordinance include the definitions of materials deemed to be 'hazardous substances'?	Yes, pg. 22-26: "Hazardous material means explosives, pyrotechnics, flammable compressed gases, flammable liquids, combustible liquids, oxidizing materials, poisonous gases, poisonous liquids, poisonous solids, irritating materials, etiological materials, radioactive materials, corrosive materials, or liquefied petroleum gases."
14) Are above ground storage tanks certified, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, pg. 86-156 (2) (b) (v): "Aboveground storage tanks shall be certified, installed, operated, maintained, closed, or removed in accordance with regulations of the state department of environmental quality"
15) Are underground storage tanks registered, installed, operated, maintained, closed or removed in accordance with regulations of the Michigan Department of Environmental Quality? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, pg. 293- 5 (v): "Aboveground storage tanks shall be certified, installed, operated, maintained, closed, or removed in accordance with regulations of the state department of environmental quality."
16) Are local regulations present that require bulk storage facilities which house pesticides and fertilizers to be in compliance with Michigan Department of Agriculture requirements? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, pg. 293-5 (vi): "Bulk storage facilities for pesticides and fertilizers shall be in compliance with requirements of the state department of agriculture."
17) Does the zoning ordinance set limits on the volume of fuels able to be stored on-site for land uses other than designated fuel storage areas?	No
18) Are there any provisions in the zoning ordinance for the demolition of buildings that include the management of wells as a standard?	No

Groundwater Protection

Question	Response
19) Are provisions present that explicitly state that no discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies? *(Source: Mark Wyckoff, Recommendations for Tri-County Communities on WHP Regulations, 2000)*	Yes, pg. 293-5 (viii): "State and federal requirements for storage, spill prevention, record keeping, emergency response, and transport and disposal of hazardous substances, hazardous wastes, liquid industrial waste, or potentially polluting materials shall be met. No discharge to surface water or groundwater, including direct and indirect discharges of waste, waste effluent, wastewater, pollutants, or cooling water, shall be allowed without approval from appropriate state, county and local agencies."
20) Does the zoning ordinance contain provisions for the protection of areas with a high potential for groundwater recharge?	Yes, pg. 62-65 and all of section 22: "Dumping or backfilling with any material in any manner. In the case where floodway fringe areas have no groundwater recharge or impoundment potential, filling may occur through compensating excavation and shaping of floodway fringe in such a way as to maintain or improve the flow or natural impoundment capacity of the floodway fringe. In no case shall the flow or impoundment capacity of the floodway fringe be reduced."

Site Plan Review Assessment

Question	Response
21) Please indicate which of the following conditions/requirements are present for approval of site plans:	
➢ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage flow.	Yes, pg. 86-154-8: "Utility plan, drawn to sale, showing the location and size of existing and proposed public water mains, wells, and sanitary sewers and associated easement or location of existing and proposed private drinking water wells, on-site wastewater treatment and disposal systems. The location of existing and proposed monitoring wells, irrigation wells, test wells, or wells used for industrial processes shall also be depicted. The location of existing and proposed private utilities including natural gas, electricity, telephone, and cable television and associated easements shall also be shown on the plan."
➢ The location and elevations of existing water courses and water bodies, including county drains and manmade surface drainageways, floodplains, and wetlands.	Yes, pg. 86-154: "The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan."
➢ Location for on-site wastewater treatment and disposal systems.	Yes, pg. 86-154-8: "The location of existing and proposed monitoring wells, irrigation wells, test wells, or wells used for industrial processes shall also be depicted. The location of existing and proposed private utilities including natural gas, electricity, telephone, and cable television and associated easements shall also be shown on the plan."
➢ Location of existing and proposed public and private drinking water wells, monitoring wells, irrigation wells, test wells or wells used for industrial processes.	Yes, pg. 86-154-8: "The location of existing and proposed monitoring wells, irrigation wells, test wells, or wells used for industrial processes shall also be depicted. The location of existing and proposed private utilities including natural gas, electricity, telephone, and cable television and associated easements shall also be shown on the plan."

➢ Description and location for any existing or proposed above ground and below ground storage facilities.	Yes, pg. 86-154-14: “A description and location for any existing or proposed above ground and below ground storage facilities.”
➢ *If floor drains are permitted:* The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.	Yes, pg. 86-154-13 and pg. 86-156-2: “The location and status of any floor drains in existing or proposed structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.” “General purpose floor drains shall be connected to a public sewer system or an on-site holding tank (not a septic system) in accordance with state, county, and municipal requirements, unless a groundwater discharge permit has been obtained from the state department of environmental quality. General purpose floor drains which discharge to groundwater are generally prohibited.”
➢ *If floor drains are permitted:* Is it a requirement that they be connected to subsurface wastewater disposal systems?	Yes, Site Plan Review, pg. 86-156-5 (i): “General purpose floor drains shall be connected to a public sewer system or an on-site holding tank (not a septic system) in accordance with state, county, and municipal requirements, unless a groundwater discharge permit has been obtained from the state department of environmental quality. General purpose floor drains which discharge to groundwater are generally prohibited.”
➢ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal (include Chemical Abstracts Service (CAS) numbers).	Yes, pg. 86-5-9 and pg. 86-154-16: “The description of the type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas for the storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.”
➢ Descriptions of type of operations proposed for the project and drawings showing size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.	Yes, pg. 86-5-9, 86-154-16, and 86-156-2b-5: “Secondary containment facilities shall be provided for aboveground storage of hazardous substances, hazardous wastes, or potentially polluting materials in accordance with state and federal requirements. Aboveground secondary containment facilities shall be designed and constructed so that the potentially polluting material cannot escape from the unit by gravity through sewers, drains, or other means, directly or indirectly, into a sewer system or to the waters of the state, including groundwater. ”
➢ Completion of the Environmental Permits Checklist on the form provided by the Zoning Administrator.	Yes, pg. 86-154-18: “Completion of the environmental permits checklist on the form provided by the department of community planning and development.”
➢ Does the zoning ordinance contain specific provisions for the on-site handling, storage, use, and manufacture of chemicals?	Yes, pg. 86-402: “Application of organic or synthetic pesticides, fertilizers, or other chemicals shall not be permitted in the natural vegetation strip.”
➢ If yes to the previous question, does the zoning ordinance explicitly state that the storage of fuels, chemicals, and other hazardous substances will be stored in a location with an impervious floor that lacks floor drains?	No

Interview Questions

This section is to be completed by relying on the community's representatives that are responsible for wellhead and groundwater protection. A combination of the following may be necessary to complete this section, examples of appropriate persons include: planners, engineers, public works officials, and health department representatives. These persons should have access to specific information pertinent to the municipality. Some of the questions listed in this audit tool are specific to mid-Michigan and this particular area. The interview part is divided into three sections: procedural and enforcement, education and outreach, and information sharing and data management. Each of these sections is then broken into specific questions for: wellhead protection and groundwater protection. The answers to these questions will help provide a basis for analyzing wellhead and groundwater protection planning. It is important to note who was interviewed, as well as the date to ensure proper reference.

Interview Subject: *Rick Brown, AICP (Associate Planner at Meridian Township)*

Date/Time: *February 23rd, 2011 10:00AM*

Location: *Meridian Township Municipal Building*

Procedural & Enforcement

Wellhead Protection

Question	Response
22) Does the community require onsite inspections of new land uses in WHPAs?	On-site inspections are required for two aspects of the development; the first is the building and its interior which is conducted by the building inspector. Anything elements outside of the building is subject to a comprehensive site inspection by Meridian Township's landscape architect.
23) How often are plugged wells inspected?	Plugged wells are not inspected by Meridian Township.
24) Is a Phase I Environmental Assessment required before starting development in a WHPA?	Phase I Environmental Site Assessments (ESA) are not explicitly required for development within WHPAs unless pre-existing contamination is known or perceived, or in some cases, may be listed as a condition if the applicant is seeking a special use permit. Additionally, a lender may require a Phase I ESA if they feel it is necessary.
25) How often are new WHPAs assessed and integrated into maps and plans?	WHPAs are typically assessed and integrated into maps and plans whenever WHPA 10-year time of travel data is made available by the USGS. Meridian's most recent well was drilled in 2000 and was incorporated into the WHPA using USGS data from 2005.

Groundwater Protection

Question	Response
26) Are there any difficulties with the enforceability of any groundwater regulations in the community's zoning ordinance?	Yes, Zoning Ordinance sets regulations for Groundwater Recharge Protection Areas; a form of overlay district. Regulations derived from these districts are unenforceable due to inconsistencies in coverage, and so are not used
27) Within the past three years, have any variances been given that affect groundwater regulations?	Mr. Brown indicated that the community had not, in recent times, issued any variances that affect groundwater regulations.
28) Does the community require potentially contaminating land uses to submit contingency plans for emergency response? Do these plans ensure protection from discharges and spills to groundwater?	The community itself does not require contingency plans for contaminating land uses; however, Pollution Incident Prevention Plans are required by the Michigan Department of Environmental Quality. Additionally, the County Health Department requires the submission of a Firefighter Right-to-Know form that describes the hazardous substances and fuels being used on site.

29) In what instances does the municipality require groundwater monitoring?	The community rarely requires groundwater monitoring, as it is typically a function of the Michigan Department of Environmental Quality. The Township may, in some cases, require monitoring wells be left installed on a site even after a redevelopment or change of use.
30) Do you have and use an environmental assessment checklist? How often is this updated?	The community has and uses an environmental checklist. This checklist was developed by Mark Wyckoff of the Planning and Zoning Center and adopted by the community in 1998. Meridian Township's environmental assessment checklist has been updated twice by the planning department since its adoption.

Education & Outreach

Wellhead Protection

Question	Response
31) Does the community provide incentives in reporting and plugging private abandoned wells?	The community does not provide financial incentives for reporting or capping abandoned wells. This is due in part to financial constraints and essential community services taking priority, though some assistance may be available from the State.
32) Does the community have signs to build awareness about WHPAs?	The community utilizes a variety of outdoor signs to identify environmentally sensitive areas such as wetlands and land preservation areas. However; these signs do not include wellhead protection areas.

Groundwater Protection

Question	Response
33) Has the community ever engaged in a media campaign that promoted groundwater quality? If so, what kind?	Meridian Township has conducted numerous media campaigns to raise awareness about the protection of groundwater. Most notable of these efforts has been the use of PSAs on Meridian's HOM TV station as well as the community newsletter, the Towne Courier. One of the most successful attempts at education has been the use of experts in the field, as guest speakers, to address the community's environmental commission.
34) Is the community actively involved in the Children's Water Festival?	Meridian Township is not actively involved in the Children's Water Festival; although, Haslett and Okemos schools are regular participants.

Information Sharing & Data Management

Wellhead Protection

Question	Response
35) When a community delineates a new wellhead protection area, is the information shared with other communities within the 10-year time of travel?	When Meridian Township delineates a new Wellhead Protection Area, communities within the 10-year time of travel are notified of this new WHPA; however this has not been done in over a decade.
36) Have any new public wells been drilled in the community since 2005, when the latest delineations occurred?	No, the last well was installed in 2000.

Groundwater Protection

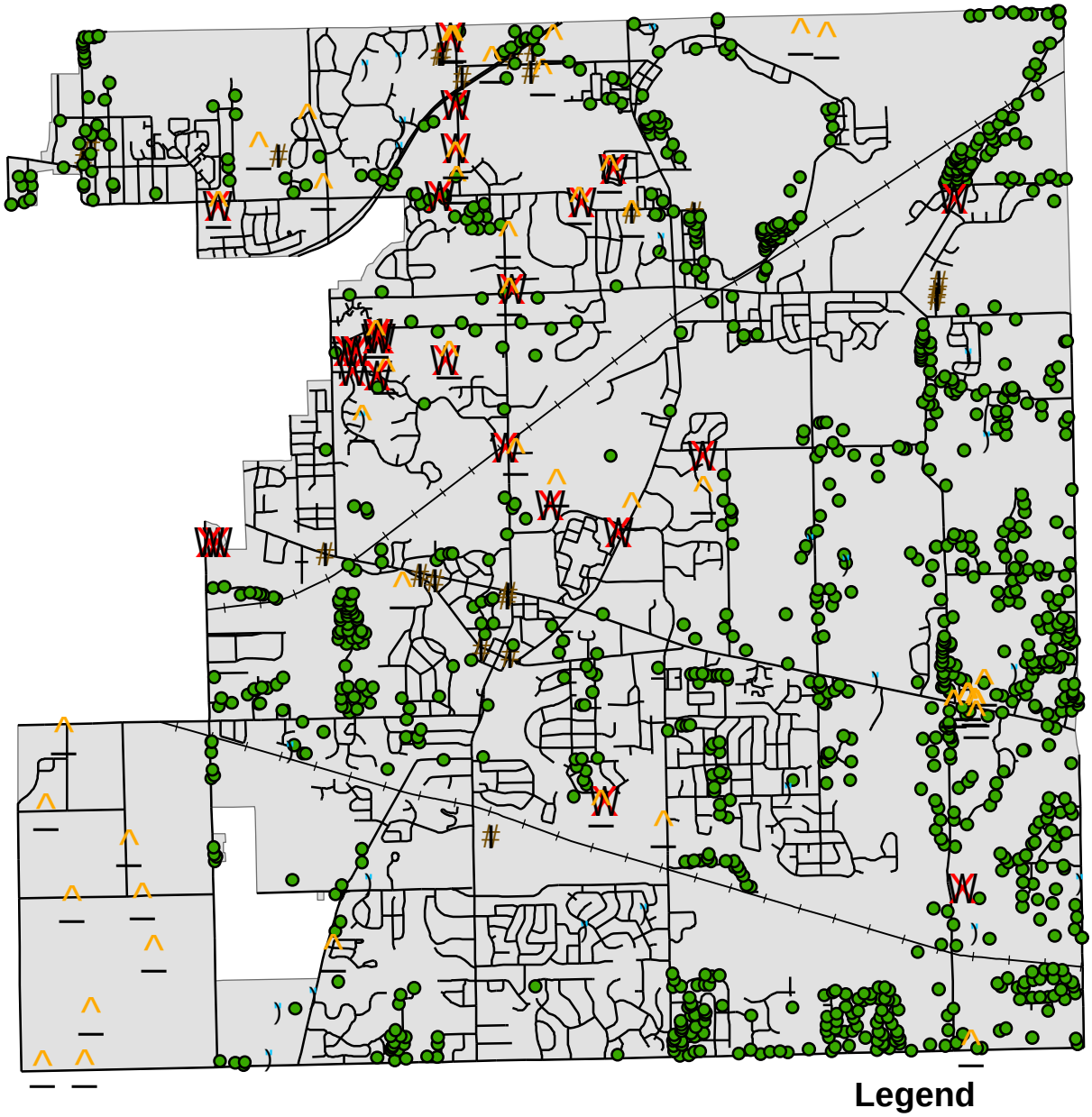
Question	Response
37) Are local groundwater regulations reviewed by a regional authority prior to implementation? Are their standards met?	When new local regulations are drafted, they are typically reviewed by the Tri-County Regional Planning Commission (TCRPC). The most current regulations for groundwater were amended to the zoning ordinance in 1998 per recommendations by Mark Wyckoff of the Planning and Zoning Center in cooperation with TCRPC.
38) To whom are questions directed when the community's zoning administrator or planning staff is in need expert or technical assistance when a question related to groundwater is unknown?	When Meridian Township's planning and zoning staff has a question regarding groundwater issues that require expert or technical assistance, they seek assistance from a number of sources depending on the problem. Past contacts have been the Township's on-staff engineer, TCRPC, East Lansing-Meridian Water & Sewer Authority, MDEQ, and Ingham County Health Department.
39) How is your community represented on the Groundwater Management Board?	Meridian Township is represented on the regional Groundwater Management Board by Ray Severy of the Department of Public Works & Engineering. Additionally, Rick Brown (associate planner) and Martha Wyatt (landscape architect) are on the Board's ordinance sub-committee.
40) Does your community maintain basic data GIS data on wells and WHPA's?	Yes
41) What is the local department that is primarily responsible for mapping and GIS? Is this data shared with regional and state entities as updates become available?	The local department responsible for managing Meridian Township's GIS data is the I.T. Department at the Township. The I.T. Department shares updates with regional and state authorities whenever they are requested.

SWOT Analysis

Based on a community's internal (the answers provided from the question-and-answer portion of the audit) and external (demography and geography) factors, an analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been created. This SWOT analysis aids in the identification of barriers and gauge the community's potential room for improvement.

Strengths	Weaknesses
• Planning Department is very knowledgeable about overall WHP process • Information is shared across agencies and communities • Maintains a regularly updated environmental checklist • Township board and planning commission are generally in favor of wellhead protection efforts • Actively participates in media campaigns • New uses require comprehensive on-site inspections (building and outdoors)	• Groundwater Recharge Protection Area is unenforceable • Does not provide plugging assistance for abandoned wells • Zoning ordinance does not set limits on volumes of fuels and chemicals able to be stored on-site and does not require storage of fuels in an area with an impervious floor without a floor drain • Lack of data on private abandoned wells • No zoning provision for the demolition of structures that include the protection of wells as a standard
Opportunities	**Threats**
• Groundwater Recharge Protection Area framework laid out, but incomplete; interest in completing • Community resources (particularly HOM TV and Towne Courier) allow for many PR opportunities	• Reduced state and federal funding threatens local wellhead protection efforts • Large amount of private household wells within urbanized residential areas

Meridian Charter Township Wells



Legend

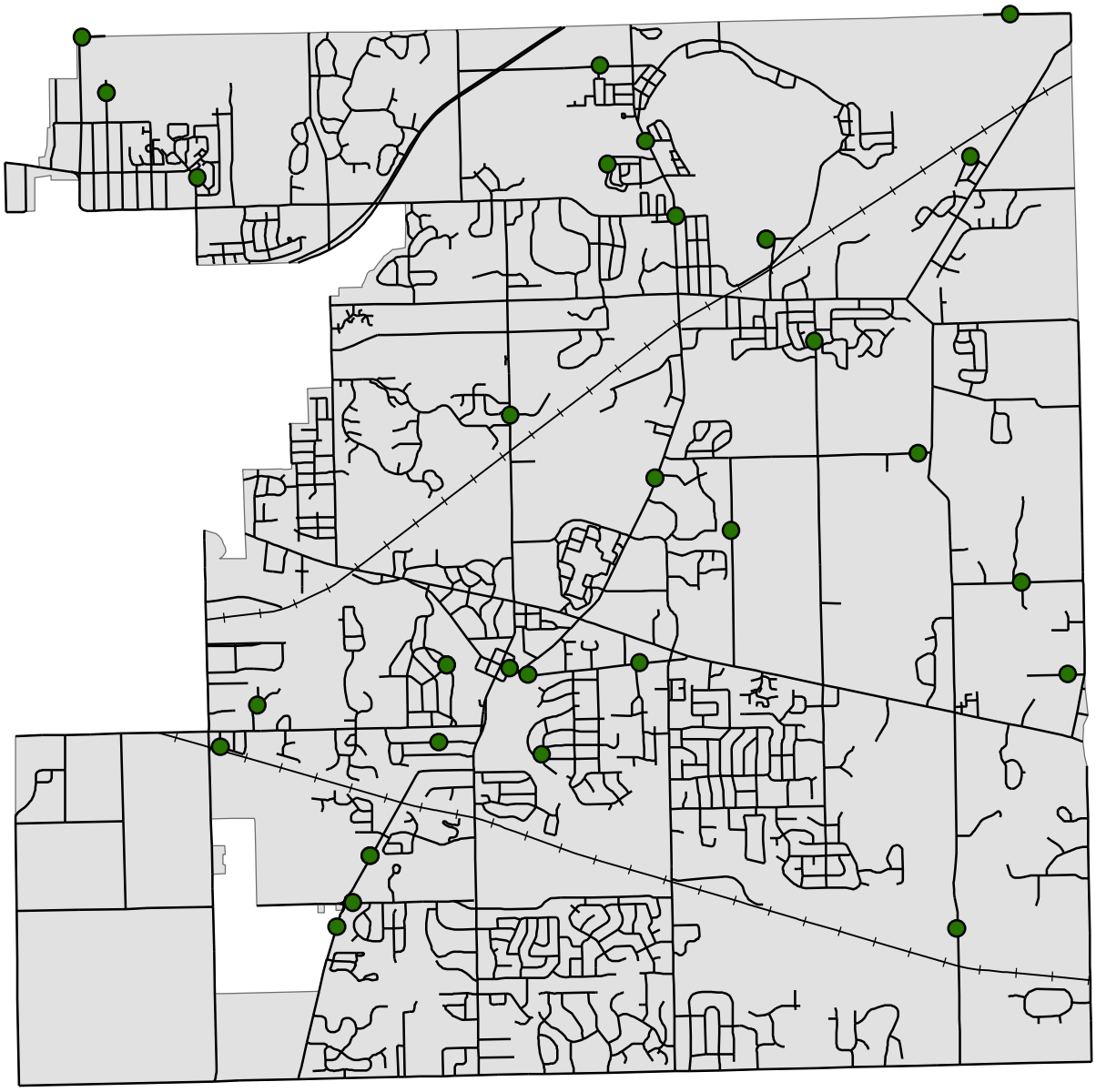
- Public Wells
- Test Wells
- Irrigation Wells
- Private Wells
- Monitoring Wells
- Railroad
- Roads
- Meridian Charter Township

4

0 950 1,900 3,800 Meters

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

Meridian Charter Township Plugged Wells Since 2005



4

Legend

- Plugged Wells since 2005
- Railroad
- Roads
- Meridian Charter Township

0 950 1,900 3,800 Meters

Source:Tri-County Regional Planning Commission and Info Geographics "Wellhead Protection Viewer" Program (November 9th, 2010)

COMPARATIVE CASE STUDY:
BATTLE CREEK, MICHIGAN

Wellhead Protection Planning

As for comparison, Battle Creek, MI was chosen by our client to compare this city to the tri-county area. Battle Creek is known for their thoroughly developed program for wellhead protection. Their Wellhead Protection program utilizes many resources and regulations that help to prevent contamination in WHPAs. They have determined the area, which contributes groundwater to its wells. These areas were graphically drafted into a 10-year time of travel. In essence, this shows how long a contamination of a well could travel in 10 years. Battle Creek also has requirements to identify known and potential sources of contamination. Examples of these could be leaking underground storage tanks, spills of hazardous chemicals from industrial sites, and transportation accidents. These areas, along with the 10-year time of travel have been drafted into WHPA zones. On top of these, detailed contingency plans were made including routine monitoring discovery, contaminant release from a site within the protection area, and a chemical spill from a transportation accident through Battle Creek's "Clean Water Program." Due to the extensiveness of these wellhead and storm water programs, our case study has offered the opportunity to make several recommendations that the Tri-County area has the potential to adopt into their strategies and plans:

- Establish wellhead and storm water protection programs separate of zoning and master plan documents. For example, a "Storm water reference manual."
- Choreograph contamination cleanups with the health departments and environmental protection agency
- Ensure that environmental checklist is current and up to date
- Create a logo the symbolizes wellhead protection areas and post signs with this along roadways to educate the public when entering a WHPA
- Actively participate in public forum on wellhead protection. For example, postings in local paper, message board, radio and television PSAs, community calendars, and encouraging implementation of water protection into school curriculum
- Update GIS maps and programs to have an advanced library of material.

Procedures & Enforcement

The City of Battle Creek has a major Wellhead Protection Plan that deals with the Health Department for much of their WHPA enforcement. The Health Department controls the inspecting and capping of wells, while the city maintains WHPA data. The city does not require Phase 1 environmental assessments to be made or onsite inspections in wellhead areas. The GIS department updates maps and plans essentially upon request from third parties.

In terms of groundwater protection, Battle Creek takes a unique approach to the subject. They have developed a storm water reference manual that deals with all enforceability aspects to groundwater regulation. Because of this, variances have not been made in the past that affects groundwater protection. There also are no contingency plans specific to the communities for hazardous contaminations. The DEQ and EPA regulate most of these aspects. The environmental checklist has not been updated for a few years, but it still remains pertinent to the current regulations

Education & Outreach

The City of Battle Creek has incredibly well developed public knowledge participations, however their involvement in capping wells has lost its state funding. The city used to have a grant that provided incentives of well reporting however, that grant has run up. Battle Creek has in-depth, ongoing programs for public information. Coupled with storm water education, many issues are brought to mainstream forum. For example, they provide Monthly message calendar (topics pertinent to surface and ground protection) disposing of hazardous waste and contamination issues, Radio commercials. Public Service Announcements, website and before movie ad, Photo contests for their calendar, Notifying of significant events for the current year and a monthly letter to editor to local paper. Schools are also required to include groundwater protection into curriculum. Furthermore, the local officials are often given updates through the groundwater management board as well as a policy committee. Battle Creek also has a groundwater protection logo that they place in sensitive areas.

Information Sharing & Data Management

The wellhead protection areas are longstanding and well developed that new wells are rarely drilled. Due to this, there are not particular regulations for data sharing in the surrounding community.

Groundwater regulations are all done independently, rather than having regional reviews. The Battle Creek wellhead department handles all specialized questions. They also have an in-depth GIS department that regularly provides updated maps and layers.