September 2020

WELLHEAD PROTECTION PROGRAM PLAN

City of Portland
Ionia County, MI

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TABLE OF CONTENTS

FIGURES (attached)

ATTACHMENTS

WELLHEAD PROTECTION PROGRAM PLAN 2020 RENEWAL

EXECUTIVE SUMMARY

Throughout the State of Michigan, areas of polluted groundwater are present in almost every urbanized area. When contamination in groundwater becomes significant, human health and economic activities may be affected. As a result, communities have recognized the need for a systematic approach to groundwater quality management. A Wellhead Protection Program (WHPP) is one approach that develops long-term strategies to protect a community's drinking water supply. The long-term management of groundwater quality is endorsed at both the federal and the state level. Specifically, the Federal Safe Drinking Water Act was amended in 1986 to include wellhead protection. Additionally, the State of Michigan provides financial and technical resources for WHPP communities. The City of Portland's WHPP Plan (Plan) is a "living" document that details action being taken to ensure the long-term integrity of the City's water supply system.

In the past, the City of Portland recognized the importance of protecting the wells that supply drinking water to the community. In 2000, the City selected Fleis & VandenBrink (F&V) to assist in developing a formal WHPP based on guidelines provided by the Michigan Department of Environment, Great Lakes and Energy (EGLE). Recently, EGLE has requested that Plans be updated in six-year intervals. In 2020, the City reviewed and revised their WHPP based on the EGLE document "Checklist for Local Wellhead Protection Program Renewal".

Development of the City's WHPP and subsequent EGLE Program Renewals included public meetings, which were held periodically and as needed from 2019 to 2020. These meetings provided an opportunity for City residents and elected officials to discuss elements of the WHPP.

The overall goals of the City's program are included in this WHPP. Previous reports detail the collection of available information on the hydrogeology of the Portland area, including the interpretation of numerous depth-to-water measurements and results from aquifer performance testing. The collected information was used to develop a groundwater model that delineated the 10-year groundwater contribution zone for the City's wellfield. This area is known as the Wellhead Protection Area (WHPA). Detailed explanations of the WHPA delineation and specific options in developing and implementing management strategies were discussed at public meetings during the development and the renewal of the City's WHPP.

This Plan also identifies sites of environmental contamination listed on state and federal databases and located within the WHPA. Documenting these sites is important for several reasons, including identifying immediate risk to drinking water. This documentation is referred to as a Contaminant Source Inventory.

Collected information was used to analyze the "sensitivity" and determine the "susceptibility" of the City's drinking water wells to potential sources of contamination. EGLE has defined the aquifer supplying the City's wells as having "high" sensitivity at wells #4, #5 and #6 and "low" sensitivity at well #7. After review of the Contaminant Source Inventory information included in this Plan, the susceptibility of the wells to impact from identified sources of surface contamination will be determined by EGLE.

Based on the City's goals, and on the delineated WHPA, the City reviewed numerous options to manage the WHPA and surrounding areas. Options reviewed included both regulatory (e.g., ordinances, site review criteria, existing programs) and non-regulatory options (e.g., public education). Options that were considered effective and practical have been implemented or will be considered for future implementation.

I. PURPOSE AND SCOPE

The purpose of the City of Portland's WHPP is to protect the City's public water supply system (PWSS) from contamination. This protection is provided by determining the groundwater areas that contribute to the existing municipal wells. This area is called the WHPA. Once the WHPA is defined, existing and potential sources of groundwater contamination within the area are identified. Finally, methods to manage the WHPA and minimize the threat to existing and future private and municipal water supply wells are considered and implemented, if appropriate.

EGLE's WHPP was developed in response to the 1986 Amendments to the Federal Safe Drinking Water Act. Portions of this WHPP are voluntary and are implemented on a local level through coordination of a Wellhead Protection Team (Team) consisting of local, county and state representatives.

Guidelines have been established for the WHPP by the EGLE. The 2000 WHPP developed for the City of Portland was based on EGLE guidelines in effect at that time.

Current EGLE WHPP Renewal guidelines include the following major elements, which are further detailed in this written WHPP Plan (Plan):

- Introduction
- Roles and Responsibilities
- WHPA Delineation
- Contaminant Source Inventory
- WHPA Management Approaches
- Water Supply Emergency Contingency Plan
- Plan for New Wells
- Public Participation, Outreach and Education

II. INTRODUCTION

The purpose of this section includes updating basic information about the PWSS and the community. The City of Portland is located in Ionia County, Central Lower Michigan and approximately 25 miles northeast of Lansing on Interstate 96 in Ionia County. According to City records, the 2010 census population of the City is 3,883.

The lead agency for the WHPP is the City of Portland. The City has been actively pursuing wellhead protection activities since 1999, when a delineation study of production wells #4, #5 and #6 was completed and approved by EGLE in 2000. Also, in 2000, the City worked with F&V to develop a WHPP Plan. In 2007 a formal delineation study of #7 was completed. An updated Plan was also developed in 2014.

The City operates four Type I wells (three drift and one rock well). The wells have a total capacity of 2,162 gallons per minute (gpm) and a firm capacity (capacity with largest production well off-line) of 1,497 gpm. The location of the wells and the WHPA are illustrated in Figure 1. The WHPA for wells #4, #5 and #6 originates in Section 28 and extends southwest into Sections 29, 32, and 31 of Portland Township, Sections 5 and 6 of Danby Township, Section 36 of Orange Township and Sections1 and 12 of Sebewa Township. The WHPA for well #7 originates in Section 29 and extends slightly into Section 20 of Portland Township. Maps of the City's WHPA can be obtained by contacting the EGLE Environmental Assistance Center at 800.662.9278 and requesting a Lansing Office WHPP representative.

Land use within the WHPA for #4, #5 and #6 is primarily residential, agricultural, and commercial and land use within the WHPA for #7 is primarily residential.

This written Plan also identifies several known and potential sources of contamination within and near the WHPA. Since the 10-year delineated WHPAs are primarily located in Portland Township, as well as Danby, Orange and Sebewa Townships, the implementation and long-term success of the program will depend on the inter-governmental cooperation of the City and Townships, and on the voluntary assistance of landowners within the WHPAs.

This section also identifies the goals for the City's WHPP. These goals and objectives are intended to develop a successful long-term program to protect Portland's drinking water wellfield and to prevent groundwater pollution in the WHPAs through public education and cooperative management by local government agencies.

GOAL #1 **To protect the public drinking water supply by preventing the pollution of surface and groundwater within the WHPAs.**

Objective is to maintain a safe drinking water supply and protect the City's water infrastructure investment by preventing pollution from entering groundwater.

Methods:
- Define the WHPA
- Inventory actual and potential contamination within the WHPAs
- Ensure historical wells have been properly abandoned
- Coordinate WHPP activities with county and state agencies

GOAL #2 **To instill a sense of ownership of the wellfields and encourage the local community to recognize that wellhead protection is both worthwhile and necessary.**

Objective is to develop local awareness and support for wellhead protection.

Methods:
- Develop educational strategies
- Notify property owners located near the wellfields

GOAL #3 **To clarify the roles and duties of agencies and individuals involved in wellhead protection.**

Objective is to develop an effective WHPP.

Methods:
- Assign municipal staff
- Identify volunteers to assist with various aspects of the program

GOAL #4 **To promote inter-governmental and intra-governmental cooperation to assure protection of the water resources within the WHPA.**

Objective is to address groundwater protection on a regional basis.

GOAL #5 **To promote the speedy and thorough cleanup of existing contamination within the WHPA.**

Objective is to reduce the likelihood of contaminants migrating into the municipal water supply.

Methods:
- Document known sites of contamination
- Work with EGLE to promote monitoring cleanup of sites

GOAL #6 **To plan and prepare for water supply emergencies.**

Objective is to plan to respond to potential natural and man-made events including hazardous material spills, vandalism, power loss, etc.

Methods:
- Develop program with multiple local and non-local agencies
- Define program in a written contingency plan

III. ROLES AND RESPONSIBILITIES

The long-term success of the City's WHPP depends largely on the effectiveness of the Team and the continuing education and awareness of groundwater issues within the local community. Most communities, including Portland, have interested citizens and uniquely qualified individuals who have lived in the area for years and can contribute greatly to the long-term success of the WHPP.

Portland's Team represents the "stakeholders" of the community. Members of the Team have provided input and guidance throughout the WHPP Renewal process. The Team also reflects the reality that the groundwater reaching the existing municipal wells does not recognize municipal boundaries, and a cooperative effort with other communities in the area is necessary to effectively manage land use and development within the WHPAs.

Current Team members, their contact information and other key WHPP organizations are listed in Attachment A. Since the previous Plan was implemented, new organizations or agencies have not become involved. Additional intergovernmental agreements or memoranda have not been implemented or updated.

A description of each team member's importance and role are described below. As mentioned above, this Plan needs to be updated every six years. The City of Portland has agreed to update the Plan. Some items will require future approval of the City Manager and/or the City Council. Below is a brief description of the Roles and Responsibilities (R&R) of each team member.

Tutt Gorman, City Manager—The City Manager has the primary role of supporting and guiding the local WHPP including monitoring the Management Schedule. In addition, the Manager should respond to inquiries from the general public, Council members, staff and other key officials.

Tim Krizov, Fire Chief—He will assist water department personnel to ensure communication is apparent and protocols are understood in the event of an emergency. He should also consider the WHPA when responding to certain emergencies within the WHPA, including transportation spills involving hazardous materials.

Ken Bowman, Local Health Department Representative—The local Health Department representative has knowledge about past and current environmental issues that municipalities throughout the County face. This individual also understands rules and regulations and can provide guidance. Local Health Department staff also work to issue well and septic permits and require wells to be properly abandoned. They can partner with the City on education and outreach programs with the City.

Chris Jensen, Adjacent Municipality Representative—Because the Township boundaries are within the City's WHPA, activities within the Township will impact the City's groundwater. The Township Representative understands the current management strategies that are being implemented.

Ken Gensterblum, DPW Superintendent—The DPW Superintendent has considerable knowledge about the municipal operations of the City. Consequently, this person will work to ensure communication across the Department's emergency personnel is coordinated. In addition, this person understands water quality and quantity issues in the City and plays a vital role in the new well planning process. This person will also work with key individuals to implement the Wellhead Protection Area Management Schedule.

Rod Smith, Water Tech—The Water Tech also has considerable knowledge about the water operations of the City. Consequently, this person will work to ensure communication is apparent with emergency personnel that may be involved in the emergency response planning process. In addition, this person will play a vital role in the new well planning process and the Contaminant Source Inventory review process. This person will also work with key individuals to implement the Wellhead Protection Area Management Schedule and the Public Participation, Outreach and Education Schedule.

Keith Moss, Wastewater Treatment Plant Operator —The WWTP Operator has knowledge about the City's infrastructure. Consequently, this person may be involved in certain emergency responses, including those involving the water system.

IV. WELLHEAD PROTECTION AREA DELINEATION

The purpose of this section is to update information about the WHPA. The Federal Safe Drinking Water Act defines a WHPA as "…*the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move towards and reach such water well or wellfield".* The entire WHPP is based on the results of this key element.

TRADITIONAL DELINEATION

Between 1999 and 2000, the City of Portland completed a hydrogeological study to identify groundwater areas that move towards and reach the City's water supply wells. The study included reviewing existing background information on the regional geologic formations, surveying groundwater elevations to determine groundwater gradients and directions of flow and conducting an aquifer pump test and analysis. Computerized groundwater flow modeling and particle tracking was used to delineate the groundwater area surrounding the municipal wellfield through which contaminants could reasonably move towards and reach the municipal wellfields. The Report also includes the methodology used to develop the WHPA including maps, figures and geological cross-sections used for the modeling. Since 2000, new geological data that will have a material impact on the current delineation has not been identified. Changes in well usage or flow rates in the current WHPA that would have a material impact on the WHPA (e.g., well abandonment, new high-volume private wells, etc.) have not been identified.

The WHPA delineations for Portland are illustrated in Figure 1. The EGLE guidelines for establishing a WHPA are based on a groundwater time of travel of 10 years. This means that the area delineated for the WHPP needs to encompass groundwater areas that contribute to the City's wellfields at a distance of 10 years' groundwater travel time. A 10-year time of travel is used to provide a reasonable length of time for addressing environmental problems within the WHPA, while limiting the size to an area which can be reasonably managed by the City's existing water operations, land planning and zoning ordinances.

A. UPDATES SINCE WHPP PLAN APPROVAL IN 2014

Since the last update, additional production wells have not been added to the City's water system.

V. CONTAMINANT SOURCE INVENTORY

The goal of this element is to identify existing and potential sources of contamination within the previously determined WHPA. Contamination has several possible pathways to reach groundwater including direct spills, interior floor drains which discharge into the ground, septic systems, leaking underground storage tanks, storm water runoff, or dry and abandoned wells. In certain hydrogeologic settings, even very small amounts of a hazardous substance can contaminate large areas of groundwater.

The Federal Safe Drinking Water Act also requires that a WHPP "…*will identify within each wellhead protection area all potential anthropogenic sources of contaminants which may have any adverse effect on the health of persons"*. An anthropogenic source is any activity performed by or caused by human actions that is, or potentially could be, a source of contamination to groundwater, including human actions affecting natural contaminants. The releases can be either from *point* sources, such as leaking tanks or impoundments, or from *non-point* sources, such as the application of agricultural chemicals or releases from areas containing septic tank/leach field systems.

A contaminant is defined in this WHPP as an organic, inorganic or microbiological substance that is regulated under federal, state or local environmental programs.

Applicable federal and state-related environmental laws and hazardous material regulations to control the use of potential contaminants generally include the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA or "Superfund"), Safe Drinking Water Act (SDWA), Clean Water Act (CWA), Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Although these regulations have imposed controls on a wide range of industries and hazardous material treatment, storage and disposal practices, they tend to focus primarily on the larger manufacturing industries which manage the majority of hazardous wastes and hazardous materials in this country. Other smaller industries and businesses are not as stringently controlled (if controlled at all) due to the focus on industries that manage wastes or materials above a threshold amount or because the materials managed by the smaller industries are not

considered "hazardous". As a result, materials and wastes that are not generally regarded or regulated as "hazardous" still have the potential to contaminate groundwater supplies.

Identifying the location and types of potential sources of contamination is essential in the development and implementation of effective management and public education strategies within the local WHPP.

A. CATEGORIES OF POTENTIAL CONTAMINATION SOURCES

As part of this WHPP, categories of sources or activities having the potential to contaminate groundwater are provided in Attachment B. The table is intended to provide a general overview of environmental risks associated with various activities. The categories have been grouped according to the type of activity (e.g., agricultural, residential, governmental, commercial and industrial) with which the source is commonly associated. The type(s) of contaminant(s) commonly associated with the various types of sources and the relative risk to groundwater quality are also provided. Additional detail on

While a number of existing and potential sites of contamination were identified, many of the properties have been assessed by various private parties, EGLE and United States Environmental Protection Agency (EPA) and private party funded initiatives. While actual and potential sources of contamination exist throughout the WHPAs, the City works with EGLE to maintain a comprehensive water testing program to maintain a quality drinking water supply. Several sites with significant impact are or have been actively remediated and monitored. In reviewing the information presented in this report, the Team considered that many identified sites located in the 10-year WHPA have been there for decades and the City has never detected a man-made contaminant in a supply well.

B. CONTAMINANT SOURCE INVENTORY PROCESS

An initial inventory was completed in 2000. The purpose of this inventory was to develop and confirm a list of existing and potential sources of contamination within the WHPAs.

The inventory was updated in 2014 and again in 2020. The identification of existing sources of contamination has been compiled using information from various agencies including those listed below:

- Sites of Environmental Contamination (201 sites), Remediation and Redevelopment Division (RRD), EGLE (Part 201 of Act 451) (http://www.deq.state.mi.us/part201ss/)
- Underground Storage Tank List, Waste and Hazardous Materials Division, EGLE (Part 213 of Act 451) (http://www.deq.state.mi.us/sid-web/)
- Leaking Underground Storage Tank Sites, Remediation and Redevelopment Division, EGLE (Part 213 of Act 451) (http://www.deq.state.mi.us/sid-web/)
- Oil & Gas Contamination Sites, Geological and Land Management Division, EGLE (Act 61) (http://www.michigan.gov/deq/0,4561,7-135-6132_6828-98518--,00.html)
- Hazardous Waste Generators, Waste and Hazardous Materials Division, EGLE (Part 111 of Act 451) (http://www.deq.state.mi.us/tsd/ & http://www.deq.state.mi.us/wdspi/)
- Groundwater Discharge Permits, Water Bureau, EGLE (Part 31 of Act 451)
- Landfill/Solid Waste Disposal Site List, Waste and Hazardous Materials Division, EGLE (Part 115 of Act 451) (http://www.deq.state.mi.us/wdspi/)
- Federal National Priorities List EPA, Region 5 (CERCLA and Superfund) (http://www.epa.gov/superfund/sites/npl/npl.htm & http://www.deq.state.mi.us/spad/)
- Other sites of concern identified by the Team

For this WHPP, *'existing'* sources are those which are known to have caused or threaten to cause groundwater contamination; regulatory agencies may have information pertaining to existing sources. *'Potential'* sources are those which may or may not have caused groundwater contamination but have the potential to do so; regulatory agencies may or may not have knowledge and/or information available relating to potential sources. F&V reviewed the Michigan Environmental Mapper for common sites of contamination (e.g. Leaking Underground Storage Tanks, “Part 201 sites”, NPDES discharges etc. as presented in Figure 5). F&V also used the services of Environmental Data Resources (EDR) to search less-common databases for less common environmental information for the WHPA. F&V reviewed the information with the Team to check for discrepancies and obtain local information about the sites identified by EDR. A copy of information used for the inventory and identified sites are included in Attachment C.

C. TRANSPORTATION ROUTES

Transportation routes represent areas with the potential for transient hazardous substances. Interstate highways, which are often primary routes for the transportation of hazardous substances, are not present in the City's WHPA. The Wellhead Protection Team recognizes that groundwater quality degradation may occur as the result of significant and sudden releases or spills of hazardous or polluting materials during transit within the City. The Portland Area Fire Authority has representation and actively participates on the Wellhead Protection Team and understands the importance of transportation spills within the WHPA being addressed promptly.

Throughout the State, the Michigan Department of Transportation (MDOT) has designated numerous alternate transportation routes that are used when major routes are unavailable. When Interstate Highway I-96 is closed along certain locations between Lansing and Grand Rapids, Business Route I-96 (Grand River Avenue) is used as an alternate route. Business I-96 traverses the City of Portland, including an area within approximately 1,000 feet south of the City's wells.

A long-term goal of the WHPP includes reviewing options to develop a contingency plan to put in effect when traffic is re-routed through the City from I-96.

D. SURFACE WATER SOURCES

The City is located in the Grand River watershed, with several communities located upstream including Grand Ledge.

Surface water quality degradation can occur through both non-point and point source discharges. Groundwater quality degradation may occur when surface water of lesser quality recharges the aquifer by means of infiltration through the streambed.

With point source discharges, the contaminant threat is dependent on the volume of the release, chemical/physical properties of the contaminant and surface water velocity.

Non-point source contaminants are usually seasonally derived, resulting from the release of fertilizer and pesticide applications in agricultural portions of the watershed and/or storm water runoff from urban areas.

It is important to note that groundwater/surface water interactions in lake and river/creek systems are often complex and are transient in nature. Because these two resources are connected, groundwater can be impacted by contaminants released to surface water and vice versa.

E. ABANDONED WELLS

Abandoned wells can pose a threat to groundwater. Wells that are not properly closed can provide a direct conduit for surface run-off and contaminants to easily reach the groundwater. Abandoned wells may be from oil and gas drilling, water wells, irrigation wells, or dry wells. In 2020, the City properly plugged an abandoned community supply well referred to as "Old PW-3" located next to PW-4 (different than the currently permitted PW-3).

As part of the Contaminant Source Inventory completed for the City's WHPP, EGLE Geological Survey Division was contacted for records of contaminated oil and gas wells or listed contamination sites within the Portland area. EGLE records report active or abandoned wells, or "dry holes" (a well used for oil and gas exploration and not associated with production) within the City's WHPA.

F. HAZARDOUS PIPELINES

Hazardous pipeline failures have resulted in surface and groundwater becoming contaminated in several states, including Michigan.

Based on records publicly available through the U.S. Department of Transportation's Pipeline and Hazardous Material Safety Administration natural gas, petroleum, and other hazardous material pipelines

in the City's WHPAs were not identified. A natural gas transmission pipeline operated by Consumers Energy is located south of I-96 and outside of the WHPAs.

G. SENSITIVITY ANALYSIS

The 1996 amendments to the Federal Safe Drinking Water Act require states analyze the "sensitivity" and determine "susceptibility" of a community's source of drinking water to potential sources of contamination.

Sensitivity is determined from the natural setting of the source water (raw water to the City's wells), and indicates natural protection afforded the source water. As documented by EGLE in 2008, information from the WHPA delineation indicates that the aquifer from which the City's wells #4, #5 and #6 obtain groundwater is "unconfined." Unconfined aquifers are geologically categorized as "sensitive", meaning that polluting materials spilled on the ground surface are not prevented from vertical migration by one or more geologic confining layers located above the aquifer. As documented by EGLE in 2008, information from the WHPA delineation indicates the aquifer from which the City's well #7 obtains groundwater is "confined". Confined aquifers are geologically categorized as "low" meaning that polluting materials spilled on the ground surface are prevented from vertical migration by one or more geologic confining layer located above the aquifer.

H. SUSCEPTIBILITY DETERMINATION

Susceptibility identifies factors within the community's WHPA that may pose a risk to the water supply. Categories of susceptibility determination are "moderately susceptible", "highly susceptible" or "very highly susceptible". The susceptibility determination provides indications of which statewide WHPAs should be given greater priority and oversight in implementing a WHPP. After review of the 2020 Contaminant Source Inventory, EGLE may determine the current susceptibility rating of the City's WHPA.

When considering sensitivity and susceptibility, it is important to understand that a system can have low sensitivity relative to some conditions (e.g., wells located a significant distance from potential contamination sources) and high susceptibility because of other conditions (e.g., the type of contaminant).

I. CONTAMINANT SOURCE INVENTORY MAINTENANCE

All data management systems require periodic maintenance. Data maintenance for the City's Contaminant Source Inventory was initiated when the preliminary list of sites was compiled. Specifically, the preliminary site names and mapped locations were confirmed by members of the Team.

VI. WELLHEAD PROTECTION AREA MANAGEMENT

The goal of this element is to provide mechanisms which will prevent existing and potential sources of contamination from reaching the community drinking water supply wells. The WHPP Plan Renewal included review of the initial management strategies and discussion of their effectiveness. Additionally, the Plan Renewal included review of other potential management activities that the City could pursue.

In developing the initial management strategies for the City's original WHPP, it was acknowledged that it is highly improbable that all risks within the WHPA can be eliminated but, by applying one or more management tools, the likelihood of groundwater contamination impacting the municipal water supply in the future can be reduced. Some management strategies to protect the drinking water supply that are required under Michigan law are not described in this WHPP.

Several management options practiced in the early 2000s were reviewed by the Team in 2000 as part of the initial WHPP. In 2015/16, the Team reviewed and reconsidered management strategies that were selected in the past. The 2020 renewal review included current concepts, thoughts and experiences from both Michigan and other nearby states and communities as well as past experience from Team members. The Team also acknowledges that the City will continue to rely on a historically and proven reliable system of mandatory federal, state and county groundwater and well operation requirements. Going forward, the Team has attempted to develop management strategies that can be both effective and measured. Management strategies that have been implemented previously, along with those that will be pursued in the future are discussed on the Wellhead Protection Area Management Schedule. Management tools that the City implemented along with other management strategies that the City may pursue are included in Attachment D.

WELLHEAD PROTECTION AREA MANAGEMENT SCHEDULE

Activity	Objective	Goal	Measure of Accomplishment	Team Lead, Implementation Date and Frequency
#1 Underground Storage Tank Cleanups (Part 213 of Michigan's PA 451)	Consider the current WHPAs or potential future WHPAs (in response to construction of new municipal drinking water wells). If requested to leave contamination that has migrated into rights-of-way and/or City property, consider current and future land use. This includes the responsible party filing a "Notice to Local Unit of Government of Land Use Restrictions" with the municipality where the restricted land use is being proposed.	City work with their Engineer and contact EGLE to request strong consideration of the Wellhead Protection Area when reviewing proposed corrective action activities at the leaking underground storage tank location.	Activities and information discussed	Lead: City Manager Developed and implemented
#2 Adopt zoning amendments related to WHPA and groundwater protection	Protect the WHPA from surface contamination thru enhanced site plan review criteria and prohibitions of certain land uses.	City Council and Township Board approval of zoning amendments	Zoning amendments	Lead: Planning Commission Developed and implemented in the City

#3 Consider expanded chemical monitoring at the wellhead in response to known sites of contamination.	**Protect the WHPA**	**Voluntarily monitor and in certain instances track trends of certain indicators of contamination of specific contaminants (e.g. PFAS).**	**Gathering of data**	**Lead: Water Tech** **Developed and implemented in the City**
#4 Contamination Source Inventory	Review and modify inventory	Address new sites and changes in the status of existing sites.	Completed updates	Lead: City Manager Developed and implemented in the City. 6-year cycle.
#5 Fire Fighter Right to Know Surveys	Conduct and maintain copies of Right-to-Know surveys at facilities located within the WHPAs.	Increase likelihood that facilities are in compliance with fire codes and storage of the hazardous materials.	Completed surveys	Lead: Authority Fire Chief Annually
#6 Private Well Permitting and Abandonment	Protect the WHPA from surface contamination migrating to the drinking water supply through abandoned, but not plugged, wells.	Contact the Health Department Sanitarian to review the WHPA and the importance of managing permits of wells within the WHPA. Additionally, for each demolition permit issued, the City will request and track the number of on-site wells plugged.	Number of wells plugged	Lead: City Manager In 2006—Participated in the EGLE (formerly MDEQ) Abandoned Well Management Program Current Effort—Plug Wells as Funding Availability
#7 Groundwater Discharge Violations within WHPA (Part 22 of Michigan's PA 451)	Address third party Part 22 violations, which provides the Local Unit of Government notification of violations to permitted groundwater discharges.	In the future, when a Part 22 related transmittal is received, the City will contact EGLE or the City's Engineer to evaluate appropriate response.	Activities and information discussed	Lead: City Manager Developed and implemented

#8 Site Plan Review Environmental Permit Checklist	**Use the Environmental Permit Checklist as part of the City's site plan review process.**	**Use the Permit Checklist is to assist developers in complying with various state and county environmental permit requirements.**	**Site plan reviews**	**Lead: City Manager** **Developed and implemented**
#9 Incorporate WHP into Township planning	Members of WHP Team participate in City and Township planning activities	Various City and Township plans include WHP	Adopted plans that reference WHP	Lead: Planning Commission Ongoing
#10 Annual Review of the Emergency Response Plan	Keep the Emergency Response Plan information and contacts up to date	Emergency Response Plan up to date, keep staff aware of procedures and contacts	Annual report added to the Emergency Response Plan listing date of review and changes or updates to the Plan	Lead: Water Tech Annually
#11 Incorporate WHP into City Planning	Develop City planning culture that considers the importance of maintaining a safe drinking water supply.	Continue referencing WHP in updates to documents such as several updates to the City's Master Plan, since 1993 and has included the goal of a partner in the preservation and enhancement of the natural environment and water quality (2008). One of the strategies is the continued implementation of the City's wellhead protection program. More recently, Portland's 2014 "Vision 2040" Master Plan has placed the highest priority (A) and shortest timeframe (1) on "Continue to implement the City's wellhead protection program" for Goal #4: Sustainability & Green Technology	Planning actions	Lead: City Planning Commission Developed and implemented

#12 Annually contact the County Drain Commissioner	Update each other on ordinances, contaminated sites, and storm water management as they pertain to the WHPP	Keep Interagency Partners up to date with activities and events occurring in the WHPAs	Meeting minutes, activities and information discussed	Lead: Water Tech Annually
#13 Annually contact the County Health Sanitarian	Update each other on ordinances, contaminated sites, cleanup events and wells as they pertain to the WHPP	Keep Interagency Partners up to date with activities and events occurring in the WHPAs	Meeting minutes, activities and information discussed	Lead: Water Tech Annually
#14 Annually contact EGLE Remediation and Redevelopment District staff	Update each other on ordinances, contaminated sites, cleanup events and wells as they pertain to the WHPP	Keep Interagency Partners up to date with activities and events occurring in the WHPAs	Meeting minutes, activities and information discussed	Lead: Water Tech Annually
#15 Participate in County-Hosted Hazardous Waste Collection Activities	Eliminate unused hazardous materials	Reduce likelihood of hazardous materials contaminating the City's drinking water supply	Pounds of hazardous materials collected	Lead: Clerk Annually
#16 Reduce number of water wells located in the City	Reduce the creation of abandoned wells	Reduce the likelihood of rapid migration of surface contaminants into current and/or future municipal drinking water supplies.	Number of wells constructed in the City	Lead: City Manager Developed and implemented by code

VII. WATER SUPPLY EMERGENCY CONTINGENCY PLAN

The goal of this element of the Plan is to provide both short-term and long-term protection of the City's water supply system by identification of personnel, testing equipment, procedures, and materials which can be used for rapid correction or elimination of environmental accidents which might constitute a water supply emergency. The contingency plan also addresses response protocols, notification procedures and methods of containment.

The existing contingency plan outlines the program for the rapid correction or mitigation of water supply emergencies. It contains an inventory of necessary stand-by personnel, equipment, chemicals, and other materials readily available for the correction of water supply problems, including emergency measures in the event of contamination of the municipal wells from an emergency spill within the WHPA. The means of notification of customers affected by an emergency is also provided, along with a description of the precautions and measures to be taken to protect the health of the affected system's water customers.

City leaders understand that response to contaminated wells is not limited to technical measures. Indeed, when a municipal well becomes contaminated, it becomes a technical problem requiring professional knowledge of hydrogeology, engineering and other disciplines. Additionally, financial, legal, public relations and risk assessment problems may occur. Often, the initial public questions include:

- What is the current water quality?
- What is the source of the contaminants?
- What are the effects of past water usage?
- What action is being taken?

When municipal wells become contaminated, it is usually a surprise. This is especially true for wells located in a Wellhead Protection community. While it is unlikely that any plan will prevent an adverse response from the City's water customers, this Wellhead Protection Plan suggests:

- Inform residents of the truth as soon as it is known.
- Inform residents immediately upon confirmation of contaminants in the water supply.
- Continue to inform residents of activities being undertaken.

If the wells become contaminated, the EGLE would likely require that the City immediately initiate activities to provide either a treated water system or a new water supply. Once contamination is discovered, action may need to be taken before bonds or loans become available to address infrastructure needs. The City's "Water System Emergency Response Plan and Contingency Plan for Response to Wellhead Protection Area Groundwater Contamination" addresses this scenario.

If the wells become contaminated, an invaluable resource would include a previously established, consistent and strong public education program. Such a program would likely provide City officials with the "benefit of the doubt" when explaining cleanup concentrations goals, how clean is clean, projected schedules, costs and funding.

Two parts of the long-term contingency planning for the City will be based on the results of the Contaminant Source Inventory. First, the City may initiate a system of self-monitoring for certain contaminants that have been identified near the wells. Specifically, the City may sample for certain contaminants at a greater frequency than required by state law. The frequency and tests will be determined upon review of available files from a contaminated site. Secondly, future updates to the Contaminant Source Inventory may identify other chemicals that should be tested for more frequently than required by law. The City will work closely with environmental professionals (state, county and private) to evaluate cost/benefit relationships of any testing beyond what is already completed by the City.

New full-time DPW employees hired by the City have received training on the emergency response protocol.

Since the Plan was last updated, the City has not encountered any water supply emergencies. A copy of the current contingency plan is included in Attachment E.

VIII. PLAN FOR NEW WELLS

The goal of this element is to provide a mechanism for incorporating new wells or wellfields into the WHPP. In the future, the City may find it necessary, as a result of existing or projected increased water demand. Aging wells/infrastructure, or as the result of a contamination threat, to explore the development of additional groundwater sources for drinking water. The City Maximum Daily Demand (from the 2014 Water Reliability Study) and capacity is below EGLE's guidelines to begin the process of increasing firm capacity. The 2020 Water Reliability Study, which has not been finalized, will re-evaluate based on current information. As part of this WHPP Renewal, the City has evaluated potential locations for a new well to provide diversity in higher quality source water found in the glacial drift (Attachment F).

When a new capacity is needed, wellhead protection provides a mechanism that can be used to help select the best site and to identify areas that should be protected now so they will be able to provide quality drinking water in the future when they are needed. Additionally, it should be realized that the development of a new groundwater source in the vicinity of existing sources may modify the movement of groundwater in the subsurface, perhaps changing the shape and orientation of the existing WHPA. Evaluation of the significance of those changes is necessary in order to ensure that the management strategy in place will continue to protect the community's drinking water supply.

Generally, the City will increase source capacity using a phased approach to conduct well site selection and to then conduct site-specific testing to evaluate potential sites. The phased approach will allow the City to evaluate and address the many technical, operational, geological, WHPP elements and financial factors involved in selecting potential well sites.

City representatives, City Engineer, EGLE engineers, County Health Department and Wellhead Team members would be involved in the site selection process. If needed, a review of EGLE files of known sources of contamination in potential locations or WHPAs of a new well is encouraged. Additionally, utilizing the State of Michigan Water Withdrawal Assessment Tool to determine areas that are not favorable for groundwater exploration because they may result in an Adverse Resource Impact (ARI) may be helpful.

Based on the initial results and the City's schedule for constructing a new Type I water supply well, additional investigations will proceed on a timeframe that will be established by the City. The additional investigations will include field testing to confirm water quantity and quality at one or more preferred future well locations.

IX. PUBLIC PARTICIPATION, OUTREACH AND EDUCATION

The goal of this element is to provide mechanisms for public participation and outreach regarding the City's WHPP. The WHPP Plan Renewal included a review of the initial strategies and discussion of their effectiveness. Additionally, the Plan Renewal included review of other outreach and education activities identified by EGLE in their WHPP Renewal guidance or otherwise presented to the WHP Team by F&V.

In developing the initial strategies for the City's original WHPP, an emphasis was placed on selecting activities that would raise awareness of the City's groundwater resources and also reduce the likelihood of existing and potential sources of contamination from reaching the community's drinking water supply wells. Some outreach strategies to protect the drinking water supply that are required under Michigan law are not described in this WHPP.

Several strategies practiced in the early 2000s were reviewed by the Team in 2000 as part of the initial WHPP. The Team was assigned the lead responsibility to recommend what specific strategies, if any, should be presented to the City Council for further consideration.

During the last update, the City implemented several management strategies for drinking water protection. They reviewed and reconsidered strategies to reflect current concepts, thoughts and experiences from both Michigan and other nearby states and communities. Additionally, the Team reviewed and reconsidered strategies that were selected in the past. Educational initiatives that have been pursued in the past, along with those that the City plans to pursue in the future are included in the

Public Participation, Outreach and Education Schedule. Educational activities that the City has pursued in the past are included in Attachment H.

Public Participation, Outreach and Education Schedule

Action	Objective	Goal	Measure of Accomplishment	Team Lead, Implementation Date and Frequency
#1 Awareness – WHPP Road Signs	Inform transporters as to the location of the wellhead protection area in case of a spill or major accident; create local awareness of the WHPA	Protect the wellhead plume area from spills of materials transported on roads or leaked from vehicles involved in accidents	Installed and maintained WHPA signs along major roads entering or crossing the wellhead protection zones	Lead: DPW Superintendent Installed in 2000 with some replaced in in 2918. Maintain annually
#2 Awareness – Oil & Hazardous Waste Collection	Coordinate annual county hazardous materials recycling events within the City.	Reduce uncontrolled disposal of hazardous materials	Number of collection events.	Lead: Fire Chief Ongoing annual event
#3 Information Distribution – Publications Informational Publications available at City Buildings	Have publications that discuss wellhead protection available to the public at City Buildings	Educate the public on the importance of wellhead protection	Publications put on display for the year and the number of publications distributed	Lead: City Manager Ongoing
#4 Information Distribution – Public Forums **Discussion of water quality, quantity and wellhead protection in public forums**	Present WHPP and discuss water quality, quantity and wellhead protection at public forums such as City council and/or committee meetings and local groups, such as the Chamber of Commerce, Rotary, and the Downtown Development Authority.	Educate the public and governmental bodies on the Wellhead Protection Plan, the City water quality and quantity	Public forum date(s) and estimated attendance	Lead: City Manager By 2022
#5 Information Distribution – Social Media and City Web Site	Use written and online media sources to introduce and develop a local understanding of the concept of wellhead protection.	Educate the public on wellhead protection using information on various aspects of WHP (e.g., household hazardous waste disposal, water conservation, abandoned wells, etc.).	Measurement will be dependent on web site monitoring capabilities of the City.	Lead: City Manager Ongoing

#6 Information Distribution – City Newsletters	Distribute general information about wellhead protection to local residents	Publish various wellhead protection information	The number of publications made	Lead: City Manager By 2021 and then every 3 years

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GLOSSARY OF TERMS

Aquifer
Permeable geologic material, such as rock, sand, or gravel, which contains water in sufficient quantities to supply a well.

Confined Aquifer
1) An aquifer overlain and underlain by impermeable layers, such as clay; or 2) an aquifer in which the groundwater is under pressure greater than atmospheric pressure and which will rise in a well above the point at which it is first encountered.

Critical Materials
Substances that are listed in Michigan's "Critical Materials Register". The Register is a list of chemicals of high environmental concern. Facilities that store critical materials on site must submit a pollution incident prevention plan to the State, and they must provide secondary containment for the materials.

Groundwater Impact/Contamination
The result of the spillage or discharge of hazardous substances or polluting materials into an aquifer.

Delineation
The mapping out of the area through which groundwater moves to reach a drinking water supply well(s).

Environmental Regulations
State environmental laws have been codified into one Act, the Natural Resources and Environmental Protection Act (Act 451 of 1994) (NREPA). The following "parts" deal directly with groundwater protection:

Part 201 of NREPA, Environmental Remediation Section
The State's own "Superfund" law, this section oversees the cleanup of contaminated sites in Michigan. The section also provides for the listing and prioritization of contaminated sites.

Part 111 of NREPA, Hazardous Waste Management
Regulates the storage, treatment, and disposal of hazardous waste. Requires permits for facilities that store, treat, or dispose of hazardous waste. Those that generate more than 1000 kilograms/month of hazardous waste are termed "large quantity generators" (LQG). These generators must report their waste generation to the State and to the EPA, provide secondary containment for liquid wastes, and prepare emergency plans. Those generating between 100 and 1000 kilograms/month are termed "small quantity generators" (SQG). These generators must report their waste generation to the State and the EPA. Those generating under 100 kilograms/month are "conditionally-exempt small quantity generators." They must keep records of their operations.

Part 111 also regulates the siting and operation of hazardous waste landfills.

Part 115 of NREPA, Solid Waste Management
Regulates the siting and operation of solid waste landfills.

Part 31 of NREPA, Water Resources Protection
Mandates the protection and conservation of the water resources of the State, including groundwater. Regulates discharges of pollution to ground and surface water. Requires facilities handling "critical materials" to prepare spill response plans and to provide secondary containment. Requires facilities discharging polluting materials to the groundwater (through floor drains or otherwise) to obtain a groundwater discharge permit. Regulates sanitary wastewater discharges of over 10,000 gallons per day.

Part 615 of NREPA, Supervisor of Wells

Regulates the drilling and operation of oil and gas wells, and the disposal of wastes created from such operations. Well drilling, operation, closure, and waste disposal must be carried out so that damage of fresh water supplies is prevented.

Part 211 of NREPA, Underground Storage Tank Regulations

Requires annual registration of underground storage tanks and compliance with leak detection requirements. Regulates response to discovered leaking tanks.

Part 83 of NREPA, Pesticide Control

Regulates the use of pesticides for agricultural uses.

State laws not codified into NREPA:

Public Health Code (Act 368 of 1978)

Regulates construction of private water wells. Part 127 requires that wells that are abandoned be properly plugged to prevent contamination.

Michigan Safe Drinking Water Act (Act 399)

Provides for the supervision and control of public water supplies and public health protection.

Relevant Federal laws:

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Often called the "Superfund Act," it oversees and funds cleanup of contaminated sites.

Underground Injection Control Program

Regulates the underground injection of toxic waste. Hazardous waste operators injecting waste into wells must obtain a permit from the EPA.

Safe Drinking Water Act (SDWA)

A federal Act designed to protect drinking water. 1986 amendments require states to develop wellhead protection plans "to protect wellhead areas within their jurisdiction from contaminants which may have any adverse effects on the health of persons."

Superfund Amendments and Reauthorization Act (SARA), Title III, Community Right-to-Know

Requires facilities using certain amounts of hazardous substances to report their usage to the EPA and to the State. Facilities meeting certain criteria must also prepare emergency response plans.

Fire Fighter Right to Know Program

Requires Fire Fighters to survey and inspect all facilities in their community that handle hazardous substances.

Freedom of Information Act

States that all information gathered by public agencies must be made available to the public upon request.

Groundwater

Freshwater that fills the spaces between sand, gravel, and clay underground.

Hazardous Substance
A chemical or other material that is or may become injurious to the public health, safety, or welfare, or to the environment. You can find hazardous substances in small and large businesses, farms, and households.

Household Hazardous Waste
Products used in the household or home garage that, when used, stored, or disposed of improperly, may pose a threat of contamination to the environment.

Hydrogeology
The study of water and geology, and how the two interact.

Hydrogeologist
A person who studies hydrogeology.

Leaky Confined Aquifer
An aquifer that has a confining layer of clay over it that is noncontiguous, allowing for some recharge ("leakage") from the surface.

Secondary Containment
Providing a kind of structure around a storage tank or container so that, if there is a spill, the substance will be contained.

Site of Environmental Contamination
Sites where leakage, spillage, or other discharge of hazardous substances has contaminated the groundwater or soil; and that the State has placed on its list of contaminated sites, under the Environmental Remediation Section (Part 201) of the Natural Resources Environmental Protection Act, PA 451.

Superfund Site
A site listed as contaminated under the Federal Superfund law.

Topographic Maps
Maps produced by the U.S. Geological Survey that show roads, lakes, streams, wetlands, developed areas, municipal boundaries, elevation contours, and other features at a scale of 1:24,000.

Tritium
An isotope of water (a water molecule that has three hydrogen atoms instead of two). Atmospheric testing of nuclear weapons in the 1950s caused tritium levels in water supplies to increase. (Don't worry! Tritium is a harmless substance). Hydrogeologists test the level of tritium in water to measure the age of the water.

Unconfined Aquifer
An aquifer with the water table as its upper boundary. Because the aquifer is not under pressure, the water level in a well is the same as the water table outside the well.

Underground Injection Wells
Wells into which treated water and/or other wastes are injected for disposal.

Underground Storage Tanks
Tanks under the surface of the ground in which gasoline, fuel oil, and other substances are stored.

Water Table
The top of an unconfined aquifer where water pressure is equal to atmospheric pressure. The water table depth fluctuates with climate conditions on the land surface above and is usually gently curved, following a subdued version of the land surface topography.

Well Logs
Records that well drillers complete when they drill a residential or public drinking water well. Well logs contain information such as depth to water table, lithology, the type of well constructed, and the depth of the well.

Wellhead
The physical structure at the land surface through which groundwater is withdrawn from an aquifer.

Wellhead Protection Area (WHPA)
The surface and subsurface area surrounding a water well or wellfield through which contaminants are reasonably likely to move toward and reach such well or wellfield. The WHPA is the "catchment area" of concern for public water supplies dependent on groundwater.

Wellhead Protection Plan (WHPP)
A plan developed by a community operating a public well water supply system that details how the community will work to protect their wells from contamination.

Adopted from: "*Wellhead Protection Community Guide"* Huron River Watershed Council, February 1997 pg. 171 - 176.

DRAFT

PRELIMINARY EVALUATION

OF

POTENTIAL COMMUNITY WATER SUPPLY WELL SITES

FOR THE CITY OF PORTLAND, MICHIGAN

PREPARED FOR:
CITY OF PORTLAND

September 2020
Project No. 3332F

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Fleis & VandenBrink (F&V) was retained by the City of Portland (City) to identify and help prioritize future community supply well sites and general areas for a future well. This work was completed as part of the City's ongoing Wellhead Protection efforts. Siting wells is a required element of the State's Wellhead Protection Program. Identifying sites which will meet the well siting requirements established by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and will provide a long-term sustainable source of drinking water, is an important planning objective of the City.

The City is evaluating areas which can sustain a 660 gallon per minute (gpm) Type I community supply well. The additional supply will provide potential replacement and/or backup capacity for the City.

The findings of this evaluation are intended to help focus future physical investigations of sites, and eventually lead to securing well sites for future use. Follow up investigations, such as additional research and hydrogeological assessments, are necessary to field verify preliminary findings and to confirm whether conditions of a site are favorable for siting a community well. Such investigations require time and financial resources. One of the purposes of this analysis is to assist those efforts.

2.0 SITE IDENTIFICATION

F&V has been working with the City's Wellhead Protection Team (Team) to evaluate future water supply needs and discuss well potential site areas. During this study, F&V met several times with the Team to review past well location efforts, basic characteristics and the types of criteria used in prioritizing well sites. The Study Area, as shown in Figure 1, generally includes the City of Portland and Portland Township.

During this investigation, ten potential well site areas were identified and evaluated. These sites represent both specific property parcels and general areas for a new well. For both, the greater the distance that a new well is considered from the site evaluated, the greater the likelihood that evaluation metrics are different. Evaluated sites are shown on Figure 1. F&V further evaluated characteristics of these sites in order to determine if they may be viable locations for siting one or more community water supply wells.

F&V has made no contact with owners of the identified sites. Property identification was based on criteria other than the owner's willingness to consider use of their property (or a portion of) for a potential well site/well field.

3.0 WELL SITING CRITERIA AND DATA SOURCES

There are many variables to consider when siting high-capacity community water wells, some of these variables are reported with varying degrees of certainty by state and federal agencies. Federal and state factors considered by F&V in assessing potential well sites are located in Section 4.2. Listed below are the data sources we reviewed to examine each criterion. Although these types of data can provide valuable insight into the viability of an area for siting high capacity wells, there are inherent limitations to such data.

The Team considered and discussed how certain characteristics of a site cannot be determined with an appropriate degree of certainty until actual field data are collected at the site. Examples of such characteristics include aquifer depths and aquifer thicknesses, depth to water, water quality and potential well yield.

- Hydrogeology and Potential Well Capacity – The Michigan Department of Environment, Great Lakes, and Energy (EGLE) and U.S. Geological Survey (U.S.G.S.) Groundwater Inventory Map (GWIM) including:
  - Locations of domestic and other wells
  - Wellhead Protection Areas (WHPAs)
  - Glacial Deposits yield estimates
  - Glacial transmissivity estimates
  - Glacial drawdown estimates
  - Geologic Setting (glacial landforms and quaternary geology)
- Standard Isolation Distances from Sources of Property Boundaries and Sources of Contamination
- Projected New Wellhead Protection Areas
- Existing Well Sites and Potential for Conflict
- Groundwater Quality – EGLE Arsenic and Nitrate data
- Known and Potential Sources of Contamination – State databases listing Part 201 sites (state-listed sites of contamination, Part 111 sites (state hazardous waste sites), Part 211 sites (underground storage tank sites), Part 213 sites (leaking underground storage tank sites), USEPA National Priority List sites (federal Superfund sites)
- Potential for Impacts to Streams and Lakes – Michigan Water Withdrawal Assessment Tool
- Water Distribution System – City of Portland utility maps
- Current and Future Land Use – City and Township planning maps
- Wetlands – National Wetlands Inventory maps
- Flood Insurance Maps for City of Portland (FEMA)

There were important and sometimes critical factors not evaluated as part of this process. These include the availability of a site and the purchase price of a site. These can be important factors when considering a site and will need to be evaluated at some future time.

4.0 SUPPORTING DISCUSSION

F&V has summarized information regarding each of the potential well sites on Summary Sheets (Appendix A). Where the data were limited or not readily available, a TBD (to be determined) designation was assigned. As future data are gathered, these characteristics should be determined for the sites. F&V also assigned a confidence level for the data. This percentage represented our estimated level of confidence the information is representative of characteristics at the site. Our assignment of these levels is based on our experience working with these types of data.

The following information is intended to supplement the summarized information contained on the Summary Sheets.

4.1 HYDROGEOLOGY AND POTENTIAL WELL CAPACITY

F&V's review included an examination of the hydrogeological characteristics of the Portland area. F&V records from past field work and other studies indicate the thickness of the glacial drift in the Portland area is approximately 200-300 feet. Underlying the glacial drift in the majority of the study area is the Grand River and Saginaw Formations (Figure 3). These particular bedrock deposits are considered a viable groundwater source in the area; however, the City of Portland would prefer the new well be screened within the drift as drift wells generally produce water in higher quality and quantity. The surficial glacial deposits of the Portland area are primarily glacial outwash sand and gravel and postglacial alluvium, as well as end moraines of medium textured till and medium-textured glacial till (Figure 4). These types of deposits can be conducive to siting water wells; however, tills can vary in their ability to provide groundwater.

F&V also reviewed the EGLE map of glacial yield, as illustrated on Figure 2. This map incorporates information regarding glacial drift thickness, the composition (grain-size and thickness) of the glacial materials, specifically the coarse-grained materials (sands and gravels). The glacial yield map is based on

interpretations by EGLE and can also be used as a rough indicator of the ability of a given location to yield groundwater. This information is reported on the Site Summary Sheets. Overall, EGLE reported the relatively high glacial yields in the Portland area as being generally favorable for high-capacity wells.

Most of the sites being evaluated are in areas rated as having relatively high yields (higher than 400 gallons per minute).

4.2 ISOLATION

EGLE requires community supply wells to maintain certain isolation from potential sources of contamination. Isolation areas are based on minimum isolation distances outlined in Part 127, Act 368, P.A. 1978 and Act 399, P.A. 1976. EGLE has identified required/recommended isolation areas for public water supply wells in a document titled “Minimum Well Isolation Distances”. A copy of this document is provided in Appendix 2. Below are some isolation areas identified in the EGLE guidance document:

- 200 feet from property boundaries
- 200 feet from any sewer or storm water line
- 200 feet from any roadway
- 200 feet from railroads
- 200 feet from wetlands or drains
- 300 feet from oil and gas wells
- 2,000 feet from leaking underground storage tank (LUST) sites
- 2,000 feet from EGLE Part 201 Contaminated Sites
- 2,000 feet from EGLE Part 111 Hazardous Waste Sites
- 2,000 feet from landfills

The City completed a Contaminant Source Inventory (CSI) in the 2020 update of it’s Wellhead Protection Plan. Various state, federal, and other sites identified in the CSI are shown on Figure 5. Figure 6 shows isolation “buffer” distances based on PA 399. Also shown are buffers from known areas of elevated arsenic and nitrates detected in groundwater.

In more recent years, it has been F&V’s experience, EGLE has put less emphasis on fixed radii from potential sources of contaminating and more weight in understating the hydrogeology around a well site. With an understanding of the potential WHPA for a well site, isolation areas may need to be increased or decreased in certain directions.

EGLE typically requires any new well be 200 feet from property boundaries, surface waters and any potential source of contamination. EGLE will occasionally provide a variance to this isolation requirement. Variances are reviewed by EGLE on a case-by-case basis and are often hard to obtain without technical justification.

Isolation information is provided in the Summary Sheets.

4.3 PRELIMINARY WELLHEAD PROTECTION AREAS

A wellhead protection area, as defined in Michigan, means the area which has been approved by EGLE in accordance with the State of Michigan wellhead protection program, which represents the surface and subsurface area surrounding a water well or well field, which supplies a public water supply, and through which contaminants are reasonably likely to move toward and reach the water well or well field within a 10-year time of travel.

The wellhead protection areas for the City’s community supply wells and other area Type I and II supply wells have been delineated. The City’s delineation included the reliance on hydrogeological parameters measured in the field. The delineation also relied on an analytical groundwater flow model. These areas are shown on Figure 7 along with existing well locations and the well sites evaluated. The following general observations are noted.

Regional groundwater flow directions in the Portland area are anticipated to be toward the Grand River and the Looking Glass River (based on the regional water table). Several of the proposed well sites are within existing WHPAs for existing City wells. These WHPAs can be used to help estimate the WHPAs of new well fields located in those areas. Additional pumping in the existing WHPAs will tend to expand the size of the WHPAs in length and/or width.

Sites located on the east side of the River would likely have wellhead protection areas that would extend to the east, and sites located on the west side of the river would likely have WHPAs that would extent to the west.

This information was considered as we evaluated potential sources of contamination in the area.

4.4 EXISTING WELL SITES AND POTENTIAL FOR CONFLICTS

Operating high-capacity wells will result in drawdown. The drawdown is greatest in the area of the operating wells and decreases exponentially away from the pumping. Other wells (such as residential/domestic, agricultural or community supply wells) can experience drawdown as a result of the operation of a high capacity well. Available drawdown from a high-capacity municipal well can be reduced from a substantial high capacity well. This occurrence is known as “well interference”.

The primary factors in determining the amount of drawdown of a well are its distance from the pumping center, its depth of completion relative to the pumping well (i.e., is it in the same aquifer), the pumping rate of the production well and aquifer characteristics.

F&V reviewed available well records in the vicinity of the proposed well sites to evaluate the number and pumping capacity of wells around the potential well sites. Several of the proposed well sites are located near existing City production wells. There are also residential wells in the areas of the proposed well sites. Potential well interference should be a part of future site-specific testing.

4.5 GROUNDWATER QUALITY

Groundwater quality is an important consideration in evaluating a potential well site. Water quality data for a specific site are usually not available until a well is installed and groundwater is sampled. Water quality from nearby locations can be used to evaluate general water quality characteristics and trends. Such information may be available from the local health department or EGLE and beneficial to establishing potential areas of concern such as areas of high nitrates or arsenic.

Nitrates – Nitrates in groundwater are typically associated with the application of nitrogen-based fertilizers and/or livestock facilities. The Maximum Contaminant level (MCL) for nitrate is 10 mg/L. EGLE mapping (Figure 9) suggest nitrates are not likely to be encountered above its MCL in the study area.

VOC Data – A map showing the VOC data collected by EGLE is shown as Figure 10. Detectable levels have been found in the southeastern portion of the study area.

Arsenic – Arsenic is a naturally occurring element found in groundwater. The current MCL for arsenic is 10 ug/L. Mapping by EGLE (Figure 11) suggests arsenic was not detected within the study area, except for one detection between 5 and 10 ug/L in the northwest portion of the study area.

Because water quality can vary considerably in relatively short distances, it is important water quality data be collected from any site being considered for a well before there is a commitment to develop a water well at the site.

4.6 POTENTIAL FOR IMPACT TO LAKES AND STREAMS

The Water Use Program was established through Part 327, Great Lakes Preservation, of the Natural Resources and Environmental Protection Act in 2008 to carry out obligations of the Great Lakes – St. Lawrence River Basin Water Resources Compact. The program is administered by the Water Resources Division (WRD) of EGLE.

Part 327 has established a process to evaluate whether a Large Quantity Withdrawals (LQWs, generally defined as a withdrawal of 100,000 gallons averaged over a 30-day period) will have an impact on a stream. EGLE developed a tool/model called the Water Withdrawal Assessment Tool (WWAT). The WWAT uses data from a site to determine whether pumping will cause an Adverse Resource Impact (ARI). An ARI generally means the stream is likely to be depleted to a level where it no longer supports characteristic fish populations. Pumping is not allowed to cause an ARI. The WWAT determines whether a withdrawal is a Zone A, B, C or D. A Zone D withdrawal indicates an ARI is likely.

Based on pumping 660 gpm (new well target capacity) continuously, six of the ten sites evaluated for this evaluation were Zone C withdrawals which means they will need further review by EGLE before they can be considered. The remaining four sites were identified as being Zone A withdrawals and are not likely to cause an adverse resource impact.

Note that exchanging capacity from one LQW to another within the same watershed is generally allowed by EGLE. Even if a potential well site may not have capacity according to the WWAT, as long as it is located within the same watershed as a well to be taken offline, it is generally acceptable by EGLE to transfer the capacity to the new well.

The study area encompasses three watersheds (Figure 7). Three of the ten sites are located in the same watershed as the City's existing production wells (Sebewa Creek-Grand River Watershed).

Although Part 327 addresses lakes, there has been no "tool" developed for establishing whether a lake is likely to be impacted by an LQW. The current definition of lake impact is flow. Section vii of Part 327 reads:

> "*Decreasing the level of a lake or pond with a surface area of 5 acres or more through a direct withdrawal from the lake or pond in a manner that would impair or destroy the lake or pond or the uses made of the lake or pond, including the ability of the lake or pond to support characteristic fish populations, or such that the ability of the lake or pond to support characteristic fish populations is functionally impaired. As used in this subparagraph, lake or pond does not include a retention pond or other artificially created surface water body."*

Lakes or ponds have not been determined to be at risk from any of the identified well sites. The vulnerability of lakes to LQW should be reevaluated before any potential well site is selected.

4.7 LOCATION RELATIVE TO WATER DISTRIBUTION

The proximity of a site to water supply infrastructure can be an important consideration for siting a community supply well. Ideally, it is recommended to site wells or well fields close to existing mains capable of accommodating the anticipated water supply from the well field. If not, additional costs will be incurred to connect a well field.

F&V conducted a review of the data regarding connections to the proposed well sites, this information can be seen on Figure 11 as well as on the attached Summary Sheets. Connection points, pipeline routes and sizes, water quality and system pressures will need to be further evaluated when considering a potential well site.

4.8 CURRENT AND FUTURE LAND USE

Current and anticipated future land use is often a consideration in site community wells. It is important to determine if a property is an acceptable use or if there will need to be some sort of variance granted for use of a parcel as a well field site. It is also important to identify if a well field site is in an area that may not be consistent with a new well, such as a proposed industrial park or other land use inherently increases the risk of future negative water quality or quantity issues.

Appendix 3 shows the current zoning for the City of Portland. The zoning classification of the investigated sites is identified in the Summary Sheets provided in Appendix 1.

5.0 FINDINGS

The Summary Sheets provide a tabulated record of the findings from each site evaluation. Based on this evaluation, we found:

Potential Well Site (PWS)-1
PWS-1 is an approximate 14-acre parcel located in the City of Portland. The site is zoned for residential uses. A small creek is present at the east end of the site, trending north and south. A well would have to be at least 200 feet from this creek and all parcel boundaries. Because of the creek and the presence of an open leaking underground storage tank site approximately 1,800 feet to the east, ideal placement of a well would be the west half of the site.

PWS-1 appears to be in a favorable hydrogeologic setting. It is located in the same sub-watershed as the City's existing production wells. Screening using EGLE's Water Withdrawal Assessment Tool showed that Adverse Resource Impacts are not likely at the proposed capacity of 660 gpm.

PWS-2
PWS-2 is an approximate 25-acre parcel located in the City of Portland. The site is zoned for residential uses. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries, known/potential sources of contamination, and surface water features. Since the site is currently used as a public school, structural development on the south half of the site could limit placement of a well.

PWS-2 appears to be in a favorable hydrogeologic setting. It is located in the same sub-watershed as the City's existing production wells. Screening using EGLE's Water Withdrawal Assessment Tool showed that Adverse Resource Impacts are not likely at the proposed capacity of 660 gpm.

PWS-3
PWS-3 is an approximate 9-acre parcel located in the City of Portland. The site is zoned for residential uses. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. Multiple sites of known or potential contamination are located within 2,000 feet of PWS-3. Further investigation would be warranted to determine if these sites have the potential to impact the well site. However, based on the presumed direction of groundwater flow to the west (toward the Grand River) and the location of the sites south and west of PWS-3, the risk of contamination reaching a well at this site is likely to be low.

PWS-3 appears to be in a favorable hydrogeologic setting. It is located in the same sub-watershed as the City's existing production wells. Screening using EGLE's Water Withdrawal Assessment Tool showed that Adverse Resource Impacts are not likely at the proposed capacity of 660 gpm.

PWS-4
PWS-4 is an approximate 24-acre parcel located in the City of Portland. The site is zoned for residential uses. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. Multiple sites of known or potential contamination are located within 2,000 feet of PWS-4. Further investigation would be warranted to determine if any of these sites have the potential to

impact the well site. However, based on the presumed direction of groundwater flow to the south (toward the Looking Glass River) and the location of the sites primarily south and west of PWS-4, the risk of contamination reaching a well at this site is likely to be low.

PWS-4 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-5

PWS-5 is an approximate 10-acre parcel located in the City of Portland. The site is currently used as a church as does not have a zoning code listed in City assessment records. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. Multiple sites of known or potential contamination are located within 2,000 feet of PWS-5. Further investigation would be warranted to determine if any of these sites have the potential to impact the well site. However, based on the distance of these sites to PWS-5, potential environmental risks are estimated to be low.

PWS-5 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-6

PWS-6 is an approximate 51-acre parcel located in the City of Portland. The site is owned by the City and does not have a zoning code listed in City assessment records. The site appears to be vacant. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. Multiple sites of known or potential contamination are located within 2,000 feet of PWS-6, including two Part 201 Sites of Contamination which adjoin PWS-6 to the east across E Grand River Ave. EGLE maps show a detection of VOCs in this area. Further investigation would be warranted to determine if any of these sites have the potential to impact the well site. Due to the proximity of the sites with known contamination, PWS-6 is at higher risk of potential contamination than other potential well sites under consideration.

PWS-6 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-7

PWS-7 is an approximate 80-acre parcel located in the City of Portland. The site is zoned TND (Traditional Neighborhood Development). A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. The majority of the site is located more than 2,000 feet from known or potential contamination. A well could be strategically placed on the parcel to minimize risk of potential contamination. If other factors necessitate placing the well closer to/downgradient from known contamination, further investigation may be warranted to evaluate environmental risks.

PWS-7 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a

new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-8

PWS-8 is an approximate 114-acre parcel located in Portland Township. A zoning code is not listed for the parcel. It appears to be currently used for agricultural purposes. A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries, known/potential sources of contamination, and surface water features.

PWS-8 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-9

PWS-9 is an approximate 52-acre parcel located in the City of Portland. The site is zoned TND (Traditional Neighborhood Development). A well could be placed on this parcel to maintain standard isolation distances from parcel boundaries and surface water features. Multiple sites of known or potential contamination are located within 2,000 feet of PWS-9. A well could be strategically placed at the east end of the parcel to minimize risk of potential contamination. If other factors necessitate placing the well closer to/downgradient from known contamination, further investigation may be warranted to evaluate environmental risks.

PWS-9 appears to be in a favorable hydrogeologic setting. It is located in a different sub-watershed than the City's existing production wells. Therefore, capacity from existing wells could not be transferred to a new well at this site. Screening using EGLE's Water Withdrawal Assessment Tool showed the potential for Adverse Resource Impacts under continuous pumping at 660 gpm. A site-specific review would be necessary to evaluate potential impacts at the desired capacity. As an alternative, it is possible that a non-continuous pumping schedule could be negotiated with EGLE. If pumping at 8 hours per day for 2 days per week, Adverse Resource Impacts are not likely.

PWS-10

PWS-10 is an approximate 4-acre parcel located in the City of Portland. The site is currently owned by the City of Portland and is developed with production well PW-7. Due to the relatively small size of the site and potential interferences with PW-7, placement of a new well would be difficult unless it will replace PW-7. Known/potential sources of contamination were identified northeast of PWS-10. Further investigation would be warranted to determine if these sites have the potential to impact the well site. However, based on the presumed direction of groundwater flow to the northeast (toward the Grand River), the risk of contamination reaching a well at this site is likely to be low.

PWS-10 appears to be in a favorable hydrogeologic setting. It is located in the same sub-watershed as the City's existing production wells. Screening using EGLE's Water Withdrawal Assessment Tool showed that Adverse Resource Impacts are not likely at the proposed capacity of 660 gpm.

6.0 CONCLUSIONS

F&V has used the collected information to assign the sites into one of three groups: **Group A, Group B or Group C**. We looked at whether a site had favorable characteristics. Examples of favorable characteristics include sufficient parcel size, prolific aquifer(s). We also looked at whether the sites have limiting characteristics. Examples of limiting characteristics include water withdrawal limitations or close proximity to sites of environmental concern. Based on the inherent uncertainty of reviewed data, uncollected site-specific field data (i.e. pump and water quality tests) and to provide maximum future City options, sites within each Group were not further prioritized.

Group A sites have highly favorable characteristics and have no identified limiting characteristics.
Group B sites have moderately favorable characteristics and potentially limiting characteristics.
Group C sites have less favorable characteristics or identified limiting characteristics.

Group A (no particular order)

- **PWS-1** appears to be a favorable potential well site. The location of a new well may be limited to the west half of the site.
- **PWS-2** appears to be a favorable potential well site. Structural development for the public school on the south half of the site could limit placement of a well.

Group B (no particular order)

- **PWS-3** is limited due to potential contaminant sources. However, the location appears to be a favorable potential well site. While further investigation of potential contaminant sources is warranted, the potential environmental risks are anticipated to be low.
- **PWS-4** is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review, negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well.
- **PWS-5** is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review, negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well. Additionally, further investigation of potential contaminant sources is warranted. However, potential environmental risks are anticipated to be low.
- **PWS-6** would be a favorable well site since it is already owned by the City. However, the site is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well. Additionally, further investigation of potential contaminant sources is warranted. Based on the presence of two sites of known contamination on adjoining properties, potential environmental risks are anticipated to be higher for PWS-6 than for other potential well sites under consideration.
- **PWS-7** is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well.
- **PWS-8** is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well. Additionally, the site is located within Portland Township and would have to be annexed into the City in order to be used as a well site.
- **PWS-9** is limited due to the potential for Adverse Resource Impacts at the desired capacity and the inability to transfer capacity from existing production wells. A site-specific review negotiated pumping schedule, or reduction in capacity would be required to use this site for a new well. Additionally, based on the presence of known/potential contamination in the area, strategic well placement and/or further investigation would be necessary.
- **PWS-10** appears to be a favorable potential well site, if intended to be developed as a replacement well for current production well PW-7. Otherwise, placement of a new well would be difficult. Further investigation of potential contaminant sources is warranted. However, potential environmental risks are anticipated to be low.

Group C (no particular order)

- No sites have been identified in Group C.

These findings can be used to help the City of Portland prioritize future well sites. Site-specific testing will need to augment the information contained in this report. We recommend this testing be completed prior to acquiring ownership of a site.

It is important to note many of the characteristics of a site are preliminary, subjective, and may change with time. Before final site selection, review criteria should be reevaluated based on the needs of the City at that time.

Limiting characteristics that were identified as part of this evaluation may be eliminated by further evaluations.

F&V recommends this study be periodically reviewed. This review should be part of the City's Wellhead Protection Program activities. City Council may consider budgeting for a new well when future water reliability studies indicate a need. Examples of site changes which may warrant updates to this analysis include:

- the installation of new large capacity wells in the area,
- the availability of new geological information,
- the discovery of a new source of contamination, or changes in the nature and extent of a known sources of contamination, and/or
- changes in the water system distribution system.