

Thermal Standards:

Potential Changes to My Plant

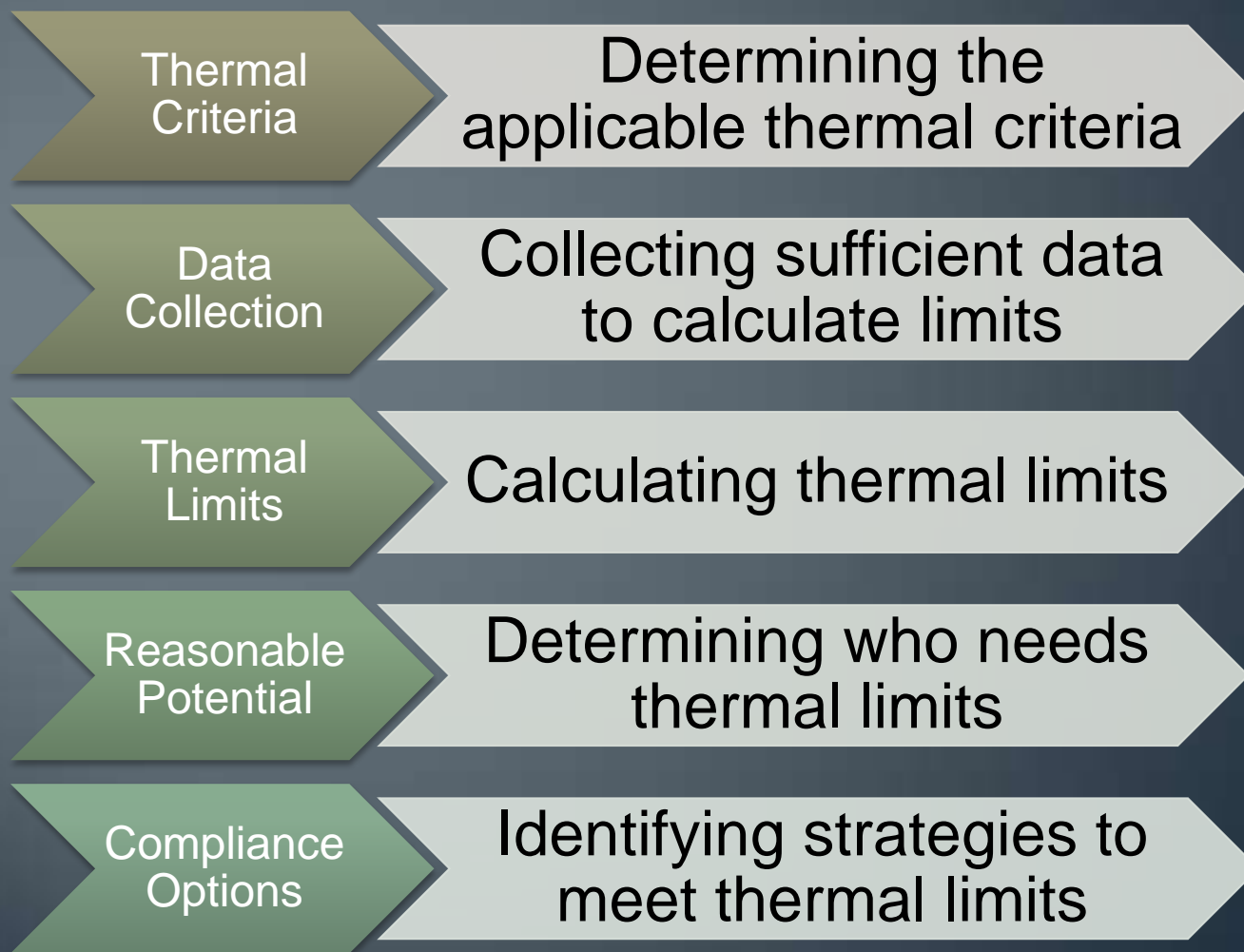
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Overview



Types of Standards (NR 102)

Fish and Aquatic Life Criteria

- Acute (lethality)
- Sub-lethal
 - Spawning
 - Juvenile growth
 - Gametogenesis
- Dependent on receiving water and species sensitivity

Public Health Criteria

- 120°F



Ambient Temperature (NR 102)

- Specific large rivers
- Northern and southern inland lakes
- Great Lakes waters
- Non-specific waters (default)



Who Needs to be Evaluated for Thermal Limits?

NR 106

- Any point source with a WPDES permit that adds heat or has a heat gradient compared to the receiving water
 - *Including Municipal POTWs*
 - *Receiving water must be a water of the State*
- Exclusion: Storm water discharges

Effluent Monitoring Requirement

- Daily maximum effluent temperature required
 - Highest record value during a 24-hour period
- Minimum effluent temperature requirements
 - Highly variable discharges
 - At least 1 operating day per week for 2 years
 - Low variability
 - At least 1 operating day per week for 1 years

How to Monitor

- Goal: Collect the maximum temperature that occurs in a 24-hour period
- Monitor during the active discharge period only during 24-hour period
- Monitoring requirements can be specified in permit or



Continuous Monitoring

- Record data every 15 minutes or less



Non-continuous Monitoring

- Record data at 6 evenly spaced intervals during day

Temperature Logger System

Setup logger with sampling frequency



Deploy logger in stream



Use coupler and base station to download data



Evaluation data using HOBOWare Pro Software



Redeploy logger



Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Cost of Data Logger System

- Data Logger
 - \$60-\$140 each
- Waterproof Shuttle
 - Communicate between computer and logger via USB
 - Download and reset logger in the field
 - \$230 each
- HOBOWare Pro Software
 - Required
 - Used for graphing and data analysis
 - \$90

Factors to Consider

| | | |
|--------------|---|-------------------|
| Battery Life | Replaceable Battery vs. Non-Replaceable | Temperature Range |
|--------------|---|-------------------|

Total Cost

\$378-\$452

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Minimum Data Requirements

- Effluent Temperature Data*
- Effluent flow (Q_e)
 - Annual design flow or daily flow
- Stream flow (Q_s) from USGS
 - $Q_s = \frac{1}{4}$ of the 7-Q10
 - Annual, Monthly or Seasonal 7-Q10
- Ambient Temperature
 - NR 102
 - Site-Specific



*If insufficient data, *limits subject to drop* may be included in permit

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Does My Discharge Need Thermal Limits?

- Preliminary $Q_s:Q_e$ ratio can also be found in Appendix D of the Guidance Document

| Flow Ratio and Limitations | | |
|----------------------------|--------------------------|---|
| Warm Water | Cold Water | Effluent Temperature Limitation |
| $Q_s:Q_e \geq 20:1$ | $Q_s:Q_e \geq 30:1$ | 120°F |
| $20:1 > Q_s:Q_e > 2:1$ | $30:1 > Q_s:Q_e > 2.5:1$ | 120°F or sub-lethal WQBEL, whichever is lower |
| $Q_s:Q_e \leq 2:1$ | $Q_s:Q_e \leq 2.5:1$ | Sub-lethal and acute WQBELs |

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Calculating the Limits...

- The Department will calculate thermal limits
- Calculation spreadsheet is also available online:
 - <http://dnr.wi.gov/org/water/wm/wqs/thermalrulesrevisions.htm>

Special cases that don't apply:

- LAL limit = 86°F daily max
- Effluent channel = 120°F daily max
- Wetland = case by case with 120°F cap

Determining the Need for a Limit

| Month | Water Quality Criteria | | | Receiving Water Flow Rate (Qs) | Effluent Flow | | Effluent Temperature | | Calculated Effluent Limits | |
|-------|------------------------|---------------------|----------------|--------------------------------|--------------------------|---------------------------|----------------------|-----------|----------------------------|-----------------|
| | Default Ambient Temp. | Sub-Lethal Criteria | Acute Criteria | | 7-day Rolling Ave (Qesl) | Daily Max Flow Rate (Qea) | Weekly Ave | Daily Max | Weekly Ave Limit | Daily Max Limit |
| | (°F) | (°F) | (°F) | (cfs) | (mgd) | (mgd) | (°F) | (°F) | (°F) | (°F) |
| JAN | 32 | 49 | 75 | 1525.00 | 274.20 | 274.20 | 63 | 67 | 93 | 120 |
| FEB | 33 | 50 | 76 | 1525.00 | 274.20 | 274.20 | 62 | 66 | 94 | 120 |
| MAR | 36 | 52 | 76 | 1525.00 | 274.20 | 274.20 | 69 | 71 | 94 | 120 |
| APR | 47 | 55 | 79 | 1525.00 | 322.60 | 322.60 | 68 | 72 | 71 | 120 |
| MAY | 60 | 65 | 82 | 1525.00 | 322.60 | 322.60 | 81 | 84 | 75 | 120 |
| JUN | 72 | 75 | 85 | 1525.00 | 322.60 | 322.60 | 89 | 92 | 81 | 112 |
| JUL | 76 | 80 | 86 | 1525.00 | 322.60 | 322.60 | 91 | 94 | 88 | 107 |
| AUG | 76 | 79 | 86 | 1525.00 | 322.60 | 322.60 | 92 | 94 | 85 | 107 |
| SEP | 67 | 73 | 84 | 1525.00 | 322.60 | 322.60 | 83 | 90 | 85 | 119 |
| OCT | 54 | 61 | 81 | 1525.00 | 322.60 | 322.60 | 73 | 75 | 75 | 120 |
| NOV | 40 | 50 | 77 | 1525.00 | 322.60 | 322.60 | 63 | 65 | 71 | 120 |
| DEC | 33 | 49 | 76 | 1525.00 | 297.24 | 322.60 | 51 | 58 | 86 | 120 |

Thermal Criteria

Data Collection

Thermal Limits

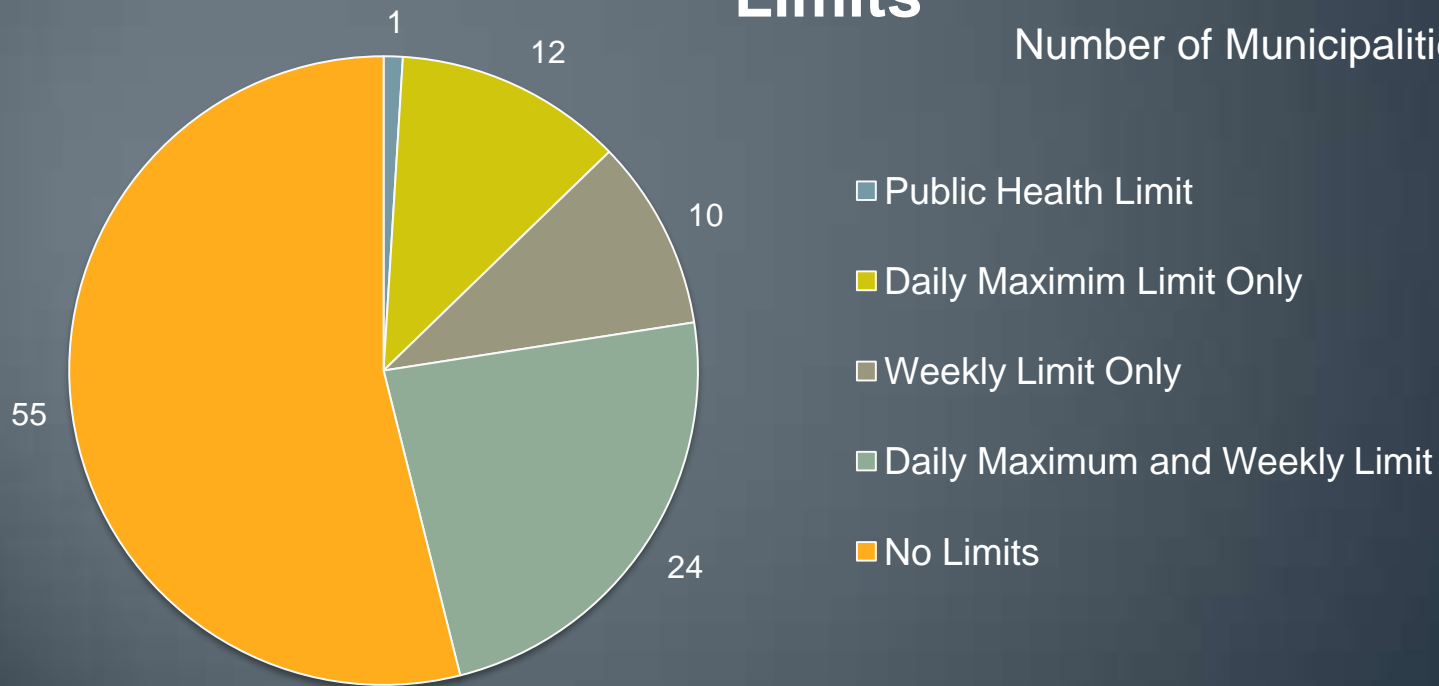
Reasonable Potential

Compliance Options

Who is Getting Limits So Far?

Number of Municipalities with Thermal Limits

Number of Municipalities=102



Last Updated: February 9, 2012

Thermal Criteria

Data Collection

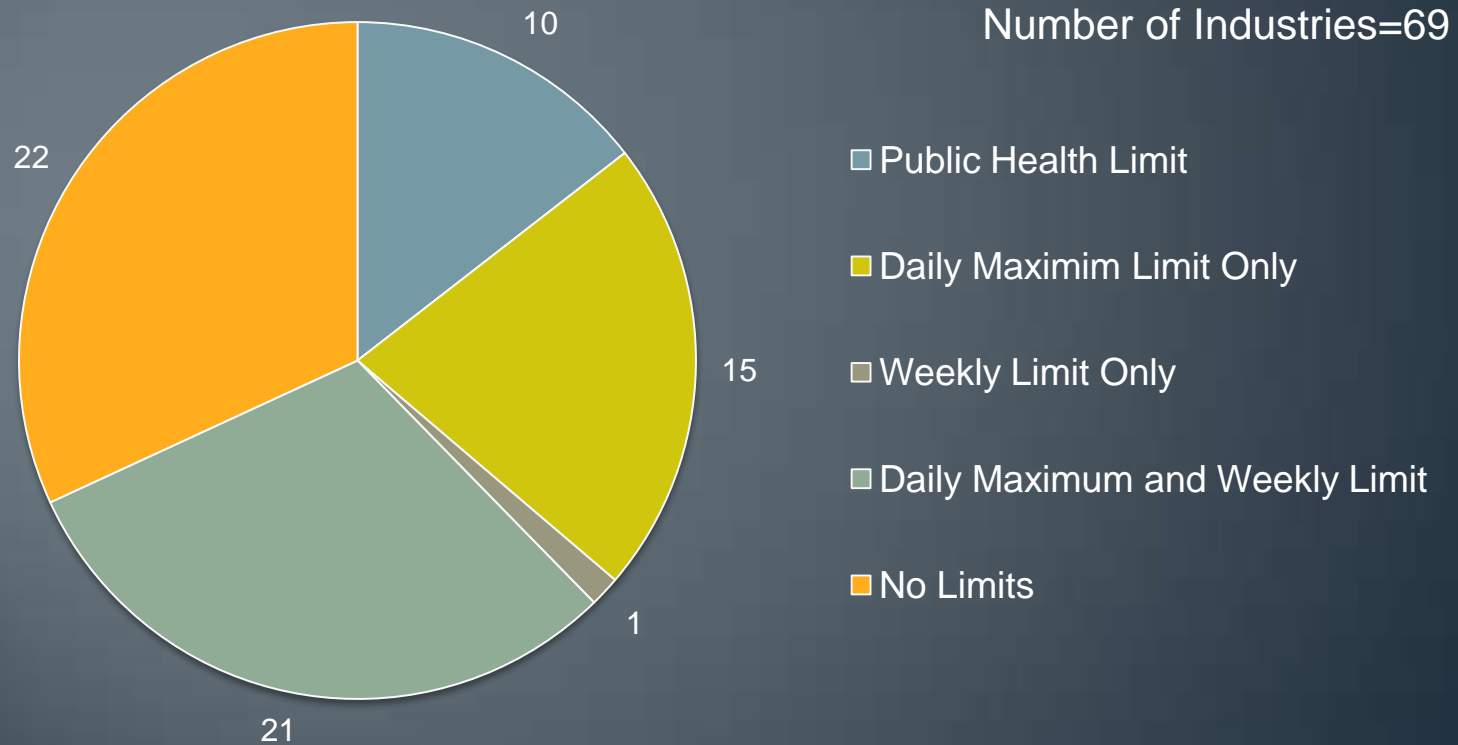
Thermal Limits

Reasonable Potential

Compliance Options

Who is Getting Limits So Far?

Number of Industries with Thermal Limits



Last Updated: February 9, 2012

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Rule Flexibility

- Limit Expression
 - Site-specific ambient temperature values
 - Annual, seasonal, or monthly limits
 - Alternative effluent limits
- Mixing Zones
 - Alternative mixing zones
 - Limits derived from water quality models
- Criteria
 - Site-specific water quality criteria
- Others
 - Dissipative cooling (*for POTWs only*)
 - Compliance schedules
 - Variances

Orange= Federal approval required



Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Dissipative Cooling

What is it?

Cooling effects associated with heat loss to the ambient water, the atmosphere and the surrounding environment (NR 106.59)

Who is it for?

Municipalities only

When to consider it?

When you have weekly limits

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

When can cooling occur?



Ambient flow conditions



High exit velocity



Structures



Loss of heat to atmosphere

Thermal Criteria

Data Collection

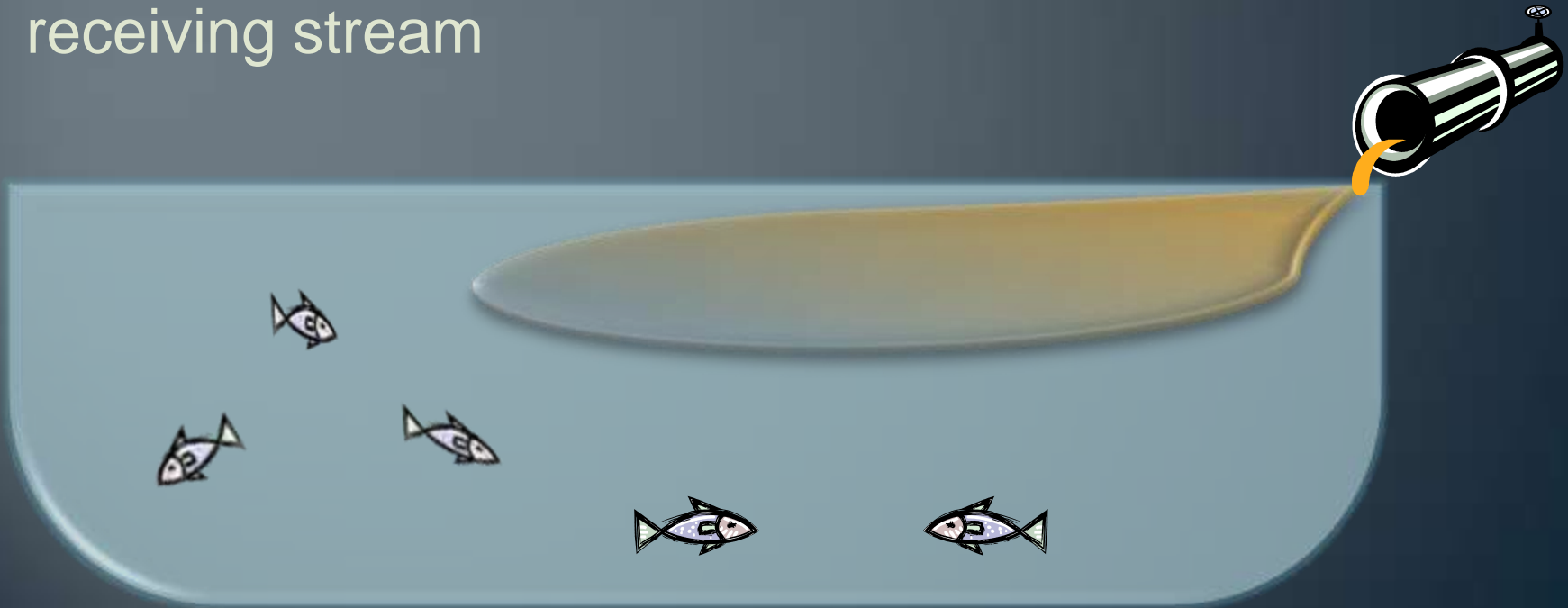
Thermal Limits

Reasonable Potential

Compliance Options

Other things to look for

- Zone(s) of free passage
- Zone does not extend more than 25% of the cross-sectional area or more than 50% of the width of the receiving stream



Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

Other things to look for

- Biota
 - Endangered/threatened species absent
 - Difference in biotic communities in and outside of discharge
 - No impediment of migration
- Multiple discharges present
- Others?



Process to apply

Collect data

Tip:

- If feasible, collect data for month(s) where weekly limits likely- fall, winter
- A picture can be worth 1000 words

Tip:

- Submit all relevant data to the Department
- If no data, submit DC request anyway. Department may re-evaluate DC request once sufficient data collected

Submit DC request form with permit application

DC decision is included in public notice

- Weekly limits not required
- Weekly limits required
- Insufficient data

Thermal Criteria

Data Collection

Thermal Limits

Reasonable Potential

Compliance Options

What is required to be submitted?

- All required items built into DC Request Form
- Required
 - Written description of physical characteristics
 - Written description of other thermal loads
- Required if available
 - Effluent temperature data
 - Biological quality data
 - Presence of threatened/endangered species
 - Receiving water temperature
 - Other
- All pertinent data should be included in submittal whether affirmative or negative

Thermal Criteria

Data Collection

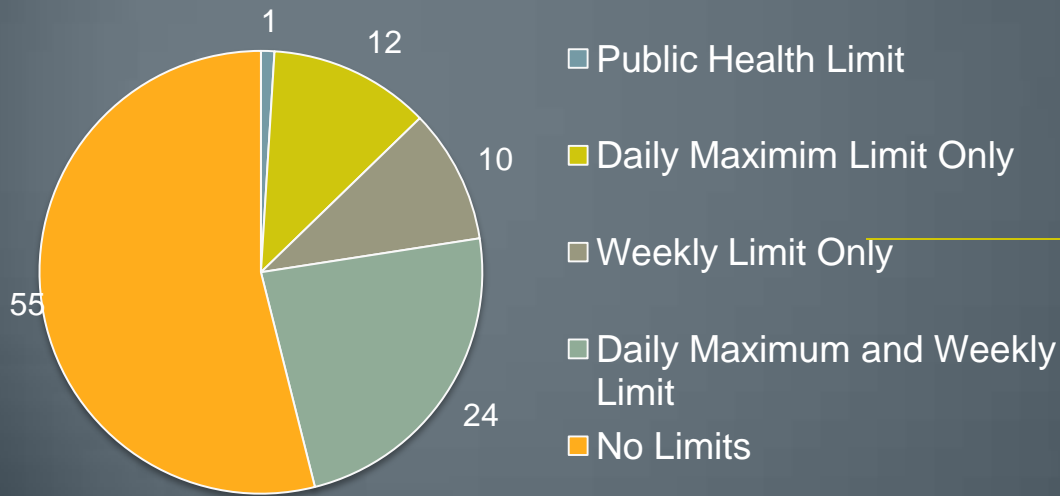
Thermal Limits

Reasonable Potential

Compliance Options

Who has applied so far?

Number of Municipalities with Thermal Limits



34 facilities eligible for DC



Number of DC Request Forms Submitted= 3

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Thermal Criteria

Data Collection

Thermal Limits

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Compliance Options

Additional Resources

<http://dnr.wi.gov/org/water/wm/wqs/thermalrulesrevisions.htm>

- Thermal Guidance Document
- Thermal Limit Calculator Spreadsheet
- Frequently Asked Questions
- Administrative Codes





Questions?

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