

# *Michigan's Water Well Construction Program*



**Drinking Water and Environmental Health Section  
Resource Management Division**

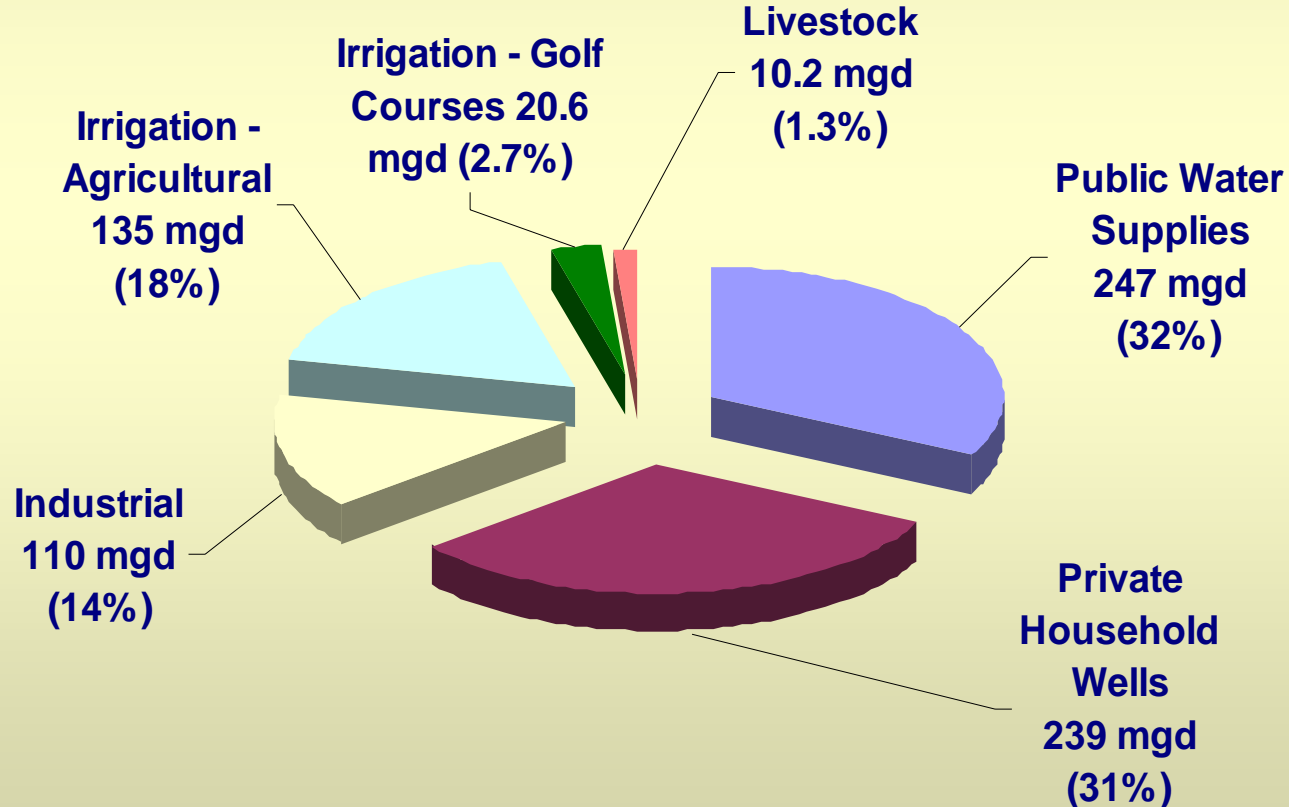
# Michigan Groundwater Statistics

- 45% of Michiganders are on groundwater
- 18% are on groundwater-dependent community water supply systems
- Statewide, we use about 700 million gallons of groundwater per day
- About 500 million gallons of that is for household use
- Remainder goes to irrigation and industry



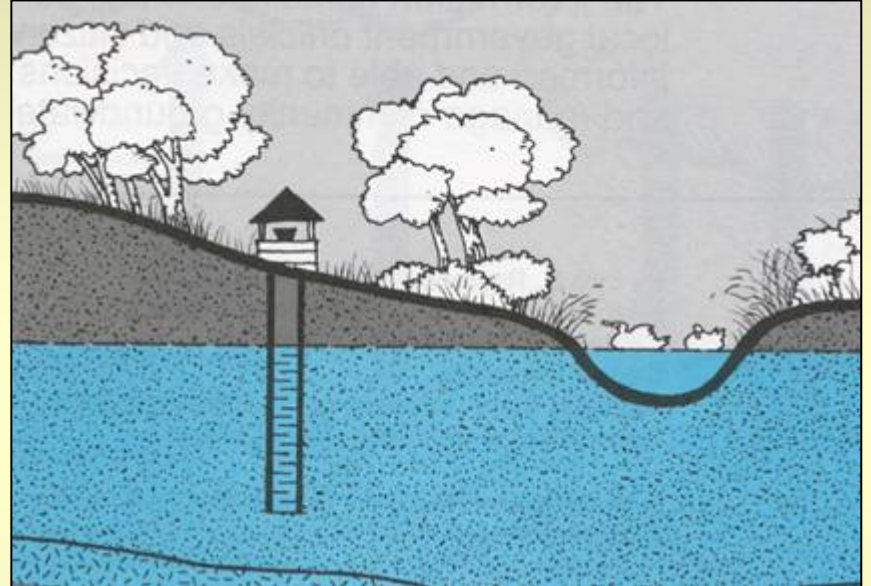
# Michigan Groundwater Statistics

Estimated Groundwater Usage in Michigan  
(in million gallons per day)



# Groundwater

- Groundwater is present in geological formations below the land surface.
- Precipitation recharges the groundwater.
- Water (and liquids) from the surface are pulled through the surface soils and the geological formations by gravity.





# Aquifer

An aquifer is a subsurface formation that will yield groundwater to a well or spring in a usable and sustainable quantity.

## Unconsolidated Aquifer

- Not cemented or formed into a solid unit by pressure
- Generally granular and can be broken by "hand"
- Sand, gravel, silt, clay

## Consolidated Aquifer

- Cemented or formed into a solid unit by pressure
- Typically "hard" and not breakable by "hand"
- Sandstone, shale, limestone, other rocks

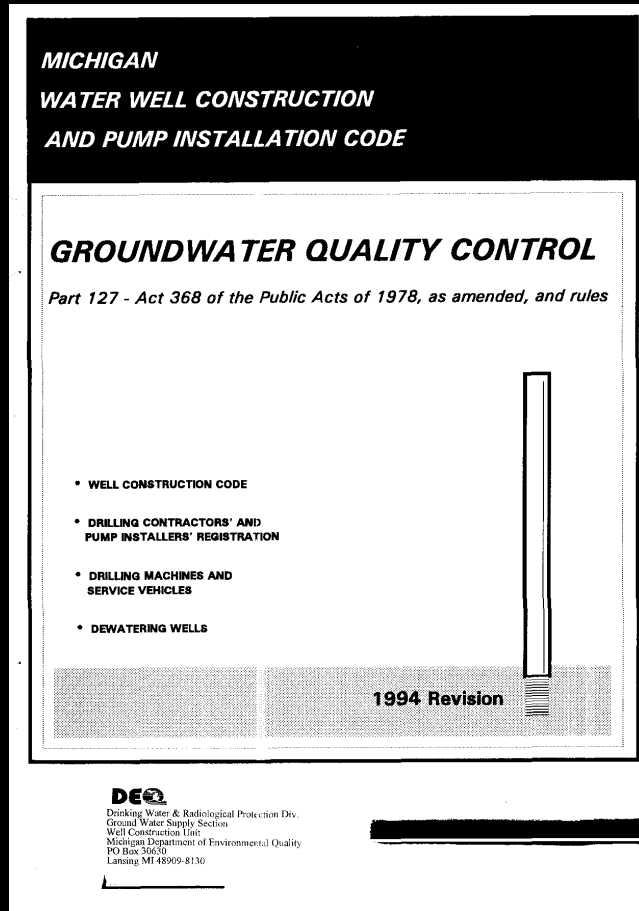
# Michigan's Water Well Construction Program

*Incorporates a preventive public health strategy to ensure that newly installed water well systems are safe and reliable*

*Proper and sanitary well construction is the key to a safe water supply!*



# Statute: Part 127 – Water Supply and Sewer Systems Act 368, PA 1978, as amended (Public Health Code)



- **Part 1 – Well Construction Code**
- **Part 2 - Drilling Contractors' & Pump Installers' Registration**
- **Part 3 – Drilling Machines & Service Vehicles**
- **Part 4 - Dewatering Wells**

**FIRST BECAME EFFECTIVE FEB. 14, 1967  
LAST REVISION – EFFECTIVE APRIL 21, 1994**

*For public water supply wells - Apply Part 8, Act 399, PA 1976 in addition to Part 127, Public Health Code*

**SANITARY  
WELL  
COMPLETION  
PRACTICES**

**PROPER  
WELL  
CONSTRUCTION  
MATERIALS**

**TRAINED  
PROFESSIONAL  
WATER WELL  
CONTRACTORS**

**COMPONENTS  
OF A  
SAFE & RELIABLE  
WATER WELL**

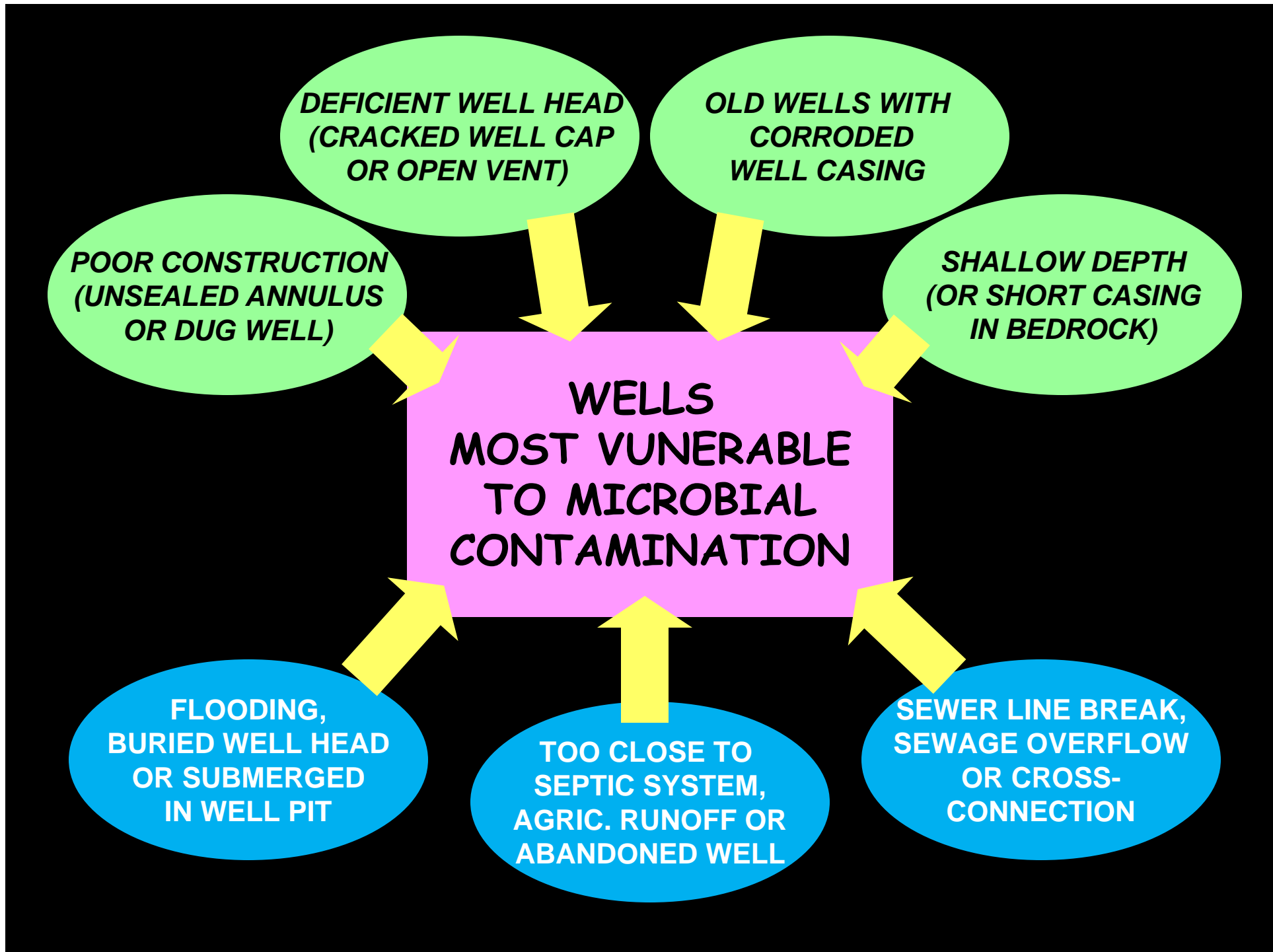
**TARGET  
AQUIFER HAS  
AMPLE YIELD  
&  
SAFE WATER**

**SUFFICIENT  
SEPARATION  
FROM  
CONTAMINATION  
SOURCES**

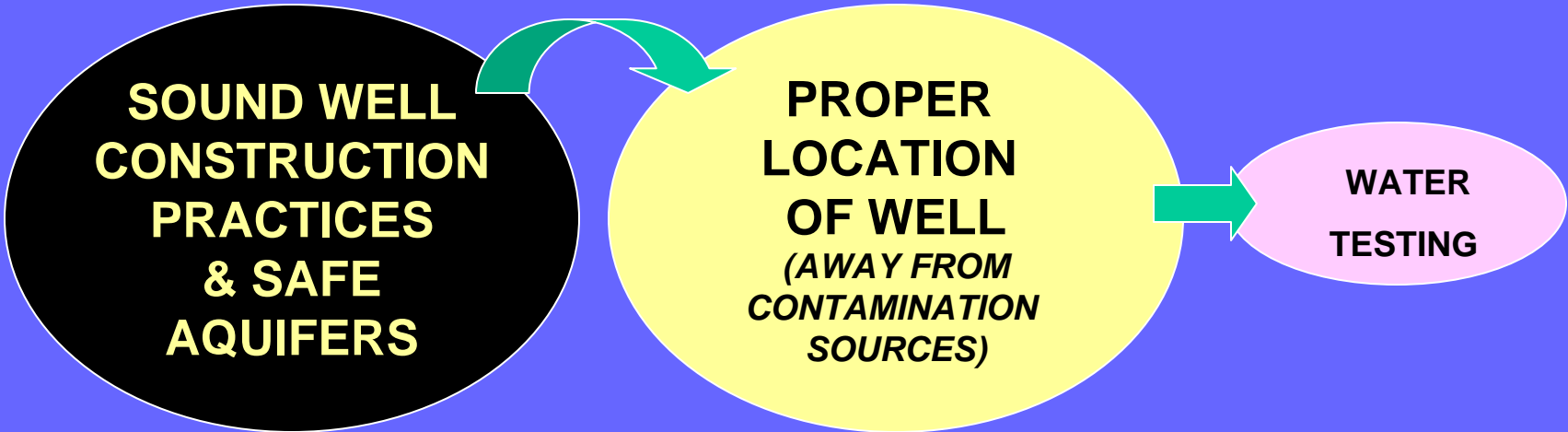
**ROUTINE  
MONITORING  
OF  
WATER  
QUALITY**

**PROPER  
WATER  
SYSTEM  
MAINTENANCE**



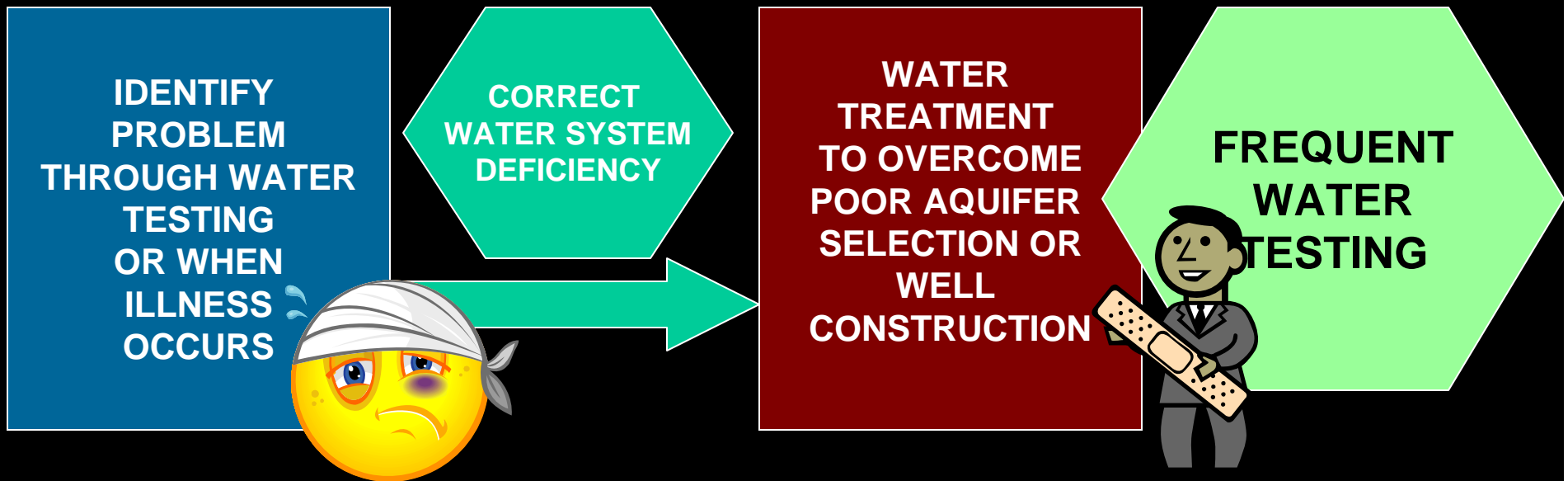


# MICHIGAN'S PROACTIVE, PUBLIC HEALTH ORIENTED APPROACH:



VS.

# REACTIVE, "BODY-COUNT" APPROACH:









It's all about **PROTECTING PUBLIC HEALTH!**



# Private & Type III Water Supply Program

*Administered as a JOINT EFFORT  
between Michigan's local health  
departments (LHD) and the DEQ*

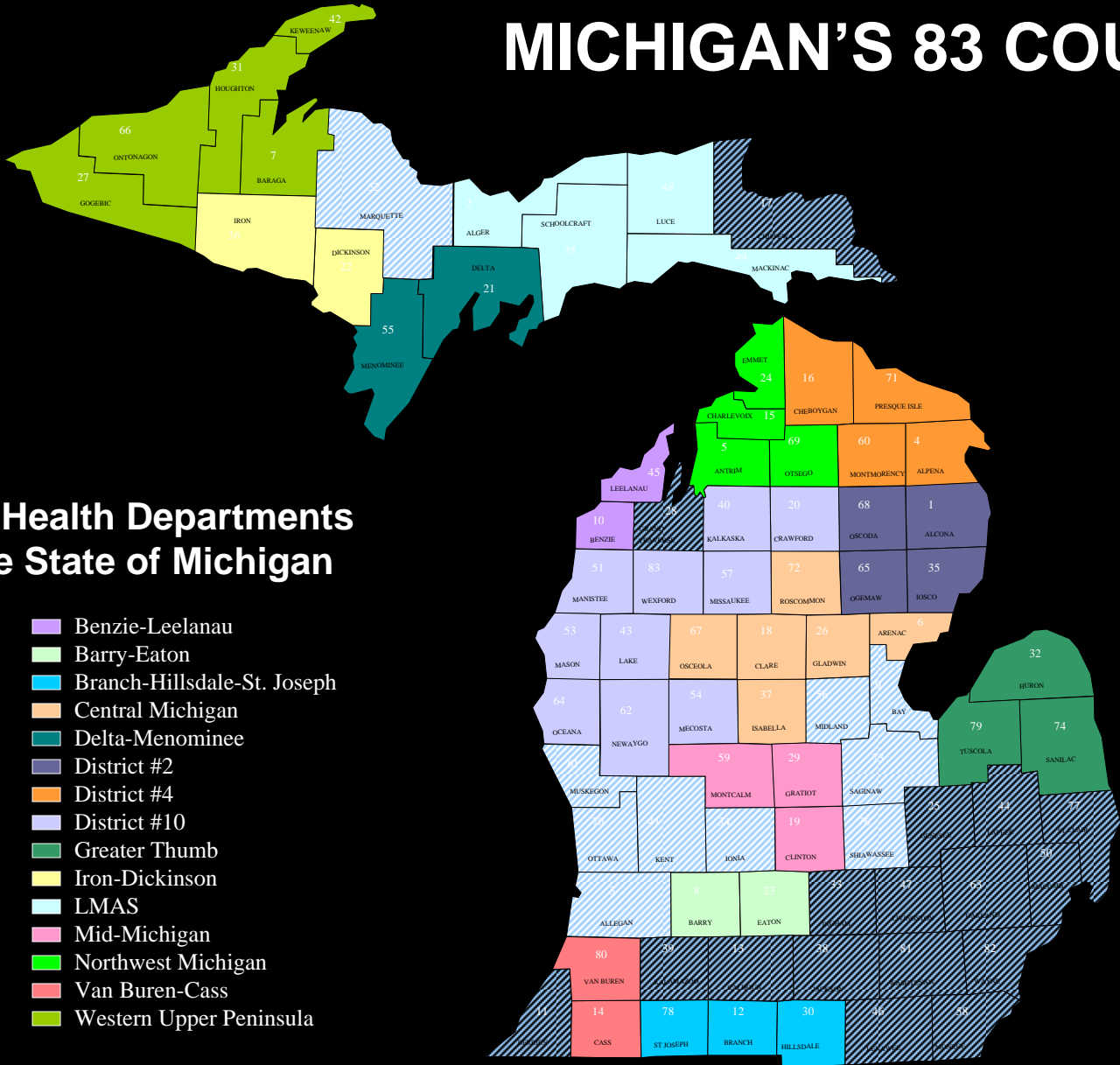




# 44 LHDs SERVING MICHIGAN'S 83 COUNTIES

## Local Health Departments in the State of Michigan

- Benzie-Leelanau
- Barry-Eaton
- Branch-Hillsdale-St. Joseph
- Central Michigan
- Delta-Menominee
- District #2
- District #4
- District #10
- Greater Thumb
- Iron-Dickinson
- LMAS
- Mid-Michigan
- Northwest Michigan
- Van Buren-Cass
- Western Upper Peninsula



# Contact the LHD

regarding:

- ✓ **Permit requirements**
- ✓ **Well locations & deviations**
- ✓ **Water well records**
- ✓ **Water sampling & quality**
- ✓ **Water supply inspections**



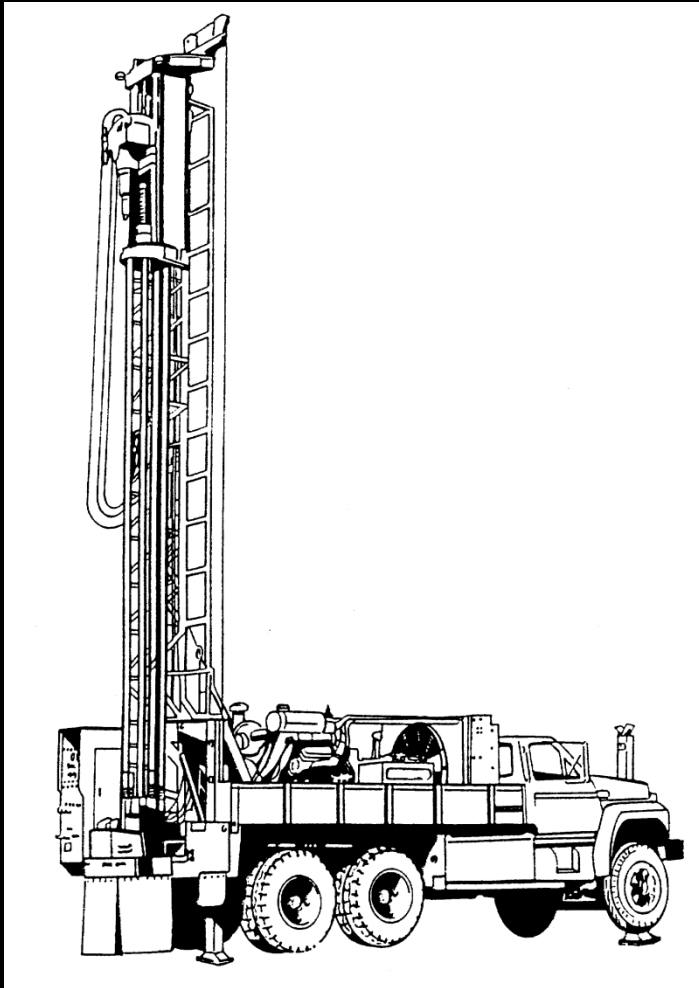
# WATER WELL DESIGN



- ❖ Provide well that meets needs of owner
- ❖ Obtain highest yield with minimal drawdown (consistent w/ aquifer capabilities)
- ❖ Provide suitable quality water (potable and turbidity-free for drinking water wells)
- ❖ Provide long service life (25+ years)

***NEW: Minimize impacts on neighboring wells & aquatic environments***

# Types of Water Wells



**DRILLED**

**DRIVEN**

# DRILLED WELLS

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- Terminated in glacial drift (sand, gravel) or bedrock
- Constructed with rotary, cable tool, jetting, hollow rod or auger drilling methods
- 2 in. or larger casing  
(Domestic wells: 4 – 6 inch diameter)



# DRILLED WELLS

---

- Casing material: Steel or PVC plastic
- Installed by well drilling contractors
- Much more common than driven or dug wells
- Most are >50 ft. deep (avg. 125 ft.)

***MOST SANITARY WELL TYPE***

**Rotary**



**Cable Tool**



# DRILLED WELL COMPONENTS

WELL CAP or  
SEAL

BOREHOLE

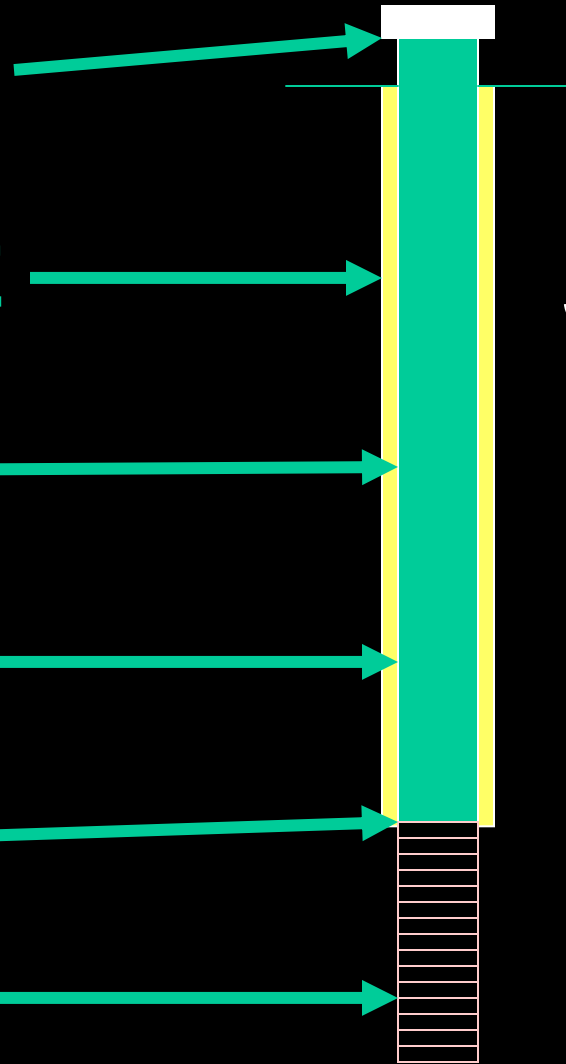
CASING

GROUT

PACKER

SCREEN

SCREENED  
WELL



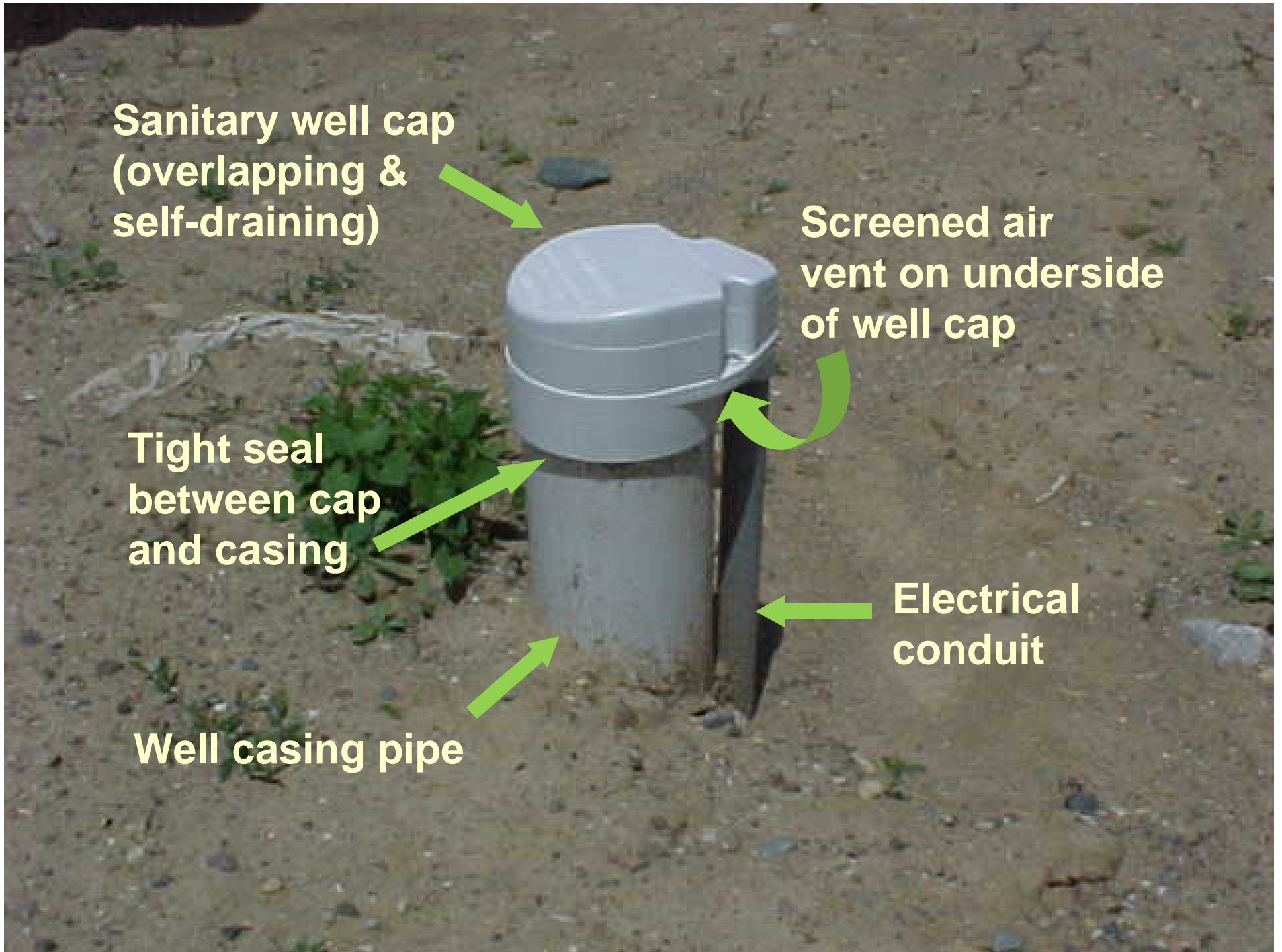
**Sanitary well cap  
(overlapping &  
self-draining)**

**Screened air  
vent on underside  
of well cap**

**Tight seal  
between cap  
and casing**

**Electrical  
conduit**

**Well casing pipe**



# HAND-DRIVEN WELLS

- Installed in glacial drift only - **CANNOT** be driven thru boulders or into bedrock
- Well point driven into ground with post-driver, tripod w/ weight or sledge hammer
- 1 1/4 in. to 2 in. diameter



# DRIVEN WELLS

- ❑ Installed by property owners
- ❑ Common around lakes and high water table areas
- ❑ Most <35 ft. deep, limited yield (7 gpm or less)

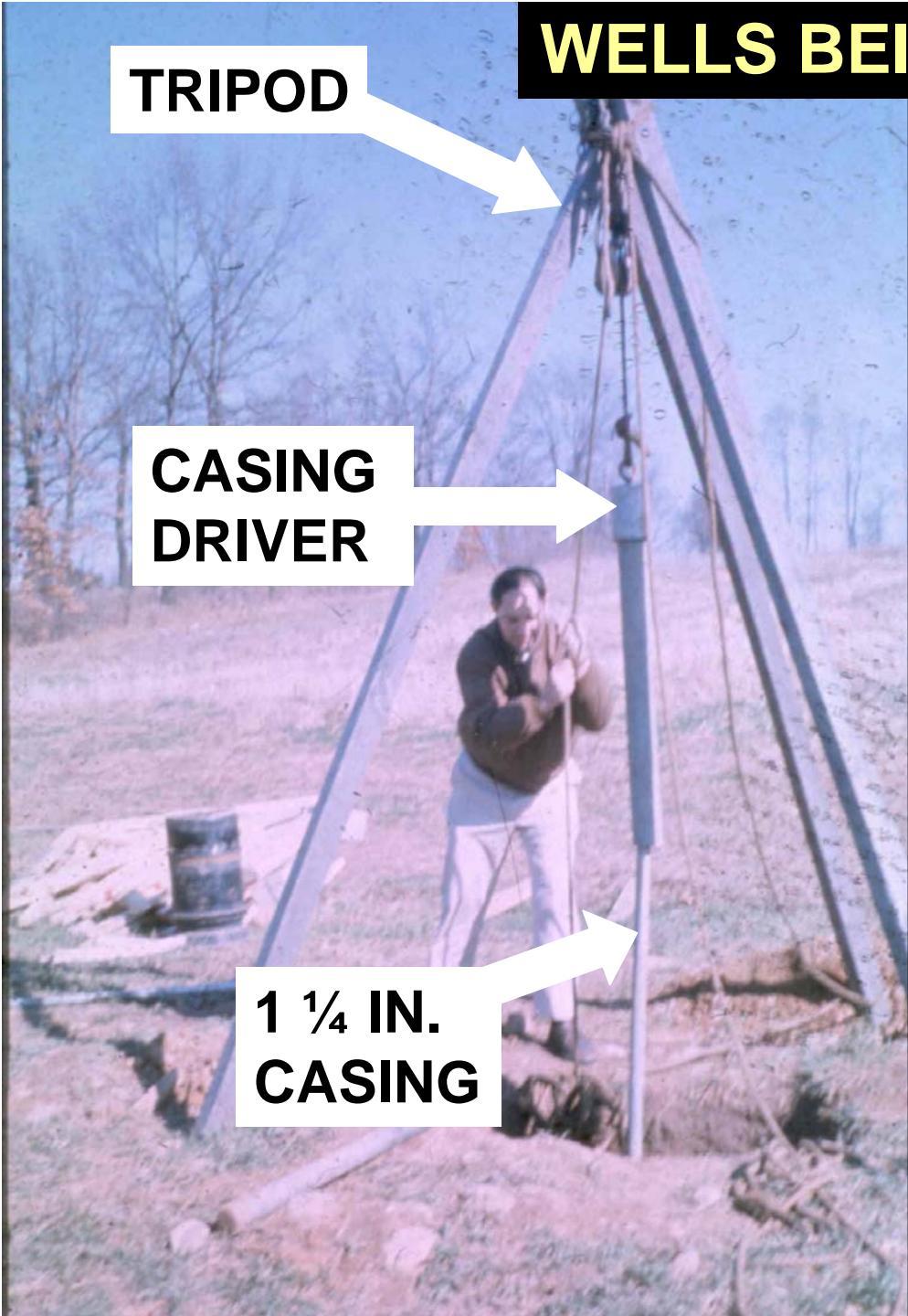
***MORE SUSCEPTIBLE TO SURFACE  
CONTAMINATION THAN DRILLED WELLS***

# WELLS BEING DRIVEN

TRIPOD

CASING DRIVER

1 1/4 IN. CASING



# IRRIGATION WELLS

- ✓ Construction must comply with Part 127
  - ✓ Permit is required in “most” counties
- ✓ Water well and pump record is required
  - ✓ Vary in size – 1 ¼” to 30”+







**2" IRRIGATION WELL  
PROPERLY CONSTRUCTED**

**10" IRRIGATION WELL  
NOT PROPERLY CONSTRUCTED**





**4" PVC IRRIGATION WELL  
NOT PROPERLY CONSTRUCTED**





**5" IRRIGATION WELL  
NOT PROPERLY LOCATED**

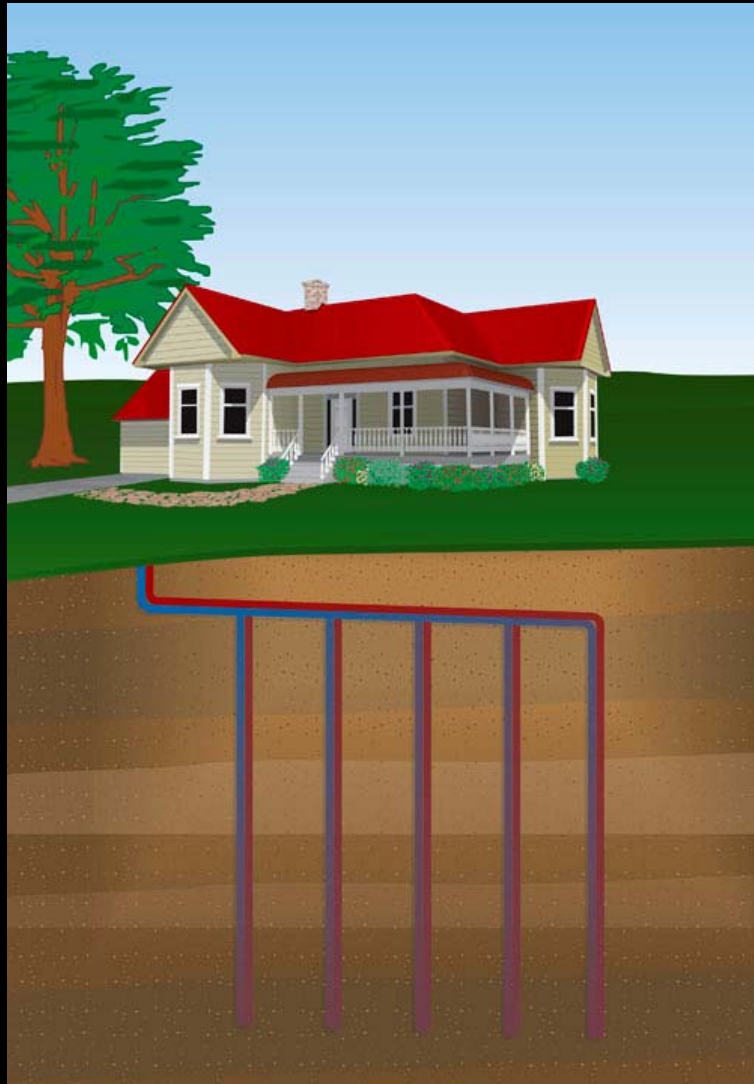




# Geothermal Vertical Closed-Loops



# Vertical Closed-Loop Field

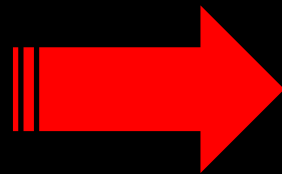


**Loops of polyethylene pipe installed in vertical boreholes**

**Number & depth of boreholes depends on heating/cooling load of building**

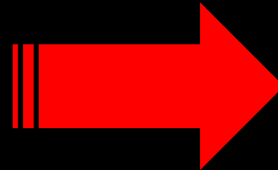
# **GEOHERMAL REGULATION**

***CLOSED LOOP  
GEOHERMAL  
SYSTEMS  
ARE NOT REGULATED  
BY THE  
STATE OF MICHIGAN***



**WATER WELL  
NOT INSTALLED**

***OPEN LOOP  
GEOHERMAL  
SYSTEMS  
ARE REGULATED BY  
THE  
STATE OF MICHIGAN***



**WATER WELL  
INSTALLED**

# ***Some county health departments require permits for closed-loops through locally-adopted ordinances***

## **Examples (Not inclusive listing):**

**DHD No. 2 (Alcona, Ogemaw, Iosco, Oscoda)**

**DHD No. 4 (Alpena, Cheboygan, Montmorency  
Presque Isle)**

**DHD No. 10 (Crawford, Kalkaska, Lake, Manistee,  
Mason, Mecosta, Missaukee, Newaygo,  
Oceana, Wexford)**

**Kent**

**Luce-Mackinac-Alger-Schoolcraft District HD**

**Marquette**

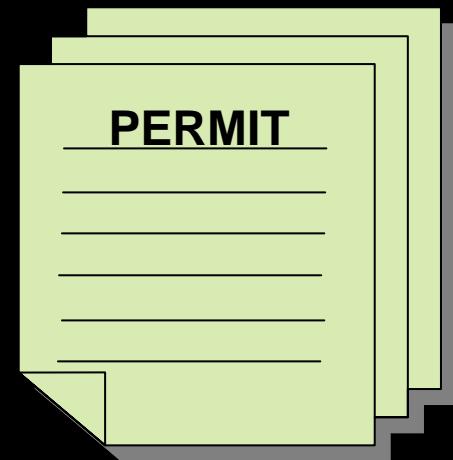
**Monroe**

**Oakland**

**Shiawassee**

**Washtenaw**

**Western Upper Peninsula DHD (Baraga, Gogebic, Houghton, Keweenaw,  
Ontonagon)**



# Best Practices for Installing Geothermal Vertical Closed-Loops



Available at:

[www.michigan.gov/deqwaterwellconstruction](http://www.michigan.gov/deqwaterwellconstruction)



# If you want more information:

- **Ground Source Heat Pump Residential and Light Commercial Design and Installation Guide,**  
2009, International Ground Source Heat Pump Association (IGSHPA), Oklahoma State University
- **Closed-Loop/Geothermal Heat Pump Systems, Design and Construction Standards,**  
2009, IGSHPA
- **Guidelines for the Construction of Vertical Boreholes for Closed Loop Heat Pump Systems,**  
Second Edition, 2009, National Ground Water Association



# DEQ's Well Construction Website

Manuals  
LHD Guide  
Contractor Directory  
Links to Water Well Records  
Fact Sheets  
Enforcement Actions  
Policies & Guidance



## Water

[Biosolids & Industrial Pretreatment](#)

[Campgrounds and Pools](#)

### Drinking Water

[Abandoned Water Wells](#)

[Community Water Supply](#)

[Contamination Investigation](#)

[Noncommunity Water Supply](#)

[Source Water Assessment](#)

[Water Wellhead Protection](#)

### Water Well Construction

[Great Lakes](#)

[Groundwater Conservation Advisory Council](#)

[Groundwater Discharge](#)

[Groundwater Modeling](#)

[Inland Lakes & Streams](#)

[On Site Wastewater](#)

[Operating Training & Certification](#)

[Part 5 Rules: Spillage of Oil/Polluting Materials](#)

[Revolving Fund Programs](#)

[Rule 97 Certifications](#)

[Surface Water](#)

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## Water Well Construction

### Michigan Well Construction Program

Our mission is to protect the health of Michigan's citizens who rely on water wells as their drinking water source through implementation of the Michigan Water Well Construction and Pump Installation Code (Part 127, Act 368, PA 1978 and Administrative Rules). Protection of public health, ground water resources, and aquifers is accomplished by assuring that water wells are constructed, operated, and decommissioned in a technically sound manner.



## Information

- [Presentations](#)
- [Manuals/Handbooks](#)
- [Guide to Local Health Department Personnel](#) [PDF](#)
- [Water Well Drilling and Pump Installation Contractor Registration](#)
- [Ground Water's Role in Michigan's Economic Vitality](#) [PDF](#)
- [Administrative Enforcement Actions](#) [PDF](#)
- [Private and Type III Water Supply Program Quarterly Report Form & Instructions](#) [DOC](#)
- [Directory of Operational Memos/Policies/Guidance](#)
- [Fact Sheets & Brochures](#)
- [Water Well Equipment Approval List](#) [PDF](#)
- [Printed Materials Order Form](#) [PDF](#)
- [Well Component Evaluation](#)
- [Well Construction Program Staff](#)
- [Educational Opportunities](#)
- [Well Complaint Investigation](#)

## Laws & Rules

- [Part 4 - Dewatering Wells Administrative Rules](#) [PDF](#)
- [Well Construction Code Administrative Rules](#) [PDF](#)
- [Public Health Code \(Excerpts\) Statute](#)

## Online Services

- [Non-Renewal Report for Well Drillers/Pump Installers](#) [PDF](#)
- [Groundwater Mapping Project](#)
- [Water Well Viewer](#)
- [Directory of Registered Contractors](#) [PDF](#)
- [Scanned Water Well Record Retrieval System](#)
- [Welllogic System](#)

***REMEMBER.....***



**ALWAYS DRINK  
UPSTREAM OF THE  
HERD**