

**DRINKING WATER SOURCE PROTECTION PLAN**  
**KNOX COUNTY WATER & WASTEWATER DEPARTMENT**

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March 18, 2009

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## 1.0 INTRODUCTION

This document presents the Drinking Water Source Protection Plan (DWSPP) for the Knox County Water & Wastewater Department. The 1996 Amendments to the Safe Drinking Water Act established the Source Water Assessment and Protection Program. The Source Water Assessment and Protection Program was established to help public water systems develop plans to protect their water resources. This document was prepared in accordance with the Ohio EPA's guidance document "Developing Local Drinking Water Source Protection Plans in Ohio, Guidance for Public Water Systems Using Ground Water, July 2003". Eagon & Associates, Inc. has worked in conjunction with the Knox County Water & Wastewater Department to institute a comprehensive source-water protection program to help prevent ground-water contamination.

The Knox County Water & Wastewater Department currently operates one well field, the Knox County Water District No. 1 Well Field. The Well Field is located near Howard south of U.S. Route 36 between the Kokosing River and Pipesville Road, as shown on Figure 1-1. A Drinking Water Source Protection Area (DWSPA) delineation and Potential Contamination Source Inventory (PCSI) for the Knox County Well Field were completed by Eagon & Associates, Inc and have been endorsed by Ohio EPA. The delineated DWSPA is shown on Figure 1-1. The delineation, source inventory, and susceptibility analysis constitute the Source Water Assessment. This protection plan is the final component of the District's source water protection program.

There are five production wells at the Knox County Well Field. The well locations are shown on Figure 1-1. Current average daily ground-water demand is approximately 0.86 million gallons per day (MGD) with a peak demand of 1.4 MGD.

As mentioned previously, a PCSI was conducted in order to identify all potential contaminant sources within the DWSPA. The potential sources that were identified have been ranked according to source characteristics and the relative threat to ground water. A protection team was formed in order to develop protective strategies for each potential contaminant source including an education/outreach program, drinking water shortage/emergency response procedures, potential

contaminant source control measures, and provisions for ground-water monitoring. This plan outlines the specific activities and protective strategies that will be used in order to help prevent the ground-water resource from becoming contaminated.

The following describes in brief the organization of this DWSPP. Sections 1.0, 2.0, and 3.0 provide general background information relative to the District's ground-water supply. Section 4.0 presents the prioritization or ranking of the potential contaminant sources. Section 5.0 discusses the items addressed by the Drinking Water Source Protection Team. Sections 6.0, 7.0, 8.0, and 9.0 outline protective strategy options and Section 10.0 presents the selected protective strategies for each potential contaminant source.

## 2.0 HYDROGEOLOGIC SETTING

The Knox County Water District No. 1 Well Field is located in east-central Knox County. This area is within the Illinoisan Glaciated Allegheny Plateau physiographic region (Brockman, 1998) east of the Allegheny Escarpment. The well field is located in the flood plain of the Kokosing River. According to the Ground-Water Resources map for Knox County (Schmidt, 1980), wells at the well field are completed in a sand and gravel buried valley aquifer that generally parallels the Kokosing River. Bedrock beneath the sand and gravel aquifer is Mississippian age sandstone and is capable of providing some recharge to the sand and gravel aquifer. Most of the recharge to the aquifer will be by direct infiltration of precipitation and by induced streambed infiltration from the Kokosing River.

The bedrock topography in the vicinity of the Knox County Well Field, presented in the DWSPA delineation report, shows that the Knox County Well Field is located over a buried bedrock valley. The bedrock valley trends from east to southwest, opposite to the flow of the Kokosing River. The bedrock valley becomes shallower and narrower near Millwood and east of Millwood.

Hydrogeologic cross sections also are included in the DWSPA delineation report. The cross sections show that the sand and gravel aquifer in which the Knox County wells are completed is in contact with the underlying bedrock at Well 6, but is generally separated from the bedrock by clay. Well 2 is screened across two sand and gravel units separated by a layer of clay. The cross sections also show that the thickness of the sand and gravel changes significantly over short distances at the Well Field. Throughout much of the low lying area along the Kokosing River well-log data is sparse so the nature of the materials in the buried valley is not well defined. The cross sections show that clay is generally present at the surface, but the clay is of variable thickness and is absent in places. Aquifer water levels are sometimes above the base of the clay so the aquifer is confined in those areas and is unconfined where water levels are below the base of the clay.

### **3.0 SOURCE WATER ASSESSMENT**

The Knox County Water & Wastewater Department Source Water Assessment includes the delineation of the DWSPA, a PCSI, and an analysis of the susceptibility of the aquifer to contamination.

#### **3.1 Drinking Water Source Protection Area Delineation**

The DWSPA delineation for the Knox County Well Field was completed by Eagon & Associates, Inc. and was endorsed by Ohio EPA on March 26, 2008. The DWSPA for this well field was delineated by use of a ground-water flow model (MODFLOW). Documentation of the ground-water flow model is included in the DWSPA delineation report. The 1, 5, and 10-year time-of-travel areas for the Knox County Well Field are shown on Figure 1-1. The area within the 5-year TOT constitutes the DWSPA for the Knox County Well Field.

Figure 1-1 also shows zoning in and around the DWSPA. Most of the DWSPA is zoned as a Conservation District(C-1). Appendix A includes a copy of Article VII of the Howard Township Zoning Manual. Article VII describes permitted and conditional land uses within the C-1 zoning district. Zoning outside of the C-1 district within the DWSPA is agricultural.

#### **3.2 Potential Contaminant Source Inventory**

The PCSI report for the Knox County Well Field was prepared by Eagon & Associates in 2007 (Potential Contamination Source Inventory Report, Knox County Water District No. 1 Well Field, Eagon & Associates, Inc., 2007) and was endorsed by Ohio EPA on March 26, 2008. A copy of the PCSI report is included in Appendix A. Figure 3-1 is a map showing land use and the location of potential contaminant sources relative to the delineated DWSPA.

The PCSI was performed by first conducting a windshield survey throughout the Wellhead Protection Area and adjacent properties. Interviews were performed with personnel familiar with the



area and the history of the area. The following databases were searched to identify potential contaminant sources: National Priorities List (NPL); Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS); Toxic Release Inventory (TRI); the Bureau of Underground Storage Tanks Regulations (BUSTR); and the Ohio Department of Natural Resources (ODNR) oil and gas well records.

Table 3-1 is a summary of the potential contaminant sources identified during the PCSI. The table provides a map number that corresponds to the map location number shown on Figure 3-1 for each potential contaminant source location. A total of 15 potential contaminant sources (PCSs) have been identified in or adjacent to the DWSPA for the Knox County Well Field. Most of the identified PCSs are on-lot septic systems at private residences and oil and/or natural gas wells. Some of the oil and gas wells are abandoned and sealed and one is still active.

Also identified as a PCS is the sand and gravel extraction operation at map location 1 operated by Small's Sand & Gravel, Inc. The current extent of the quarry is well outside of the delineated DWSPA, but the boundary of a proposed expansion to the facility is just outside of the 10-year time-of-travel (TOT) approximately 4000 feet upgradient of the Knox County Well Field. The potential effect of the quarry operation on ground-water quality has been a concern of area residents and the Knox County Water & Wastewater Department. The greatest threat to ground-water quality from the quarry operation would be from operational practices related particularly to fuel handling and storage. The Conditional Use Permit issued by Howard Township to Small's Sand & Gravel, Inc. for the quarry expansion includes restrictions on fuel storage within the expansion area and includes a requirement for installation of ground-water monitoring wells. The requirements of the Conditional Use Permit will be discussed in greater detail in Sections 8 and 9 of this plan. The PCSI will be updated every 5 years.

### **3.3 Susceptibility Analysis**

The susceptibility analysis for the Knox County Well Field is included in the annual Water-Quality Reports. A copy of the 2007 Water-Quality Report is included in Appendix B. The

susceptibility analysis indicates that the aquifer that supplies drinking water to the Knox County Well Field has a relatively high susceptibility to contamination. This determination was made based on the fact that the aquifer is not overlain by a continuous confining unit and the depth to the top of the aquifer is relatively shallow. The presence of PCSs within the DWSPA makes the well field potentially vulnerable to contamination.

#### 4.0 POTENTIAL CONTAMINANT SOURCE RANKING

The potential contaminant sources have been ranked based on the risk that each source presents to the aquifer. The relative risk of ground-water contamination as a result of potential sources identified during the PCSI was evaluated based on source characteristics and the hydrogeologic sensitivity of the physical setting at each source location. The rankings were outlined and discussed in the potential contamination source inventory report for the Knox County Well Field and are shown on Table 3-1.

All of the potential contamination sources that were identified were given a low risk ranking. There is no known ground-water contamination within the DWSPA and the identified PCSs do not pose a high risk of causing ground-water contamination. The Knox County Health Department permits, inspects, and tests all new private water wells. Knox County Health Department Regulation 801 specifies requirements for the design, construction, installation, location, maintenance, and operation of household sewage disposal systems. The Ohio Department of Natural Resources (ODNR) controls permitting, operation, and abandonment of oil and natural gas wells and abandonment of unused ground-water wells. Potential nonpoint sources such as land application of agricultural chemicals and use of road deicing compounds has not resulted in contamination of the ground water and continued use of best management practices will minimize any potential risk from these sources. The greatest threat to ground-water quality at the Knox County Well Field would be from a spill of fuel or agricultural chemicals along Pipesville Road.

## 5.0 DRINKING WATER SOURCE PROTECTION TEAM

A Drinking Water Source Protection Team was established and was comprised of individuals representing local government and the Knox County Water and Wastewater Department. The Source Water Protection Team participated in the evaluation of PCSs and the development of protective strategies. The following individuals were the team members:

<u>Name</u>	<u>Organization</u>
Ron Simpson	Superintendent, Knox County Water and Wastewater Department and Howard Township Trustee
Thomas McClarnen	Knox County Commissioner
Allen Stockberger	Knox County Commissioner
Robert Wise	Knox County Commissioner
Stephen Champa	Eagon & Associates, Inc. - Consultant

The team first met to review the DWSPA delineation and the PCS. PCS rankings were discussed at that meeting. After a draft of this document was prepared the team met again to review the Source Water Protection Plan and to discuss protective strategies, appropriate education/outreach activities, emergency response, and contingency measures.

## 6.0 EDUCATION AND OUTREACH PROGRAM

The purpose of the Education and Outreach Program is to inform people who live and work in the DWSPA of how their activities can potentially impact ground water and steps that can be taken to prevent ground-water contamination.

The DWSPA for the Knox County Well Field is sparsely populated and is not traversed by high traffic roadways. Residences within the DWSPA are not served by the Knox County Water distribution system and utilize private wells for their drinking water needs. Protection of the ground-water resource for the Knox County Water District is also protection of the source of water for residents within the DWSPA. The public education and outreach strategy will focus on direct correspondence with the DWSPA residents in the form of an annual letter to each resident. An example of the first letter to be sent out is included in Appendix C. Each annual letter may be modified slightly to communicate new information.

The letters will focus on the vested interest that the residents have in maintaining high quality ground-water and will encourage residents to exercise care in the storage and use of household and lawn care chemicals, to properly dispose of household waste, and to maintain their septic systems in accordance with Knox County Health Department regulations. Property owners that use their properties for agricultural activities will be encouraged to use best management practices in the application of agricultural chemicals, to store chemicals safely, and to keep the amount of stored chemicals to a minimum. Residents will also be asked to report the presence of any old, unused ground-water or oil/natural gas wells on their property so that steps can be taken to see that any unused wells are properly decommissioned.

Residents also will be encouraged to report any illegal dumping or other activity in the area that might pose a threat to ground-water quality. The letters will include a phone number that residents can call to get answers to any questions that they may have about wellhead protection or to report circumstances that they wish to communicate to the Knox County Water & Wastewater

Department. Residents will also be informed of the location of a publicly accessible copy of the Source Water Protection Plan so that they can review the plan if they desire to do so.

Drinking water source protection area signs will be posted along roadways at the limits of the DWSPA to inform motorists that they are entering a drinking water protection area.

## **7.0 DRINKING WATER SHORTAGE/EMERGENCY RESPONSE**

The Knox County Water & Wastewater Department's Drinking Water Supply Contingency Plan is included in Appendix D of this report. The plan was written to meet the regulatory requirements of OAC 3745-85-01 to address water shortages due to power failures, water main breaks, ground-water contamination, and distribution system problems or failures. The plan contains emergency contact numbers and procedures to be followed in the event that any of these circumstances were to occur.

### **7.1 Drinking Water Shortage**

The Knox County water distribution system has no connection to any other public water supply system. In the event of a water shortage that would cause a reduction in production capacity or require shutdown of the entire well field, water would have to be trucked in. The Water Supply Contingency Plan contains a list of emergency water suppliers that would be utilized to meet short-term water supply needs until the problem can be resolved or a long-term solution can be implemented. The Contingency Plan also includes water supply service levels and a list of critical water users should restriction of use and prioritization of service become necessary.

The Knox County Water & Wastewater District production wells are located at one well field, but individual wells are separated by as much as 900 feet. It is unlikely that contamination of all of the wells would occur simultaneously so in the event of a spill or other ground-water contamination it should be possible to redistribute pumping to contain the contamination and maintain a supply of uncontaminated water from other wells. This might require disconnecting a well or wells from the distribution system and pumping the well or wells used for control of contaminant migration to waste until a more permanent solution can be achieved. Depending on the extent of contamination and the remaining system capacity it may be necessary to institute water use restrictions until normal supply can be resumed.

In the event of a long-term interruption of service, surrounding communities that could be able to supply water are Danville, Gambier, and Mt. Vernon. Since the Knox County Water and Wastewater Department is a County owned utility, funding for emergency expenditures would come from the Knox County Emergency Management Agency (EMA).

The Knox County Water and Wastewater Department is in the process of locating suitable well-field property at a second location as an additional source of supply. A second well field would also provide some degree of system redundancy that would reduce the overall vulnerability of the system to the effects of potential ground-water contamination at the existing well field.

## **7.2 Emergency Response**

The Contingency Plan in Appendix D specifies emergency response procedures for the following emergencies:

- Power Outage
- Water Main Break
- Inorganic/Organic Contamination
- Bacteriological Contamination
- Suspected Tampering
- Distribution System Storage Failure
- Water System Depressurization
- Suspected Backflow or Cross Connection
- Source Failure, and
- Unplanned Absence of Operator.

If Knox County Water & Wastewater personnel are the first to discover a leak, spill, or illegal discharge within the DWSPA they will immediately notify the Superintendent, the Knox County Commissioners, the Knox County Sheriff, the Knox County Health Department, the Knox County EMA, and the Ohio EPA. Emergency contact numbers for the Superintendent and employees of the



Knox County Water and Wastewater Department are included in the Contingency Plan. Contact numbers for other emergency response agencies and contractors are included in Appendix A of the Contingency Plan.

The first responder must provide the Superintendent with the location of the incident, the type and amount of materials released, the time that the incident occurred, and the current status of the situation. The first responder will remain at the site and continue to monitor and report events until relieved. Once notified, the Superintendent will make whatever further notification and/or requests for assistance he deems appropriate.

The Superintendent will go to the site and establish further coordination with the appropriate responders. An incident log will be started to record the information available regarding time, quantity, and the type of chemical released and subsequent events relative to the response, cleanup and potential for risk to the well field. The Superintendent will decide, based on responder input, whether or not to shut off a well(s) in order to prevent contamination of the drinking water supply. He will decide whether or not to institute water conservation measures, sample production wells, and notify critical water users.

During the response and subsequent clean up and/or remediation efforts, the Superintendent will advise responders relative to well-field conditions and ground-water flow. He will ensure that responders recognize the threat of surface infiltration and the possibility of contaminants already in the subsurface. If necessary, the Superintendent will request additional investigation which might include excavation and/or installation of monitoring wells.

## **8.0 POTENTIAL CONTAMINANT SOURCE CONTROL STRATEGIES**

Potential contaminant source control strategies for the PCSs identified in the PCSI report are discussed in the following sections. The PCS control strategies that have been selected by the Knox County Water & Wastewater Department to address PCSs within the DWSPA are a combination of site-specific strategies, existing local and state regulations, use of best management practices, and public awareness. Most of the DWSPA is zoned as a conservation district (C-1) which provides some restriction on the types of facilities that might be developed within the DWSPA. Acceptable and conditional land uses within the conservation district are defined in Article VII of the Howard Township Zoning Manual. A copy of Article VII is included in Appendix A of this report.

### **8.1 Small's Sand & Gravel**

In December 2006, the Howard Township Board of Zoning Appeals issues a Conditional Use Permit to Small's Sand & Gravel Inc. for expansion of their quarry operation. A copy of the Conditional Use Permit is included in Appendix E.

The Conditional Use Permit prohibits any washing of equipment or extracted materials, storage of fuel, construction of any buildings, and use of portable offices on the expansion properties. Other aspects of quarry operation and eventual reclamation of the quarry are regulated by the Ohio Department of Natural Resources (ODNR) and the Ohio EPA. Small's has installed two ground-water monitoring wells, at the locations shown on Figure 3-1, in accordance with the permit conditions. Ground-water monitoring will be discussed in greater detail in Section 9 of this report.

Small's is also obligated to identify any oil & gas wells located on the quarry property and to work with ODNR as part of the Orphan Well Program to properly decommission any oil & gas wells that are identified.

## **8.2 On-Lot Septic Systems**

There is no sanitary sewer service within the DWSPA and all residences within the DWSPA utilize private on-lot septic systems. Permitting, construction, and inspection of septic systems is regulated by the Knox County Board of Health as specified in Knox County Board of Health Regulation 801.

## **8.3 Transportation Routes**

Motorists will be made aware that they are entering a Drinking Water Protection Area by signs posted along roadways at the limits of the DWSPA. Residents will be asked to report any open dumping. The Knox County Board of Health and the Knox County Sheriff's Department have enforcement authority in cases of littering or open dumping.

The use of best management practices in the application of road deicing compounds, and pesticides and herbicides, by County and State employees will help to prevent contamination of the aquifer by these compounds.

## **8.4 Oil & Gas Wells**

Residents will be encouraged to report the locations of any oil & gas wells on their properties so that the condition of the wells can be verified and any wells that have not been decommissioned can be properly decommissioned. Property owners can get assistance in decommissioning these wells as part of the ODNR Orphan Well Program.

## **8.5 Agricultural Land Use**

Farmers within the DWSPA will be encouraged to use best management practices in the application of fertilizers, pesticides, and herbicides. They will also be asked to keep quantities of

stored chemicals to a minimum and to use proper procedures in mixing, use, and disposal of agricultural chemicals.

## **8.6 Abandoned Wells**

Residents will be asked to provide information regarding the presence of any abandoned ground-water wells on their properties. They will be encouraged to seal any abandoned wells in accordance with ODNR regulations.

## 9.0 GROUND-WATER MONITORING

Ground-water monitoring of production well water-quality is currently performed in accordance with the requirements of Ohio EPA. No contamination of the aquifer has been identified based on results of the water-quality testing that has been performed. The PCSs located within and near the DWSPA have a low potential for contamination of the aquifer and are, in some instances, nonpoint sources. Therefore, ground-water monitoring at points other than the production wells has not been considered to be necessary. The greatest threat to water quality at the well field would be from a spill of fuel or agricultural chemicals along the local roads and ground-water monitoring could be initiated in response to such a spill. Details of any potential ground-water monitoring system installed in response to a spill would depend on the type and amount of contamination and the location of the source relative to the well field.

Small's Sand & Gravel, Inc. has installed two monitoring wells (MW1 and MW-2) along Stull Road, in accordance with the conditions of the Conditional Use Permit that was granted to Small's for expansion of their quarry operation. The monitoring well locations are shown on Figure 3-1 and the well logs are included in Appendix F. Since the greatest threat of contamination from the quarry operation would be from improper handling or storage of fuel for equipment used at the quarry, the wells are relatively shallow, 30 feet, and are equipped with 10 foot well screens set from 20 to 30 feet below ground level. The conditional use permit specifies that monitoring of these wells is the responsibility of Howard Township. Details regarding a monitoring schedule and parameter list for these wells have not yet been agreed on by the Township. When these details are available, they will be added to this Source Water Protection Plan in a future update.

## 10.0 REFERENCES

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