

Step 4: Identify Candidate High TTHM Sites

It is not the intent of IDSE monitoring to identify sites with maximum daily or hourly TTHM concentrations. Instead, you should choose candidate sites to represent areas of the distribution system where you expect to find the highest TTHM levels throughout the year.

In general, **higher water temperatures** and **increased water age** lead to higher TTHM concentrations in distribution systems. The following guidelines can be used to select high TTHM sites.

Use your distribution system map

- If your system has booster disinfection, you should locate candidate high TTHM sites after booster disinfection has been applied (additional disinfectant may have increased DBP formation).
- If your system has storage tanks or reservoirs, you should locate candidate high TTHM sites hydraulically downstream of those tanks or reservoirs.
- You should locate candidate sites near dead ends, particularly those that are on smaller lines, far from major transmission lines. Sparsely populated residential areas can be good candidate sites for high TTHM. However, be sure to locate the candidate sites before or at the last group of customers on a dead end line. Samples taken at the very end of a dead end line are not representative of the water received by customers.



Locate candidate high TTHM and HAA5 sites downstream of tanks

Use residual disinfectant data

- You should locate high TTHM sites in areas with low disinfectant residual, or with residual concentrations that are significantly less than average. (See Step 3 of this section for how to calculate the system average disinfectant residual.) The low residual may indicate a long residence time. Be careful when interpreting disinfectant residual data because there are other conditions other than water age that can result in low residuals in the distribution system (see Exhibit 5.5).

Use additional water quality data and/or advanced tools

- Hydraulic models and tracer studies can be very useful in selecting candidate high TTHM sites. If one or more of these tools are available to your system, refer to Chapter 7 of the *IDSE Guidance Manual*

Step 5: Identify Candidate High HAA5 Standard Monitoring Sites

As with high TTHM standard monitoring sites, it is not the intent of IDSE monitoring to identify sites with maximum daily or hourly HAA5 concentrations. Instead, you should choose high HAA5 standard monitoring sites to represent areas of the distribution system where you expect to find the highest HAA5 levels throughout the year.

Higher temperatures and increased residence time can lead to higher HAA5 concentrations. However, microorganisms can consume HAA5, causing levels to decrease. This is known as *biodegradation*. Biodegradation is more likely to occur when disinfectant residual levels are low or non-existent, particularly in warmer months. Therefore, a high HAA5 site will not necessarily be the site with the longest residence time. You can use the following guidelines to select high HAA5 sites.

Review historical HAA5 data

One way to determine if HAA5 biodegrades in your system is to examine Stage 1 DBPR monitoring or other HAA5 data. You should evaluate the data over time at different locations in the distribution system to look for trends. Consider evaluating your data to answer the following questions:

Are the highest HAA5 levels typically in the summer months (if you monitor more than once per year)?

- Are your HAA5 levels at your Stage 1 DBPR maximum residence time site higher than at your treatment plant (if you monitor at the treatment plant)?
- Do the highest HAA5 generally occur at the same time of year and locations as high TTHM values?

If you answered “**yes**” to all of these questions, it is unlikely that you are experiencing biodegradation of HAA5. If you answered “**no**” to any of these questions, HAA5 compounds may be degrading in your system due to biological activity. It is important that you also evaluate disinfectant residual data to determine the potential for biodegradation in your distribution system.

You should **not** select high HAA5 sites in locations that regularly or in the summer months have free chlorine residuals less than 0.2 mg/L or with chloramine residuals less than 0.5 mg/L.

*If you **don't** believe that HAA5 biodegrades in your system*

High HAA5 sites will be similar to high TTHM sites. You should use the principles in Step 4 to select high HAA5 sites. Remember, high HAA5 sites **must be different** from high TTHM sites for standard monitoring.

*If you **do** believe that HAA5 biodegrades in your system*

You should consider locating HAA5 sites in areas with lower water age in the center regions of your system where you maintain high disinfectant residuals.

Step 6: Plot Sites on a Distribution System Map

A key step in selecting standard monitoring sites from candidate sites is plotting all candidate sites on a map of your distribution system. If you have not already done so, locate all Stage 1 DBPR compliance monitoring locations, near entry point sites, and candidate average residence time, high TTHM, and high HAA5 sites on your water distribution map. Consider color coding the sites by the site type.

As noted in Step 1, your map should also contain the system attributes that will be useful in identifying representative standard monitoring sites, such as:

- Layout of pipes
- Storage facilities
- Pumping stations
- Booster disinfection stations
- Pressure zone boundaries

If possible, your map should also include the location of large water users, areas of significant development, and areas with relatively few customers.

Step 7: Select Standard Monitoring Sites from Candidate Sites

You should now have identified more candidate average residence time, high TTHM, and high HAA5 sites than are required for standard monitoring. Your next step is to narrow down your candidate sites to select standard monitoring sites. This section addresses this question by providing general guidelines for (1) evaluating sites and determining if they meet expectations, and (2) narrowing down the candidate sites to standard monitoring sites. Remember that you must write a justification for each standard monitoring site and a summary of data considered (see Step 8), to be included in your IDSE standard monitoring plan. You may want to consider how you will write your justifications as you examine your candidate sites.

IMPORTANT: You should always **visually confirm** that standard monitoring sites, in combination with existing Stage 1 DBPR monitoring sites, provide geographic coverage of the distribution system. You should confirm that you are not missing key areas that may not have been sampled in the past.

Evaluate Sites. Do They Meet Expectations?

- Are candidate high TTHM sites located in the extremities of the distribution system?