Lansing Wellhead Protection Team

GEOTHERMAL Best Management Practices

2018-2019 EGLE Source Water Grant

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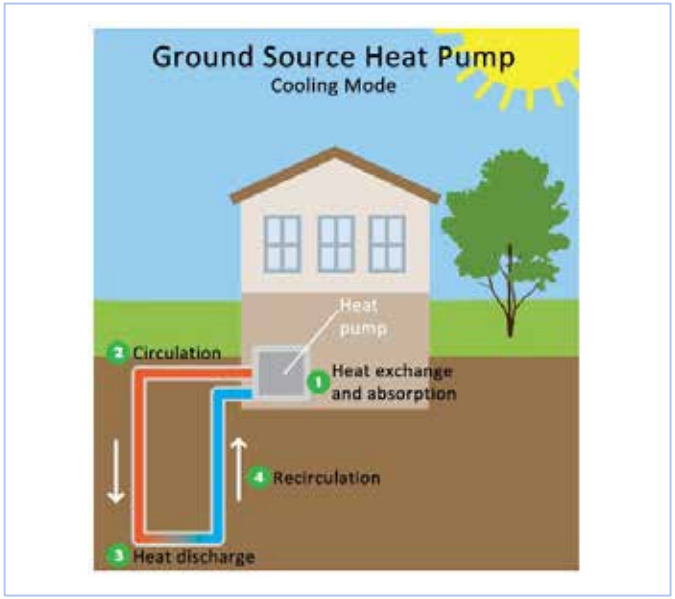
Lansing Board of Water and Light

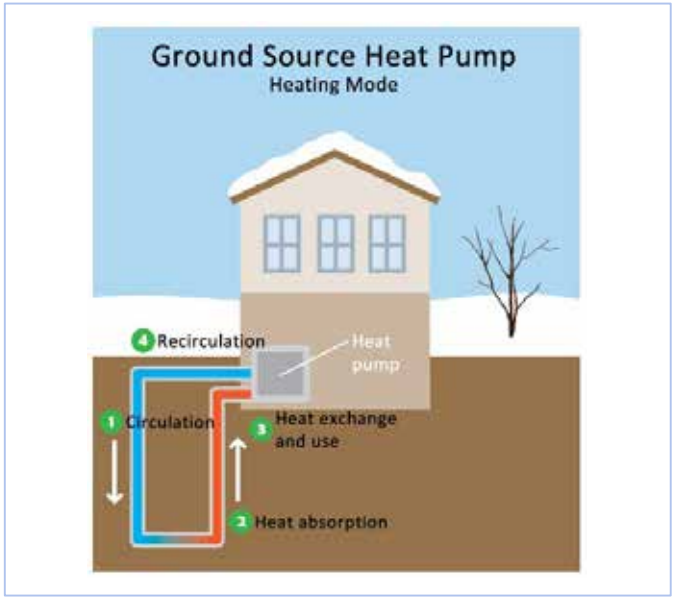
AGENDA

- Geothermal Basics
- Groundwater Protection
- Why did we do this project?
- Geothermal Installations
- Geothermal Guidance Document
- Regulation Update EGLE David DeYoung

Basics

- In the 1940’s technology developed to utilize the Earth’s heat is called Geothermal and is considered a renewable resource.
- The Earth maintains an almost constant temperature a few feet below the ground unlike ambient air temperature seasonal swings.
  - Winter the Earth is warmer than the air, and in the summer the Earth is colder than the air.
  - Geothermal exchanges the Earth’s temperature with the air temperature for heating and cooling.
  - A heat exchanger is connected to either Vertical or Horizontal pipes that move water (and /or a thermal chemical) to move heat from one point to another providing heat or air conditionings to building spaces.





Heat Pump Mode (Source EPA)

Groundwater Protection

- Clinton, Eaton and Ingham County created a formal forum to coordinate groundwater efforts and address concerns with the creation of the Groundwater Management Board (GMB).
  - GMB meets quarterly for continuing education, review current groundwater issues and comment on regulations in our area.
- Wellhead Protection Teams
  - The GMB area has a minimum of 6 consistent wellhead protection teams
    - Lansing, East Lansing Meridian, Lansing Township, Delta Township, Delphi Township, Williamston

Why did we do this project?

- The GMB was notified of two large scale geothermal system installation projects.
- GMB activated our Groundwater Technical Advisory Committee to assist with technical review of the installations and provide recommendations to the GMB.
  - The research indicated no regulations, ordinances, requirements, or permits required to install large scale geothermal systems in our area.
- GMB formally documented recommendations for well permit, hydrogeological data, construction practices, monitoring, maintenance and decommissioning to the installer in lieu of any geothermal regulations at the state level.
- Lansing wellhead protection team decided we needed more guidance for our planner, developers and stakeholders until regulations were establishjed

Geothermal installations

- Michigan State Capital Commission (MSCC) 2017
  - GMB and the Lansing Board of Water and Light was approached by the MSCC to install a Geothermal (heat and cooling) system with 255 wells extending into the Saginaw Aquifer (Lansing's drinking water source) on the grounds of the Capital in Lansing, Michigan.
  - This is the largest installation of Geothermal vertical wells in the Lansing wellhead protection area.

- Midwest Geothermal (MG) 2018
  - East Lansing Public Schools contracted MG to install a Geothermal heating/cooling system at 5 elementary schools being rebuilt 2018-2020.
  - Each school installed (or scheduled to install)l 48 wells (240 wells total) extending into the Saginaw aquifer.
  - East Lansing Planners utilized the GMB letters to MSCC to specify MG contract requirements.

Geothermal Guidance Document

- History of geothermal
- Definitions
- Sample current ordinance language
- Applications Open vs. closed loops
- Decision tree
- Decommissioning
- References

Education

- Three types of Geothermal systems
  - Deep enhanced geothermal systems
    - Utilized to generate electricity
  - Geothermal heat pumps (GHP)
  - Direct Use geothermal
- Geothermal Heat Pumps(GHP) is common for residential and commercial buildings.
  - Why?
    - The system life is 12-15 years for equipment and 50 plus years for wellfield.
    - The return on investment for energy savings is 5-10 years.
    - Renewal energy source with limited electrical requirements.

Two types of circulation systems

- Closed

Utilizes an antifreeze solution through a plastic tubing loop to recirculate solution and is switched out as needed.

- Open Loop

Utilizes surface body water as the exchange fluid in the system.

Plus, discharges to ground via well, surface water, sanitary sewer etc.

Open Loop Decision Tree

OPEN-LOOP GEOTHERMAL HEAT PUMP SYSTEM (GHPS)

Step 1. Installer Qualifications & Permit Requirements

Qualification for Supply Well Installation

1. Certificate of Registration as a Well Drilling Contractor by the State of Michigan [a]

Qualification for Well Pump Installation

Certificate of Registration as a Well Drilling Contractor by the State of Michigan [a], OR

1. Certificate of Registration as a Well Pump Installer by State of Michigan [a], OR
2. Master Plumber licensed by the Michigan Department of Licensing and Regulatory Affairs (LARA)[b]

Role of Local Health Department

The local health department may have additional design and construction requirements specific to each County that should precede State recommended guidelines herein.

Installers shall contact their local health department to obtain a well construction permit.

*Installation in a Wetland, Floodplain, or Critical Dune Area

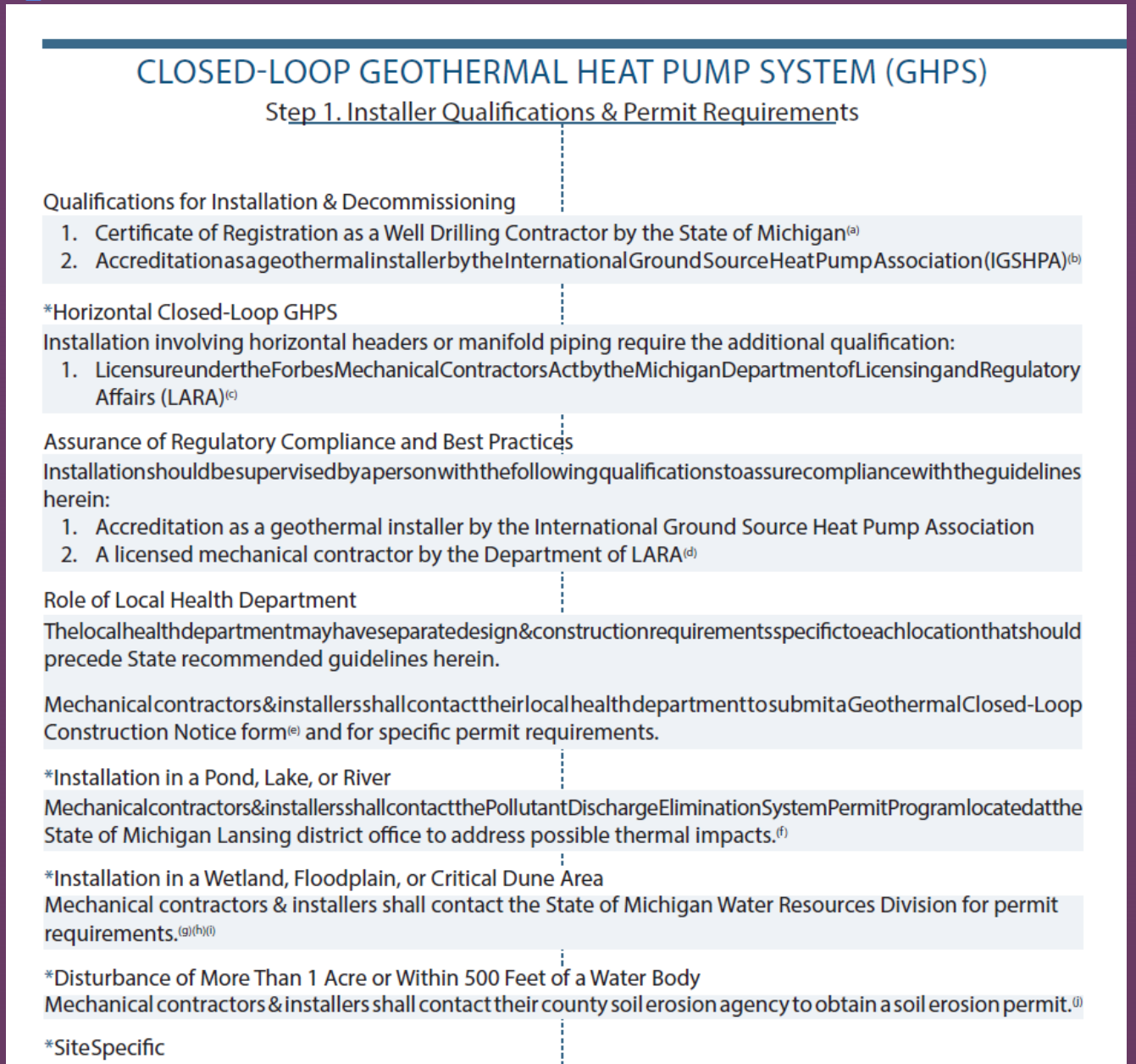
Installers shall contact the State of Michigan Water Resources Division for permit requirements.[c][d][e]

*Supply Well Withdrawal Capacity Greater than 100,000 Gallons

Water use must be reported to the State of Michigan for a GHPS supply well with a withdrawal capacity equal to or greater than 100,000 gallons per day (70 gallons per minute) over a 30-day period.[f]

*Site Specific

Closed Loop Decision Tree



CLOSED-LOOP GEOTHERMAL HEAT PUMP SYSTEM (GHPS)

Step 1. Installer Qualifications & Permit Requirements

Qualifications for Installation & Decommissioning

1. Certificate of Registration as a Well Drilling Contractor by the State of Michigan[a]
2. Accreditation as a geothermal installer by the International Ground Source Heat Pump Association (IGSHPA)[b]

*Horizontal Closed-Loop GHPS

Installation involving horizontal headers or manifold piping require the additional qualification:

1. Licensure under the Forbes Mechanical Contractors Act by the Michigan Department of Licensing and Regulatory Affairs (LARA)[c]

Assurance of Regulatory Compliance and Best Practices

Installation should be supervised by a person with the following qualifications to assure compliance with the guidelines herein:

1. Accreditation as a geothermal installer by the International Ground Source Heat Pump Association
2. A licensed mechanical contractor by the Department of LARA[d]

Role of Local Health Department

The local health department may have separate design & construction requirements specific to each location that should precede State recommended guidelines herein.

Mechanical contractors & installers shall contact their local health department to submit a Geothermal Closed-Loop Construction Notice form[e] and for specific permit requirements.

*Installation in a Pond, Lake, or River

Mechanical contractors & installers shall contact the Pollutant Discharge Elimination System Permit Program located at the State of Michigan Lansing district office to address possible thermal impacts.[f]

*Installation in a Wetland, Floodplain, or Critical Dune Area

Mechanical contractors & installers shall contact the State of Michigan Water Resources Division for permit requirements.[g][h][i]

*Disturbance of More Than 1 Acre or Within 500 Feet of a Water Body

Mechanical contractors & installers shall contact their county soil erosion agency to obtain a soil erosion permit.[j]

*Site Specific

CLOSED LOOP GEOTHERMAL HEAT PUMP BOREHOLES LEGISLATION

CURRENT STATUS

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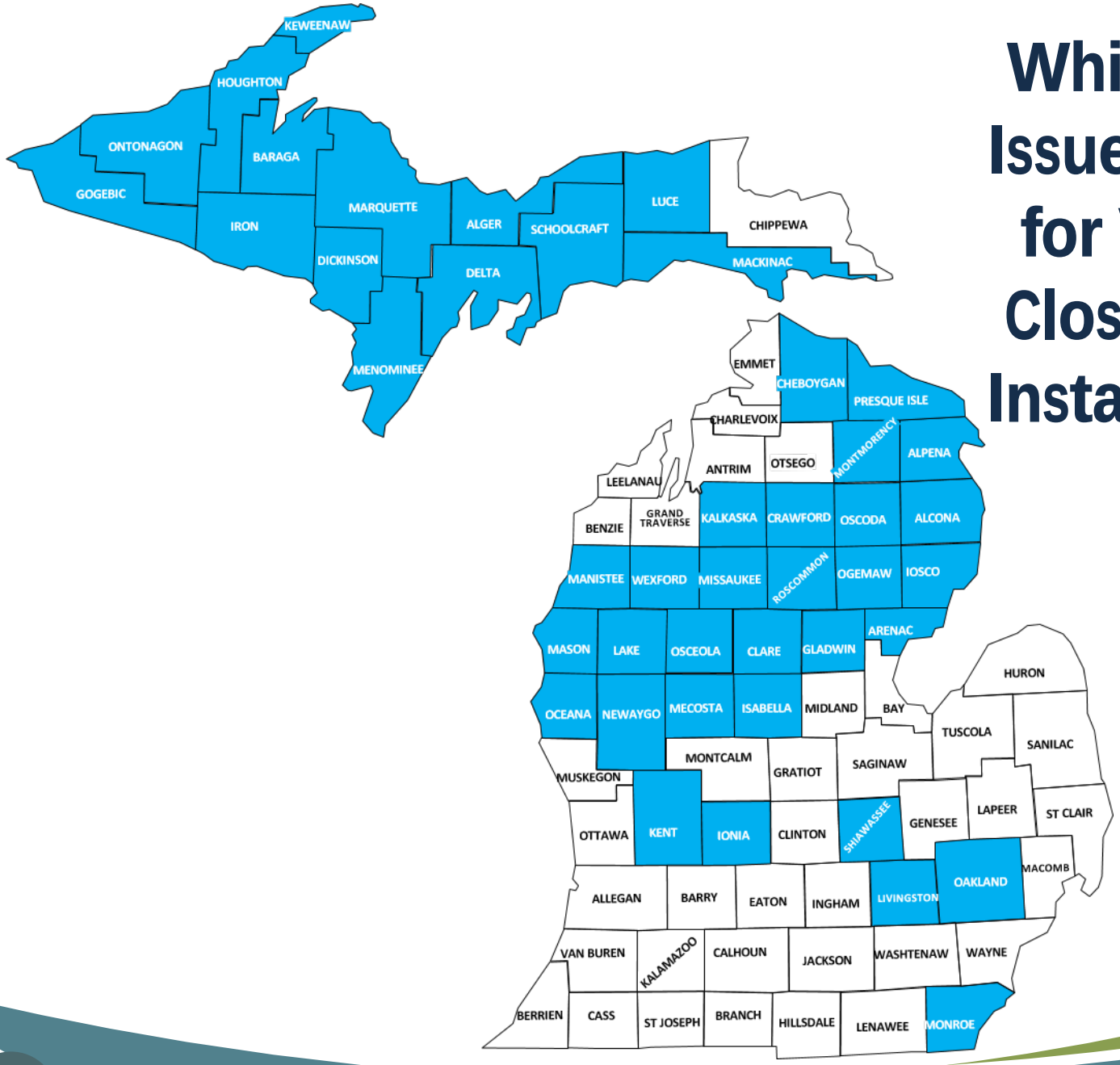
WHAT DAMAGE COULD DRILLING SOME HEAT PUMP BOREHOLES IN THE GROUND DO?

Which LHDs Issue Permits for Vertical Closed Loop Installations?



PAST STATEWIDE ATTEMPTS TO REGULATE CLOSED LOOP BOREHOLES…

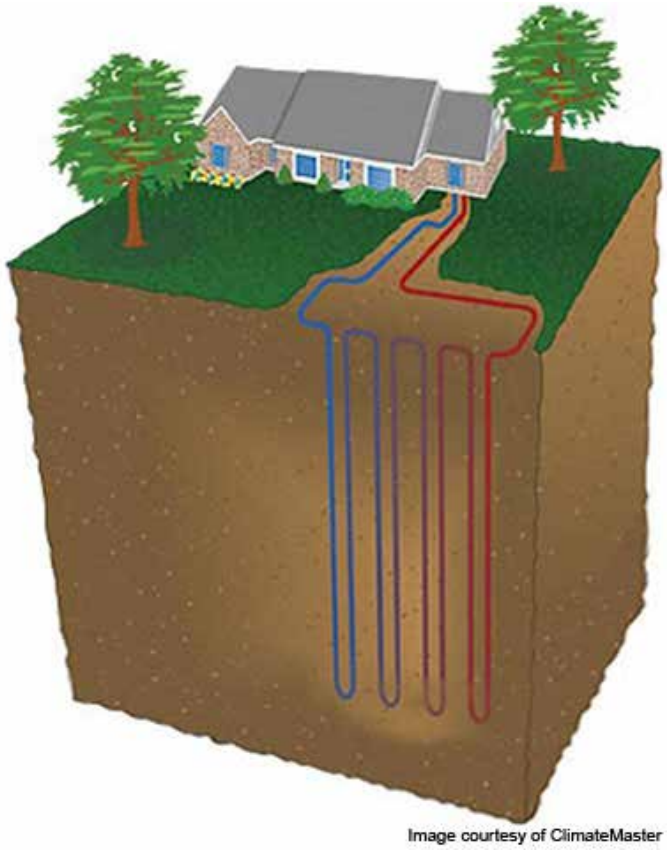


Image courtesy of ClimateMaster

HB 4656 **1989-1990 Session**

Passed Michigan House but died in Senate committee

HB 4093 **1999-2000 Session**
HB 4117 **2001-2002 Session**
HB 4295 **2003-2004 Session**

Never reached vote in Michigan House of Representatives

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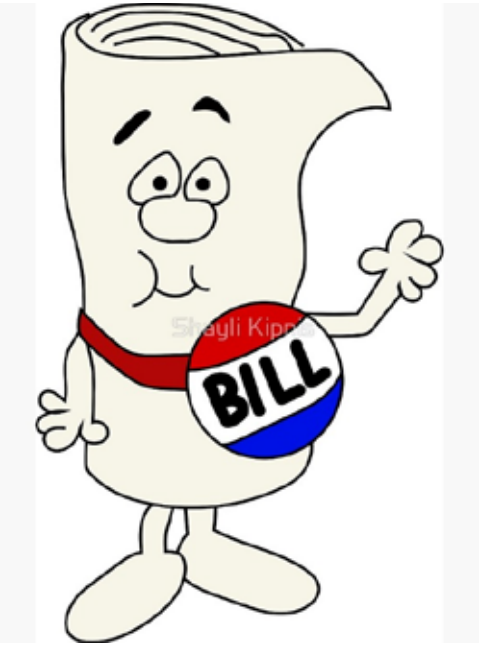
MOST RECENT STATEWIDE ATTEMPT TO REGULATE CLOSED LOOP BOREHOLES…

January 26, 2017 Water Well Advisory Committee
- Initial Discussion
- Review of Previous Legislative Attempt Documentation
- Communication With Potential Stakeholders For Input

November 13, 2017 Stakeholder Meeting
- Original Draft Geothermal Legislation Modified and Posted
- Additional Comments Received and Legislation Further Modified

June 4, 2018 Department Fails to Find Legislative Sponsor
- New Executive and Legislative Officials Take Office
- Currently Awaiting Contact For Further Action



CLOSED LOOP BOREHOLES RESOURCES STATE OF MICHIGAN

https://www.michigan.gov/egle

Water, Drinking Water, Water Well Construction

Information, Geothermal Heat Pumps

EGLE Best Practices Installation Document

EGLE Heat Pump Systems Guide

Geothermal Heat Pumps Webpage Includes:

Draft Statue Language

Contractor Registration

Borehole Grouting Requirements

Piping/Heat Transfer Fluid Requirements

Isolation Distances

Record Keeping

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Michigan Department of
Environment, Great Lakes, and Energy

800-662-9278
Michigan.gov/EGLE

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Acknowledgements

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- Team at OHM Advisors

- Please contact me if you have any questions Cheryl.louden@lbwl.com
- Any other questions can be directed to Christine Spitzley at OHM Advisors
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